



The Treatment of Epilepsy





The Treatment of Epilepsy

A HOLISTIC APPROACH

Based on the Edgar Cayce Health Methods

David McMillin, MA



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DISCLAIMER: This book is directed primarily to healthcare professionals who are interested in alternative perspectives on the causes and treatment of epilepsy. This book should not be regarded as a guide to self-diagnosis or self-treatment. The cooperation of a qualified healthcare professional is essential if one wishes to apply the principles and techniques discussed in this book.

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Introduction

This manuscript is an attempt at integration of diverse information on the condition called *epilepsy*. On the one hand there is an extensive and complex body of data of a scientific nature (primarily clinical and experimental research). There is also information from an entirely different type of source, namely the psychic readings of Edgar Cayce.

Cayce (1877–1945) was a prominent figure in the development of the holistic medicine movement in America. The association of “holism” with Cayce has become widely recognized, culminating in this reference from an editorial in the *Journal of the American Medical Association*:

The roots of present-day holism probably go back 100 years to the birth of Edgar Cayce in Hopkinsville, Ky. By the time

he died in 1944 [sic], Cayce was well recognized as a mystic who entered sleep trances and dictated a philosophy of life and healing called “readings.” His base was established at Virginia Beach, Va., now the headquarters of the Cayce Foundation. Closely associated with that foundation is the Association for Research and Enlightenment, Inc. [A.R.E.], which also runs a medical clinic under physician direction in Arizona. (Callan, 1979, p. 1156)

Interestingly, most of the Cayce material is of a medical nature (so-called “physical readings”) that provides detailed anatomical, physiological, and pathological descriptions of the etiology and pathophysiology of numerous diseases including epilepsy—in its varied forms and manifestations. Thus, with regard to integration, an important emphasis is biological: the correlation of the scientific medical literature with the health information provided by Cayce.

To this end, organization of the text has three parts:

Part 1 is a purely scientific, medical literature review of subcortical and peripheral involvement in epilepsy. There is no mention of Edgar Cayce or his readings. This is a stand-alone section that covers some of major aspects of the Cayce approach to epilepsy, insofar as it has correlations with the medical literature. An earlier work (*The Treatment of Schizophrenia: A Holistic Approach*, McMillin, 1991a) used a similar approach wherein a master’s thesis (*Autonomic Nervous System Involvement in Schizophrenia*) became the first chapter of the book. Fundamentally, the health information in the Cayce readings correlates quite well with the medical literature (historical and current) in certain respects, particularly with regard to the subcortical and peripheral aspects explored in the medical literature review.

Part 2 covers the relevant content from the Cayce readings presented as a conceptual overview followed by numerous case studies containing representative information from the readings. A brief discussion of research into the Cayce hypothesis is provided.

Part 3 provides supplemental resources that address some of the important aspects of the Cayce approach that do not directly correlate with modern medicine. These appendices are essentially essays that explain

concepts in the readings (again primarily biological, but also historical) that are not part of the current epilepsy literature. There is also some information of a more metaphysical nature pertaining to the mental and spiritual aspects of the Cayce holistic approach that is relevant to epilepsy.

In seeking to create this integration of diverse information on epilepsy, one of the primary challenges is to reconcile the role of peripheral and subcortical systems with that of the cerebral cortex. The current medical model has become focused almost entirely on one area of the brain (the cerebral cortex). Thus there is a risk of becoming myopic—that is, nearsighted, shortsighted, unimaginative, narrow minded, etc. (American Heritage Dictionary, 2011)

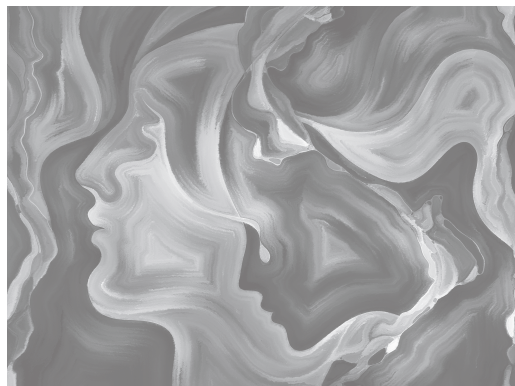
. . . the corticocentric view of brain organization is myopic because it does not let us see that the ‘higher’ functions of the brain are made possible by a reciprocal interconnection between cortical and subcortical structures rather than being localized only in the upper tip of the vertical neuroaxis. (Parvizi, 2009, p. 354)

The Cayce approach to epilepsy emphasizes not only subcortical areas of the brain, but peripheral systems in the body as well. Therefore, in order to integrate these models, common ground must be found. That is the purpose of the literature review in Part 1—to build a bridge from which to consider the Cayce material with an open mind, even if that mind is totally unsympathetic to the source of the information. From a scientific perspective, the information should be approached on its own merit—as an hypothesis.

This text is not meant to portray the mainstream model as necessarily wrong. Rather the current medical approach is incomplete (as any open-minded scientist would readily admit). As to what is allowed to be considered as valid inquiry into the missing pieces of the epilepsy puzzle is the primary problem addressed in this work.

With the awareness that in many cases of epilepsy the cause is unknown and treatment is not always effective, medical science is persistently seeking to diminish the realm of unknown causation with biological explanations that lead to more effective treatment. Expansion in knowledge and clinical efficacy can be furthered by an open-mind-

ed attitude with regard to subcortical and peripheral involvement in epilepsy. Interestingly, such an expansive view also invites a broader consideration of the human experience, including the spiritual and mental dimensions. This integrative effort is simply an application of the scientific model with goals and objectives that are already a priority in epilepsy research and clinical practice.



Part One

Subcortical and Peripheral Involvement in Epilepsy

A Literature Review

1.1 Overview

Epilepsy is a relatively common, chronic neurological disease, affecting approximately 0.5%–2% of the world's population, resulting in substantial morbidity and mortality (Banerjee et al, 2009). Medical treatment of epilepsy has progressed significantly during the last century, and yet about 30% of patients continue to have seizures or experience unacceptable pharmacologic side effects (Boon et al, 2001).

Despite advances in the treatment of epilepsy, the ways in which seizures start, spread, and terminate have not been fully elucidated. And it is not clear whether these mechanisms and processes are the same as those involved in the development of the disorder. Thus the successes achieved in the medical treatment of epilepsy have been based more on

empiricism (practical application) than knowledge of pathophysiology of the disorder (Gross, 1992). Clearly there is still much work to be done.

In this regard, one of the primary challenges facing modern medicine is integration. The field is broad and complex, and yet the current medical model has become focused almost entirely on one area of the brain, the cerebral cortex:

The main problem with corticocentrism is the lack of appreciation of the reciprocal connectivity between cortical and subcortical structures. The problem is to see the relationship between cortical and subcortical structures in a one-way linear manner, and almost always in a top-down and hierarchical manner: from the cerebral cortex to the subcortex. In reality, the actual pattern of connectivity between a given cortical region and subcortical structures is far more reciprocal. (Parvizi, 2009, p. 357)

Thus, with regard to the neurology of epilepsy and the problem of corticocentric myopia, it is essential to recognize and honor the bidirectional nature of neurological function (both afferent and efferent). Instead of automatically trying to understand and explain every piece of data from a corticocentric mindset focusing exclusively on top-down efferent impulses from the cerebral cortex, one can simply take the same data and ask the question—what might this information reveal about afferent (i.e., subcortical and peripheral) involvement?

Historically, corticocentrism has not been a problem. The historical literature review of epilepsy that follows clearly illustrates this point, particularly during large portions of the nineteenth century when peripheral and subcortical systems were emphasized. That is not to say that we should revert entirely to that perspective. Rather, the emphasis is on integration—how that information can be of benefit in our current understanding of the causes and treatment of epilepsy.

Epilepsy is a heterogeneous condition with multiple etiologies including genetics, infection, trauma, vascular, neoplasms, and toxic exposures. (Macquire & Salpekar, 2012, p. 352)

In this literature review we will certainly cover multiple etiologies with a few added to the above list. After an historical overview, three primary categories of subcortical and peripheral factors in epilepsy are examined—sensory, autonomic, and hormonal—all of which are primarily subcortical and peripheral in terms of anatomy and physiology. These three areas of biological activity are analyzed because they may reveal important clues as to the causes and effective treatment of certain forms of epilepsy, which to this point have proven elusive. The general review also includes some treatment implications based on an integrated approach.

With all of this in mind, here are some key points to keep in mind as you read this literature review:

1. Epilepsy is a diverse collection of syndromes with varied causes and etiologies.
2. In many cases of epilepsy the cause is unknown.
3. Although the current model of epilepsy is almost exclusively corticocentric (with regard to etiology, pathophysiology, and treatment), perhaps there are yet unrecognized (or even ignored) subcortical and peripheral dysfunctions that can cause or contribute significantly to some of the currently recognized forms of epilepsy due to the bi-directional nature of neurological interactions.
4. Open-minded exploration and integration of subcortical and peripheral aspects of epilepsy may be helpful in understanding medical conditions that overlap with epilepsy, especially what the nature of such comorbid relationships may reveal about epilepsy itself.

1.2 Historical Perspectives (From Galen to Gowers)

The following historical overview is selective in focusing on subcortical and peripheral aspects of epilepsy theory leading up to the modern era. The essential point is that historically, theories about the etiology and pathophysiology of epilepsy have (on the whole) included subcortical and peripheral aspects.

1.2.1 Galen's Triune Model

Although other writers of antiquity expounded on epilepsy, for the purposes of this review the major contributor was Galen (circa 130–210 AD) who “has proved probably the most influential figure of all in the

long history of medicine" (Eadie & Bladin, 2001, p. 24). Galen differed from his predecessors by establishing two broad categories of epilepsy (idiopathic and sympathetic) with three distinct types:

To present day thinking, the first of Galen's three types of epilepsy, the cerebral or idiopathic one, would have comprised convulsive seizures, which might be manifestations of partial or of generalized epilepsy, whilst the other two types would be simple partial seizures which became secondarily generalized, whether or not they went through a complex partial seizure stage. Galen subdivided the latter two (sympathetic) types of epilepsy on the basis of whether or not the initial seizure manifestations appeared to be experienced in the region of the stomach, or elsewhere. (Eadie & Bladin, 2001, p. 25)

The "elsewhere" mentioned here could vary, but primarily focused on the "cardia":

This theory then was to account for epilepsy as an idiopathic disease of the brain. The affliction began in early childhood, and most epileptics belonged to this group. But in a limited number of cases the original lesion was located somewhere else, and the epileptic attacks were the result of a "sympathetic" affliction of the brain. Galen tried to explain such sympathetic involvement, of which he distinguished two possibilities, on quite natural grounds. The first possibility, which he studied in the case of the grammarian, Diodorus consisted of a primary impairment of the cardia. In persons with an abundance of bile and weakness of the stomach, ichors might accumulate and give rise to exhalations which affected the brain and might cause epilepsy. (Temkin, 1971, p. 63)

Thus Galen's triune model of epilepsy consisted of these:

- epilepsy originating within the brain itself (idiopathic), or from the
- stomach (sympathetic), or
- cardia (sympathetic).

Interestingly, for Galen, *cardia* inferred more than just the cardiovascular function of the heart:

The modern term cardia is derived from the classical Homeric Greek word kardia, the heart. (Siegel, 1968, p. 344)

Following the traditional teaching, Galen attributed to the heart a two-fold function. He thought that it was the focus of respiration where blood is contained during its invisible utilization by the heat derived from the inhaled air; he also believed that it expels the arterial blood with its content of air and heat toward the rest of the body. (Siegel, 1968, p. 30)

Actually, even in terms of our modern understanding of epileptic physiology, Galen's dual meaning of *cardia* makes perfect sense. Both respiratory and cardiovascular functioning are regulated by the autonomic nervous system, and both systems can be involved in the pathophysiology of epilepsy (Jansen et al., 2013). Cardiovascular involvement in epileptic seizures is most obvious with regard to tachycardia and bradycardia (speeding up or slowing down) in heart rate that has been extensively documented in various forms of epilepsy (Moseley et al., 2012).

Galen's model dominated the medical approach to epilepsy through the Renaissance, where the basic model still survived but was simplified and narrowed down somewhat. Instead of Galenic humors as the means by which seizures were manifest, the peripheral irritation that was the source of the seizures in the "sympathetic" form of the disorder was conceptualized as an "ascending vapor" (Temkin, 1971, p. 202).

This acknowledgment of the importance of the irritation theory

of epilepsy (by whatever name one might wish to call it) from Galen through the Renaissance is sufficient for the purposes of this selective review. We will now skip to the nineteenth century where scientific research began to be systematically applied yielding results that are relevant to a modern discussion of subcortical and peripheral factors in the etiology and pathophysiology of epilepsy.

1.2.2 The Nineteenth Century

By the early nineteenth century, beliefs in demonic possession had largely been replaced by a scientific approach that viewed epilepsy as a physical illness of the brain (although peripheral irritation could be an important factor in epileptogenesis).

No even reasonably satisfactory hypotheses about epileptogenesis were available till Marshall Hall (1790-1857), from 1836 onward, popularized the concept of reflex action which had earlier been described by Robert Whytt (1714-1776) under the name 'sympathy'. Marshall Hall interpreted epilepsy as due to abnormal irritability in the afferent limb or central section of what later came to be called the reflex arc, loss of consciousness in the seizures being the result of secondary cerebral venous congestion. This concept of epileptogenesis was refined by Brown-Séquard, who in 1858 ascribed a more important role to overt or occult peripheral afferent nerve irritability, considered that the central element of the relevant reflex mechanism involved the medulla oblongata, and believed that reflex cerebral vasospasm, rather than cerebral venous congestion, caused loss of consciousness in the seizures. Almost contemporaneously, Schroeder van der Kolk placed considerably greater emphasis on the medullary element in causing the increased excitability of the reflex arc that produced epileptic seizures. (Eadie, 1992, p. 26)

During the latter decades of the century and leading into the twentieth century there was a shift to a more corticocentric approach led by Jackson and Gowers, a trend that has continued and assumed a dominant position in modern thinking on the causes of epilepsy.

1.2.3 Hall's Centric and Eccentric Epilepsy

Marshall Hall (1790–1857) was an English physician, physiologist and early neurologist whose name is associated with the theory of reflex arc mediated by the spinal cord:

Marshall Hall recognized and described that the cerebrum was the source of voluntary motion, the medulla oblongata was the source of respiratory motion, and the spinal cord was the middle arc of reflex function. (Pierce, 1997, p. 228)

His ideas about epilepsy derive directly from his research into the anatomy and physiology of these reflex arcs, which connect the peripheral viscera with the brain via the spinal cord and medulla oblongata (as illustrated in the following table from one of his books):

1619. The *principal* features of this disease are represented in the following

TABLE OF EPILEPSY.

I. <i>The Excitors.</i>	II. <i>The Centre.</i>	III. <i>The Motors.</i>
1. <i>The Pneumogastric in the Stomach.</i>	<i>The Medulla Oblongata.</i>	1. <i>The Recurrent of the Pneumogastric, closing the Larynx.</i>
2. <i>The Spinal in</i>		2. <i>The Spinal, inducing</i>
1. <i>The Intestine.</i>		1. <i>Forcible Expirations.</i>
2. <i>The Uterus.</i>		2. <i>Convulsion.</i>
		3. <i>Eupulsion of the Urine, &c.</i>

This table (Hall, 1841, p. 324) provides an excellent visual representation of Hall's model of epilepsy. Note the peripheral "excitors" (gastro-intestinal, spinal and reproductive) which correlate nicely with Galen's model of sympathetic epilepsy. The "excitors" irritate the motor neurons in the brain via the pneumogastric (tenth cranial nerve—vagus) in its connections in the medulla oblongata. Some of the peripheral effects

of the brain seizure (e.g., changes in respiration) are considered to be mediated by the pneumogastric (which in modern medical thinking could constitute an autonomic effect).

Hall used the terms “centric” and “eccentric” to differentiate whether the origin of an epileptic seizure was central (i.e., “centric”—what we would now call the central nervous system, particularly the brain) or peripheral (i.e., “eccentric”—particularly the visceral organs). Thus he used his biological research to update the ancient Galenic conceptions of cerebral (idiopathic) and sympathetic (peripheral). In his own words:

III. Centric Convulsions, or Epilepsy.

1587. Any disease within the cranium or spine, whether effusion, tumor, exostosis, &c. may induce convulsions or epilepsy.

1588. Fright, or other sudden mental emotion, has induced convulsion, and this convulsion has been repeated, affording one of the most deplorable cases of epilepsy.

1589. I have already suggested, indeed, that all convulsive diseases are affections of the true spinal marrow. I refer my readers to the observations made § 188; etc.

1590. The cerebrum is obviously the seat of the mind: it is neither sentient itself, nor the originator of motions in itself.

1591. The true spinal marrow, on the contrary, is the term of certain excitements and the combiner of certain motions: the centre, in a word, of a peculiar series of excito-motory phenomena, physiological and pathological. Unlike the cerebrum, it induces, if stimulated, convulsive movements in the organs appropriated to ingestion and egestion, and in the limbs.

1592. Diseases within the cranium, by irritating excitor nerves, or the medulla oblongata, induce convulsions or epilepsy, too frequently, alas, of an incurable character.

1593. Disease within the spinal canal may prove the source of convulsion or epilepsy, still more immediately. This form of epilepsy is also, for the most part, incurable. (Hall, 1841, pp. 319-320)

Of “eccentric epilepsy” he wrote:

1611. The principal causes of eccentric epilepsy are: 1, the presence of indigestible food in the stomach; 2, the presence of morbid matters in the intestines; 3, uterine irritation. The first of these acts through the medium of the pneumogastric; the second and third through that of peculiar spinal nerves; all excitors belonging to the true spinal system.

1612. I have so repeatedly known a patient, subject to this form of epilepsy, experience an attack within a few hours after eating some indigestible article of food; or on experiencing a deranged condition of the bowels; or on every return of the catamenial period, as to leave no doubt upon my mind upon these important points. I have known the attacks prevented by a steady and cautious attention to rules in reference to these circumstances.

1613. In detailing the symptoms of epilepsy, I shall have to repeat all that I have said respecting the physiology of the true spinal system; every part, every function, which belongs to that system, is involved in the pathology of epilepsy, the functions of ingestion and of egestion are precisely those affected in this disease; the causes act through the excitor nerves, the symptoms are manifested through the motor nerves of that system.

1614. The first thing observed in the severe forms of this fearful malady is a varied distortion of the eye-ball, which is drawn from the axis of vision generally upwards, and outwards, or inwards, and of the features. The second symptom is a forcible closure of the larynx, and expiraton efforts, which suffuse the countenance, and, probably, congest the brain with venous blood. In all these circumstances there is a most marked and important difference between epilepsy and hysteria, on which I shall insist hereafter. (Hall, 1841, pp. 322-323)

The last portion of this excerpt contains the respiratory aspect of his

theory (“forcible closure of the larynx, and expiration efforts”), leading to congestion of the blood supply to the brain. Initially, Hall theorized that neck muscle contraction and resulting congestion of the brain blood supply was the cause of loss of consciousness during seizures. However, after criticism from his peers, he modified his theory, placing increased emphasis on laryngeal spasm (laryngismus) and tracheal spasm (trachelismus) as they occurred during the course of a seizure (Eadie & Bladin, 2001).

Hall’s emphasis on original biological research emphasizing reflexes from the spine, the medulla oblongata and vascular involvement in the development of epileptic seizures was influential to other researchers and clinicians of that era, particularly with regard to the work of Brown-Séquard and Schroeder van der Kolk (as reviewed below).

1.2.4 Todd and “True” Epilepsy

Robert Bentley Todd (1809–1860) was an Irish-born physician who is best known for describing Todd’s palsy, a form of postictal paralysis that bears his name. His work with epilepsy represents some of the best of the nineteenth century in that he defined epilepsy in a very clear (although somewhat limited) manner and then utilized laboratory experiments (with animals) to explore the regions of the brain that, when stimulated with electricity, could produce the specified symptoms.

His definition of epilepsy minimized peripheral influences (i.e., the Galenic sympathetic or reflex phenomena), focusing rather on the brain itself as the source of “true” epilepsy (which correlates closely with Galen’s idiopathic designation):

The leading and pathognomonic features of true epilepsy are these:—loss of consciousness and sensibility, most frequently accompanied by convulsions of the kind which I have described as epileptic, i.e. of movements which consist of alternate relaxations and contractions of muscles rapidly succeeding each other: these paroxysms occurring at intervals of variable length, with something of periodicity, the patient during the interval recovering himself completely. These phenomena are most frequently ushered in without any warning whatever, so that the patient is suddenly, and

on the instant, seized, rendered senseless, more or less violently convulsed, and then awakes more or less suddenly. In many instances all this is done in scarcely as much time as it takes to describe the phenomena; at other times the fit is of much longer duration. (Todd, 1855, p. 995)

Having thus defined epilepsy, he performed a series of laboratory experiments to determine where in the brain those phenomena are most likely to be elicited by electrical stimulation:

These experiments, which I repeated several times, and each time with like results, seem to denote that convulsions are modified according to the part of the cerebrospinal axis which is primarily excited: if it be the spinal cord, they are tetanic; if the medulla oblongata, they are tetanic likewise, other parts being involved; if the corpora quadrigemina and the mesocephale, they are epileptic; if the cerebral hemispheres, you scarcely have any convulsions, but slight twitchings of the muscles. (Todd, 1855, p. 1001)

Note that it was only the corpora quadrigemina and the mesocephale that produced the symptoms that he considered to be “true” epilepsy. Thus only the brain itself is essential (without any need for peripheral involvement in the production of epilepsy). However, based on his findings using Galvanic stimulation of the brainstem, he concluded that the mid-brain played a major role in the production of bilateral tonic-clonic seizures (Eadie & Bladin, 2001). With regard to the actual cause of *true epilepsy* in humans, Todd favored a vascular explanation in which the blood is anemic in some manner, failing to provide sufficient nutrition to the brain:

The terms centric and eccentric are so far useful as directing attention to the source of the depraved nutrition of the brain; but epilepsy is always the result of such depraved nutrition, and it is highly improbable that it can ever be looked upon as produced by reflex action—that is, by a peripheral irritation

propagated to a centre, and exciting great irritation there, involving spinal cord, and motor and sentient nerves. (Todd, 1855, p. 1007)

Reynolds (2004) credits Todd with being the United Kingdom's first outstanding neurologist and neuroscientist, deserving credit for laying the foundations of our modern understanding of epilepsy:

With his microscope, Todd perceived each nerve vesicle and its related fibres as a distinct entity 50 years ahead of the Nobel Prize-winning neuron doctrine of Golgi and Ramon y Cajal, but without their staining techniques and microtomes. Furthermore, he foresaw each nerve vesicle and the grey vesicular centres of the brain and spinal cord as the generators of nervous polarity transmitted by unknown "molecular" and "nutrient" mechanisms in the white nerve fibers in many directions throughout the rest of the nervous system. Comparing nervous function and polarity with those in a galvanic battery, he was the first to develop and confirm an electrical theory of brain function some 30 years ahead of Fritsch and Hitzig and Ferrier and Caton. Todd then applied these new electrical ideas to epilepsy, influenced also by Faraday's concepts of disruptive discharges. He was thus at least 20 years ahead of Jackson's concepts of sudden, excessive, rapid, and local discharges of grey matter. (Reynolds, 2004, p. 990)

1.2.5 Reynolds's "Epilepsy Proper"

John Russell Reynolds (1828–1896) was an eminent and highly influential British neurologist and physician and protégée of the great experimental physiologist, Marshall Hall, who discovered the reflex arc. (Eadie, 2007) It was Reynolds who was the first to identify and define "epilepsy proper" with idiopathic epilepsy (Reynolds, 1861).

Epilepsy should be regarded as an idiopathic disease, i. e. as a morbus per se, distinct from eccentric convulsions, from toxaemic spasms, from the convulsions attendant

upon organic lesion of the cerebro-spinal centre, and, in fact, from every other known and appreciable malady. The special organic condition upon which it depends may be induced in various ways, but it may occur primarily; and, in the vast majority of cases of epilepsy proper in the human subject, there is no evidence to show that the disease is other than idiopathic and primary. (Reynolds, 1861, p. 32)

Thus epilepsy proper should not concern itself with peripheral effects or processes (Galen's *sympathetic epilepsy* or symptomatic seizures associated with intestinal, reproductive, or spinal cord pathology). Rather "epilepsy proper" should be considered a disease of the brain in its own right:

As far as the seat of epilepsy, he [Reynolds] also supported the theory of the medulla oblongata and that the change was of a functional and not of an anatomical nature. Idiopathic epilepsy was, to him, a disease of unknown etiology. In general, he suggests that epilepsy has its own right as a disease, but its pathological basis is still not known. (Sid-iropoulou et al., 2010, p. 157)

Since Reynolds' perspective focuses primarily on classification, here is his model in a very clear outline form:

§ XII. The classification of convulsive diseases may be effected by regarding the various groups of remote causes. "We have then the following:—

- I. *Idiopathic convulsions; including,—epilepsy proper;*
"idiopathic epilepsy."
 Eclampsia puerorum; "idiopathic convulsions" of children.
- II. *Secondary, or eccentric, or sympathetic convulsions;—*
"Sympathetic epilepsy;" uterine, gastric, etc.

“Sympathetic convulsions” in children.

III. Diathetic, or cachectic convulsions; from,—

General nutrition-changes:

Healthy in kind, but morbid in degree; puberty, etc.

Morbid in kind and degree; tuberculosis, scrofulosis.

Toxaemiae, arising from,—

Retained excreta; urinaemic convulsions, “renal epilepsy.”

Metamorphosed plasma; pneumonic convulsions, rheumatic, etc.

Poison introduced from without; “syphilitic epilepsy,” lead, variola, etc.

IV. Symptomatic convulsions; from centric disease,—

“Symptomatic epilepsy,” from

Disease of meninges; tubercle, syphilis, traumatic, etc.

Disease of nervous centres; tumour, softening.

In this volume I propose treating only of **epilepsy proper**, viz., of that form of idiopathic convulsions to which I believe alone the name of epilepsy ought to be applied. (Reynolds, 1861, p. 27)

Another way to think of Reynolds’ epilepsy proper is to consider Hall’s model of epilepsy that postulated centric (of the brain) and eccentric (of the periphery) types. Reynolds removed eccentric types from the definition of epilepsy proper, regarding them simply as a form of “ . . . epileptiform convulsion . . . in my opinion, to be excluded from the category of epileptics . . . ” (Reynolds, 1861, p. 57)

Thus:

In his writings Reynolds was the first English author to apply the approach to classification of neurological disorders that is still often used, though now in modified form . . . and was arguably the originator of the influential concept that an idiopathic disease, epilepsy, existed, one to be distinguished from 'epileptiform' seizures due to brain pathology. (Eadie, 2007, p. 309)

In other words:

If epilepsy can exist without diathetic disease, without blood-poisoning, without violent eccentric irritation, and without organic lesion, then these conditions are not essential to the disease, and when they exist, cause symptoms which are over and above those **proper** to the epilepsy itself. Such conditions may co-exist with **epilepsy proper**, but much more rarely than is supposed, the cases in question being then more correctly denominated by another word; but when there is such co-existence, we ought to separate the one element from the other, and the first step in this process is to define as accurately as possible what is included in epilepsy itself. (Reynolds, 1861, p. 36)

1.2.6 Brown-Séquard's Spinal Epilepsy

Charles Edouard Brown-Séquard (1817–1894) *"was one of the nicest remarkable medical men of the Victorian age and is remembered particularly for his contributions to neurology (admirably) and to endocrinology (pejoratively)."* (Tattersall & Turner, 2000, p. 61) One of his remarkable contributions to neurology was the description of Brown-Séquard Syndrome, a disorder bearing his name, characterized by reduced or loss of motor function due to ipsilateral damage in the corticospinal tract, and decreased or loss of pain and temperature sensation in the contralateral extremity, with conservation of deep sensation (Kobayashi et al., 2003).

Brown-Séquard's fascination with spinal cord research led to the formulation of his "spinal epilepsy" theory, derived from experimentation on the spine of guinea-pigs:

I have found that a convulsive affection, very much resembling epilepsy, may be produced in animals. A few weeks after certain injuries to the spinal cord, in the dorsal or the lumbar region, especially in guinea-pigs, fits appear spontaneously several times a day, or, at least, once every two or three days. But the most interesting point is, that it is possible to produce a fit when we choose, by simply pinching a certain part of the skin. These fits consist in clonic convulsions of almost all the muscles of the head, the trunk, and the limbs, except those muscles which are paralyzed. The animal seems to have lost its consciousness, or, at least, its sensibility. (Brown-Séquard, 1860, p. 178)

Continuing with this basic research, Brown-Séquard eventually concluded:

Epilepsy seems to consist essentially in an increased reflex excitability of certain parts of the cerebro-spinal axis, and in a loss of the control that, in normal conditions, the will possesses over the reflex faculty. The base of the encephalon, and especially the medulla oblongata, is the most frequent seat of the increase in the reflex excitability, so that this part of the nervous centre is the ordinary seat of epilepsy . . . I have tried to show that the same cause that produces the first convulsions in some muscles of the neck, the eye, the larynx, and the face, produces also a contraction of the blood vessels of the brain proper, which contraction is necessarily followed by the loss of consciousness. (Brown-Séquard, 1860, p. 183)

Thus his approach to epilepsy was inspired by experimental observations made in the laboratory, and were not simply theoretical concepts:

In brief, he believed that external stimuli led to activation of the medulla . . . with resultant constriction of the cerebral

blood vessels leading to loss of consciousness . . . he attributed the onset of seizures to increased reflex excitability . . . he found a role for the vasomotor nerves, whose existence he had demonstrated so recently. In particular, he suggested that excitation of the spinal cord or brainstem (medulla) led to excitation of sympathetic vasomotor fibers passing to the blood vessels of the head, and this, in turn, caused facial pallor and an impairment of the blood supply to the cerebral hemispheres . . . An epileptic seizure seems to result from an imbalance between excitatory and inhibitory inputs in the brain, but the precise details and their application to different seizure types remain to be elucidated. Brown-Séquard was beginning to grope vaguely toward such a belief at the end of his long career, well ahead of many of his contemporaries . . . Others confirmed Brown-Séquard's findings about the occurrence of "epileptiform convulsions" with spinal lesions, including Vulpian, Victor Horsley (the noted British neurosurgeon, who also confirmed that consciousness was indeed lost during the attacks), and Graham Brown, a young physiologist who studied and worked with Sir Charles Sherrington. It seemed that "spinal epilepsy" or "Brown-Séquard's epilepsy" might serve as an experimental model of epilepsy in humans and provide some clue as to its basis. (Aminoff, 2011, pp. 185-190)

As noted, in addition to his emphasis on the spine, Brown-Séquard focused strongly on the medulla oblongata as the central nervous system site of epileptogenesis. The central role of the medulla oblongata in the development of epileptic seizures was an important theme running through the theories of many writers in the nineteenth century, including the studies of Schroeder van der Kolk.

1.2.7 Schroeder van der Kolk and the Medulla Oblongata

The Dutchman Jacobus Schroeder van der Kolk (1797-1862) became Professor of Anatomy and Physiology at the University of Utrecht in 1826, and it was there he introduced microscopic and experimental techniques in the study of histological anatomy (Haas, 1994).

With regard to his interest in epilepsy, his writings evolved from primitive Galenic ideas. He initiated investigations using morbid anatomy, publishing an important work *Anatomy of the Cord and Medulla* (as described by Pearce, 1998). His laboratory findings firmly located the site of epileptogenesis in the ganglion cells of the medulla oblongata:

The medulla oblongata is the principal centre, whence the more general reflex movements and convulsions derive their origin. I have for years been accustomed to seek in it the starting-point of epileptic attacks, and consider that to it the physician should direct his special attention. Even though the primary irritation may be remote, for example, in the intestines, a morbidly elevated sensibility and irritation in the medulla oblongata always form the foundation of such attacks, and render the organ in question more capable of, as it were, discharging itself in involuntary reflex movements. (Schroeder van der Kolk, 1859, p. 207)

The following expansive explanation of the role of the medulla oblongata is more explicit in recognizing the possible triggering effect of “a remote irritant” (with special emphasis on the spinal cord, intestines, and sexual organs) while laying out an important concept in an integrative approach to epilepsy—peripheral irritation transferred by reflex to the medulla oblongata.

The special seat and starting-point of these convulsive movements is situated in the ganglionic cells of the medulla oblongata, which, as reflex ganglia, possess the peculiar property, that when once brought into an excited condition, they may more or less suddenly discharge themselves and communicate their influence to different nervous filaments. After their discharge, a certain time is again required to bring them to their former degree of excitability, and to render them capable of fresh discharges, just as we see to be the case with electric batteries, or in the phenomena of an electrical fish. Hence, a slight attack of epilepsy, whereby these cells are not completely discharged, is usually fol-

lowed more quickly by a second attack, while a longer free interval generally succeeds to a severe fit . . . The exalted irritability and capacity for convulsive movements in the medulla oblongata is commonly excited by a remote irritant, whether this proceed from the brain, from one of the nerves of the spinal cord, from the influence of the sympathetic on the spinal cord, from the intestines, or the sexual organs. To the influence of such a remote irritant, epilepsy is very frequently due. (Schroeder van der Kolk, 1859, pp. 283-284)

As has been noted in many of the theories of epilepsy in this brief review of the nineteenth century, in addition to emphasizing the medulla oblongata, a vascular/vasomotor aspect is asserted.

Schiff found that, after cutting through the medulla oblongata on one side on a level with the point of the calamus scriptorius, an increase of heat took place in the head and ears on the side operated on, whence it would appear, that the medulla oblongata must exercise a strong influence on the vascular nerves of the head. In like manner the experiments of Callenfels have shown, that irritation of one sympathetic may produce constriction of the arteries of the pia mater of the cerebrum, which is rapidly followed by considerable dilatation. It thus seems to be scarcely doubtful, that the excited action of the ganglionic cells in the medulla oblongata must extend its influence to the vaso-motor nerves of the brain, and this altered and more or less disturbed state of the circulation is, in my opinion, the cause of the loss of consciousness during an attack of epilepsy . . . I therefore freely admit, with Kussmaul, that in an epileptic attack the whole brain participates more or less in the change; but the commencement of the fit, or of the discharge, must, I think, be referred to the medulla oblongata. In like manner we must explain the loss of consciousness as the result of the action so produced on the walls of the vessels of the brain, while consciousness may, as I shall hereafter show, in some slight attacks, even be maintained, or else may be

lost without convulsions being produced. (Schroeder van der Kolk, 1859, pp. 229-230)

Note that “the whole brain participates more or less in the change.” This is consistent with the many other theorists of the nineteenth century who focused on a local area of the brain (most often the medulla oblongata with the possibility of peripheral nerve irritation as a triggering event), and yet recognized that a seizure is a cerebral event of the brain itself.

Certainly Schroeder van der Kolk was not alone in advocating a central role for the medulla oblongata in epileptogenesis. Thomas Laycock, a teacher of Hughlings Jackson, epitomized the attitude of the age in setting the medulla oblongata at the center of brain activity:

There are phenomena, however, in favour of the doctrine that the medulla oblongata is the common sensory of all conscious states,—whether they refer to corporeal processes, or the purely encephalic changes associated with ideas. The cerebral and cerebellar hemispheres may be considered as extensive peripheries, having, like the corporeal periphery, the medulla oblongata for their centre. (Laycock, 1860, p. 443)

1.2.8 Jackson’s Corticocentric Epilepsy

The modern era of epileptology is often dated from the time of John Hughlings Jackson (1835–1911), “the father of epilepsy” (Shorvon, 2011, p. 1033). In contrast to many other theorists of the nineteenth century who were fascinated by peripheral reflexes and sympathetic epilepsy, Jackson was primarily interested in the cerebral cortex of the brain, describing the pathophysiology of epilepsy in simple terms—as an occasional, sudden, excessive, rapid, and local discharge of gray matter (Jackson, 1873). Thus Jackson offered a new explanation of epileptic seizures that differed from that of his predecessors who claimed the seat of the disease lay in the medulla oblongata (Sidiropoulou et al., 2010). Furthermore, Jackson’s corticocentric concept of epilepsy de-emphasized classification, accepting many different clinical entities as “epilepsy.”

The distinction between idiopathic and sympathetic epilepsy was thus mooted, and the hypothesis raised that all seizures have a similar pathophysiology—a position still actively investigated. (Gross, 1992, p. 73)

As a practical matter, the “Jacksonian March” of symptoms in focal motor seizures bears his name. In a more philosophic vein, Jackson theorized on the evolutionary organization of the nervous system for which he proposed three levels: a lower, a middle, and a higher. At the lowest level (i.e., the spinal cord and medulla), movements were to be represented in their least complex form; the middle level consists of the centers in the motor area of the cortex, and the highest motor levels are found in the prefrontal cortex of the brain. This line of thinking influenced Wilder Penfield in the twentieth century, who also hypothesized about the location and function of the highest level with his *centrencephalic* theory of epilepsy (a topic for the next section of this review).

Probably the most enduring influence of Jackson’s research and writings is the corticocentric emphasis, which has come to dominate modern epileptology. Not only has the peripheral (sympathetic) aspects of epilepsy been minimized, but even subcortical involvement in epilepsy (which was not necessarily entirely abandoned by Jackson) is now greatly diminished.

1.2.9 Gower’s Borderland

William Gowers (1845–1915) was a British neurologist and junior associate to Jackson. As such, Gowers was well aware of Jackson’s concepts within the context of the prevailing theories of that era on subcortical/peripheral involvement in epilepsy:

The teaching of experiment, then, is that both the cortex and the medulla may originate convulsions. The teaching of pathology is, as Wilks long ago insisted, that epileptiform convulsions have, in most cases, their origin at the surface of the brain. It may be doubted, however, whether the pathological facts alone, or in conjunction with experiment, quite warrant the conclusion that epilepsy is a disease of

the cerebral cortex. Burdon-Sanderson's researches make it probable that the convulsions which occur when the surface is irritated may depend on the discharge of motor centres more deeply seated, though connected with, and excitable from, the surface regions (Gowers, 1885, pp. 201-202).

As was often the case with many neurologists of his era, Gowers was concerned as to what is and is not epilepsy. One of his major works, *"The Border-land of Epilepsy"* (1907) sought to define the boundaries of true epilepsy in several conditions (faints, vagal attacks, vertigo, migraine and sleep symptoms) where the "dividing line" is most challenging. For example, in the case of vertigo:

Border-line Epilepsy.—We have seen how often vertigo approaches the line that separates it from epilepsy. But epilepsy also may come near the dividing line, at any rate in semblance. True epileptic attacks may begin, not only with the familiar giddiness, but also with tinnitus, the combination of symptoms characteristic of labyrinthine vertigo. (Gowers, 1907, pp. 62-63)

Many phenomena in the nervous system can only be intelligibly explained on the assumption of a discontinuity of conduction at the junction of the neurons, which compose each conducting path. At such interruptions impulses are re-excited, instead of simply passing on . . . On this hypothesis only can we conceive that the same nerve process may underlie the loss of consciousness in both fainting and epilepsy. (Gowers, 1907, p. 4)

Likewise for cardiovascular and vaso-motor processes that may be confused for true epilepsy, the dividing line can become blurred:

These cases present strong evidence of the influence of repeated cardiac syncope in disposing to epilepsy. They suggest that the state of the nerve elements that underlies

the loss of consciousness in syncope may, by repeated induction, acquire a tendency to spontaneous development, which constitutes minor epilepsy. (Gowers, 1907, pp. 9-10)

Considering that many of the major theories of epilepsy put forth in the nineteenth century rely on cardiovascular and/or vasomotor etiologies, some modern theorists regard Gowers' border-land material as putting an end to such theories. Yet he was still open to the possibility that peripheral irritation could be a factor in the etiology and pathophysiology of epilepsy:

Gowers identified "reflex causes" mediated by irritation of peripheral nerves, visceral or external; pain; digestive derangement; or an "anomalous or indigestible meal." (Shorvon, 2011, p. 1036)

Eventually his emphasis on the overriding importance of the grey matter of the cerebral cortex took precedence, even as he still allowed room for the medulla oblongata and peripheral irritation as contributing factors:

The conclusion, then, is that all the phenomena of the fits of idiopathic epilepsy may be explained by the discharge of grey matter; that the hypothesis of vascular spasm is as unneeded as it is unproved; that there are no facts to warrant us in seeking the seat of the disease elsewhere than in the grey matter in which the discharge commences; that this is in most cases within the cerebral hemispheres, probably often in the cerebral cortex, although possibly in some instances lower down, even in the medulla oblongata; that epilepsy is thus a disease of grey matter, and has not any uniform seat. It is a disease of tissue, not of structure. (Gowers, 1885, p. 211)

Eadie nicely summarizes Gowers' contribution in the context of nineteenth century epileptology:

After weighing the available evidence he [Gowers] concluded that the medulla oblongata epileptogenic site of Kussmaul and Tenner (1859), Brown-Séquard (1860) and Reynolds (1861), a site experientially located to the dorsal pons by Nothnagel (1868), probably had a role in producing the convulsive manifestations of epileptic seizure activity. However, he judged that Jackson (1870), and before him Wilks (1866), were correct in the view that epileptic seizure activity usually, if not always, began in the cerebral cortex. (Eadie, 2011, p. 1047)

Key Points to Remember

- Galen expounded an influential triune model of epilepsy that included brain and peripheral aspects, including intestinal and cardiovascular/respiratory etiology.
- The nineteenth century was marked by systematic scientific research and theorizing.
 - During the first half of the nineteenth century, peripheral influences (with Hall's reflex theories leading the way) were predominant with the spine and medulla oblongata as key factors in the pathophysiology of epilepsy.
 - From a conceptual and theoretical perspective, classification was emphasized by certain individuals who sought to define what is and is not epilepsy. Thus categories such as "true epilepsy" "centric/eccentric epilepsy," idiopathic and sympathetic epilepsy were declared.
 - Vasomotor theories were common with either too much or too little blood flow to the brain cited as causative factors.
 - The influence of Jackson and Gowers increased during the latter decades of the nineteenth century, shifting attention in a decided corticocentric direction, which grew to be the dominant model even into modern times.
 - Broadly speaking, from the time of Galen through the nineteenth century, medical theories included significant recognition of peripheral and subcortical involvement in epilepsy, even when the cerebral hemispheres of the brain were regarded as the ultimate location of seizure activity.

1.3 The Centrencephalic Coordinating and Integrating System

1.3.1 Background

The history of epilepsy (like epilepsy itself) is episodic. From Galen's triune classification (with its inherent tension between central/idiopathic and peripheral/sympathetic types and causes), through the centuries this interplay of causation and classification, centric and eccentric, has revealed itself in cycles. During the nineteenth century, when tremendous progress was made through laboratory experimentation and clinical observation, the early decades emphasized peripheral factors such as vascular and vasomotor effects, nerve reflexes from viscera and spine itself (as reviewed in the previous section). Although most theorists acknowledged the brain as the ultimate link in a complex chain of causation, the focus was on the subcortical areas and, in particular, the medulla oblongata that mediated between the body and cerebral cortex. Then in the latter decades of the nineteenth century (especially with the work of Jackson and Gowers), the emphasis shifted dramatically towards a corticocentric approach, which has largely dominated the study of epilepsy until the present era.

And yet, within the historical cycles of epileptology, there was a major theoretical shift in the twentieth century that refocused attention on subcortical portions of the brain as a coordinating and integrative influence in brain functioning, particularly with regard to epileptogenesis and physiopathology—the *centrencephalic* integrating system. The *centrencephalic* concept was most explicitly advocated by Wilder Penfield (1958). A neurosurgeon with years of "hands-on" experience (quite literally) in brain functioning and pathology, Penfield was well acquainted with Jackson's theories. Actually he was enthusiastic about the implications of Jackson's ideas and was able to confirm from his own surgical experience that electrical stimulation of specific locations on the surface of the cortex could produce particular symptoms of epilepsy, just as Jackson had postulated. However, it was Jackson's concept of hierarchical centers within the brain that led Penfield in the direction of the *centrencephalic* hypothesis (Penfield, 1974).

In seeking to identify the "highest" center, he came to believe that it was not located in the cerebral cortex (as per Jackson). Rather it was in the upper portion of the brainstem (midbrain) working closely with

adjacent areas in the thalamus and nearby structures—all entirely subcortical. Considering that Penfield had invested years of his professional life investigating and therapeutically intervening in the cerebral cortex, this is quite an amazing and revealing turn of events. One might naturally assume that he would have followed Jackson's lead and focused entirely on the cortex itself. To make such a drastic shift, the evidence must have been very compelling. So exactly what led him to take (what turned out to be) such a controversial position on the source of certain types of epileptic seizures?

It began with newly available experimental evidence for a separate system of neurons extending through the brainstem into the diencephalon, together with more diffuse cortical and subcortical projections. This so-called "reticular activating system," which apparently had the potential for regulating the functional state of the brain as a whole in sleep and waking, also raised the possibility of explaining the sudden appearance of certain forms of generalized seizures involving both hemispheres simultaneously (Jasper, 1969). Herbert Jasper, who worked closely with Penfield in developing the *centrencephalic* concept, provided this personal yet authoritative explanation of the genesis of the theory:

Parallel with the experimental demonstration of the functional importance of the reticular activating system, and its reciprocal interaction with the cerebral cortex has been the conception of the "centrencephalic system" proposed by Penfield largely on the basis of neurosurgical experience with epileptic patients . . . the conception of a centrencephalic integrating system was conceived initially as a logical development of the "highest level" of integration in the sense of Hughlings Jackson. The precise anatomical basis for the "highest level" was not precisely formulated by Hughlings Jackson, but he proposed that it might involve large areas of frontal and parietal cortex, excluding specific sensory receiving areas and specific cortical motor areas. Although emphasizing diencephalon and brain stem interacting with these cortical areas Penfield's hypothetical "centrencephalic system" shares with Jackson's "highest level" the lack

of precision regarding anatomical basis. They agree in the logical necessity of such a conception and that the “highest level” or “centrencephalic system” would exclude specific sensory and motor systems, cortical and subcortical. (Jasper, 1969, pp. 202-203)

The *centrencephalic* model evolved and changed over the years, due in part to the intense criticism leveled by more traditionally minded individuals who clung tightly to a rather literal interpretation of some of Jackson’s original ideas. In particular, Walshe took objection to Penfield’s crediting of the “highest level” of integration to subcortical areas of the brain, at the expense of the cerebral cortex:

It seems scarcely credible that within this small and phylogenetically ancient part of the brain such numerous and complex functions could be carried out. How comes it that despite the great development of the cerebral cortex in man, the gamut of physiological and psychological activities characteristic of man, should still be carried on in these meagre collections of cells in the “old brain,” as Penfield says? (Walshe, 1957, p. 537)

To be clear, Penfield’s original definition in 1950 emphasized the *integrative* function of the *centrencephalic* system with regard to both cerebral hemispheres:

. . . that central system within the brain stem (including diencephalon) which has been, or may be in the future, demonstrated as responsible for integration of the function of the two cerebral hemispheres. The centrencephalic system would not, thus, include the cranial nerve nuclei nor other subcortical structures the function of which is related solely to one cerebral hemisphere. (Penfield, 1950, p. 514).

A later version clarified the model somewhat, acknowledging a greater participation of the cortex in seizures designated as *centrencephalic*

and yet was left purposely vague so as not to prejudice experimental studies (Jasper, 1969).

Those parts and circuits within the brain stem which may be shown to serve the purpose of interrelationship of the cortical gray matter of the two hemispheres may be defined as the centrencephalic system and only those . . . We are not discussing a new or separate block of brain. There is no centrencephalon as distinct from diencephalon, for example . . . It would be absurd to suppose that this central integration could take place without implication and employment of cortical areas selected appropriately according to the needs of the organizational problem that faces the brain mechanisms. To suppose that centrencephalic integration is possible without utilization of the cortex would be to return to the thinking of Descartes and to enthrone again a spiritual homunculus in some area such as the nearby pineal gland. It would be equally absurd to consider that the . . . reticular formation is functionally separable from the cortex. (Penfield, 1957 as cited in Jasper, 1969, pp. 202-203)

1.3.2 Research

As intended, the *centrencephalic* theory stimulated research with animal and human subjects. Notably, in one extensive study during a nine-year period, well over 1000 weanling albino rats were subjected to varied localized brain damage, were allowed to recover, and were subsequently tested on a wide variety of problems designed to measure general learning ability. Thus it became possible to map a number of brain systems involved in the acquisition of specific problem-solving tasks. The research uncovered a "nonspecific mechanism" (a "general learning system") located in the interior parts of the brain responsible for "coordinating and integrating" the activities of that division of the brain. The investigators reported:

. . . our lesion data on laboratory rats are readily explicable in terms of Penfield's theory. First, the nonspecific mechanism that we uncovered could constitute the neural substrate of

Penfield's CC [centrencephalic core] since it is subcortical in origin. Second, this nonspecific mechanism could be responsible for coactivating the various specific mechanisms (see Chapter 5) needed to solve the particular problems making up the test battery. Finally, this nonspecific mechanism, which contains elements belonging to the extrapyramidal motor system (and more specifically to the basal ganglia), could conceivably carry out the executive (motor) functions ascribed to the centrencephalic integrating system. In light of the foregoing considerations, it is proposed that those brain sites making up the nonspecific mechanism underlying problem-solving in the rat define those sites that constitute Penfield's CC. This proposal would appear to be congruent with the spirit of Penfield's theory when it is considered that the centrencephalic system was originally envisioned as coordinating and integrating the activities of that division of the brain (cerebral cortex) most intimately linked to higher mental functions. (Thompson et al., 1990, p. 171)

In another extensive series of animal experiments intended to test Penfield's theory, Faingold utilized genetically epilepsy-prone rats that exhibit a genetically-based, abnormally high sensitivity to seizure induction by a number of modalities including high intensity acoustic stimuli. The auditory stimulus leads to convulsive audiogenic seizures (tonic convulsions) requiring brainstem nuclei. Upon repetition a *kindling* effect results in post-tonic generalized clonus, closely mimicking human generalized tonic-clonic seizures, including cortical epileptiform EEG not seen prior to kindling. After kindling, the seizure network permanently expands from the brainstem to include the forebrain. The sensory (auditory) initiation of seizures represents a reflex model of epilepsy that Faingold calls the "two hit hypothesis." In the genetically epilepsy-prone rats, the first hit is a genetic defect in GABA-mediated inhibition, and the second hit is an intense acoustic stimulus that initiates the audiogenic seizure. The *two hit* hypothesis (nature plus nurture) is proposed as a common cause of human epileptic syndromes. Thus, a genetic predisposition is the first "hit," and an inducing event, such as a brain injury or infection, is the second "hit" that triggers the onset

of the epileptic syndrome (Faingold, 2012). Similar mechanisms may also be operative in other forms of epilepsy, since the ability of sensory stimuli to trigger convulsions (reflex epilepsy) is also seen in many experimental epilepsy models and in human epilepsy (Faingold, 2012, p. 378). Summarizing his extensive experimentation, Faingold concludes:

Penfield and Jasper proposed that generalized seizures involve the brainstem reticular formation (BRF). Considerable research has confirmed a major role of the BRF in generalized tonic-clonic seizures (GTCS). Direct stimulation of the brainstem or spinal cord alone induces tonic muscular activity, resembling the tonic convulsions of GTCS. (Faingold, 2012, p. 386)

A third example of serial studies by researchers investigating the *centrencephalic* system hypothesis is provided by Kohsaka et al. (1999, 2001, 2002, 2012). One of the major challenges in confirming the hypothesis is the difficulty in measuring the neural activity of the brainstem. To address this difficulty, Kohsaka et al. measured brainstem auditory-evoked potentials (BAEPs) in human subjects with various forms of epilepsy.

Auditory potentials recorded from the vertex of humans by a modified averaging technique have very short latencies and are probably generated by brain stem structures located at a considerable distance from the recording point. The evoked waves, which show considerable detail and consistency within and across subjects, may be clinically useful in evaluating subcortical function. (Jewett et al., 1970, p. 1517)

Since Jewett et al. (1970) first discovered BAEPs, the method has been widely used to investigate the brainstem function in various neurological disorders. BAEPs are classified as “far-field evoked potentials” because, with their very short latencies (usually below 7 ms), individual evoked potentials (EPs) generated in the brainstem by an acoustic trigger signal are transmitted to the scalp electrodes by volume conduction, even during the paroxysmal discharge of epileptic seizures within the

cortex. BAEPs are independent of the level of cortical activities, and although individual EPs are embedded in a large electroencephalographic (EEG) fluctuation (spindle oscillation), major component waves are discernible.

With regard to the *centrencephalic* hypothesis, the topography of the generator for two major component waves (wave-III and -V) has been investigated, and a consensus has been gained on their location: the generator of wave-III is located in superior olivary complex (SO) in the ventral part of the lower brainstem (lower pons); and the generator of wave-V is considered to be located near the inferior colliculus (IC) in the dorsal part of the upper brainstem. Thus the use of BAEPs provides a simple, practical means for testing the *centrencephalic* hypothesis. An early study utilized simultaneous analysis of BAEPs with reference to EEG to examine the brainstem function corresponding to the EEG event during pre- and paroxysmal discharge in human typical absence seizures (TA), classified as primary generalized epilepsy (PGE):

The results reappraise the classical hypothesis of “centrencephalic system” on seizure generating mechanism in human PGE. The results prove the primary triggering role of the lower brainstem . . . the excitability in the lower brainstem fluctuates spontaneously, and this long-range fluctuation (acceleration to deceleration) triggers rhythmic (3 Hz) oscillations in the brainstem in human PGE with TA. (Kohsaka et al., 1999, p. 277; 287)

Interestingly, both phases of fluctuation in the lower brainstem excitability (i.e, acceleration to deceleration) *preceded* the onset of cortical paroxysmal discharge, suggesting that the origin of the seizures was in the lower brainstem area corresponding to the ventral part of the lower brainstem close to superior olivary complex. Thus “ . . . the excitability change in the lower brainstem is probably conveyed to the thalamus as ascending signals” (Kohsaka, 1999, p. 286).

A subsequent study investigating generalized epilepsy (GE) with nocturnal convulsive seizures (generalized tonic-clonic seizure or generalized tonic seizures) focused on the excitability change of the brainstem which was evaluated over the course of the interictal parox-

ysmal discharge (poly spike-and-wave complex, poly SWC). BAEPs were again utilized, this time comparing data collected before and during one sequence of poly SWC:

The excitability in the ventral brainstem, measured with the parameters of wave-III, showed a biphasic fluctuation (deceleration-acceleration) before the onset of poly SWC . . . On the other hand, the excitability in the dorsal brainstem, measured with the parameters of wave-V, showed no significant difference over the course of poly SWC. The results suggest that the biphasic excitability change in the ventral brainstem is conveyed to the cortex through the ascending activating system . . . Probably, this internally generated biphasic excitability fluctuation, the enhanced excitability coupled with the preceding reduction in the ventral brainstem, offers the basis for triggering the cortical poly SWC in human GE. (Kohsaka et al., 2001, pp. 53; 60)

Additional studies found widespread activation of the brainstem preceding the recruiting rhythm in human generalized epilepsy (Kohsaka et al., 2002). K-complexes (KCs) in the electroencephalographs indicate a moderate depth of slow-wave sleep in humans and animals. Because KCs often appear together with diffuse epileptic discharges, research was done to investigate the possible role of brainstem activation in the manifestation of EEG K-complexes. Consistent with previous studies cited above, brainstem activation was found to precede and outlast the k-complexes in humans (Kohsaka et al., 2012). Thus, a considerable body of diverse evidence supporting the *centrencephalic* hypothesis of brainstem involvement in epilepsy has been developed through the use of BAEPs by these researchers.

A fascinating possible indirect outcome from BAEP brainstem research derives from the study of anti-seizure medications. Because epilepsy may produce alterations in BAEPs, anti-epileptic drugs studied alone or in combination appear to lead to "normalization" of BAEPs (Panjwani, 1996).

1.3.3 Evolution of the Centrencephalic Concept

As evident in the writings of Penfield himself, his *centrencephalic* concept evolved and became more explicitly inclusive (with regard to the cerebral cortex). This evolution continued through the work of other researchers who shifted the direction of the concept even further in the direction of cortical influence. For example, Gloor's "corticoreticular" theory (1968), while recognizing the importance of cortical activity in seizure production, included a major role for subcortical involvement:

. . . cortical mechanisms are very important for the physiopathogenesis of these seizures. It seems, however, unjustified to exclude reticular brain stem and thalamic mechanisms entirely, since the animal experimental evidence supporting their role in the mechanism of the generalized bilaterally synchronous spike and wave discharges is very strong. It is proposed that this type of generalized seizures results from an abnormal interaction of cortical and subcortical grey matter and that the mechanism of discharge cannot be satisfactorily explained by evoking only cortical or only subcortical mechanisms. For this reason the term of "generalized cortico reticular epilepsies" is proposed. (Gloor, 1968, p. 249)

Currently the corticoreticular model seems still to be the most widely accepted of the theories for absence epilepsy, although the relative contributions of cortex and thalamus and the exact mechanisms are still matters of debate (Meeren et al., 2005).

In the final chapter of *Basic Mechanisms of the Epilepsies*, Penfield restated his position, emphasizing that in his view the centrencephalic coordinating and integrating system included the cortical areas it connected. He also stated that centrencephalic seizures could start in the frontal or temporal cortex rather than in the brain-stem. The corticoreticular hypothesis attempts to reconcile these various points of view. (Fromm, 1987, p. 204)

Another variation of the *centrencephalic* concept was proposed by Buzsáki (1991) with his “thalamic clock” theory. Pacemaker cells produce rhythmical oscillation within certain thalamic neuronal populations that expand as more cells are recruited with each cycle of the oscillation until the entire thalamic network is entrained in rhythmic discharges. Thus, rhythmic epileptic discharges in the cortex during seizures are the result of abnormal rhythmic oscillation in the subcortical intrathalamic network.

The “cortical focus” theory proposed by Meeren et al. (2005) represents a more integrated approach wherein the large-scale synchronization evident in the EEG during seizures appears to be mediated by the fast propagation of seizure activity from a focal site through corticocortical networks, which then initiates the paroxysmal oscillation within the corticothalamic loops. “Subsequently, thalamus and cortex start to drive each other, hereby amplifying and sustaining the discharges.” (p. 375)

In a similar vein (although much more closely allied with the basic centrencephalic concept), the “core” hypothesis put forth by Fromm (1987) is primarily based on experimental studies. The hypothesis posits that the nonspecific reticular core of the brainstem and spinal cord is the common anatomical substrate for all tonic-clonic convulsions in the experimental animals. This accounts for the similarity in motor patterns and response to drugs of experimental tonic-clonic convulsions and explains the rostrocaudal spread or march of such convulsions. “It would therefore appear that the spinal cord is an active partner in the production of generalized convulsions.” (p. 212)

As has been noted, the *centrencephalic* concept (in its initial formulation) relied on evidence that subcortical involvement was essential for the development and spread of generalized seizures. The concept appeared to be refuted by the beneficial effect of section of the corpus callosum and other forebrain commissures in some patients with refractory seizures. However, Fromm points out limitations to the effectiveness of the surgical procedure in that: (1) it seems most effective against akinetic and falling seizures; (2) since other generalized seizures and EEG generalized epileptiform discharges can continue to occur postoperatively, structures other than the cerebral commissures must also play a role in the generalization and propagation of these convulsions; and

(3) some patients experience a recurrence of seizures if they attempt to stop their antiepileptic medications after successful section of the corpus callosum. "The clinical and experimental evidence currently available would thus indicate that seizure activity can spread and generalize both via the corpus callosum and via the RF [reticular formation] in humans as well as in experimental animals." (Fromm, 1987, p. 210) Adopting an integrative perspective for the "core" hypothesis, Fromm concludes:

As with so many scientific controversies, it is not a question of either/or but rather of recognizing the merits of both points of view. Both the cerebral cortex and the RF are crucially involved in the pathogenesis of convulsive seizures. The clinical data support the notion that in humans generalized convulsions have a cortical origin. However, the clinical and experimental data also indicate that the RF is a major pathway for the generalization of seizures. Furthermore, the main pathway for the propagation of paroxysmal discharges to spinal motoneurons to produce convulsive movements appears to be the reticular core of the brain-stem and spinal cord. Convulsions are thus neither a purely cortical nor a purely reticular event but a cerebreticular phenomenon. (Fromm, 1987, pp. 213-214)

1.3.4 Functional Connectivity and Neural Networks

Advances in neural network theory may call for a reconsideration of the possible contribution of the *centrencephalic* concept. The traditional corticocentric model insists that all seizures are entirely dependent on cortical pathology for initiation and spread. This approach relies heavily on "structural connectivity" of neurons and tends to be focal in orientation. Neural network theory expands the context of seizure pathophysiology beyond a limited focal perspective by taking into consideration widespread "functional connectivity."

Brain functioning is increasingly seen as a complex interplay of dynamic neural systems that rely on the integrity of structural and functional networks. Recent studies that have

investigated functional and structural networks in epilepsy have revealed specific disruptions in connectivity and network topology and, consequently, have led to a shift from “focus” to “networks” in modern epilepsy research. (Van Diessen et al., 2013, p. 1855)

Advances in neuroimaging technology reveal that even when there is an identified focal area of seizure (such as the temporal lobe), that area may be linked to other (even remote) regions of the brain, including the subcortical areas (Haneef et al., 2013). Thus functional connectivity of networks (with both cortical and subcortical components) is required to produce loss of consciousness during generalized seizures (from the onset) or focal seizures that become bilateral (i.e., generalize). Of particular note, the “network inhibition hypothesis” proposes that decreased activity within subcortical arousal systems removes the normal activation of the frontoparietal association cortex, leading to depressed neocortical function and impaired consciousness. Thus the neocortex enters a sleep-like (or minimally conscious-like) state because of remote network effects on subcortical arousal systems rather than direct seizure propagation (Blumenfeld, 2011).

Interestingly, the *network inhibition hypothesis* (with its strong neurobiological underpinnings) has connections with Penfield and Jasper’s *centrencephalic* concept of subcortical involvement in epilepsy:

. . . the centrencephalic theory influenced later studies showing midbrain and thalamic involvement during temporal lobe seizures and our subsequent network inhibition or network disruption by seizure hypothesis. Our proposed “consciousness system” is a coarse outline of structures, including the medial thalamus and upper brain stem, interhemispheric regions . . . (Yu & Blumenfeld, 2009, p. 55)

Obviously, as new models evolve from advances in neural network research, they will not be called *centrencephalic*—and yet, the basic concept may continue to be useful and worthy of consideration with regard to the role of subcortical and peripheral systems in the etiology and pathophysiology of epilepsy.

1.3.5 Looking Ahead

Although interest in the *centrencephalic* theory of epilepsy has waned in recent decades, perhaps there will be future cycles with renewed interest in subcortical factors becoming more relevant in epileptology. If so, hopefully some of these ideas will continue to stimulate research and theory. There are already some indications in this direction with the current interest in neural network theory (that includes subcortical areas—i.e., *network inhibition hypothesis*). Research into the causes of sudden unexplained death in epilepsy (SUDEP), where subcortical autonomic nervous system functions have been implicated, is a very active field of investigation. Vagus nerve stimulation as a treatment for epilepsy even reintroduces the nineteenth century concept of peripheral nerve involvement via the medulla oblongata—cycles upon cycles! The next three sections (covering the sensory system and reflex epilepsy, the autonomic nervous system in the pathophysiology of seizures, and hormonal factors in epilepsy) provide undeniable evidence for the relevance of subcortical and peripheral involvement in epileptic seizures that resonates with the spirit of Penfield's *centrencephalic* coordinating and integrating system.

Key Points to Remember

- Although controversial, the *centrencephalic* theory that developed in the mid-twentieth century by Penfield in association with Jasper and others was influential in epileptology during that era.
- The *centrencephalic* theory stimulated important research into the etiology and pathophysiology of epilepsy.
- With the advent of modern neuroimaging technology and conceptual breakthroughs (such as neural network theory), some of the basic *centrencephalic* ideas (especially subcortical involvement in seizures) continue to be relevant in understanding the causes and treatment of epilepsy.

1.4 Sensory System Involvement in Epilepsy

1.4.1 Background

The sensory nervous system is responsible for processing sensory information from both the exterior and interior environments. In either case, the anatomy and physiology of sensation relies heavily on peripheral and subcortical systems, including the cranial nerves in the

brainstem and somatosensory receptors in the skin:

The sensory receptors of the five primary senses are located in the special sensory organs of hearing, vision, olfaction, and taste and in the somatosensory receptors that are distributed in the skin over the entire body . . . The sense organs communicate sensory information to the CNS through sensory nerves, several of which are cranial nerves or parts of cranial nerves (olfaction, CN I; vision, CN II; taste, CN VII, IX, and X; hearing, CN VIII). Skin receptors are innervated by spinal nerves (dorsal roots) and the sensory portion of the trigeminal nerve (CN V) for the face. Skin receptors include receptors that respond to noxious stimuli (nociceptors) and are also found in viscera. (Møller, 2014, p. 37)

Sensory system involvement in epilepsy is extensive, particularly with regard to the bidirectional interaction of cortical and subcortical/peripheral components of the sensory system:

The relations of epilepsy and the sensory systems are bidirectional. Epilepsy may act on sensory systems by producing sensory seizure symptoms, by altering sensory performance, and by epilepsy treatment causing sensory side effects. Sensory system activity may have an important role in both generation and inhibition of seizures. (Wolf, 2016, p. 369)

Thus, for the purposes of this review, sensory system involvement in epilepsy has three main aspects:

- 1) sensory seizures (traditionally described as an aura at the beginning of the seizure),
- 2) sensory dysfunction (including sensory side-effects resulting from treatment),
- 3) sensory generation and inhibition of seizures (including reflex seizures and reflex epilepsy).

The following review will focus on these three aspects with an emphasis on the bidirectional interaction of the cerebral cortex and the

subcortical and peripheral elements of the sensory system. In other words, seizures can produce sensory effects; the pathophysiology of epileptic seizures and/or treatment can cause or contribute to sensory system dysfunction; sensory input can trigger seizures in an unstable brain (i.e., reflex seizures), and possibly contribute to (or even cause) cerebral instability.

1.4.2 Sensory Seizures

Traditionally, the term *aura* (a “breeze” or “soft air” in Latin and Greek etymology) has been recognized since the time of Pelops (Greek, second century CE) as a warning that a seizure is imminent. More recently an *aura* is regarded as that portion of the seizure which occurs before consciousness is lost and for which memory is retained afterwards (Perven & So, 2015).

The current epilepsy classification system recognizes focal sensory seizures that may present with somatosensory, olfactory, visual, auditory, gustatory, hot-cold sense, or vestibular sensations (Fisher et al., 2017). Gastrointestinal sensations are a common form of epileptic aura and are typically associated with seizure activity in the temporal lobes and/or insular cortex (Henkel et al., 2002). It is usually assumed that abdominal sensations at the beginning of a seizure are produced by the brain; however, the relationship between the brain and peripheral sensory systems is complex and bidirectional:

How seizures can induce abdominal sensations has been studied but is still not precisely known. Stimulation of temporal lobe structures, including the amygdala, hippocampus, and insular cortex, has been shown to induce abdominal sensations, including nausea, hunger, and ‘funny feelings’, in humans. Others have produced changes in gastrointestinal secretion and motility in animals by stimulation of the limbic system. Thus, one might postulate that the seizures of abdominal epilepsy are activating those neurons that ordinarily are responsible for abdominal sensations. However, some have postulated that the etiology of the abdominal symptoms could result from true visceral stimuli which, through connections to the brain, could

thereby induce seizures. (Zinkin & Peppercorn, 2005, p. 271)

1.4.3 Sensory Dysfunction in Epilepsy

Although seizures that are repetitively provoked by sensory stimuli (i.e., reflex seizures—to be discussed in the next section) occur only in a minority of patients, epilepsy is often associated with dysfunctional neuronal responses to sensory stimulation compared with controls (van Campen et al., 2015). For example, epileptic patients show a reduced threshold for sweet and bitter taste, and smell detection thresholds are greatly reduced (especially in partial seizures with complex symptomatology). Age, sex, and antiepileptic drugs do not affect taste and smell acuity (Campanella et al., 1978).

Because sensory dysfunction inherently requires brainstem and thalamic participation (in addition to eventual processing within the cerebral cortex), there is always subcortical involvement with the possibility of etiological or therapeutic implications. This is implicit in the recognition that epilepsy is a “network disease” involving neural circuits distant from the seizure focus:

There is a compelling, though not absolute, correlation between affected sensory modality and underlying epilepsy syndrome. Olfaction is clearly affected in temporal lobe epilepsy, while visual information processing is disturbed in occipital lobe epilepsy. The cause of interictal perceptual dysfunction is unknown, but propagating epileptiform discharges may play a role. The presence of specific perceptual disturbances in focal epilepsy syndromes is consistent with the view that epilepsy is a network disease, with the potential to affect neural circuits distant from the seizure focus. (Grant, 2005, p. 511)

Echoing the relevance of sensory networks, Wang et al. (2010) have observed that, compared to healthy subjects, there is decreased functional connectivity in somatosensory, visual, and auditory networks in epilepsy patients with generalized tonic-clonic seizures. Sensory dysfunction in epilepsy may result from treatment, especially with medications (Wolf, 2016).

1.4.4 Reflex Epilepsy and Reflex Seizures

Reflex epilepsy and *reflex seizures* represent the most obvious and substantiated area of subcortical and peripheral involvement in the entire epilepsy literature. *Reflex seizures* are a group of widely heterogeneous epileptic events triggered by specific motor, sensory or cognitive stimulation, such as flashing lights, startling noises, thinking, music, eating, exercise, reading, hot water, and orgasms (Irmen et al, 2015). *Reflex epilepsy* is more narrowly classified as a specific syndrome in which *all* epileptic seizures are precipitated by sensory stimuli (Italiano et al., 2014).

In either instance (*reflex seizures* or *reflex epilepsy*), when the triggering phenomena involve sensory stimulation (whether internal or external), there is an inherent bidirectional flow of information between the cortex and subcortex (and even the periphery in some cases). Most notable (with the bidirectional premise in mind) are the afferent sensory nerve impulses passing through the brainstem on their way to the thalamus (or other subcortical areas such as the hypothalamus) before being transferred to the cortex as a trigger for a seizure (which may itself produce a reaction to the sensory system). This bidirectional process of ictogenesis has important pathophysiological and nonpharmaceutic therapeutic implications that will be discussed later.

Historically, the term “reflex” dates back to Marshall Hall (1841), who differentiated seizures precipitated by peripheral stimuli (eccentric) from central (centric) causes (section 1.2.3). In the 1960s, Servit, heavily influenced by Pavlov, stated that the genesis of epilepsy can be considered as a reflex mechanism (Kasteleijn-Nolst Trenit, 2012). However, strictly in terms of physiology, the use of the term “reflex,” when referring to epileptic seizures, is problematic:

Chavany thinks the term “reflex epilepsy” to be physiologically incorrect, since a reflex activity can be postulated only in the presence of a pre-existing or a conditioned afferent tract, a reflexogenic center and an efferent tract; such conditions are not found in reflex epilepsy. He admits, however, that reflex epilepsy may be individualized when a peripheral irritation is recognized as the etiologic factor. (Vizioli, 1962, pp. 294-295)

Thus, keeping in mind the limitations of the term “reflex” in this context, it will be used during the remainder of this section as a practical means to access and discuss the literature and not to indicate a literal physiological process:

Many authors comment on the inappropriateness of the term reflex, but it has been widely adopted and used for all seizures and epilepsies characterized by seizures being consistently and sometimes uniquely related to specific modes of precipitations. Given the vast literature on this subject, it would be unwise to change this term. The definition, however, could be much more precise, perhaps with a percentage of increase in seizures and epileptiform discharges. (Kasteleijn-Nolst Trenit, 2012, p. 112)

While the use of the terms *reflex epilepsy* and *reflex seizures* may be with us for some time and clarification is needed, various alternatives have been put forth to broaden the concept while making it more physiologically accurate. For example, Shorvon (2011) prefers the terms *provoked seizures* and *provoked epilepsy* in which specific systemic or environmental factors are the predominant cause of seizures where there are no gross causative neuro-anatomic or neuropathic changes and no inherent cause can be identified.

While acknowledging that the distinction may be somewhat arbitrary, Antebi and Bird (1992) distinguish between *seizure facilitators* (which indirectly increase the likelihood of seizure by sensitizing the central nervous system) and *seizure evokers* (a stimulus that directly produces a seizure within a matter of seconds). Similarly, Aird (1983) refers to *inducing factors* and *precipitating* or *triggering factors*. Panayiotopoulos (2012) distinguishes between *facilitating stimuli* (that increase the frequency of seizures or electroencephalography discharges) and *precipitating stimuli* (that consistently provoke them). In their excellent review of the subject, Illingworth & Ring (2013) argue that the various distinctions between reflex and nonreflex (spontaneous) epileptic events require clarification and that the context be broadened:

It has been proposed that theoretically there is no clear distinction even between those seizures deemed spontaneous

and those deemed to be reflex seizures. Various authors have suggested that there is a conceptual continuum between reflex and spontaneous seizures, rather than there being a dichotomy as suggested by current terminology, or argue that to some extent all or most seizures may be precipitated . . . Historically it has been argued by many epileptologists that seizures result from an interaction between an underlying predisposition and a precipitating event . . . suggesting that the role of the latter is not limited to reflex seizures and epilepsies. (Illingworth & Ring, 2013, pp. 2035-2036)

For example, the sensory initiation of seizures represents a reflex model of epilepsy that Faingold (2012) calls the “two hit hypothesis” (section 1.3.2). In genetically epilepsy-prone rats, the first hit is a genetic defect in GABA-mediated inhibition, and the second hit is an intense acoustic stimulus that initiates the audiogenic seizure. Thus in a controlled laboratory environment, the triggering stimulus is easily observed and measured. However, in many cases of human epilepsy, the precipitating event may not be at all obvious, particularly if it involves internal processes or subcortical and peripheral factors.

Thus there may be a continuum of so-called reflex and spontaneous seizure phenomena with a wide variety of triggers. In fact, it appears possible that neuronal activity within one area of the brain can trigger epileptogenic activity in other regions. Such an intrinsic trigger would not meet the narrow definition of reflex seizures as currently understood (Irmen et al, 2015). Thus “ . . . the distinction between reflex and nonreflex may relate more to observational ability than to objective fundamental differences in seizure phenomena.” (Illingworth & Ring, 2013, p. 2044)

Reflex epilepsies are unique, because the mechanism of excitation within an identifiable neural system is known to the individual, but identifying the tipping point—when normal physiological activities or sensations lead to recurrent extreme events—is still an observational challenge. In some cases, such as in patients with photosensitive epilepsy,

changes in the excitability state of the underlying networks can be uncovered before changes in EEG activity are evident, but changes that precede a seizure might be unobservable, resulting in apparently spontaneously occurring seizures. (Koepp et al, 2016, p. 101)

We conclude that due to the variability of the trigger-seizure relationship and the related varying observability of triggers, a range of yet undiscovered factors that could be categorized as a trigger may be involved in the onset of most if not of all epileptic seizures. We thus suggest that reflex seizures and spontaneous seizures may be the two extremities of a conceptual continuum on which seizures are generated by extrinsic or intrinsic triggers. (Irmen et al, 2015, p. 73)

The concept of a continuum of reflex and spontaneous seizure phenomena is crucial to the premise that will be explored throughout this review: namely, subcortical and peripheral factors are present in epilepsy as presently recognized categories of “*reflex epilepsy*” and “*reflex seizures*” and may also be primary causative factors. The reason that such subcortical and peripheral factors are not currently recognized as causing epilepsy is that the “changes that precede a seizure might be unobservable, resulting in apparently spontaneously occurring seizures” (Koepp et al., 2016, p. 101).

Although the various types of reflex stimuli and effects are diverse and numerous, we will focus on two areas of peripheral activity that are established in the literature as producing “reflex seizures” and even “reflex epilepsy”—and also may reasonably be considered as possible causative factors in the etiology of some forms of epilepsy. With this criteria in mind, the two categories to be examined involve *somatosensory* and *viscerosensory* activity.

1.4.5 Somatosensory Reflex Seizures and Epilepsy

The somatosensory system is a part of the sensory nervous system consisting of sensory neurons and pathways that respond to changes at the surface (extraceptive) or inside (intraceptive) the body. At the surface of the body, various forms of touching (such as rubbing) can

trigger reflex seizures. “Rub” epilepsy is a special type of extraceptive somatosensory evoked reflex epilepsy where long or repeated touching of a skin area (arm, leg, head, or shoulder) induces simple partial seizures with or without secondary generalization (Kasteleijn-Nolst Trenit, 2012). These patients may detect the mechanism to evoke daily seizures deliberately some years after spontaneous (paresthesia and no touching or rubbing) sensory seizures originating from that same area (Kanemoto et al., 2001).

Spiller et al. (2005) reported on three patients in whom epilepsy developed shortly after painful soft tissue injuries to their hands. The attacks started in the injured hand with no evidence of an underlying brain lesion by history or imaging studies. Apparently the injuries suggested the possibility that the peripheral somatosensory injuries produced the epilepsy:

Presumably the injuries led to plastic changes in the sensory/motor cortex, resulting in increased excitability and ultimately in seizures. The belief that peripheral injuries can cause seizures is not new. Hall was the first to popularize the concept of the reflex arc, and he believed that epileptic seizures were due to heightened activity of the reflex arc. Brown-Séquard elaborated on this idea and hypothesized that all seizures were due to excess activity originating in the afferent limb of the reflex arc (i.e., that a peripheral source of irritation, either overt or occult, was responsible for epileptic seizures even in cases of epilepsy due to brain disease). (Spiller et al., 2005 p. 1254)

The authors of this report clearly were aware of the historical connections in these cases wherein peripheral injury or irritation can cause epilepsy in the cerebral cortex as explicitly stated in their summary. This report has major implications for the hypothesis that peripheral and subcortical factors can play a central role in epileptogenesis—a causative role in which the bidirectional interaction of periphery and cortex produces an epileptic syndrome that can be regarded as reflex epilepsy with peripheral etiology—an important theme of this manuscript.

One further point made by the authors was the therapeutic potential

of their analysis: "Also not new is the idea that peripheral stimulation can modulate cerebral seizures, as demonstrated by ligature therapy and reflex epilepsies." (p. 154) They went on to provide an extensive literature review supporting their premise, concluding:

These cases, however, demonstrate that strong or patterned peripheral stimulation can provoke hyperexcitability and seizures, and removal of the peripheral trigger zone can prevent seizures. (p. 154)

The authors concede that the mechanism by which a peripheral injury results in cortical hyperexcitability and seizures is less clear. However, they go on to provide numerous examples of central neuronal plasticity and reorganization that result from either peripheral stimulation or injury.

This study exemplifies the concept of integration at multiple levels. At purely clinical and biological levels there is integration of peripheral and cortical aspects of epilepsy in which the peripheral can play a significant role in the etiology, pathophysiology, and treatment of epilepsy. At a conceptual level, the use of historical sources (that were more open to peripheral and subcortical factors in epilepsy) allowed a new integration that may stimulate research into the possibility of cerebral neural plasticity in conjunction with peripheral pathology—a bidirectional model that extends the concept of neural networks beyond a limited cortical framework.

Next, we shall consider another form of somatosensory involvement in epilepsy that focuses on the interior (intracereptive) sensory nerve activity. The theme of peripheral pathology as the source of irritating sensations that trigger epileptic seizures is well-established in the historical epilepsy literature. For example, nineteenth century thinking and writing on epilepsy were heavily influenced by theories of reflex spinal epilepsy, originating initially from the work of Marshall Hall (1790–1857):

. . . who turned reflex action from a physiologic phenomenon to a biologic principle, favoured the concept of a spinal and brainstem origin of epilepsy. He upheld a reflex theory of the disease and believed a central origin existed in the spinal

medulla and medulla oblongata. Diseases acting directly on these centres could cause epilepsy . . . The localization of reflex action in the spinal cord and medulla oblongata makes it clear why epilepsy was also thought to originate there. (Koehler, 1994, p. 191)

Brown-Séquard followed Hall's lead:

Whereas Brown-Séquard recognized a spinal form of epilepsy, the ordinary seat of major epilepsy was in the medulla oblongata. From analogies between experimental epileptic animals and human patients, Brown-Séquard concluded that in humans epilepsy might also be caused by disease of the spinal cord. (Koehler, 1994, p. 192).

The medulla oblongata was consistently emphasized as an essential factor in spinal epilepsy:

Lesions of the cord, however, are but the remote cause of the convulsions in spinal epilepsy. The proximate cause, as in ordinary epilepsy, is to be referred to the medulla oblongata: the spinal cord probably acts only as a conductor, transmitting the impulses it receives from the brain to the muscles. (McAldowie, 1878, p. 915).

The osteopathic physicians of the nineteenth and early twentieth centuries likewise placed emphasis on pathology of peripheral nerves as a causal or at least contributing factor in epilepsy:

From the osteopathic point of view it [epilepsy] is caused by lesions interfering with the nutrition of cord or brain, or irritating the motor nerve strands running to the peripheral motor structures, or exciting connected nerves. (Hazzard, 1905)

Meythaler et al. (1991) reported on a patient who, nine months after

a motor vehicle accident in which he suffered cervical spinal injury, developed periodic episodes of involuntary myoclonus of the upper extremities. Noting that the patient exhibited signs consistent with autonomic dysreflexia prior to the seizures, they concluded: "Whether the autonomic dysreflexia causes spinal seizures or was a part of the seizure activity is open to conjecture." (Meythaler et al. 1991, p. 559)

Seizures after spinal surgery are rare. Khokbar et al. (2015) reported on a patient who experienced a tonic-clonic seizure after lumbar laminectomy and spinal fixation. No cause was identified from preoperative history. Based on a literature review the authors felt that the seizure may have been triggered by antibiotics mixed with water for irrigation of the surgical field. If so, this could be regarded as a reflex seizure triggered by irritation to the peripheral nervous system along the lower spine.

Orgasm-induced reflex seizures are another fascinating example of somatosensory involvement in epilepsy:

Orgasm may be related to epileptic seizures in several ways. Epileptic somatosensory seizures can be manifested as a vaginal sensation, which may induce a compulsion to masturbate until orgasm. Orgasm may very rarely evoke epileptic seizures as a kind of reflex epilepsy mechanism. (Janszky et al., 2004, p. 441)

There are at least three known ways in which orgasm can precipitate or trigger seizures: (1) changes in the general biochemical milieu (such as hormones, which will be discussed in a later section); (2) psychological factors (such as imagination or emotion); and (3) by the application of specific external (i.e., sensory) stimuli such as peripheral neuronal mechanisms (Hoenig & Hamilton, 1960).

The majority of reported cases of orgasm-induced seizures are in women and usually manifest as complex partial seizures with localization in right hemisphere, which is the locus for human sexual experience. Autonomic changes during orgasm may provoke seizure from this hyper-excitable epileptogenic area (Chaukimath & Patil, 2015; Bancaud et al., 1971; Sengupta et al., 2010; Ozkara et al., 2006).

Interestingly, Mosovich & Tallafero (1954) described electro-enceph-

alogram changes during orgasm resulting from self-stimulation in three women and three men. They reported: "At the acme of the orgasm . . . there is a slowing of the electrical activity with increase in voltage until there are paroxysmal, three per second waves which are mixed with alternating muscular discharges." They drew attention to the similarity of EEG patterns occurring during orgasm and during epileptic convulsions (as cited in Fox & Fox, 1969, pp. 405–406).

Perhaps there is an inherent biological relationship between orgasm and seizures. Other possible reproductive system connections with epilepsy will be explored in a later section on sex hormones and seizures.

1.4.6 Viscerosensory Reflex Seizures and Epilepsy

The association of epilepsy with the gastrointestinal (GI) tract and the activities of eating, digestion, assimilation, and elimination are well established in the literature. Reflex eating seizures are rare, usually of complex partial type in patients with both reflex and nonreflex seizures (Haddad et al., 1991; Cukiert et al., 2010). Physiopathological mechanisms are complex with participation of various internal sensory stimuli including autonomic, somatosensory, or proprioceptive afferents (Italiano et al., 2014). Thus identification of specific sensory stimuli that trigger eating seizures has yielded a variety of possible factors. Gastric distention was hypothesized as a trigger in four patients by Boudouresques and Gastaut (1953). Vizioli (1962) found that the richness of the meal was a provocative factor in nine cases. Symonds (1959) suggested that precipitation of epileptic attacks by visceral sensory stimuli was more common than generally appreciated. He described the case of a man who suffered seizures in the form of sudden confusion and a sense of familiarity which lasted two or three minutes while eating a heavy meal. Senanayake (1990) reported that during a nine-year period, two clinics that register 150–200 epilepsy cases per year identified 150 patients whose seizures were related to a meal, either exclusively or in the majority of instances.

Koul et al. (1989) report that eating epilepsy is the most common reflex seizure type in the Vale of Kashmir (5% of all seizures). Considering that eating epilepsy may have geographic and cultural aspects, it is perhaps significant that in that temperate region, the staple diet is rice eaten directly with the hand and eating seizures tend to occur

only during the chewing stage.

With regard to the pathophysiology of seizures linked to eating, a detailed case study of a Lebanese boy presented by Gastaut and Poirier (1964) is instructive. During the onset of a seizure (which his mother linked to eating specific foods), he experienced abdominal pain, and the threshold for photic stimulation was lowered. The case was categorized as "abdominal (enteric) epilepsy." The authors noted that genuine "enteric seizures" represent a small proportion of abdominal epilepsies, of which they have documented only thirty cases where the auras and seizures were of a true enteric or intestinal type. Of these cases, intestinal abnormalities were characterized by umbilical (often right-sided), colicky abdominal pain, accompanied by intestinal peristalsis and borborygmi, frequently with flatus and defecation. At times belching and vomiting suggested gastric involvement. With regard to the frequent complaint of right-sided abdominal pain, all cases had their appendix removed; many were subsequently operated on for "adhesions"; one patient had undergone ten such operations. Returning to the case study of the boy with abdominal/enteric epilepsy, Gastaut and Poirier noted:

The patient's abdominal seizures were experimentally reproduced by the authors, by means of original "activating" techniques, namely, administration of a cold water enema and intramuscular injection of prostigmine. Adequate electro-clinical evaluation of these seizures could thus be achieved. Concomitant electrographic and radio-cinematographic recording seemed to suggest that the afferent impulses resulting from intestinal contractions precipitated the electro-clinical discharges presented by the patient. In the opinion of the authors, such a case can be used as definitive proof of the influence of peripheral (afferent) stimuli, and sheds light upon the important role of non-specific systems of the reticular formation, in the precipitation of some types of epilepsy, especially the so-called reflex-epilepsy. (Gastaut & Poirier, 1964, p. 269)

The care taken in the documentation of this case that indicates "definitive proof of the influence of peripheral (afferent) stimuli" stands in

contrast to the standard corticocentric view of paroxysmal visceral pain associated with seizures that:

. . . may exist without any abnormal visceral activity, such as disordered intestinal or gastric motility. Thus, this type of sensory seizure may be a primary perceptual disorder of central visceral sensory centers, or a secondary experience derived from peripheral autonomic dysfunction centrally induced. (Glaser, 1957, p. 185)

Due to the strong autonomic nervous system (ANS) features of this case and the depth of documentation, it will be examined in greater detail in a later section that focuses on ANS involvement in epilepsy. At this point it is only necessary to point out the strong abdominal symptoms and visceral pathophysiology that were believed to precipitate the seizures. As noted, the authors regarded this case as having implications for the understanding of “some types of epilepsy, especially the so-called reflex-epilepsy”.

Visceral phenomena (such as abdominal pain or discomfort associated with eating) are present in many epileptic attacks. The frequent insistence of the epileptic patient that these symptoms are related to visceral disease is undoubtedly a consequence of the common occurrence of these symptoms as an important part of the attack (Mulder et al., 1954).

In our patients the precise nature of the abdominal symptoms is not always understandable. Clearly, such phenomena as vomiting, borborygmi, involuntary defecation, or urinary incontinence are indicative of motor responses involving the viscera. However, in other patients it cannot be determined with certainty whether the symptoms are motor or sensory in character. Thus, paroxysmal pain may be caused by spasm of the intestine or it may represent a sensory phenomenon [hallucination] interpreted by the patient as pain in a viscus. (Mulder et al., 1954 p. 489)

With regard to reflex eating seizures, an important distinguishing feature is timing—do the visceral symptoms precede (and presumably

precipitate) the seizure? This can be tricky, because the onset of a seizure can be difficult to ascertain. Also, the question of actual visceral pathology is also complicated by the possibility of motor impulses from a seized brain region producing peripheral effects (but again, presumably the seizure has already begun at that point in time and can be documented).

There are unique treatment implications for reflex eating seizures. For example, Cukiert et al. (2010) studied the effects of vagal nerve stimulation (VNS) on reflex eating seizures, which could theoretically be triggered by neural activity and signaling from organs innervated by the vagus nerve. Seizures were frequently dramatically reduced in all patients (10–95%). Interestingly, a less impressive reduction in nonreflex seizures was also noted in two patients (5–40%), suggesting that seizure frequency was likely modulated by afferent neural impulses to the central nervous system through the vagus. With regard to pathophysiology and treatment implications, the authors noted:

Temporolimbic and insular areas might be crucial in generating eating seizures at the cortical level, but these episodes are triggered by peripheral input from organs innervated by the vagus nerve . . . It is possible that unilateral VNS would be modulating bilaterally the ascending activity at the brainstem level, after going through the tractus solitarius complex . . . VNS seems to be an especially useful treatment modality in patients with reflex eating seizures not amenable to resective surgery. (Cukiert et al., 2010, p. 303)

Thus in eating seizures or eating reflex epilepsy the sensory stimulus (whether consciously processed or not) is of an internal sensory nature. Note that in these cases the triggering sensory stimulation could be actual physical pathology in a peripheral viscera system and that sensory impulses from the viscera mediated through the vagus to the autonomic centers in the medulla oblongata are the most often cited connection with brain seizures.

Key Points to Remember

- Sensory system involvement in epilepsy may manifest as sensory

seizures (auras), sensory dysfunction, or sensory generation and inhibition of seizures (reflexes).

- The literature cited in this section relating to peripheral sensory involvement exemplify the continuum between reflex and spontaneous seizures. Thus some subcortical and peripheral sensory factors that trigger epileptic seizures may not be currently recognized because they are unobservable, resulting in apparently spontaneously occurring seizures.
- These same factors may actually do more than trigger seizures; they may be the cause of the seizures through afferent nerve impulses to the brain, which causes pathological changes due to neural plasticity.

1.5 Autonomic Nervous System Involvement in Epilepsy

1.5.1 Background

The autonomic nervous system (ANS) is a network of nerves and ganglia that controls involuntary physiologic actions while maintaining internal homeostasis and stress responses. The ANS innervates structures within the cardiovascular, gastrointestinal, endocrine, exocrine, pulmonary, genitourinary, and central nervous systems (Duke, 2011). The ANS is represented by nuclei and ganglia in the periphery and subcortical regions of the brain (primarily the brainstem and hypothalamus) with input from other areas including the cerebral cortex (Buijs, 2013).

Conceptually (from a modern perspective), the ANS has three major subdivisions: The *sympathetic*, the *parasympathetic*, and the *enteric* nervous systems. The sympathetic system controls “fight-or-flight” reactions during emergencies by increasing the sympathetic outflow to the heart and other viscera. The parasympathetic system is responsible for the basal autonomic functions such as heart rate and respiration under normal conditions (i.e., “rest and digest”). The enteric system regulates peristalsis of the gut wall and regulates the activity of the secretory glands of the intestinal tract (Kim & Kim, 2012). The extent and degree of ANS involvement in epilepsy is remarkable:

The autonomic nervous system is often involved in both focal and generalized seizures. Indeed, autonomic changes

have been documented interictally, ictally, pre-ictally, and post-ictally. While all aspects of autonomic function can be affected, cardiac and pulmonary changes that may contribute to sudden unexplained death in epilepsy (SUDEP) have been most robustly explored and emphasized. The immense autonomic disturbances during and immediately after a generalized tonic-clonic seizure are obvious to any onlooker. However, focal seizures also may manifest with autonomic phenomena such as tachycardia and less often bradycardia and asystole, pallor, epigastric and cephalic sensations, hypersalivation, respiratory modifications, and pupillary changes. While they usually appear together with other neurological symptoms, they may also occur alone for brief or lengthy periods. (Moseley et al., 2012, p.375)

Thus the subcortical and peripheral aspects of ANS involvement in epilepsy are well documented and widely acknowledged. However, the meaning of ANS signs and symptoms can be problematic. For example, although ANS symptoms are common in both focal and generalized epilepsy, in some cases of focal epilepsy the ANS manifestations are so extreme at the beginning of the seizure (a so-called aura), the seizure itself is classified as an “autonomic seizure” (Fischer, Cross, et al., 2017 p. 535). And yet the meaning of ANS involvement in such instances is entirely corticocentric. The ANS symptoms are usually viewed simply as physiological effects of the seizure in the cortex without regard to possible etiological implications. Perhaps ANS manifestations at the beginning of a seizure indicate a role for the ANS in causing (or at least contributing to) the production of the seizure in the cortex. This possibility will be explored in this section.

Whereas traditionally the term “autonomic” has suggested at least a high degree of autonomy, the modern corticocentric perspective has relegated the ANS to little more than a handmaiden of the central nervous system (CNS). The reasoning behind this diminished status of the ANS makes use of a concept called the *central autonomic network* (CAN), which has two divisions within the brain—cortical and subcortical (e.g., Baumgartner et al., 2001; Leutmezer et al., 2003; Bassi & Bozzali, 2015).

The central autonomic network encompasses cortical limbic areas, including the amygdala, anterior insula, anterior cingulate cortex, and posterior orbitofrontal cortex. These areas directly connect with subcortical regions of the central autonomic network, including the hypothalamus, periaqueductal gray, parabrachial region in the pons, solitary tract nucleus, and ventrolateral medulla. Electrical stimulation and spontaneous seizures arising from or spreading to cortical limbic areas can alter autonomic functions and evoke visceral and emotional feelings. (Devinsky, 2004, p. 43)

Thus, although technically the CAN consists of both subcortical and cortical components, as a practical matter, the modern corticocentric model of epilepsy focuses almost exclusively on the cortical aspects with a strong top-down, unidirectional emphasis. From this perspective, the ANS is little more than an extension of the brain's cortex. The subcortical ANS regulating centers in the hypothalamus and brainstem are largely ignored as etiological and pathophysiological factors in epilepsy (except in the case of sudden unexplained death in epilepsy (SUDEP), as discussed below). Likewise, but even more so, peripheral ANS pathological manifestations in epilepsy are regarded as merely side-effects of a fundamental cortical dysfunction. Thus, although ANS disturbance is a common feature of many seizure types, involvement of ANS dysfunction is often overshadowed by the more apparent motor and higher cerebral effects of seizures (Ansakorpi et al., 2000). With regard to epilepsy, the most significant impact of "*corticocentric myopia*" (Parvizi, 2009) relates to the understated role of ANS in the etiology and pathophysiology of epileptic seizures.

Interestingly (from an historical perspective as discussed in section 1.2), various theories have postulated peripheral nervous system dysfunction relaying reflex irritation to ANS centers in the medulla oblongata as a key factor in the development of epileptic seizures (e.g., Hall, 1841; Schroeder van der Kolk, 1859; Brown-Séquard, 1860). Despite the currently predominant corticocentric approach to the pathogenesis of epilepsy, there is significant evidence that seizure production can be caused (or at least triggered) by subcortical and even peripheral components of the ANS. Therefore, a more realistic approach is bidi-

rectional and open to peripheral, subcortical, and cortical factors in epileptogenesis:

Together, these observations highlight the bidirectional coupling of central epileptogenesis with autonomic regulation wherein seizure activity can provoke potentially pathological autonomic change. On the other hand the state of peripheral autonomic arousal also impacts on seizures occurrence. This coupling may also add a psychophysiological dimension to epilepsy control by neural systems controlling emotional and bodily arousal influence seizure thresholds. (Nagai, 2015, pp. 1-2)

The “psychophysiological” manifestations of ANS involvement in epilepsy also extend to focal seizures of the temporal lobe:

Seizures are sometimes associated with “deja vu” and/or fear sensations . . . increased muscle activity and body temperature, swelling, and gastrointestinal and urogenital effects . . . When such emotional, motor or autonomic effects are followed by ictal cardiac changes, the latter could be regarded as adaptive physiologic responses to the former. However, ITs [ictal tachycardias] often occur prior to, or in the absence of, any clinical manifestation of seizures . . . Similarly, it is difficult to appreciate if the combined IT/ IB [ictal tachycardia/ictal bradycardia] changes and ictal oscillatory HR [heart rate] patterns are baroreflex interactions, or result from alternate sympathetic/parasympathetic activation during seizures. Although the first possibility is probable . . . studies have also documented alternate sympathetic/parasympathetic responses prior and during seizures. For example, Novak et al. observed preictal sympathoparasympathetic activation, which was followed by parasympathetic withdrawal 30 s prior to seizure and a peak sympathetic activity at the seizure onset. (Sevcencu & Struijk, 2010, p. 730).

Thus the preictal timing of ANS involvement in seizure production that often precedes cortical manifestations (such as standard EEG) may indicate peripheral or subcortical etiology and pathophysiology that will be explored in the sections that follow. The remainder of this chapter will document the bidirectional aspect of ANS involvement in epilepsy, with particular emphasis on ANS dysfunction during all phases of the syndrome (interictal, preictal, ictal, and post ictal). However, before proceeding to that portion of the literature review, it will be helpful to take a closer look at the third division of the ANS—the *enteric nervous system*.

1.5.2 The Enteric Nervous System

Typically, only the sympathetic and parasympathetic branches of the ANS are emphasized. However, beginning with Langley's formulation of the ANS (Langley, 1921), a third division called the "enteric nervous system" (ENS) is now often included (e.g., Goldstein et al, 2013; Rao & Gershon, 2016; Furness et al, 2014). Because of its complexity and relatively autonomous function, the ENS is often referred to as the "second brain" (e.g., Grubiši & Parpura, 2015; Avetisyan et al., 2015) or "gut brain" (e.g., Arneth, 2018; Fowlie et al., 2018).

Although the ENS is thought to be more autonomous than the other ANS divisions, it is still influenced by the CNS through those divisions (i.e., sympathetic and parasympathetic). And yet, even with the "bidirectional information flow between the ENS and CNS . . . removal of vagal or sympathetic connections with the gastrointestinal tract has minor effects on GI function" (Furness et al., 2014, p. 39).

Significantly, the bidirectional flow of impulses between the ENS and CNS weighs heavily on the side of the ENS. For example, the vagus nerve is one of the primary connections between the ENS and CNS. The direction of the nerve impulse flow is overwhelmingly afferent (sensory) going from the ENS to the CNS.

Although the ENS can function without input from the CNS, it does not normally do so; the CNS influences enteric behaviour and the gut also sends information to the brain. In fact, 90% of vagal fibres between the gut and brain are afferent, suggesting that the brain is more of a receiver than

a transmitter with respect to brain-gut communication. (Rao & Gershon, 2016, p. 518).

Researchers are beginning to elaborate the etiological and pathophysiological implications of a bidirectional link between the ENS and CNS:

The gut-brain axis facilitates a critical bidirectional link and communication between the brain and the gut. Recent studies have highlighted the significance of interactions in the gut-brain axis, with a particular focus on intestinal functions, the nervous system and the brain . . . Researchers have found that the vagus nerve drives bidirectional communication between the various systems in the gut-brain axis . . . The communication that occurs in the gut-brain axis can alter brain function and trigger various psychiatric conditions, such as schizophrenia and depression. (Arneth, 2018, p. 446)

The part the ENS plays in neurological disorders, as a portal or participant, has also become increasingly evident. ENS structure and neurochemistry resemble that of the CNS, therefore pathogenic mechanisms that give rise to CNS disorders might also lead to ENS dysfunction, and nerves that interconnect the ENS and CNS can be conduits for disease spread. We review evidence for ENS dysfunction in the aetiopathogenesis of autism spectrum disorder, amyotrophic lateral sclerosis, transmissible spongiform encephalopathies, Parkinson disease and Alzheimer disease . . . The gut-brain alliance has raised consciousness as a contributor to health, but a gut-brain axis that contributes to disease merits equal attention. (Rao & Gershon, 2016, p. 517)

Perhaps epilepsy could be added to the list of neurological conditions in which the gut-brain axis plays a bidirectional role in etiology and pathophysiology (McMillin et al., 1999).

1.5.3 Abdominal Epilepsy

The association of abdominal symptoms with epilepsy has been recognized for many years. For example, “gastric and intestinal disturbances” were viewed as primary etiological factors by medical doctors during the late nineteenth and early twentieth centuries (Dercum, 1912, p. 917).

Historically, the first case of abdominal epilepsy reported in the literature was probably documented by Troussseau in 1867. A child of about ten years old “four or five times a day, before as well as after a meal, always without any appreciable cause, complained suddenly of a sensation of pressure in the pit of the stomach, soon followed by vomiting. Immediately upon this he felt violently giddy, and turned deadly pale. These phenomena lasted altogether for about a minute.” (Trousseau, 1867, p. 63)

The attending physician believed it to be a case of dyspepsia, which did not respond to treatment. Trousseau diagnosed epilepsy, which did manifest as repeated seizures within the next year. Trousseau observed: “This visceral aura escapes the observation of the physician all the more easily from its simulating other affections in a numerous class of cases.” (Trousseau, 1867, p. 63)

The difficulty of distinguishing an epileptic “visceral aura” (as described by Trousseau) from other affections with similar features was also addressed by Gowers in his elaboration of similar conditions on the “border-land of epilepsy.”

The term “vagal attacks” is unfamiliar, but it seems a useful designation for prolonged seizures, the symptoms of which consist chiefly in disturbance of some of the functions of the pneumogastric. They are for the most part sensory and therefore subjective. The word “vagal” is used only as a convenient descriptive term, bringing together symptoms which cannot easily be included in a useful designation. The symptoms comprehend subjective gastric, respiratory and cardiac discomfort, sometimes cardiac pain and even a sense of impending death. (Gowers, 1907, p. 17)

The “pneumogastric” (tenth cranial nerve) is now called the *vagus*, the

major visceral nerve of the parasympathetic branch of the ANS. In cases of abdominal epilepsy, the vagus is often cited as a likely link between peripheral visceral symptoms and the cerebral cortex (via the medulla oblongata in the brainstem). The challenge, of course, is not only to clinically discriminate between cases with abdominal autonomic features that may or may not be seizure disorders, but also to understand how they overlap so as to better understand the role of the ANS in epilepsy. Gowers recognized that in both epilepsy (with significant ANS involvement) and certain non-epileptic "border-land" disorders (also displaying obvious ANS features), "the mechanism may be the same . . ." (Gowers, 1907, p. 4).

The term *abdominal epilepsy* was introduced into the medical lexicon by Moore in 1945 to identify patients with predominant abdominal pain and/or nausea and vomiting attributed to seizures (Moore, 1945). A few papers published in the medical journals during the 1960s called attention to the abdominal features in epilepsy (Berdichevskii, 1965; Takei and Nakajima, 1967; Juillard, 1967). More recently, numerous researchers and clinicians have reported on various aspects of abdominal epilepsy (Agrawal et al., 1989; Babb and Eckman, 1972; Bondarenko et al., 1986; Douglas and White, 1971; Hotta and Fujimoto, 1973; Loar, 1979; Matsuo, 1984; Mitchell et al., 1983; Moore, 1972; O'Donohoe, 1971; Peppercorn et al., 1978; Peppercorn and Herzog, 1989; Reimann, 1973; Singhi and Kaur, 1988; Yingkun, 1980; Zarling, 1984; Solana de Lope et al., 1994).

Common clinical features of abdominal epilepsy include abdominal pain, nausea, bloating, and diarrhea with nervous system manifestations such as headache, confusion, and syncope (Peppercorn and Herzog, 1989).

Although its abdominal symptoms may be similar to those of the irritable bowel syndrome, it may be distinguished from the latter condition by the presence of altered consciousness during some of the attacks, a tendency toward tiredness after an attack, and by an abnormal EEG. (Zarling, 1984, p.687).

Mitchell et al. (1983) regard cyclic vomiting as a primary symptom of abdominal epilepsy manifesting as simple partial seizures. Although

abdominal epilepsy is diagnosed most often in children, the research of Peppercorn and Herzog (1989) suggests that abdominal epilepsy may be much more common in adults than is generally recognized.

One of the primary problems in understanding abdominal epilepsy is clearly defining the relationship of the abdominal symptoms to the seizure activity in the brain. In other words, what is the pathophysiology of abdominal epilepsy? Is the essential pathology located in certain areas of the brain that happen to be connected to the abdominal organs? Or is the primary pathology in the abdomen, which is conveyed through connecting nerve fibers (such as the vagus) to the brain, resulting in epileptic seizures? Peppercorn and Herzog noted both possibilities in their attempt to understand the cause of abdominal epilepsy:

The pathophysiology of abdominal epilepsy remains unclear. Temporal lobe seizure activity usually arises in or involves the amygdala. It is not surprising, therefore, that patients who have seizures involving the temporal lobe have GI symptoms, since discharges arising in the amygdala can be transmitted to the gut via dense direct projections to the dorsal motor nucleus of the vagus. In addition, sympathetic pathways from the amygdala to the GI tract can be activated via the hypothalamus. On the other hand, it is not clear that the initial disturbance in abdominal epilepsy arises in the brain. There are direct sensory pathways from the bowel via the vagus nerve to the solitary nucleus of the medulla which is heavily connected to the amygdala. These can be activated during intestinal contractions. (Peppercorn & Herzog, 1989, p. 1296).

1.5.3.1 Case Report of Reflex Induction of Abdominal (“Enteric”) Epileptic Seizures

A case study reported by Gastaut & Poirier (1964) illustrates the complexity of abdominal epilepsy, in which cortical, subcortical, and peripheral factors are recognized within an integrative model. Due to importance of the case and its implications for this review, a detailed account follows.

A nine-year-old boy, with negative family history and normal birth, complained of recurrent attacks of abdominal pain. Generalized

convulsions began on the 20th day of life and recurred until age 24 at which time (upon developing measles and hemiparesis) the generalized seizures were replaced by frequent partial seizures with complex abdominal features. Typically, an attack began with severe colicky pain in the umbilical area, at times radiating to the right hypochondrium. The boy's appendix, removed at age seven, was found to be histologically normal. The mother believed that diet triggered the attacks with ingestion of unripe or stewed fruits, cooked vegetables, rare meat, boiled fish, or rich sauce and other specific items blamed for the subsequent fit.

Psychological assessment indicated slight mental retardation and a short attention span. Skull X-rays were negative. Atrophy of the temporal lobe was suggested by a pneumoencephalogram showing dilatation of the right temporal horn.

The authors noted that genuine "enteric seizures" represent a small proportion of abdominal epilepsies, of which they have documented only thirty cases where the auras and seizures were of a true enteric or intestinal type. Of these cases, intestinal abnormalities were characterized by umbilical (often right-sided), colicky abdominal pain, accompanied by intestinal peristalsis and borborygmi, frequently with flatus and defecation. At times belching and vomiting suggested gastric involvement. With regard to the frequent complaint of right-sided abdominal pain, all cases had their appendix removed. Many were subsequently operated on for "adhesions"—one patient had undergone ten such operations.

Abdominal epilepsy (whether associated with gastric or intestinal features) is generally considered to be due to neuronal discharges in the areas of the brain where the digestive tract is represented. This is the current mainstream corticocentric perspective. In this case the partial epilepsy manifestations could be ascribed to a focal lesion in the right hemisphere producing the intestinal disturbances accompanying the seizures. This corticocentric perspective would be consistent with the pneumoencephalogram showing dilatation of the right temporal horn.

However, the authors hypothesized that the brainstem reticular formation was the site of origin for the generalized EEG spikes and waves, supported by the fact that the reticular formation has been shown to have a regulatory function upon gastrointestinal motility. Progressive enhancement of the excitability of the brain (lowering of convulsive

threshold) could have resulted from impulses from the alimentary tract to the brainstem reticular formation.

The patient's abdominal seizures were experimentally reproduced by the authors, by means of original "activating" techniques, namely, administration of a cold water enema and intramuscular injection of prostigmine. Adequate electro-clinical evaluation of these seizures could thus be achieved. Concomitant electrographic and radio-cinematographic recording seemed to suggest that the afferent impulses resulting from intestinal contractions precipitated the electro-clinical discharges presented by the patient. In the opinion of the authors, such a case can be used as "definitive proof" of the influence of peripheral (afferent) stimuli, and sheds light upon the important role of non-specific systems of the reticular formation, in the precipitation of some types of epilepsy, especially the so-called reflex-epilepsy (Gastaut & Poirier, 1964, p. 269).

The authors of this case report were experienced, recognized authorities who understood the implications of their investigation and took all reasonable measures to confirm with "definitive proof" the influence of peripheral (afferent) stimuli in the development of the epileptic seizures. Considering the preponderance of gastrointestinal symptoms (mediated via the ANS) that are associated with various types of epileptic seizures, it seems reasonable to be open to the possibility of peripheral reflexes from the GI tract in epilepsy, rather than simply assuming an exclusively corticocentric etiology and pathophysiology (as is typically the case in modern clinical practice and research).

So was the abdominal dysfunction the result of a cerebral lesion (presumably in the temporal lobe) or the result of adhesions produced in the lower right abdomen (perhaps related to appendectomy)? Maybe both were factors in this case of abdominal epilepsy. Either way, irritation to the bowel was sufficient to trigger seizures.

In a similar case of visceral stimuli inducing epileptic seizures, Jacome (1978) reported on a twenty-year-old man with a history of seizures since early childhood who was observed having periods of

unresponsiveness lasting for fifteen to thirty minutes accompanied by ANS symptoms including mydriasis, increased salivation, pallor of the skin, tachycardia, and mild hypertension. It was noted that these episodes preceded defecation or urination or both. If neither event occurred (defecation or urination), then rather than the relatively mild focal-impaired awareness with ANS symptoms, dramatic generalized seizures with head turning to either side, massive flexion myoclonus, tonic-clonic movements, and high temperatures would follow. Jacome concluded:

Afferent bladder or bowel stimuli mediated by the autonomic nervous system probably relay through the reticular formation of the brainstem and later project over both hemispheres (and are then responsible for the bilateral synchronous electroencephalographic disturbances). This case calls attention to the fact that visceral stimuli at times can be the trigger mechanisms for seizures . . . ” (Jacome, 1978, p. 166)

1.5.3.2 Connection of Acquired Epilepsy with Colitis

Beach (1918) reported a case of acquired epilepsy due to subnormal colon function. A forty-seven-year-old woman suffered from grand mal and petit mal attacks at varied intervals for fifteen years. Twenty years previously, she had an oophorectomy and appendectomy performed, which were followed by severe intestinal stasis and colitis—and a few years later she began experiencing epileptic seizures. Her neurologist referred for examination of her colon, which revealed obstinate constipation, glairy mucus, severe periodic cramps, and a large postoperative hernia. The hernia was repaired, but the surgeon noted adhesions too extensive to break up, involving the ascending colon and the sigmoid. So with the hope of reducing the colitis to a minimum (and possibly favorably influencing the epilepsy), cecostomy was performed. For two years following the operation, she did not have any seizures, and in the six years previous to the journal report, she had only three grand mal attacks (but some mild cataleptic spells of momentary duration). Acknowledging that there are few advocates of the theory that acquired epilepsy (i.e., beginning late in life) is from the colon, Beach concluded:

On the whole, she has had a comparatively good six years, when contrasted with the weekly and daily attacks previously recorded. I am not prepared in this case to deduce any definite conclusions, but I believe that, if the extensive intestinal traumas could be corrected, the correction would go a long way toward clearing up this case permanently. I believe, also, that the case is a good illustration of the verity of the theory that the subnormal function of the colon is a diathesis leading to acquired epilepsy . . . (Beach, 1918, p. 1455)

Beach was inclined to interpret the improvement in his patient to decreased toxicity from the colon (the *autointoxication theory of epilepsy*), but one might also infer that if the improved colon health was related to reduced seizures, it is more a matter of decrease in irritated nerve reflex from the colon to the brain, probably via the vagus, as has been discussed previously.

1.5.4 Cardiovascular Dysfunction in Epilepsy

Abnormalities in heart rate, blood pressure, and cerebral blood flow are well documented in epilepsy (Diel et al., 1997; Freeman, 2006; Nei, 2009). Yet the meaning of these autonomic features is open to interpretation. This is particularly evident in the abundance of research data and theoretical interpretations surrounding the preictal manifestation of cardiovascular anomalies—physiological events preceding the overt clinical and electrophysical (typically EEG) evidence of seizure activity (e.g., Baumgartner et al., 1998; Carter, 1998; Paolo et al., 2005; Hawco et al., 2007; Schwartz et al., 2011; Zhao et al., 2011; Patel et al., 2013; Moseley et al., 2014). If seizures are the sole cause of cardiovascular effects, how—and why—do the effects so often seem to precede the seizure? Furthermore, what is the source of heart rate and rhythm anomalies documented in the epilepsy literature? And how might all of this relate to sudden unexpected death in epilepsy (SUDEP)?

1.5.4.1 Heart Rate and Rhythm Aberrations

Beginning with heart rate and rhythm aberrations, decades of research confirm that the ANS plays an important role in the modulation of cardiac electrophysiology and arrhythmogenesis, providing evidence

supporting the relationship of autonomic tone to clinically significant arrhythmias (Shen & Zipes, 2014). Cardiac arrhythmia (also known as cardiac dysrhythmia) is a group of conditions in which the heartbeat is irregular: too fast (tachycardia), too slow (bradycardia), or nonexistent (asystole, a form of cardiac arrest). Naturally, asystole is the most serious cardiac arrhythmia and may be linked to “sudden unexplained death in epilepsy” (SUDEP).

1.5.4.2 Sudden Unexpected Death in Epilepsy (SUDEP)

Although ANS anomalies are pervasive in almost all forms of epilepsy, the relatively high prevalence of SUDEP (and its unknown source) has led to a strong research impetus into a possible ANS association. Ictal tachycardia is the most commonly reported arrhythmia associated with seizures (Blumhardt et al., 1986). Tachycardia (along with related ANS manifestations such as hypertension, rise in cardiac output, and rise in cerebral blood flow) occurs less frequently in children than adults (O'Regan & Brown, 2005). Ictal tachycardia is associated with excessive sympathetic activity (or underactive parasympathetic activity), whereas the opposite pattern is associated with ictal bradycardia and asystole (Lee & Devinsky, 2005). Ictal bradycardia and asystole are relatively rare in adults (Rocamora et al., 2003) and children with epilepsy (O'Regan & Brown, 2005). However, bradycardia and asystole are thought to be strongly linked to SUDEP (Kothare & Singh, 2014).

A balance between sympathetic and parasympathetic drive is needed to protect against bradycardia, asystole, and hypotension versus gross tachyarrhythmias, ventricular arrhythmias, and hypertension. Although there are mechanisms to compensate for a seizure, they can be overridden by the effects of the seizure discharge itself into medial temporal lobe, insula, and limbic areas. This could contribute not only to SUDEP, but also to the increased risk of permanent brain damage in children (O'Regan & Brown, 2005, p. 7).

Understanding the anatomy and physiology of the ANS is helpful in recognizing how ANS involvement can influence (or perhaps even cause) cardiac dysfunction in epilepsy. The two main branches of the ANS (sympathetic and parasympathetic) are said to work in a complementary, or even antagonistic, manner. The sympathetic system becomes dominant during times of crisis or danger (“fight or flight”).

The parasympathetic is more useful for relaxation (“rest and digest”). The term “balance” is sometimes used to portray a healthy ANS and “imbalance” when one division becomes excessive. However this terminology can become confusing. Certainly there are situations when extreme activity in one direction or the other is not only appropriate, but essential—for example, when a life-threatening, dangerous situation requires the sympathetic branch to dominate. In such a situation the role of two ANS branches is not equal, yet they can *coordinate* for the benefit of the whole system. During (or even preceding) an epileptic seizure, sometimes one or both branches of the ANS can become erratic, switching dominance for no apparent or adaptive reason—or both branches can become activated simultaneously in a dysfunctional way. Thus there is a pathological *incoordination* or *dysregulation* within the ANS that is inherent in the various cardiovascular abnormalities that may be a factor in SUDEP.

Extrinsic and intrinsic ANS regulation is another important aspect of ANS anatomy and physiology. For example, physiologically, cardiac function is regulated via extrinsic and intrinsic ANS innervation:

Throughout the heart, numerous cardiac ganglia, each of which contains 200 to 1000 neurons, form synapses with the sympathetic and parasympathetic fibers that enter the pericardial space. The vast majority of these ganglia are organized into ganglionated plexi (GP) on the surface of the atria and ventricles. The intrinsic cardiac ANS thus forms a complex network composed of GP, concentrated within epicardial fat pads, and the interconnecting ganglia and axons. These GP may function as integration centers that modulate the intricate autonomic interactions between extrinsic cardiac ANS and intrinsic cardiac ANS. (Shen & Zipes, 2014, p. 1005)

Extrinsic cardiac ANS innervation consists of sympathetic and parasympathetic components. Sympathetic fibers derive mainly from major autonomic ganglia along the cervical and thoracic spinal cord. Included in these ganglia are the superior cervical ganglia (C1–3); the stellate (cervicothoracic) ganglia (C7–8 to T1–2); and the thoracic ganglia (as

low as the seventh thoracic ganglion). The axons of the postganglionic sympathetic neurons located in these ganglia form the superior, middle, and inferior cardiac nerves and terminate on the surface of the heart. The parasympathetic cardiac innervation originates predominantly in the nucleus ambiguus of the medulla oblongata and is carried almost entirely within the vagus nerve (Shen & Zipes, 2014). Thus, the peripheral ANS nerves of the upper spine and the brainstem medulla oblongata play an immediate and essential role in the *coordination* of ANS innervation of the heart. Therefore, cardiac ANS innervation (efferent) is inherently both subcortical and peripheral, regardless of whatever cortical input may be associated with seizure activity. The immediate beat-to-beat, life-supporting regulation of cardiac function is essentially subcortical and peripheral, one of several important factors to consider with regard to the significant ANS involvement in epilepsy (and particularly SUDEP):

However, genetic disorders and variants—as with other brain disorders that cause epilepsy—could increase SUDEP risk through effects on the following: epilepsy severity (seizure frequency, duration, spread pattern, intensity, and postictal effects); postictal depression of consciousness; central or peripheral autonomic function; brainstem cardiorespiratory control . . . (Devinsky et al., 2016, p. 1078)

Although the mechanisms underlying SUDEP are probably heterogeneous . . . many SUDEPs result from a combination of postictal dysfunction of cardiorespiratory control and depression of consciousness, consistent with many animal models. The primary integrative centres and final output pathways for breathing and autonomic output are located in the brainstem (defined here as the medulla, pons, midbrain, and diencephalon), as are modulatory systems associated with maintenance of arousal. (Devinsky et al., 2016, p. 1083)

1.5.4.3 Heart Rate Variability Abnormalities

In addition to monitoring for clinically significant cardiac arrhyth-

mias, the measurement of *heart rate variability* (HRV) is a more subtle, widely used, yet noninvasive approach for detecting cardiac dysfunction. There is significant beat-to-beat variability in the rhythm of a normal heart that is dependent upon the balance between parasympathetic and sympathetic nerve innervation of the heart. Typically, high HRV is a sign of a healthy heart with well-functioning autonomic nervous system, whereas low HRV is viewed as unhealthy (Evrengul et al., 2005).

HRV is usually measured via standard electrocardiography (ECG) and special software that analyzes successive beat-to-beat heart activity. Analysis of power spectral density (such as the high-frequency and low-frequency indexes related to vagal and sympathetic activity, respectively) provides a window into the physiologic mechanisms of sympathetic-parasympathetic dysfunction in epilepsy (Lotufo et al., 2012).

Considering the heterogeneity within the various types of epilepsy with differing etiology and pathophysiology, it is not surprising that research into HRV in epilepsy patients has yielded variable results. Therefore, focusing on HRV within specific populations is a common strategy for obtaining greater consistency. Because disease duration and possible medication effects can influence pathophysiology (particularly of the ANS), research with newly diagnosed and untreated patients provides important insights into the etiology and pathophysiology of epilepsy. For example, Romigi et al. (2016) measured HRV in a group of newly diagnosed, untreated patients (n=14) with temporal lobe epilepsy (TLE) and found evidence for ANS dysfunction (particularly “sympathetic overdrive”). The ANS dysregulation combined ictal activation of the sympathetic nervous system, possibly preceded by a preictal reduced vagal tone:

Our data confirm the hypothesis of a sympathovagal imbalance related to temporal seizures in patients with newly diagnosed and untreated epilepsy . . . These findings are intriguing because they reflect a combined seizure-induced activation of the sympathetic nervous system, possibly preceded by a preictal reduced vagal tone. This could suggest that inputs from cortical and/or subcortical structures involved in and/or affected by the epileptic discharge may

account for sympathetic imbalance in TLE. (Romigi et al., 2016, pp. 422-423)

Similarly, Goit et al. (2016) measured HRV in a group of untreated, newly diagnosed patients (with mixed diagnosis—forty-four with focal epilepsy and twenty-one with generalized epilepsy). They concluded that newly diagnosed patients with epilepsy have significant cardiac autonomic dysfunction characterized by decreased cardiac parasympathetic activity but increased cardiac sympathetic activity (Goit et al., 2016).

Dericioglu et al. (2013) explored the effects of temporal lobe surgery on HRV in a group of twenty-four consecutive patients with intractable epilepsy. Standard anterior temporal lobectomy with amygdalo-hippocampectomy was performed. Considering evidence for autonomic dysregulation in temporal lobe epilepsy and the fact that the structures removed are important centers of central cardiovascular control, the authors hypothesized that surgery could alter the cardiovascular autonomic function. The effects of temporal lobectomy on HRV in the early and late postoperative periods were monitored:

Cardiovascular autonomic functions are altered in favor of the parasympathetic system early after TLE surgery, but the sympathetic system predominates after the first post-operative month while HRV remains reduced. These findings suggest that resection of the temporal lobe, amygdala and hippocampus may have acute effects on CV autonomic control. Further alterations however indicate that mechanisms other than removal of the aforementioned anatomical structures are also active. (Dericioglu et al., 2013, p. 717)

So although there was an immediate impact on normalizing ANS functioning as measured by HRV, later post-operative data suggest that the underlying ANS anomalies remained, indicating that mechanisms other than the surgically removed structures were still active. Considering the inherent subcortical and peripheral participation in cardiovascular functions, perhaps subcortical or even peripheral mechanisms play a role in ANS dysfunction in TLE.

More broadly, the common theme that runs through the extensive HRV literature in epilepsy is the presence of autonomic dysregulation—specifically an imbalance or incoordination between the sympathetic and parasympathetic divisions of the ANS, even preceding the clinical manifestations of the seizure itself.

1.5.4.4 Cerebral Circulation Anomalies

Epileptic lesions of all types, it seems to me, show cytological evidence of previous progressive small ischemias. I have tried to put the idea to the test by some of the circulation control procedures . . . but I have failed. It is an unproved hypothesis that will, I suppose, go to the grave with me. Some undiscovered secret of cerebral circulation is the ultimate cause of epilepsy, I fancy. (Penfield, 1971, p. 126)

Penfield's thoughts on circulatory dysfunction as a primary factor in epileptic seizures reflect the medical literature, from Galen's *cardia* through the nineteenth century (with its multitude of vascular and vasomotor theories as reviewed previously)—and even up to and including the most recent studies, some of which will be cited in this section. That there is an ANS cardiovascular component to epilepsy is obvious. But just what the nature of that involvement is (whether cause or effect—or both) is complex and unresolved at this point. Or as Penfield noted with regard to his own theorizing, ultimately he was left with an “incomplete hypothesis for the control of cerebral circulation” (Penfield, 1971, p. 124).

The current dominant model of brain circulation in epilepsy is, like all other aspects, driven by a corticocentric perspective that relies on neurovascular coupling to examine the relationships among neuronal activity, metabolism, tissue and blood oxygenation, and blood flow. During normal cortical processing, increases in neuronal activity simultaneously increase the cerebral metabolic rate of oxygen and glucose, leading to an increase in cerebral blood flow and cerebral blood volume, as the brain attempts to perfuse active neurons with oxygenated hemoglobin (Schwartz, 2007).

However, recent research has increasingly called into question the traditional neurovascular coupling model as applied to epileptic seizures. Most notably, numerous studies using various modalities have

documented consistent abnormalities in cerebral blood flow that, for some, suggest the possibility of vascular causation, much as Penfield had envisioned. For example, using PET H215O blood flow imaging, Carter (1998) continuously monitored cortical blood flow (CBF) in thirteen patients with forty-three epileptic seizures. There was a significant increase in epileptic temporal lobe CBF approximately ten to twenty minutes before the electrical seizure onset. Simultaneously, CBF decreased in the nonepileptic temporal lobe. During seizures, Carter found that CBF increases bilaterally and the late postictal CBF is significantly reduced in the epileptic temporal lobe. These results indicating CBF changes preceding seizure onset electrical changes were interpreted as a *vasomotor* abnormality that triggers the electrical event. The compatibility of these findings with Penfield's observations was noted. Carter concluded: "Generally, one assumes that CBF changes are dependent on the cerebral metabolic activity; however, in pathological conditions, this is not necessarily the case." (Carter, 1998, p. 1196)

Using single-photon emission computed tomography in cases of temporal lobe epilepsy, Baumgartner et al. (1998) found evidence that CBF is increased in the epileptic temporal lobe several minutes before the actual EEG or clinical seizure onset. They interpreted the findings as suggesting that an increased perfusion of the epileptic temporal lobe actually heralds and does not simply follow the impending seizure activity. However it is unclear if such CBF changes are causative for the transition from the interictal to the ictal EEG state (Baumgartner et al., 1998).

Using functional MRI (fMRI) analysis of the pre-ictal state in three patients with intractable focal epilepsy, Paolo et al. (2005) reported a change of blood oxygenation level dependent (BOLD) signal several minutes before the onset of the seizure. Similarly, using fMRI to measure BOLD changes occurring prior to EEG epileptic spikes, Hawco et al. (2007) also noted BOLD changes starting prior to the spike. Because BOLD change is expected to result from the spike, this surprising finding can be explained in two ways:

Two hypotheses appear plausible: either the BOLD signal change that precedes the neuronal discharge is its cause, or there is a change in neuronal activity that occurs prior

to the discharges seen on the scalp, and which results in the BOLD signal change. The first hypothesis would imply that the primary, causal event in an epileptic discharge is an event that results in a BOLD change but does not result from a change in neuronal activity. This initiating event would therefore be a change in blood flow, blood volume, or oxygen content. (Hawco et al., 2007, p. 1454)

Weinand et al. (1997) implanted bilateral subdural strip electrodes for long-term electrocorticographic (ECoG) measurement of surface CBF in thirteen patients with medically intractable complex partial seizures. The results of the study strongly suggest that some prior fundamental perturbation produces the ictal ECoG seizure onset. Significant alterations in CBF (in both epileptic and nonepileptic cortex) preceded electrocorticographic and clinical onset. Beginning approximately twenty minutes preictus, epileptic cortical CBF increases. At approximately ten minutes preictus, epileptic cortical CBF increased significantly from ischemic levels. Approximately two minutes prior to ECoG onset, nonepileptic CBF significantly decreased, approximating epileptic CBF. The authors concluded that the CBF alterations preceding ECoG seizure activity suggest that *vasomotor* changes may produce electrical and clinical seizure onset.

The results of this study suggest that epileptogenicity is a function of epileptic cortical perfusion. Electrical and clinical seizure onsets appear to be epiphenomena that are preceded by significant changes in CBF. Whether early preictal CBF changes are due to redistribution from nonepileptic to epileptic cortex, changes in metabolic activity, or some other factor cannot be determined from the data. Further research is needed to discover the perturbation causing preictal alterations in epileptic and nonepileptic CBF. (Weinand et al., 1997, pp. 230-231)

Interestingly, with the observation that “some other factor” could be responsible for the cortical perfusion that produces epileptic seizures, Weinard et al. did leave room for subcortical and peripheral involve-

ment in the etiology and pathogenesis of epilepsy.

Diehl et al. (1997) measured CBF velocities using transcranial Doppler and observed slow spontaneous oscillations attributed to changes in sympathetic activity (M waves, 3 to 9 cycles per minute) and to discharges of monoaminergic neurons in the brain stem (B waves, 0.5 to 2 cycles per minute) of epilepsy patients. The authors interpreted the data as suggesting a direct brainstem involvement in the generation of these abnormalities.

Using a rat model, Zhao et al. (2011) identified preictal neurovascular or neurometabolic events in the surround that may elucidate mechanisms for seizure initiation. They found decreased metabolism in the cortex surrounding a seizure focus and preictal vasoconstriction in a ring of cortex surrounding the seizure focus, which actively shunts blood to the ictal focus and may serve to prepare the focus for the impending dramatic increase in neuronal activity and metabolism. Reluctantly, they were led to acknowledge the controversial possibility that hemodynamic events could be primary causative factors in seizure development.

The controversial aspect of this line of thinking is that it resonates with the *vasomotor model of epilepsy*, popular (in various forms) during much of the nineteenth and early twentieth centuries. This was discussed in the historical portion (section 1.2) of this review with regard to Hall, Todd, and Brown-Séquard—each including some anomaly of cerebral circulation in their explanation of epileptic seizures. Hare (1909) was one of the more prominent advocates of this theory as it fell into decline, in part due to Gower's criticism:

Thus between the fact that profound anaemia of the brain and medulla oblongata will cause both loss of consciousness and convulsion, and the theory that these are commonly so caused in epilepsy, there is a gulf over which no bridge has yet been placed. (Gowers, 1885, p. 209)

Penfield, stimulated by his surgical observations of abnormal blood circulation during seizures, tried unsuccessfully to build that bridge. Some modern researchers, confronted with data suggesting abnormal patterns of preictal blood circulation are facing a similar challenge, as

cited above. Some (Weinand et al., 1997; Carter, 1998) even go so far as to assert plainly that epileptogenicity is a function of cerebral perfusion. That changes in CBF “precede the electrical changes with seizure onset implies that there is a vasomotor abnormality that triggers the electrical event” (Carter, 1998, p. 1196).

ANS neural control of the cerebral circulation is tonically active and likely plays an important role in the beat-to-beat regulation of cerebral blood flow (Zhang et al., 2002). This is the basis for vasomotor regulation of blood flow—systemic and cerebral. Considering the extensive ANS involvement in epilepsy, perhaps some of the circulatory anomalies preceding and during epileptic seizures are a consequence of ANS involvement.

1.5.5 Respiratory System Involvement in Epilepsy

ANS control of respiration is located in the dorsal rostral pons, inferior ventral pons, and lateral medulla of the brainstem. These centers receive afferent input from both central and peripheral chemoreceptors and stretch receptors. Higher brain systems including the prefrontal cortex, amygdala, and insula, in conjunction with the thalamus, provide descending input to the brainstem respiratory centers (Jansen et al., 2013).

ANS dysfunction in epilepsy is believed to affect respiration and possibly be a factor in SUDEP (Berilgen et al., 2004). In a study of respiratory functioning in seventeen patients with epilepsy, Nashef et al. (1996) noted that ictal apnea was often present and when associated with bradycardia indicated involvement of cardiorespiratory reflexes which may contribute to SUDEP. ANS dysfunction during seizures is easily explained as resulting from connections to the cortex via the central autonomic network (CAN). However, interictal (i.e., between seizure) ANS dysfunction is difficult to explain:

Autonomic dysfunctions occur during but also in between seizures. During seizures, the direct involvement of central autonomic control centers causes specific changes in heart rate and respiration. The pathophysiology of autonomic dysfunctions that are observed in the interictal period is more difficult to explain. These alterations are most likely due to changes in the epileptic network and/or, to a lesser extent,

due to direct interictal spike activity disturbing central autonomic centers. (Jansen et al., 2013, p. 410)

From a neural network perspective, epilepsy involves diverse and distant (from a focal seizure area) activity including subcortical regions in the brainstem. For example, in a study of fifty-seven consecutive patients with intractable localization-related epilepsy admitted for in-patient video-EEG telemetry to assess candidacy for epilepsy surgery, Bateman et al. (2008) found that seizure-associated oxygen desaturation was common and occasionally severe, and may result from disruption in the brainstem respiratory centers:

The descending pathways from limbic areas to the brainstem respiratory centres are primarily ipsilateral. Therefore, seizure-related bilateral impairment of these descending pathways may be a requisite for pronounced respiratory inhibition. There is evidence for significant projections from limbic regions to brainstem areas involved in control of respiratory activity. (Bateman et al., 2008, p. 3244)

Both the duration of the seizure and electrographic evidence of contralateral spread appeared to influence the degree of desaturation in this group of patients. This is important because ictal hypoxemia (abnormally low concentration of oxygen in the blood) may contribute to SUDEP.

1.5.6 The Skin as a Window into ANS Dysfunction in Epilepsy

An often overlooked but increasingly important aspect of ANS anomalies in epilepsy is the role of electrodermal activity (EDA). Sympathetic postganglionic fibers consisting of nonmyelinated class C nerve fibers surround eccrine sweat glands in the skin. Their activity modulates sweat secretion (Sato et al, 1989). Thus, sympathetic arousal increases sweat gland (sudomotor) activity, which in turn increases skin conductance as measured by applying direct current to the stratum corneum of the epidermis beneath measuring electrodes (Sharma et al., 2016).

Poh et al. (2010) utilized a wearable wristband sensor to continuously monitor and evaluate the differences in EDA changes between gener-

alized tonic-clonic seizures (GTCS) and complex partial seizures (CPS). The authors detected a massive sympathetic outflow occurring during GTCS and continuing postictally. Thus, EDA increases during GTCS were greater than during CPS and were sustained for a longer duration.

Seizure-induced EDA elevation is a possible sign of autonomic instability that could play a role in the pathophysiology of SUDEP. We predict that the periods of postictal sympathetic EDA elevation are associated with periods of impaired vagal reactivation. (Poh et al., 2010, p. 4418)

Poh et al. (2010) also investigated the potential of this technology to predict seizures. As with many ANS manifestations associated with epilepsy, there are measurable EDA changes preictally—seizures that may signal an approaching seizure. Further research is required to determine the practicality of this area of ANS involvement in epilepsy.

Another aspect of sympathetic activity of the skin is vasomotor regulation of the peripheral blood vessels in the skin and underlying tissues due to thermoregulation or as a fear reaction (fight or flight). When the body is too cold, the body constricts blood vessels in the skin so that less blood is exposed to the cooler external elements, which reduces heat loss. This sympathetic vasoconstriction results in pale or even whitish skin color due to less red blood near the surface. Cutaneous sympathetic vasoconstriction can also result from fear or simply stress. Thus, the skin becomes pale from fear (Benitez-Quiroz et al, 2018). Presumably this is the source of common expressions such as “white with fright” or turning “white as a ghost” when terrified. Thus, the versatility of the sympathetic system in dealing with external threats (whether cold or danger) is reflected in the cutaneous circulation and changes in skin color. Given the widely recognized sympathetic nervous system involvement in epilepsy, dysfunctional sympathetic activity in epilepsy could be reflected in evoked patterns of skin color or local changes in skin temperature.

Interestingly, visual manifestation of preictal sympathetic involvement in seizures was noted by Edward Tracy, a physician practicing during the early twentieth century (Tracy, 1918). Tracy was a medical doctor in Boston who utilized a simple technique to evaluate sympa-

thetic response in his patients. He used a common instrument (such as a wooden tongue depressor) to gently stroke the skin of the arm. In normal patients, this produced a brief-lasting vasodilation, followed by a vasoconstriction in the stroked area lasting a couple of minutes. One day, on testing a patient with idiopathic epilepsy, he was struck by the unusual variation in the intensity and duration of the vasoconstriction reaction. As he noted, "Objective phenomena that were visible and measurable in epilepsy certainly invited careful study" (p. 776).

For a period of two and a half years he followed this case performing the assessment twice a day for much of that period, also noting convulsive attacks and other physical phenomena. His interest engaged, ninety other cases of idiopathic epilepsy were examined during that time and the objective data recorded (amounting to seventeen hundred observations) together with photographs taken of the vasoconstriction phenomena. Tracy provided this physiological explanation for the sympathetic response evoked by the stroking of the skin in these experiments:

The white streak that follows stroking the skin of a normal individual and lasts a couple of minutes is a vasoconstriction reaction, caused by the involved blood vessels becoming constricted and squeezing out the blood that gives color to the skin. This reaction cannot be attributed to a local smoothing muscle reaction brought about by the application of mechanical stimuli, for the muscle tissue does not come in contact with the mechanical irritant. Further, in the normal individual there is a difference in the reaction time of the face and forearm,—the vasoconstriction coming quicker in the forearm after stroking than in the face,—although the skin structure is the same. The vasoconstriction is evidently brought about by the vasoconstriction nerves for stroking the face, a diffuse vasoconstriction frequently occurs—outside the stroked area. This can only be explained by nerve action. Moreover, the vasoconstriction reaction to stroking has all the elements of a true reflex, viz.: stimuli going over afferent fibers (the sensory nerve innervating the skin), stimuli coming over efferent fibers (the vasoconstrictor), and

muscular action (the vasoconstriction that results). (Tracy, 1918, pp. 777-778)

After making a careful daily record of reaction times and the occurrence of convulsions for two years, Tracy noted that a quickening of one or more reaction times took place within twelve hours before the onset of convulsions. Since the vasoconstriction reaction time indicates the irritability of sympathetic nerves involved in the reaction, this demonstrated an increase in irritability manifested by the sympathetic system activation preceding a convulsion. As a result of his observations and analysis, he concluded: “. . . idiopathic epilepsy is a sympathicopathy, a disease of the sympathetic neurones” (p. 777).

A more recent investigation of possible cutaneous sympathetic vasomotor activity in epilepsy (King et al., 2017) explored the hypothesis that abdominal visceral pathology in epilepsy (as discussed above) could be reflected in dermal thermographic anomalies on the abdomen. Fifty patients with the diagnosis of focal-onset epilepsy were compared with fifty control subjects with no history of epilepsy for abdominal thermal anomalies (*“cold spots”*). Under controlled room conditions all subjects had infrared thermographic images made and recorded for analysis:

The results support the hypothesis that individuals with focal onset epilepsy have colder abdominal areas. If substantiated in further research, present study results will require further examination of the mechanisms of action for epilepsy, and suggest the need for re-examination of older formulations of abdominal epilepsy, including the place of abdominal injury, inflammation, and adhesions in epileptic pathology. The concept of somato-visceral and viscero-somatic neurological interactions is one of the possible mechanisms underlying the “coldspot” findings and warrants further consideration. (King et al., 2017, p. 46)

1.5.7 Autonomic Epilepsy (Panayiotopoulos Syndrome)

As a final example of ANS involvement in epilepsy, we will now consider a condition defined by that relationship: Panayiotopoulos syndrome (PS), a benign yet common idiopathic childhood-specific epilepsy

with predominantly autonomic symptoms (Panayiotopoulos, 2007).

Autonomic seizures are the hallmark of the Panayiotopoulos syndrome. Autonomic symptoms and signs (mainly vomiting) occur from the onset in 80% of seizures, with half of them lasting for more than thirty minutes to hours, thus amounting to autonomic status epilepticus . . . Other autonomic manifestations may occur either concurrently with vomiting or later in the course of the seizure, and include pallor, mydriasis, cardiorespiratory, gastrointestinal and thermoregulatory alterations, incontinence, and hypersalivation. (Koutroumanidis, 2002, p. 1228)

PS could be considered as a model of “system epilepsy” (Wolf, 2006; Koutroumanidis, 2007). According to the “system epilepsy” hypothesis, dysfunction of a single brain structure or location cannot be solely responsible for the complex manifestations of these epileptic syndromes. Rather, an essential requirement is the recognition of a pathological system in which different brain areas (such as the cortex, thalamic nuclei, and brainstem) work together, actively and simultaneously participating in the epileptogenic process (Pal et al., 2016).

The cause of PS is unknown, but a genetic factor may be involved (Grosso et al., 2007; Livingston et al., 2009). Fever is a common trigger for focal autonomic seizures in PS (Cordelli et al., 2012).

1.5.8 Vagus Nerve Stimulation

The vagus nerve is an important source of peripheral afferent (sensory) input from the viscera to the brain via the parasympathetic centers in the medulla oblongata. Interestingly, due to its strategic location and connections, the vagus has made a significant therapeutic contribution in epilepsy.

Vagus nerve stimulation (VNS) is a neuromodulatory treatment that consists of chronic intermittent electrical stimulation of the left vagus nerve, delivered by a programmable pulse generator. Most commonly, a surgically implantable device is placed under the skin below the patient’s collarbone. Wires from the device are wrapped around the left vagus nerve where it delivers electrical impulses to the vagus (Mehran-

fard & Navidhamidi, 2016). Thus VNS is a unique epilepsy treatment in that a peripheral intervention is used to treat a disease that is entirely related to pathological events occurring within the brain (Krahl, 2012).

VNS has been widely accepted as an adjunctive therapy for the approximately 30–40% of patients who fail to attain seizure control with antiepileptic drugs (Yamamoto, 2015). The results of VNS are generally positive and well tolerated. Severe side-effects are rare. In addition to seizure reduction, improved mood, increased energy level, improved memory, and decreased fear of seizures have been noted. Thus VNS is an effective and safe option for patients who are not suitable candidates for intracranial epilepsy surgery (Handforth et al., 1998; Ben-Menachem, 2001; Klinkenberg et al., 2012).

Besides the direct therapeutic benefits of VNS for the patient, research directed at understanding how VNS works may contribute to a better understanding of subcortical and peripheral involvement in epilepsy. If stimulating the vagus nerve can help heal epilepsy, perhaps the vagus also plays a causal role as a conduit for aberrant nerve impulses from abdominal viscera to the brain. Thus some of the therapeutic effects of VNS may result from an alteration in such impulses transmitted by the vagus to the brain, eliminating (or at least moderating) a potential trigger for seizures.

Key Points to Remember

- Autonomic nervous system (ANS) involvement is extensive and well documented in both focal and general epilepsy.
- Abnormal ANS activity may occur before the clinical onset of the seizure, possibly indicating a causative role.
- Focal epilepsy includes a classification for autonomic seizures where ANS symptoms predominate at the beginning of the seizure.
- ANS involvement in epilepsy often manifests as an imbalance or dysregulation between the sympathetic and parasympathetic divisions of the ANS.
- Some epileptic seizures have strong enteric nervous system involvement, as well and may be called *abdominal* or *enteric epilepsy*.
- Although the central autonomic network (CAN) within the brain can be used to explain how cortical processes can activate subcortical and peripheral systems producing ANS symptoms during seizures, the

relationship is bidirectional, allowing subcortical and peripheral ANS components to influence or even trigger cortical seizures.

- ANS cardiovascular and respiratory anomalies are prominent in epilepsy and have been linked to sudden unexplained death in epilepsy (SUDEP).

- Peripheral dermal ANS manifestations (both sudomotor and vasomotor) may occur before and during epileptic seizures, possibly providing a means for detection and/or prevention of seizures.

- Panayiotopoulos Syndrome (also called “autonomic epilepsy”) is a childhood form of epilepsy distinguished by predominant ANS manifestations.

- Vagus nerve stimulation is an effective treatment that may also have etiological significance suggestive of peripheral and subcortical involvement in epilepsy.

1.6 Neuroendocrine Involvement in Epilepsy

1.6.1 Background

Endocrine hormones are chemical messengers produced by glands for release into the systemic circulation. By interacting with organs throughout the body, endocrine hormones regulate a wide variety of functions and processes including reproduction, emotions, carbohydrate and lipid metabolism, and responses to stress. Endocrine glands (such as the gonads, adrenals, and pineal) are ductless and secrete hormones internally (usually into the bloodstream, but in the case of the pineal, also into the cerebrospinal fluid). Exocrine glands (such as sweat glands) secrete hormones through ducts to the outside surface of tissue (Harden, 2003; Schapel et al., 1995).

Various endocrine hormonal irregularities have been linked to epilepsy with abnormalities of sex hormones cited most frequently:

Several alterations in different hormonal profiles have been described for patients with epilepsy. The brain directly regulates hormonal status through hypothalamus-pituitary-endocrine gland feedback loops. Epilepsy itself, with both interictal and ictal effects, and the medications used to treat epilepsy can have direct effects on regulation of these hormone systems. Epilepsy and AEDs [anti-epileptic drugs]

can target a number of substrates to affect hormone levels, including the limbic system, hypothalamus, pituitary, peripheral endocrine glands, liver, and adipose tissue. Abnormalities of the sex steroid hormones have been described most frequently, but have also been reported for thyroid hormone levels, prolactin, and vitamin D. (Pennell, 2009, p. 941)

The extensive interaction between the nervous system and hormones secreted by endocrine glands is termed *neuroendocrine*. Neuroendocrine involvement in epilepsy is an active area of research with important clinical implications.

1.6.2 Sex Hormones and Seizure Susceptibility

As with the nervous system in epilepsy (with its interaction of cortical, subcortical, and peripheral divisions), endocrine hormonal activity is also bidirectional between the cerebral cortex and endocrine glands distributed throughout the body, particularly the sex glands:

There is a complex, bidirectional interdependence between sex steroid hormones and epilepsy; hormones affect seizures, while seizures affect hormones thereby disturbing reproductive endocrine function. Both female and male sex steroid hormones influence brain excitability. (Taubøll et al., 2015, p. 3)

Common symptoms of hormonal involvement in epilepsy include sexual dysfunction, decreased fertility, premature menopause, and polycystic ovarian syndrome. The primary sex steroid hormones are estrogen and progesterone from the ovaries and testosterone from the testis. These hormones are controlled by the hypothalamic-pituitary-gonadal axis and directly affect brain function and excitability (Pennell, 2009). Thus, there may be subcortical and peripheral involvement in seizure production when sex hormones are involved.

Because of the cyclic nature of hormone release, women are especially susceptible to the effects of these shifting hormones on seizure frequency and severity. A correlation has been observed between the cyclic monthly levels of estrogen and progesterone and seizure frequency for women with epilepsy during the reproductive years. When

the pattern of seizure occurrence in a woman with epilepsy fluctuates with the menstrual cycle, it is called *catamenial epilepsy* (Pennell, 2009). Typically, in such cases, there is increased seizure frequency when the ratio of estrogen/progesterone levels in the bloodstream increases (Kandeepan & Shaaban, 2016).

Specifically, three patterns of *catamenial* seizure exacerbation have been observed: perimenstrual and periovulatory in the ovulatory cycle and the entire luteal phase in the anovulatory cycle. Thus, cyclical changes in the circulating levels of estrogens (proconvulsant) and progesterone (anticonvulsant) play a central role in the development of *catamenial epilepsy* (Verrotti et al., 2010).

If reproductive hormones have a role in seizure occurrence, it naturally follows that reproductive hormones may also play a role in treatment (Herzog, 2015). A randomized, double-blind, placebo-controlled study compared the efficacy and safety of adjunctive cyclic natural progesterone therapy versus placebo treatment of intractable seizures in 294 subjects. The general findings showed that cyclic progesterone is comparable to placebo in the treatment of intractable seizures in women with partial epilepsy. However, a pre-specified secondary analysis identified a subset of women with perimenstrual seizure exacerbation who were responsive to progesterone treatment (Herzog et al., 2012). Therefore, progesterone therapy may provide a clinically significant benefit for many women with perimenstrual catamenial epilepsy (Reddy, 2013).

1.6.3 The Hypothalamic-Pituitary-Adrenal Axis and Stress

Just as the hypothalamic-pituitary-gonadal axis is the basis for sex hormone involvement in epilepsy, similarly the stress-related activity of the hypothalamic-pituitary-adrenal (HPA) axis may play a role in the generation of epileptic seizures (Rhodes et al., 2004)—echoing the theme of subcortical/peripheral involvement in epilepsy.

Stress is the most frequent seizure-precipitating factor reported by patients with epilepsy, while stressful life events may increase seizure susceptibility (Stavropoulos et al., 2017). Stress leads to the activation of two systems: the autonomic nervous system (ANS) and the HPA axis. In humans, the main components of these systems are noradrenaline, corticotropin-releasing hormone (CRH) and cortisol (Arida et al., 2009). The production of stress hormones is mediated by the HPA axis, involving

the release of CRH from the hypothalamus, which acts in the anterior pituitary to signal the release of adrenocorticotrophic hormone (ACTH), which then triggers the release of cortisol from the adrenal cortex in humans (O'Toole et al., 2013).

One of the challenges in addressing stress as a factor in seizure production is defining exactly what it means and how it can be measured. Is stress, in this context, primarily a psychological or emotional manifestation—or perhaps the experience of physiological changes that occur preceding seizure activity that take on the quality of an aura?

The majority of patients with epilepsy identify factors precipitating seizures, including sleep deprivation, alcohol intake, menstrual status, and stressful life events. Overwhelmingly, the most common precipitating factor reported is stress, with 30-64% of patients reporting feeling stressed prior to seizure occurrence. However, it is also plausible that physiological changes preceding seizure activity induce a feeling of stress in patients with epilepsy, such as in the form of an aura. Although the association between stress and seizure activity is anecdotally widely accepted, it has been difficult to quantify the impact of stress on seizure susceptibility in the human population due, in part, to the vague definition of the word “stress” and the lack of objective measures of stress. (Maguire & Salpekar, 2012, p. 354)

Tackling the problem of vagueness and lack of objective measures of stress, Stavropoulos et al. (2017) examined levels of cortisol in the hair of children with epilepsy. They hypothesized that hair cortisol, a biomarker of chronic stress reflecting approximately three months of preceding exposure, might be increased in children with a first seizure (as compared to control children). Standardized questionnaires to examine the presence of stress-related behavioral markers were also employed. Children with a first seizure showed significantly higher levels of hair cortisol than control children. Interestingly, children with first seizures were also more likely to complain of somatic problems than the controls. However, there were no differences in perceived stress and anxiety or depressive symptoms between the two groups as

measured by the standardized questionnaires. Increased hair cortisol indicates chronic hyperactivity of the HPA axis prior to the first seizure, suggesting a preexisting abnormal function of the stress system in these children. Thus, pre-seizure stress may have contributed to the epileptogenesis process and may help explain the higher incidence of antecedent *somatic complaints* in the first seizure group. In this context, the term *somatic complaints* may include atypical headaches or other pain, nausea, abdominal pain, eye irritability, etc., which may have been caused by chronic stress and associated inflammation. Alternatively (from the perspective of subcortical/peripheral involvement in the etiology and pathophysiology of epilepsy), the *somatic complaints* could be indicative of pre-existing somatic or visceral dysfunction as has been discussed in previous sections. Thus somatic/visceral dysfunction could be viewed as a form of internal physiologic stress that activates a stress response as reflected by the increased hair cortisol levels. The HPA axis regulates somatic responses to both physical and emotional stress (Wuslin et al., 2018).

The association of HPA axis and stress in epilepsy is also implicated in the comorbidity with psychiatric conditions such as depression (Koe et al., 2009). More than 2000 years ago, Hippocrates described a bidirectional relationship between depression and epilepsy. He wrote, "Melancholics ordinarily become epileptics, and epileptics, melancholics: what determines the preference is the direction the malady takes" (as cited in Kwon & Park, 2014, p. 175).

Depression is the most common psychiatric comorbidity in people with epilepsy, but it remains underrecognized and undertreated. In addition to its negative impact on quality of life, depressive disorders are predictive of a worse response to pharmacologic and surgical treatment of seizure disorders. This phenomenon is probably an expression of a bidirectional relationship between epilepsy and depression, which in turn is indicative of common pathogenic mechanisms that are operant in the two conditions. The abnormal role of the hypothalamic-pituitary-adrenal axis is one of the common pathogenic mechanisms that explains why patients with depression are at greater risk for developing epilepsy

and vice versa. (Kanner, 2009, p. 307)

With regard to therapeutic options, blocking the actions of stress hormones is not straightforward. Essential actions of stress hormones on the immune system and metabolic functions have presented obstacles to the successful use of drugs directed at HPA axis dysfunction. Despite the obstacles encountered in targeting the HPA axis for treatment, HPA axis modulation remains a compelling therapeutic target (Maguire & Salpekar, 2012). Biofeedback is a nonpharmacological treatment modality that has been shown to be effective in decreasing seizure frequency by reducing reactions to stress. "The activation of the subcortical arousal system and the acquisition of skills to use [sympathetic] electrodermal biofeedback as a countermeasure seem to be key factors in sustaining beneficial reductions in seizure frequency." (Nagai & Trimble, 2014, p. 152)

1.6.4 The Pineal Gland

The pineal gland is a small subcortical endocrine gland located in the epithalamus of the brain in contact with the cerebrospinal fluid of the third ventricle. Melatonin, an endogenous hormone secreted by the pineal gland, has a prominent, albeit controversial, role in epilepsy (Vimala et al., 2010). Low melatonin levels have been reported in epilepsy studies, but whether low melatonin represents a cause or effect of seizures remains uncertain (Yalýn et al., 2006). Furthermore, there is evidence for proconvulsive properties of melatonin which may account for the increased occurrence of seizures at night when melatonin plasma levels are 5-to 8-fold higher than during the day (Sandyk et al., 1992). "The relationship between sleep and epilepsy is complicated and reciprocal. Sleep affects epilepsy, and epilepsy, in turn, affects sleep." (Yalýn et al., 2006, p. 542)

The pineal gland and melatonin secretion exert a major influence in the control of brain electrical activity and have been shown to be involved in both seizure and sleep mechanisms (Sandyk et al., 1992). In animal studies pinealectomy facilitates the epileptogenic process (Janjoppi et al., 2006), and this facilitation can be partially reversed by simultaneous administration of melatonin (de Lima et al., 2005).

Surgical removal of the pineal gland apparently produces rather uniform alterations in EEG activity and, under special circumstances (e.g., when rats are previously parathyroid-ectomized), severe seizures occur when the pineal gland is surgically extirpated. Several other rodent species . . . and certain strains of mice convulse after simple pinealectomy, i.e., loss of the parathyroid gland is not a prerequisite . . . The appearance of the convulsions suggests basic alterations in the biochemical and electrical activity of the CNS which are presumably due to the loss of some pineal constituent. (Reiter, 1977, p. 257)

Considering the role of sex hormones in epilepsy (as discussed above), it is interesting to note that the pineal gland may also play a role in reproductive system development and activity through its regulation of the pituitary gland. Motta et al. (1967) reported that the pineal gland influences the pituitary gland's secretion of the sex hormones, follicle-stimulating hormone (FSH), and luteinizing hormone (LH). Pinealectomy, when performed in male rats, produces no change in pituitary weight but causes a significant increase in weight of the testes, the prostates, and the seminal vesicles, suggesting that the pineal gland usually inhibits the secretion of LH and of FSH. Melatonin administered to male rats diminishes the weights of prostates and of seminal vesicles but does not change testicular weight, indicating that exogenous melatonin suppresses the secretion of LH but does not interfere with FSH release. In prepuberal female rats, melatonin retards puberty and decreases pituitary weight, as well as the weights of the ovaries and the uteri, confirming that melatonin reduces LH secretion. The authors concluded that the pineal gland exerts an anti-FSH effect through compounds different from melatonin.

Pineal tumors and cysts in children may result in precocious puberty—perhaps due to stimulation of the hypothalamic-pituitary axis or a loss of pineal gland inhibitory effect on the release of gonadotropins, resulting in an increase in gonadal hormones (Dickerman et al., 2004). In a study of epilepsy patients with pineal gland cysts (PGC), Bosnjaka et al. (2018) concluded that the pathomechanism of epileptic seizures in patients with PGC cannot be attributable solely to PGC volume or

compression on surrounding brain structures based on MRI findings. Rather than mechanical pressure, a possible pathomechanism of seizures in patients with PGC could be decreased levels of melatonin, synthesized by pinealocytes within the pineal gland.

1.6.5 The Brain as an Endocrine Gland

In a chapter titled “The Brain: An Endocrine Gland and Hormone Target”, Stumpf (1974) posited a fascinating perspective on the neuroendocrinology of the brain:

The brain is a gland, a gland of a very special kind. It secretes upon sensory input from the blood, the nervous liquor, and the conducting elements coming from the specialized structures of sense. The latter have grown in phylogeny, making the brain appear as an organ for electrical conduction while it is eminently secretory. Electrical neurotransmission is the exception. Neurotransmission is essentially secretory. (Stumpf, 1974, p. 2)

Stumpf’s position was stated in the first chapter of an entire book (*Anatomical Neuroendocrinology*) dedicated to the subject. Thus, he set the tone and established the premise that was developed in subsequent chapters by numerous other contributors who had participated in the 1974 International Conference on Neurobiology of CNS-Hormone Interactions.

Anatomically, the core of Stumpf’s concept focuses on the *circumventricular organs* that surround the midline ventricles of the brain. These ependymal structures are conspicuous by high vascularization and accumulation of sex hormone concentrating cells within them and/or in their vicinity.

The circumventricular organs are part of a larger network that Stumpf calls the “periventricular brain”—a phylogenetically old part of the vertebrate brain, largely premammalian, components of which are directly concerned with endocrine regulation. The components of the periventricular brain, containing the steroid hormone target areas, make up relatively large portions of the brain in the lower vertebrates and mammals. In higher mammalian species, mainly because of the

development of the telencephalon, the reptilian periventricular brain in essence forms the core, a truncate system that continues to function while being overshadowed by the cerebral cortex with which it constantly interacts. Together, “hormones and neurotransmitters are integral elements of the coordinatory system of the body.” (p. 6)

This brief summary of Stumpf’s perspective is included here to provide a context for understanding the importance of neuroendocrine activity in the brain. It is fundamental and extremely relevant to the role of hormonal participation in epileptic seizures—particularly subcortical and peripheral involvement as has been emphasized in this and previous sections.

Key Points to Remember

- Endocrine glands are involved in epilepsy, both in terms of causing or contributing to seizures and providing possible treatment options.
- Sex hormones, stress hormones (associated with the HPA axis), and pineal gland melatonin are well represented in the epilepsy literature, but like the rest of this complex field, the exact mechanisms of involvement are often unclear or unknown.

1.7 Etiology, Pathophysiology, and Classification

1.7.1 Background

The diagnosis and classification of epilepsy is closely linked to etiology (causation) and pathophysiology (anatomical and/or physiological abnormalities). Without a proper understanding of etiology and pathophysiology, classification amounts to little more than making up labels and indulging in name calling.

Fortunately, the 2017 classification update created by the International League Against Epilepsy (ILAE) recognized this problem. Even with the desirability of creating a science-based classification, it was acknowledged that “our understanding is not sufficiently advanced to construct a classification on a scientifically rigorous basis” (Scheffer et al., 2017, p. 513). Therefore, the 2017 classification revisions were termed “operational”—leaving much room for transition to a more substantial framework as knowledge advanced.

This encouraging acknowledgment of limitation is a sign of humility

that hopefully precludes openness to new approaches (or even older, traditional models that have been abandoned). The historical review and preceding sections on subcortical and peripheral involvement are attempts to contribute to such a process. This section will focus more directly on etiology and pathophysiology as it relates to the diagnosis and classification of epilepsy.

Classification serves many purposes by providing a framework for understanding the various types of seizures, how they are produced, and what triggers them—all of which guide the selection of antiepileptic therapies. Classification also recognizes the role of comorbidities associated with epilepsy, including cognitive impairment, psychiatric illness, and increased mortality risk such as sudden unexpected death in epilepsy (Scheffer et al., 2017).

With regard to the central theme of this review, recent changes in epilepsy classification put forth by ILAE in 2017 allow a broader, more flexible framework for recognizing subcortical and peripheral involvement in epilepsy. This is made possible by advances in neuroimaging techniques (such as functional MRI) that reveal cortical and subcortical connections that can be both local and remote. Furthermore, the connections need not be explicitly “structural” (directly hardwired). There can be “functional connectivity” through widely dispersed networks. This has led to the understanding that the pathophysiologic mechanisms of epilepsy define epilepsy as a “network” disease and not only a symptom of local brain abnormalities. Thus, seizures can arise in neocortical, thalamocortical, limbic, and brainstem networks (Fisher, Cross, D’Souza, et al., 2017).

Considering all of the above, it is likely that future advances in epilepsy research and theorizing will include further elucidation of subcortical and peripheral involvement in epilepsy, as detailed below. Therefore, the following selected review will focus on the subcortical and peripheral aspects of epilepsy classification, etiology, and pathophysiology within the conceptual framework of the 2017 ILAE guidelines.

1.7.2 Epileptic Seizures

An epileptic seizure is a “transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in

the brain" (Fisher et al., 2005, p. 470). Many episodic phenomena can imitate epilepsy (such as syncope and psychogenic nonepileptic seizures), hence the need for differential diagnosis (Brodtkorb, 2013). Therefore it is essential to define what is, and what is not, epilepsy prior to classifying the kind of epilepsy it may be.

With regard to pathophysiology, the above definition includes three essential criteria: (1) abnormal *excessive* neuronal activity; (2) abnormal *synchronous* neuronal activity; and (3) the abnormal neuronal activity is located in the *brain*. Each will be explored in some detail, beginning with the *brain*—which is defined as follows:

. . . the portion of the vertebrate central nervous system enclosed in the skull and continuous with the spinal cord through the foramen magnum that is composed of neurons and supporting and nutritive structures (such as glia) and that integrates sensory information from inside and outside the body in controlling autonomic function (such as heartbeat and respiration), in coordinating and directing correlated motor responses, and in the process of learning. (Merriam-Webster Dictionary, 2019)

Because the brain includes cortical and subcortical divisions, epileptic seizures (by definition) may involve all areas including the subcortical sensory and autonomic centers (that have been reviewed in previous sections). Also, the current (2017 ILAE) classification for seizures includes these categories (Fisher, Cross, D'Souza, et al., 2017). Whereas previously there had been an almost exclusive corticocentric emphasis in understanding the etiology and pathophysiology of epilepsy, that appears to be shifting, if ever so slightly. The change is largely due to research into neural networks: "From a network perspective, seizures could arise in neocortical, thalamocortical, limbic, and brainstem networks." (Fisher, Cross, French, et al., 2017, p. 523)

The current formal recognition of subcortical involvement in the production of epileptic seizures has strong historical roots in the nineteenth century (e.g., Hall, 1841; Todd, 1855; Schroeder van der Kolk, 1859; Reynolds, 1861—section 1.2). Even Jackson was open to such possibilities, defining epilepsy in terms of abnormal discharge of neurons

in the grey matter of the brain (Jackson, 1873). Subcortical areas of the brain have grey matter, especially the cerebellum. Cerebellar atrophy is a common finding in patients with long-standing partial epilepsy, although its etiology remains uncertain (Bohnen et al., 1998). Jackson included cerebellar dysfunction in his concept of epilepsy (Firth, 1920; Berger, 2000; Boop et al., 2013). This is not to say that cerebellar involvement is necessarily a primary factor in the various types of epilepsy. Yet it may (along with other subcortical regions such as the brainstem and thalamus) play a role in the etiology and pathophysiology of epileptic seizures.

Much more controversial is the concept of peripheral involvement in epilepsy, another concept with substantial historical support (e.g., Galen reviewed in Temkin, 1971; Hall, 1841; Brown-Séquard, 1860). Certainly, there is grey matter scattered throughout the body, especially in the spinal cord and visceral plexuses. Spinal seizures are a recognized pathological entity, but not usually included as epilepsy in the modern scheme (e.g., Kirchner et al., 2007; Tubbs et al., 2007). If cortical and subcortical grey matter can be involved in seizure generation, why not other grey matter elsewhere in the body?

1.7.2.1 Abnormal Excessive Neuronal Activity

The abnormal *excessive* neuronal activity that characterizes an epileptic seizure can be understood as an imbalance of naturally occurring processes of excitation and inhibition at the level of individual neurons and networks. Historically, the two prevailing models to explain neuronal hyperexcitability in epilepsy are the potassium (K⁺) hypothesis and the glutamate/ γ -aminobutyric acid (GABA) hypothesis—views that are not mutually exclusive (as reviewed by DiNuzzo et al., 2014).

The potassium (K⁺) hypothesis is based on the process of electrochemical signaling in the brain that is mediated by ions moving into or out of cells according to their transmembrane electrochemical gradient. If potassium (K⁺) accumulates in the neuronal extracellular space (the “potassium accumulation hypothesis”), neurons become more depolarized, firing more action potentials and releasing further potassium (K⁺) into the extracellular space, resulting in a runaway, positive-feedback cycle—i.e., the *excessive neuronal activity* associated with epileptic seizures. Although potassium (K⁺) has been observed to increase during seizures,

it is unclear whether this is a cause, rather than simply an effect of epileptiform activity (as reviewed by Raimondo et al., 2015).

Because glutamate is the predominant excitatory neurotransmitter in the adult mammalian brain, much past epilepsy research has attempted to understand the role of glutamate in seizures and epilepsy (Barker-Haliski & White, 2015). The excitatory influence of glutamate is counterbalanced by the inhibitory neurotransmitter γ -aminobutyric acid (GABA). The glutamate/GABA hypothesis posits an imbalance resulting in abnormal excitation of neurons—due to either too much glutamate or insufficient GABA to maintain a normal equilibrium in neuronal activity (Kumar & Singh, 2016).

With regard to the concept of subcortical and peripheral involvement in epilepsy, normal neuronal activity can become abnormally excessive regardless of its location. For example, autonomic nervous system (ANS) centers in the medulla oblongata that regulate the balance between the excitatory influence of sympathetic (“fight or flight”) and inhibitory parasympathetic (“rest and digest”) may become imbalanced, resulting in abnormal excessive neuronal activity (in the medulla oblongata or elsewhere in the brain—see section 1.5). A powerful depressor and sympathoinhibitory response can be evoked from the caudal midline medulla mediated by a GABAergic synapse in the rostral ventrolateral medulla (Coleman & Dampney, 1998).

The subcortical hypothalamic paraventricular nucleus (PVN) harbors the pre-autonomic neurons that control peripheral sympathetic and parasympathetic activity. The PVN is an important target area for biological clock output from the hypothalamic suprachiasmatic nuclei (SCN) that regulates circadian rhythm. Research by Kalsbeek et al. (2008) indicates an important role for a GABAergic–glutamatergic switch with respect to both the sympathetic and parasympathetic branches of the ANS influenced by the PVN and SCN. This is evident in the different timing of the daily peak in melatonin release from the pineal gland and hepatic glucose production from the liver influenced by the ANS and entrained to the circadian rhythm of the SCN.

1.7.2.2 Abnormal Synchronous Neural Activity

Neuronal *synchronization* can be defined as a correlated appearance in time of two or more events associated with various aspects of neuronal

activity. This may include chemical and electrical synaptic as well as ephaptic and non-specific interactions (Timofeev et al., 2012). Normal neuronal activity tends to exhibit rhythmic fluctuations (oscillations) at the level of single neurons, local neuronal populations, and/or multiple neuronal assemblies distributed across brain regions as networks. Synchronized oscillations among large numbers of neurons depend on inhibition that paces assemblies of excitatory neurons to produce alternating temporal windows of reduced and increased excitability. Synchronization of neuronal activity is evident in electrocorticographic, electroencephalographic, magnetoencephalographic, and local field potential recordings (Mathalon & Sohal, 2015).

Fundamentally, brain cells communicate and process information via synchronized activity (Jefferys et al., 2012). Alterations in neural synchronization are associated with normal changes in states of consciousness such as wakefulness, REM (dreaming) sleep, and NREM (nondreaming) sleep (Brown et al., 2012). Pathologically, abnormal neural synchronization is a defining characteristic of epileptic seizures (Fisher et al., 2005). However, the precise nature of the abnormality is complex and controversial.

Historically, Penfield and Jasper (1954) are notable for their observation that epileptic seizures are characterized by both excessive neuronal activity and hypersynchrony:

Electrophysiological analysis of epileptic discharge shows that there is not only excessive activity of individual neurones but that larger numbers of neurones usually (not always) fire together. This has been called hypersynchrony. Synchronous firing produces much more effective summation of excitation so that larger masses of neurones are recruited in a local area and conduction across distant synaptic barriers is facilitated. (Penfield & Jasper, 1954, p. 232)

Conceptually, Penfield and Jasper emphasized the importance of the brainstem reticular formation (BRF) and other extensively connected brain sites as a centrencephalic system (section 1.3). The BRF contains a high proportion of conditional multireceptive neurons that may be a key mechanism in abnormal reticulocortical synchronization associated

with generalized convulsive seizures (Faingold, 2010).

A more current view of epileptic hypersynchronicity explains seizure generation as a process by which a critical mass of neurons in the brain is progressively involved in synchronized high-frequency discharging that culminates in a seizure (Yaari & Beck, 2002). However, issues of complexity and controversy have arisen due to evidence suggesting that the process of seizure generation is not necessarily confined to the focal area of the seizure. Also, preictal changes in synchronization may start long before the actual seizure onset and appear to be an immanent part of the mechanisms of seizure generation in humans (Mormann et al., 2003). *Desynchronization* has been observed preceding seizures or during their early stages, and high levels of synchronization observed towards the end of seizures may facilitate termination (Jiruska et al., 2012; Schindler et al., 2007). This raises the question of association—is extreme synchronization of neuronal activity a cause or effect of seizures? (Majumdar et al., 2014)

With regard to generalized seizures, Garcia Dominguez et al. (2005) have observed that synchronization patterns may differ somewhat depending on the epileptic syndrome, with primary generalized absence seizures displaying more long-range synchrony in all frequency bands studied than generalized tonic motor seizures of secondary (symptomatic) generalized epilepsy or frontal lobe epilepsy. All seizures tend to be characterized by enhanced local synchrony compared with distant synchrony. Furthermore, there may be fluctuations in the synchrony between specific cortical areas that vary from seizure to seizure in the same patient. Seizures proceed by a recruitment of neighboring neuronal networks. "Together, these data indicate that the concept of widespread 'hypersynchronous' activity during generalized seizures may be misleading and valid only for very specific neuronal ensembles and circumstances" (p. 8077)

Sleep, neural synchronization, and seizures are interrelated with sleep state influencing seizures and interictal epileptiform discharges (Malow, 2006). Experimental and clinical evidence shows that many types of epileptic paroxysms preferentially appear during the state of non-rapid eye movement (NREM) sleep (Steriade & Amzica, 2003). NREM sleep is a state of relative neuronal synchronization characterized by coordinated synaptic activity needed to initiate and sustain a seizure (Steriade et al., 1994). During rapid eye movement (REM) sleep,

cortical activation occurs when cholinergic brainstem afferents increase firing rates, producing depolarization in thalamocortical relay neurons (Malow, 2006). Thus, compared to NREM sleep, REM sleep has a maximally desynchronized EEG pattern resulting in a strong antiepileptic effect against focal interictal discharges, focal seizures, and generalized seizures (Ng & Pavlova, 2013).

1.7.2.3 Consciousness (Awareness)

With regard to the modern classification of epilepsy, assessment of consciousness at the onset of seizures is emphasized. Because the role of consciousness in defining a seizure type is complex and difficult to apply in practice, the ILAE 2017 terminology uses the word “awareness” as a surrogate marker for consciousness operationally defined as knowledge of self and environment (Fisher, 2017). In this classification system, seizure types may be classified as generalized or focal depending upon the state of consciousness at onset. Generalized seizures at the onset show loss of consciousness (awareness). Focal seizures may present with either impaired or unimpaired consciousness, which may later become bilaterally generalized seizures with loss of consciousness. With regard to pathophysiology, generalized seizures involve the entire brain, whereas focal seizures are restricted to one hemisphere at onset, and may later spread bilaterally, as noted (Fisher, 2017).

This returns us to the role of subcortical factors in epilepsy. The traditional corticocentric model insists that all seizures are entirely dependent on cortical pathology for initiation and spread. Recently, however, considerable research findings suggest that networks (with both cortical and subcortical components) are required to produce loss of consciousness during generalized seizures from the onset (Li et al., 2017) or focal seizures that later become bilateral (Englot & Blumenfeld, 2009; Mueller et al., 2014).

The leading theory in this movement is called the “network inhibition hypothesis” (Norden & Blumenfeld, 2002; Blumenfeld & Taylor, 2003; Englot & Blumenfeld, 2009), which relies on both cortical and subcortical connections within the central nervous system (CNS) to generate conscious experience:

Specific areas of the CNS are involved in maintaining con-

sciousness. The brainstem is the location for the reticular activating system, which maintains our level of general awareness. The reticular activating system's most important connection is with the thalamus, which, in turn, has widespread projections to the cortex. This pathway is responsible for regulation of cortical activity, which is necessary for the generation of conscious experiences. (Mann & Cavanna, 2011, p. 378)

The network formed by these subcortical and cortical regions has been called the *consciousness system* (Blumenfeld, 2011), which is fundamental to the *network inhibition hypothesis* that explains impaired consciousness during epileptic seizures:

. . . absence, generalized tonic-clonic, and temporal lobe complex partial seizures—all converge on the consciousness system when they cause impaired consciousness. Although the anatomic regions causing impaired consciousness in these 3 seizure types appear to be the same, the physiologic mechanisms may differ. Thus, different patterns of abnormal increases or decreases in activity can occur in different seizure types, but they all lead to impaired consciousness by affecting the same set of anatomic structures. (Blumenfeld, 2011. p. 815)

The *network inhibition hypothesis* proposes that decreased activity within subcortical arousal systems remove the normal activation of the frontoparietal association cortex, leading to depressed neocortical function and impaired consciousness. Thus the neocortex enters a sleep-like (or minimally conscious-like) state because of remote network effects on subcortical arousal systems, rather than direct seizure propagation (Blumenfeld, 2011).

Interestingly, the *network inhibition hypothesis* (with its strong neurobiological underpinnings) has connections with Penfield and Jasper's centrencephalic concept of subcortical involvement in epilepsy:

. . . the centrencephalic theory influenced later studies show-

ing midbrain and thalamic involvement during temporal lobe seizures and our subsequent network inhibition or network disruption by seizure hypothesis. Our proposed 'consciousness system' is a coarse outline of structures, including the medial thalamus and upper brain stem, interhemispheric regions . . . (Yu & Blumenfeld, 2009, p. 55)

The *centrencephalic* theory implies inherent subcortical involvement in the pathophysiology of seizures. With this simple recognition of the contribution of *centrencephalic* theory to understanding the role of consciousness in classifying seizures, we will now consider a similar contribution with regard to motor symptoms during seizures.

1.7.2.4 Motor Symptoms

The presence (or absence) of motor symptoms, along with the type of motor activity, is a crucial factor in the modern classification of epileptic seizures, both focal and generalized. The list of motor behaviors include atonic (focal loss of tone), tonic (sustained focal stiffening), clonic (focal rhythmic jerking), myoclonic (irregular, brief focal jerking), epileptic spasms (focal flexion or extension of arms and flexion of trunk), hyperkinetic (pedaling, thrashing), and automatisms. The distinction between clonic and myoclonic is somewhat arbitrary, but clonic implies sustained, regularly spaced stereotypical jerks, whereas myoclonus is less regular and in briefer runs (Fisher, Cross, D'Souza, et al., 2017).

Identifying the type of motor behavior for classification of seizures is helpful in the choice of treatment options and understanding pathophysiology. Yet, in spite of the advances in functional neuroimaging methods, little is known about the underlying pathophysiologic mechanisms of convulsive epileptic seizures in humans, with most of the evidence coming from animal research. Artifacts caused by excessive motor activity make it technically extremely challenging, plus limited investigation time in a neuroimaging scanner during motor seizures further complicates the required data collection in humans (Conradsen et al., 2013; Beniczky et al., 2016).

Interestingly, much of the data from animal studies on convulsive epileptic seizures has been collected by researchers interested in the *centrencephalic* model of Penfield and Jasper. This extensive body of

literature indicates substantial subcortical (especially brainstem) participation in convulsive motor symptoms during seizures, with significant spinal involvement, as well (as summarized by Fromm, 1987). The theme that runs through these studies is the role of the reticular formation (and particularly its core in the lower brainstem) that integrates sensorimotor activity resulting in appropriate, normal complex motor behavior. Pathologically, epileptic motor convulsions (as evident in tonic and tonic-clonic seizures) may be regarded as runaway activity in these motor control pathways from the reticular formation (Van Der Kooy, 1987).

In terms of the reticular formation's involvement in the motor control of epilepsy, it is perhaps the long descending pathways from the brain-stem reticular formation to the intermediate zone and motor nuclei of the spinal cord that are of the most interest . . . In the caudal medulla, cells with long descending projections are present in the dorsal column nuclei, lateral portions of the nucleus of the solitary tract, and the retroambigous nuclei. In the rostral medulla, one of the most numerous groups of neurons giving rise to the descending pathways is seen ventrally in the medial tegmental field (in the so-called gigantocellularis nucleus) and in the midline raphe (primarily the raphe magnus) . . . (Van Der Kooy, 1987, pp. 17)

The spinal cord and its peripheral nerves play an essential role in the production of convulsive epileptic seizures. In the most extreme animal experiments exploring this premise, the upper spinal cord is completely transected, isolating it from the brain. Using chemical agents, paroxysmal discharge of spinal origin is recorded below the level of the transection:

Strychnine has long been considered the prototype of a spinal convulsant drug because . . . strychnine convulsions can occur in the absence of a brain but not in the absence of a spinal cord. Moreover, strychnine painted directly on a spinal segment elicits typical convulsions in the muscles

innervated by that segment . . . (Somjen 1987, p. 96)

Similarly, other agents have been used to generate seizures with the brain intact:

A spinal cord in its normal anatomical continuity with the brain-stem may, however, also be capable of generating seizure discharges. In unanesthetized cats rendered comatose by midbrain reticular formation lesion, penicillin-induced seizure discharges can sometimes erupt in the spinal cord, preceding the onset of cortical seizures by 5 to 70 msec . . . (Somjen 1987, p. 96)

Furthermore, animal research utilizing electrical stimulation suggests that the various types of convulsive seizures can be produced by varying the frequency of the efferent electrical impulse delivered to the spinal motor tracts (as reviewed by Jobe, 1987). In rats in which the central nervous system was severed at the atlanto-occipital junction, direct electrical stimulation of the proximal spinal cord produced convulsions that duplicated all motor patterns observed during generalized seizure in the intact animals. Clonic or tonic responses were obtained predictably by varying only one stimulus parameter—the square wave frequency. Thus Esplin and Freston (1960) concluded that the convulsive (motor) response is dependent only upon the number of impulses per unit time delivered to the spinal cord.

In these studies, relatively high-frequency electrical stimulation of the spine (200 to 300 pulses per second) resulted in tonic flexion of the neck, trunk, and limbs, which occurred initially and was followed by tonic extension. As the frequency of electrical stimulation was reduced, the first detectable change in convulsive motor pattern was an increased duration of tonic flexion. With yet lower frequency stimulation, tonus disappeared. Even lower frequency of stimulation resulted in clonic and running movement.

Interestingly, these progressive changes in motor patterns closely paralleled those which occur in the intact animal given increasingly greater doses of anticonvulsant drugs while being stimulated with maximal electroshock. As noted by Esplin and Freston (1960), these

results support the concept developed by Toman et al. (1946) that maximal flexor–extensor convulsions occur because of a high degree of epileptic discharge, whereas clonic convulsions occur because insufficient impulse frequency has been generated at supraspinal levels (in the brain). Keep in mind that all of this was determined with the spine of experimental animals severed so as to prevent interaction with the brain. “The spinal cord produced different motor patterns in response to alterations in the frequency of incoming impulses.” (Jobe, 1987, p. 89)

Historically, an important series of animal experiments involving dogs and seizure motor activity was performed by Johann Prus in 1898. The results of these studies called into question the dominant role of the cerebral motor cortex and associated pyramidal tracts in generating convulsive epileptic motor events. Prus unilaterally transected the pyramidal tract in dogs and observed that bilateral epileptic seizures occurred on stimulation of the cerebral cortex, on the same as well as the side opposite the electrical stimulation (Louis, 1993). These experiments led Prus to the recognition of “extrapyramidal tracts”:

As a physiologist, Prus was interested in asserting that the pyramidal tracts were the pathways through which epileptic activity experimentally evoked from the cerebral cortex was transmitted to the spinal cord. To test his hypothesis he cut the pyramidal tracts in the internal capsule, peduncle, pons, pyramid, and spinal cord, first on one, then on both sides. Contrary to his expectation the pyramidal sections did not prevent the occurrence of seizures at all. Prus then postulated that the epileptic activity reached the spinal cord through alternative motor pathways that necessarily lay outside the pyramidal tracts, for which he coined the term “extrapyramidal tracts”. (de Oliveira-Souza, 2012, p. 844)

Although the conceptual evolution of the extrapyramidal system in the twentieth century was “an amalgam of disparate and often conflicting ideas with a tortuous history,” the excellent review by de Oliveira-Souza & Tovar-Moll (2012) concludes that “the extrapyramidal concept is a valid and robust anatomic concept as long as it strictly refers to the collection of descending fibers originating in a few discrete brainstem tegmental

motor nuclei that project to the spinal cord.” (p. 280) Specifically, the extrapyramidal system in humans is composed of a collection of six “tracts” that originate in brainstem motor cell groups—medial and lateral reticulospinal, medial and lateral vestibulospinal, medial tectospinal, and lateral rubrospinal (de Oliveira-Souza, 2012). This formulation of the extrapyramidal system (particularly with its implications for epileptic seizure motor symptoms) is consistent with the animal research done into the *centrencephalic* theory as reviewed above.

Shifting now to the relatively scant clinical and research data on convulsive motor symptoms in humans, we find some similar themes with regard to the production of tonic and clonic seizures with subcortical and peripheral involvement. Paralleling the generation of experimental spinal seizures in animals, Khokhar et al. (2015) reported on a case where a tonic-clonic seizure appeared in a patient after lumbar laminectomy and spinal fixation. No cause could be found based on preoperative history. From a review of literature the surgeons concluded that the tonic-clonic seizure was likely produced by antibiotics mixed with water for irrigation of the surgical field, or intravenous antibiotics used for the prevention of infection after surgery. Although rare, similar reports of motor seizures linked to spinal surgery and related pathology are present in the literature (Schwarz & Tritthart, 1987; Talwar et al., 1995; Lin et al., 2002; Battaglia et al., 2004; Habibi et al., 2010; Choi et al., 2011).

Ekbom et al. (1968) reported on two cases with sensory-motor seizures of spinal origin. The seizures were described as “Brown-Séquard syndrome in reverse” (p. 67) with the classical pattern of sensory and motor deficit replaced by corresponding sensory and motor irritative disturbances. The main clinical features of the seizures were unilateral tonic spasm, followed by or preceded by contralateral sensory disturbances; an invariable temporal relation between the different sensory disturbances and a sensation of warmth always preceded a severe pain; and brief duration with high frequency of attacks. A spinal cord lesion was hypothesized as the source of the seizures:

The notion that an irritative lesion affecting a sensory path somewhere in the central nervous system can give rise to paraesthesia or pain is generally accepted. On the assump-

tion that the same kind of irritative lesion when it affects a motor path can give rise to a tonic spasm, the combination of motor and sensory disturbances during the seizures can be explained by a single lesion in the lateral funiculus of the spinal cord. A transversely spreading activation of axons at the affected level in the spinal cord could explain the crossed distribution of the tonic spasm and the sensory disturbances, and the onset of the sensation of warmth before the sensation of pain. One must assume that the lesion was purely irritative and that it did not interrupt the motor and sensory paths. (Ekbom et al., 1968, p. 67)

While the literature clearly supports the concept of spinal seizures (in animals and humans), the purpose of including this information is not necessarily to suggest that this is a common or regular occurrence in epilepsy—but simply that it is possible. When coupled with other research on the brainstem reticular formation and subcortical involvement in epilepsy, perhaps the spine has a role to play in the etiology and pathophysiology of convulsive epileptic seizures. It may be helpful to be open to such evidence as epilepsy classification continues to evolve.

Consistent with the animal studies cited above, Conradsen et al. (2011) found that tonic seizures in humans are produced by a significant increase in the frequency of the signal recorded by electromyogram during seizures. Their study also compared tonic seizures with the tonic phase of tonic-clonic seizures which were characterized by increased amplitude of the signal compared to tonic seizures. The researchers explained the shift toward higher frequencies during the tonic seizures as recruitment of high threshold motor neurons (similar to the pattern displayed by Parkinson's patients). They hypothesized that the shift was due to excessive activation of the subcortical extrapyramidal system—a finding that echoes the early electroclinical studies of the tonic seizures by Gastaut, who believed that tonic seizures result from an activation of subcortical/extrapyramidal structures (Gastaut et al., 1963). Possible subcortical/extrapyramidal involvement in motor seizures is important because it is associated with "involuntary" motor activity whereas "voluntary" movements are produced by the motor cortex (Carroll, 2007). This distinction defines the intersection between consciousness

and motor symptoms in epilepsy. The pathological quality of epileptic motor symptoms is that normally voluntary muscle activity becomes involuntary. Understanding the pathophysiological process by which voluntary motor activity becomes involuntary is an outstanding problem in epilepsy research. Perhaps subcortical/extrapyramidal processes play an underappreciated role in epileptic motor symptoms.

In a subsequent study that explored the dynamics of muscle activation during generalized tonic-clonic seizures (GTCS), Conradsen et al. (2013) measured EMG deltoid muscle activity during GTCS from thirteen patients and compared to GTCS-like events acted by ten control subjects. Contrary to the ILAE description of tonic seizures beginning with a sudden sharp tonic contraction of the muscles, the findings of the study showed a gradual rather than abrupt tonic muscle activation. Thus there is a continuum between the “vibratory” phase (movements of higher frequency and lower amplitude) and the clonic phase (movements of lower frequency and higher amplitude). “These data further challenge the classical view that homogeneous excitation in large populations of cortical neurons is the primary mechanism underlying seizure initiation.” (Conradsen et al., 2013, p. 91) With regard to the clonic phase, the beginning was a transient increase in the energy of the clonic discharges suggesting a synchronization in the firing of the motor neurons. Additionally, an increase in the inter-muscular synchronization during the clonic phase was observed, as shown by increased coherence between the muscles on the left and right side. Thus, during the clonic phase, the neural activity became highly synchronized but was interrupted by the inhibitory mechanisms causing silent periods. Citing the work of Lado and Moshé (2008), Conradsen et al. observed: “It is tempting to hypothesize that this reflects the widespread inhibitory effect of remote, subcortical structures . . . ” p. 92).

1.7.2.5 Generalized Nonmotor (Absence) Seizures

Nonmotor epileptic seizures fall into two groups: generalized absence seizures and focal nonmotor seizures. Generalized absence seizures (previously called “petit mal”) usually occur during childhood or adolescence resulting in a momentary loss of consciousness lasting 3–15 seconds. The episodes often go undetected, except for brief staring spells, eyelid flutter, or minor automatisms that are dependent on the

duration of the seizure. The patient is unresponsive and has no memory of what went on during the seizure. Absence seizures are characterized by distinctive EEG tracings with a normal background and 3-Hz spike-and-wave complex during the seizure (Mattson, 2003).

As reviewed by Seneviratne et al. (2012), several theories have been proposed to explain the pathophysiology and unique EEG pattern of absence seizures. The *centrencephalic* theory of Penfield and Jasper argued for the existence of a pacemaker in the brainstem and diencephalon. Buzsaki's *thalamic clock theory* postulated a pacemaker in the reticular thalamic nucleus. Gloor's *corticoreticular theory* pointed to thalamocortical circuitry as the source of the unique 3-hz spike-wave discharges. Finally, the *cortical focus theory* of Meeren et al. proposed initiation by cortex in the generation of the distinctive spike-and-wave discharges, with the thalamus playing a secondary role by amplifying and maintaining the rhythmic discharges. Notice that there are varying degrees of subcortical involvement in all of these theories.

1.7.2.6 Focal Nonmotor Seizures

The 2017 ILAE classification of focal nonmotor seizures includes five subdivisions: autonomic, cognitive, emotional, focal behavior arrest, and sensory. Essentially, these categories represent *auras* at the beginning of a seizure. With regard to subcortical and peripheral etiology and pathophysiology, sensory and autonomic seizures are most relevant and have been discussed in detail in previous sections (1.4 and 1.5, respectively).

1.7.3 Epilepsy Syndromes

Epilepsy syndromes are characterized by a cluster of features incorporating seizure types, EEG, and imaging features that tend to occur together. Such syndromes are often age-dependent with seizure triggers, diurnal variations, and comorbidities. The various syndromes may be associated etiologically, prognostic, and treatment implications. There is no one-to-one correlation with an etiology, and one of the important functions of syndrome classification is to guide management (Scheffer et al., 2017).

The classification of epilepsy syndrome provides more sophisticated information than does an epilepsy type diagnosis for some patients.

There are many well-recognized syndromes, and new ones are constantly emerging (Falco-Walter et al., 2018).

One of the well-recognized classifications is Dravet syndrome, a severe form of epilepsy that is part of a group of genetically linked diseases known as SCN1A-related seizure disorders. The condition appears during the first year of life as frequent fever-related (febrile) seizures.

From a peripheral perspective, the association of systemic fever in association with childhood seizures is interesting. Febrile seizures affect 3–5% of infants and young children (Chen et al., 1999). Although it is generally agreed that simple febrile seizures are benign, atypical (i.e., complex, prolonged, multiple, or lateralized) febrile seizures have been associated with mesial temporal lobe epilepsy (Scantlebury et al., 2005). Retrospective studies of adults with temporal lobe seizures have demonstrated a high prevalence of a history of prolonged febrile seizures during early childhood, suggesting a possible etiological link. Thus, neuronal damage induced by febrile seizures may be a factor in the development of mesial temporal sclerosis, the pathological hallmark of temporal lobe seizures (Bender et al., 2004).

Various sleep-related epilepsy syndromes are well documented (as reviewed by St. Louis, 2011). Juvenile myoclonic epilepsy is an idiopathic primary generalized epilepsy syndrome characterized by myoclonic, absence, and generalized tonic-clonic seizures, usually occurring shortly after arousal from sleep, but may also occur during sleep or throughout the daytime hours. Generalized tonic-clonic seizures upon awakening are a closely related primary generalized epilepsy syndrome with a similar pattern of occurrence of convulsions but lacks myoclonic seizures. Benign rolandic epilepsy presents as simple partial seizures with hypersalivation, hemifacial focal motor clonic and secondary generalized tonic-clonic seizure activity, often occurring exclusively during sleep.

Continuous spike and wave during slow wave sleep (CSWS) is an epileptic encephalopathy that presents with neurocognitive regression and clinical seizures. CSWS demonstrates an electroencephalogram (EEG) pattern of electrical status epilepticus during sleep. CSWS typically occurs in children at about five years of age, with clinical seizures progressing to a severe epileptic encephalopathy within two years. The pathophysiology of CSWS is unclear, but the corticothalamic neuronal

network involved in sleep patterns is thought to be involved (Singhal Sullivan, 2014). Sleep is highly regulated by subcortical systems (Brown et al., 2012). The close interrelationship of sleep and epilepsy also likely involves both subcortical and cortical participation (Malow, 2006).

Within the current classification system, reflex epilepsies (and reflex seizures) fall within the scope of epilepsy syndromes. Section 1.4 on sensory involvement in epilepsy covers the subject in sufficient detail for the purposes of this review.

1.7.4 Etiology

Epilepsy is a heterogeneous condition with multiple etiologies including genetics, infection, trauma, vascular, neoplasms, and toxic exposures. (Macquire & Salpekar, 2012, p. 352)

In its 2017 classification update, the ILAE Task Force recognized the etiological heterogeneity of epilepsy with six categories, focusing on those etiologies with management implications: (1) structural; (2) genetic; (3) infectious; (4) metabolic; (5) immune; and (6) unknown (Falco-Walter et al., 2018). Each of these will be briefly discussed with regard to possible subcortical and peripheral involvement.

1.7.4.1 Structural Etiology

Structural etiology in epilepsy refers to abnormalities visible on structural neuroimaging (in conjunction with other assessments), leading to a reasonable inference that the imaging abnormality is the likely cause of the patient's seizures (Scheffer et al., 2017). *Structural etiology* in epilepsy is exemplified by mesial temporal sclerosis (MTS) commonly associated with temporal lobe epilepsy (TLE). TLE is the most common type of epilepsy in adults. Although it primarily affects the temporal lobes, TLE has come to be recognized as a network disease with widespread extra-temporal effects, including structural and functional changes well beyond the temporal lobes (Haneef et al., 2013).

Evidence for brainstem network disruption and structural damage in TLE with MTS has been reported by Meuller et al. (2014). The brain structural abnormalities beyond the epileptogenic focus encompass remote but anatomically connected cortical and subcortical regions, and

most importantly regions belonging to the central autonomic system. The structural pathology to the brainstem (caudally extending to the medulla oblongata) includes atrophic changes and volume loss that can impair ANS functioning, possibly contributing to sudden unexplained death in epilepsy (SUDEP):

In conclusion, TLE can be associated with atrophic changes in brainstem regions involved in central autonomic control that could be responsible for interictal and ictal autonomic disturbances which can aggravate the damage to critical parts of the autonomic control system and thus potentially increase the risk for SUDEP. The preliminary findings in this study suggest that deformation-based morphometry using a standard MRI exam in combination with advanced graph analysis does not only detect this volume loss but might also be able to identify features that indicate that the volume loss is severe enough to critically impair the autonomic system making a life threatening breakdown of the autonomic control during a seizure possible. (Mueller et al., 2014, p. 215)

Although it is impossible to determine whether the structural damage documented in this study caused (or contributed to) the TLE, considerable research on surgery for treatment-resistant TLE strongly suggests that even the limited area of structural damage visible on MRI may not be entirely responsible for the seizures. Surgery for patients with unilateral MTS are challenged by a “somewhat consistent failure rate” (Vale et al., 2012, p. 1). Only about 50% of patients show long-term benefit, suggesting that other pathological areas cause or contribute to TLE seizures, even when MTS is evident during the initial assessment (Najm et al., 2013). Another aspect of remote network involvement in TLE is that bilateral generalization may occur. In other words, structural damage to brainstem areas could contribute to the bilateral spread of the seizure beyond the initial focal location: “. . . volume loss in these [brainstem] regions could predispose patients to suffer longer lasting and/or more severe seizures with increased risk for secondary generalization.” (Mueller et al., 2014, p. 215)

1.7.4.2 Genetic Etiology

Genetic etiology applies to cases in which epilepsy directly results from a known or presumed genetic mutation in which seizures are a core symptom of the disorder. The epilepsies in which a genetic etiology is suspected are diverse, and, in most cases, the underlying genes are not yet known (Scheffer et al., 2017). In part, the inherent diversity of the various seizure types and heterogeneity of etiologies contribute to the difficulty of identifying genetic factors in epilepsy:

Heterogeneity represents the single biggest contributor to phenotype-related problems in genetic analysis of any common disease. When clinically similar conditions have different etiologies, the genetic analysis methods fail. (Greenberg & Subaran, 2011, p. 4)

Moreover, epilepsy in the majority of individuals is a sporadic disorder associated with environmental precipitants (i.e., brain tumors, stroke, or trauma from unidentified causes). As Crino (2007) points out, there is increasing evidence that altered gene expression and common sequence variations in common gene alleles found throughout the population may be associated with a lowered threshold for seizures. Thus, even fairly common, nonspecific genetic material can contribute to lowered threshold for seizures, allowing environmental precipitants or endogenous etiological factors (such as metabolic disorders and immune dysfunction, as reviewed in this section) to trigger seizures.

Of course genetic defects of this nature are not limited to neurotransmission in cortical areas where seizures occur. Subcortical (and even peripheral) neuronal activity can be affected by genetic defects.

1.7.4.3 Infectious Etiology

Infections and infestations are among the most common risk factors for seizures and acquired epilepsy in the world and are probably the most common preventable risk factor, particularly in resource-poor settings (Vezzani et al., 2015). For example, consider cysticercosis, a parasitic infection that results from ingestion of eggs from the adult tapeworm, *Taenia solium*. When cysticercosis involves the central nervous system, it is called “neurocysticercosis,” the most common parasitic infection of

the brain and a leading cause of epilepsy in the developing world—and an increasingly important health issue in the United States due to immigration from Latin America (DeGiorgio et al., 2004).

Neurocysticercosis results from consumption of food contaminated with feces of a *T. solium* tapeworm carrier. When eggs from the worm are ingested and exposed to gastric acid in the human stomach, they turn into larval cysts, called “oncospheres,” that cross the gastrointestinal tract and migrate via the vascular system to the brain and other structures. The larval cysts initially generate a minimal immune response and may remain in the brain as viable cysts for years (DeGiorgio et al., 2004).

Interestingly, infection by worms as a cause of epilepsy, along with treatment recommendations, was described by Gowers in the nineteenth century:

Acute convulsions frequently result from the irritation of various forms of intestinal worms in children, and sometimes in adults. Usually, however, they cease when the worms are expelled. In rare cases, the attacks, set up in the first instance by the intestinal irritation, recur and continue after the irritation is at an end. In six cases the first fit was apparently due to this cause; the attacks had continued, although the worms had been expelled, and a renewal of the vermifuge treatment had no influence on the disease. (Gowers, 1885, pp. 28-29)

Presumably the seizures continued after the worms had been expelled because of the larval cysts resident in the brain and nervous system. In making a distinction between idiopathic epilepsy and reflex convulsions, Gowers assumed a peripheral cause of the seizures due to reflex irritation of the intestines as a trigger for the seizures:

Of other sources of reflex irritation which may cause convulsions, the most frequent are intestinal worms. They are of diagnostic importance chiefly in cases of recent fits, or in which only one convulsion has occurred. In such cases, especially in children, this cause should be borne in mind,

and excluded by careful enquiry and, in most cases, by the administration of vermifuge remedies. Tape-worms and round worms are both occasional causes. The existence of the former may generally be ascertained without difficulty by the frequent passage of joints. It is doubtful whether thread-worms cause fits, in spite of the great irritation of which the patient is conscious. It is very rarely that convulsions can be distinctly traced to this cause, although it is so common. When convulsions excited by intestinal worms have continued for several mouths, they do not usually cease when the exciting cause is removed. The repeated fits have apparently induced a state of the nervous system similar to, perhaps in part identical with, that which exists in idiopathic epilepsy, from which these cases cannot then be separated. The form of convulsion may sometimes lead to a suspicion that it is due to worms. It may be quite similar to the convulsions of idiopathic epilepsy, but frequently is slighter in degree, and consists only of tonic spasm. In the intervals between the fits, convulsive starts are especially common. (Gowers, 1885, pp. 232-233)

Intestinal worms as an etiological factor is a curious and yet extremely relevant example of peripheral involvement in epilepsy in the world today.

1.7.4.4 Metabolic Etiology

The substantial list of *metabolic disorders* associated with epilepsy is expanding due to a greater understanding of the phenotypic spectrum emerging. The current concept of metabolic etiology in epilepsy is that seizures result from a known or presumed metabolic disorder in which the seizures are a core symptom of the disorder—such as porphyria, uremia, aminoacidopathies or pyridoxine-dependent seizures (Scheffer et al., 2017).

Considerable research suggests an important etiological role for glucose metabolism dysregulation in epilepsy (McDonald et al., 2018). For example, GLUT1 deficiency syndrome is a disorder of glucose transport into the brain caused by a variety of mutations in the SLC2A1 gene. Sei-

zures associated with GLUT 1 deficiency tend to be pharmacoresistant, but alternative treatments (particularly the ketogenic diet that does not rely on glucose metabolism) can be effective (Daci et al., 2018).

While a threshold glucose concentration is necessary to support synaptic transmission, abnormal glucose (blood sugar) levels, whether too high or too low, can cause seizures. It appears that elevated extracellular glucose (hyperglycemia) is associated with neuronal hyperexcitability; thus, glucose balance is necessary for normal neurotransmission (Stafstrom, 2003). Because epilepsy etiology is heterogeneous and multifactorial, abnormal glucose levels could be a contributing factor in lowering seizure threshold and increasing the likelihood of seizures (Schwechter et al., 2003). Thus, glucose abnormality need not be THE single cause of epilepsy (or even seizures) in any given case, but could be a contributing factor (in a multifactorial model) in the etiology of epilepsy.

Although this problem is especially pertinent to individuals with diabetes (whose blood glucose levels can fluctuate widely over the course of a day), even non-diabetic hyperglycemia can produce similar systemic pathology, including damage to the nervous system. For example, with “stress hyperglycemia” the response to stress is mediated largely by the hypothalamic-pituitary-adrenal (HPA) axis and the sympathoadrenal system. The HPA axis, sympathoadrenal system and proinflammatory cytokines act collectively and synergistically to induce stress hyperglycemia (Marik & Bellomo, 2013). At any level and from whatever source, elevated blood sugar levels are a health risk. Citing the effects of hyperglycemia on brain neuronal mitochondria, Patel and Rho (2012) concluded that *“Sweets are BAD for Seizures.”* From the standpoint of differential diagnosis and treatment, recognizing diabetes-related seizures is essential; however, an understanding and appreciation of the possible role of glucose metabolism dysregulation as an etiological factor within the diverse family of epilepsies may also be helpful.

1.7.4.5 Immune Etiology

Immune etiology implies direct involvement of the immune system in which seizures are a core symptom of the disorder (Scheffer et al., 2017). For example, viruses that replicate within the CNS may produce inflammation of parenchymal CNS tissue, which is defined as enceph-

alitis. Most viruses enter the human body through peripheral routes such as skin, gastrointestinal or respiratory tracts. The virus may then be spread to other sites via the systemic circulation or by neural pathways (axonal transport) into the CNS (Vezzani et al., 2015).

Disruption of the blood-brain-barrier (BBB) can trigger immune response in the brain, leading to seizures (Marchi et al., 2012). The BBB is a dynamic and complex system which isolates the brain from the systemic blood circulation, protecting it from contamination while assisting with homeostasis. BBB function may be impaired in epilepsy, leading to abnormal and excessive neuronal firing resulting in seizures (Van Vliet et al., 2015). The question of whether BBB dysfunction is a cause or a consequence of epileptic seizures (or both) remains open (Rüber et al., 2018). In either case, a compromised BBB exposes the brain to peripheral influences. *"Systemic inflammation is thought to have an influence on the epileptogenic process."* (Yuen et al., 2018, p. 57)

Until recently, the brain was considered to be an immunologically privileged organ that was protected from the peripheral immune system by the blood-brain-barrier. It is now apparent that this view is incorrect and that the brain is directly influenced by peripherally derived cytokines, chemokines, prostenoids and glucocorticoids, as well as some immune cells, that can access the brain . . . Once in the brain, the proinflammatory cytokines activated both neuronal and non-neuronal (for example, the microglia, astrocytes and oligodendroglia) cells via the nuclear factor-kappa-beta (NF-kB) cascade in a similar manner to that occurring in the peripheral inflammatory response. (Leonard, 2010, p. 206)

Autonomic nervous system, endocrine, and peripheral systemic involvement in epilepsy (a prominent theme in this entire review) may also be factors in BBB dysfunction and immune etiology:

The evidence reviewed so far supports the notion that the symptoms of epilepsy and seizures are not only initiated by CNS cells but can also be caused by altered immune responses in the periphery causing havoc in the brain. This

may be potentiated by the activation of sympathetic and parasympathetic neurons and pathways. A cortical stress, such as seizures, may promote activation of the hypothalamic-pituitary-adrenal and the sympathetic adrenal-medullary axes, triggering peripheral leukocyte activation and production of proinflammatory cytokines. Upon activation, blood leukocytes may exacerbate BBB damage. Such brain-to-periphery crosstalk may extend to peripheral organs of immunologic competence such as lymph nodes, the spleen, and bone marrow . . . under these circumstances the role of BBB remains crucial, since it resides at the anatomic interface between the periphery and the brain, responding to stimuli and cells coming from both sides. (Marchi et al., 2012, p. 1882)

Recognition of BBB dysfunction as a link between immune system activation and seizures may explain the comorbidity of epilepsy and autoimmune conditions such as systemic lupus erythematosus, Hashimoto's encephalopathy, Behcet's disease, type I diabetes, Crohn's disease, antiphospholipid syndrome, Sjogren's syndrome, ulcerative colitis, rheumatoid arthritis, and celiac disease (Rana & Musto, 2018).

Circumventricular organs (CVOs) are subcortical brain areas outside the BBB characterized by increased permeability compared with other brain regions. CVOs may facilitate entrance of peripherally generated pro-inflammatory cytokines which eventually affect other brain regions (Wilson et al., 2002).

The involvement of CVOs in the communication of the immune system with the nervous system has been considered before. Due to their fenestrated capillaries the CVOs are often referred to as "windows of the brain" and have been thought to serve as entry points for pro-inflammatory cytokines into the CNS. (Schulz & Engelhardt, 2005, p. 10).

1.7.4.6 Unknown Etiology

The category of unknown etiology may apply where there is insufficient information due to limited evaluation of the patient, so that

the etiology remains unclear (Scheffer et al., 2017). Perhaps another possibility is that some links in the etiological chain of causation are unrecognizable within the current classification framework. Perhaps some links are missing entirely—i.e., subcortical and/or peripheral links that are unacknowledged or (with regard to certain historical approaches) essentially ignored. The purpose of this review is to point in the direction of some possible causal missing links that might be associated with *unknown etiology* (e.g., dysfunction of the central and peripheral ANS, enteric nervous system, endocrine glands, abdominal lymphatics, spinal nerves, circumventricular organs, etc).

1.7.5 Comorbidity

1.7.5.1 Somatic Comorbidities

Persons with epilepsy are at increased risk for early mortality and for comorbidities that can shorten the lifespan, complicate management, and increase health-care costs. Using data from the 2010 National Health Interview Survey (NHIS) to assess the prevalence of nonpsychiatric comorbidities, the Centers for Disease Control (CDC) reported that adults with epilepsy had a higher prevalence of cardiovascular, respiratory, inflammatory, metabolic, and other disorders (e.g., headache, migraine, and various other types of pain) than adults without epilepsy. These comorbidities might result from shared disease mechanisms, social disadvantages associated with chronic disease, treatment side effects, or shared genetic, environmental, or other factors (Centers for Disease Control and Prevention, 2013).

People with epilepsy in the general population also have a two- to five-fold prevalence of somatic comorbid conditions, as compared with people without epilepsy . . . not only is there a high prevalence of chronic comorbid conditions in epilepsy, but the incidence of new health problems is also higher. The importance of conceptualizing epilepsy as a condition with multiple coexisting morbidities cannot be overemphasized. All clinicians caring for people with epilepsy need to be keenly aware that these patients are ill in many ways and require a more comprehensive and integrated approach. Also, because chronic comorbid conditions may cause

epilepsy, result from epilepsy, or share pathophysiological mechanisms with epilepsy, their recognition provides opportunities for investigating new pathophysiological and therapeutic alternatives. (Téllez-Zenteno et al., 2005, p. 1961)

Thus, somatic comorbidities with systemic features may be etiologically significant, contributing to epileptic pathophysiology. Furthermore, the recognition of systemic dysfunction as a significant factor in epilepsy comorbidity has implications for classification and treatment. With regard to classification, it may be helpful to acknowledge that epilepsy be considered as the sum of seizures and comorbidities caused by systemic dysfunction.

The evidence that epilepsy is associated with increased comorbidity is now irrefutable. Together with the observation that even people with epilepsy in remission have an increased risk of early mortality, this suggests that there is a systemic component contributing to their ill health. These observations lead us to suggest that it may be helpful to consider epilepsy to be the sum of seizures and comorbidities and that there is a systemic dysfunction that is the primary contributor to the comorbidities. This systemic dysfunction can also aggravate epileptogenicity and increase seizure occurrence. (Yuen et al., 2018, p. 60)

Conveniently, the 2017 classification guidelines encourage textual annotations and provide a list of terms that can personalize each patient's condition. Several diseases, including anxiety, depression, migraine, dementia, heart disease, peptic ulcers, and arthritis, are up to eight times more common in people with epilepsy than in the general population (Keezer et al., 2016). Documenting comorbidities may provide clinical and research benefits by recognizing systemic interactions.

Epilepsy may coexist with a variety of sleep disorders, including obstructive sleep apnea (OSA), restless legs syndrome, narcolepsy, and insufficient sleep. These disorders may contribute to excessive daytime sleepiness or insomnia and are associated with an increased vulnerability to seizure activity. Effective treatment of comorbid sleep disorders

is helpful for improving epilepsy (Malow, 2006).

With regard to etiology, pathophysiology, and somatic comorbidity, ANS and endocrine involvement in epilepsy (as reviewed in previous sections 1.5 and 1.6) are obvious potential candidates as mediators of systemic dysfunction as cited in the literature. The interactive and bidirectional relationships (between CNS brain dysfunction and peripheral pathology) are being explored in numerous neurological conditions, including amyotrophic lateral sclerosis, transmissible spongiform encephalopathies, Parkinson's disease, and Alzheimer's disease (Rao & Gershon, 2016). An open-minded consideration of subcortical and peripheral involvement in epilepsy may be the key to understanding the meaning of somatic comorbidity in epilepsy—and perhaps even unlocking some heretofore hidden aspects of the mystery called epilepsy.

1.7.5.2 Depression and Epilepsy

In addition to somatic comorbidities, various psychiatric illnesses are known to be associated with epilepsy. For example, reports from numerous studies suggest that epilepsy and depression are closely linked and that this association is more frequently reported than in other chronic medical conditions (Mula & Schmitz, 2009). The reasons for this comorbidity are both biological and psychosocial (Kanner & Balabanov, 2002). Epilepsy may contribute to depression through chronic stress exposure, in which stressful life events and inherent vulnerability affect the likelihood of developing depression. Additionally, the uncertainty and unpredictability of seizures may induce learned helplessness—a common feature of depression. Conversely, depression may facilitate the development of epileptic activity through hyperactivity of the hypothalamic-pituitary-adrenal (HPA) axis and disturbances of glutamate and aminobutyric acid neurotransmitters (Fiest et al., 2013). Stress leads to the activation of the autonomic nervous system and the HPA axis, including the release of stress hormones in the brain and peripherally from the adrenal cortex (O'Toole et al., 2013).

A hyperactive HPA axis has been found in both epilepsy and depression and may lead to substantive cortical changes, particularly in the volume of the hippocampus and frontal lobes. (Fiest et al., 2013, p. 597)

Neurotransmitters are chemical messengers in the brain by which nerve cells transmit electrical impulses and carry out activities. The “monoamine-deficiency” hypothesis of depression posits a depletion of certain neurotransmitters in the monoamine family (most notably serotonin and norepinephrine), which hinders neurotransmission.

Most of the monoamine neurons are located in brainstem nuclei that project to large areas of the entire brain. This allows the monoaminergic systems to be involved in the regulation of a broad range of normal brain functions, including mood, attention, reward processing, sleep, appetite, and cognition—all of which are disturbed in depression.

With regard to the anatomy of neurotransmission, the synaptic cleft is a channel between the axon of one neuron and the dendrites of another. Neurotransmitters act within this channel to stimulate (or inhibit) other neurons. A monoamine deficiency within the synaptic clefts could result in a lapse of nerve impulse that is characteristic of depression.

Anatomically, most axons in the brain are surrounded by a type of white sheath or covering called “myelin” whereas nerve cell bodies and dendrites are bare, giving a pinkish gray color. Thus, the brain gives the appearance of having segregated areas of white matter and gray matter. White matter is found primarily in the deeper tissues of the brain (subcortical). The gray matter is found on the surface of the brain (cortical). A simple explanation of the monoamine-deficiency hypothesis of depression is that there is a lapse of nerve impulse between the white and gray matter of the brain—which also corresponds to cortical and subcortical in terms of anatomy and physiology. These same subcortical areas and monoamine systems are involved in epilepsy. Incidentally, none of the antidepressant drugs prescribed to address monoamine deficiency has been shown to be more than marginally superior to placebo (Sharples, 2009). As noted above, research evidence is pointing in the direction of other neurotransmitters (glutamate and GABA) as potential factors in both depression and epilepsy (Kanner et al., 2017). Thus, epilepsy and depression share possible pathophysiology that involves subcortical and cortical involvement via faulty neurotransmission and HPA axis neurohormonal dysfunction.

1.7.5.3 Schizophrenia and Epilepsy

Kraepelin, a key figure in the founding of modern psychiatric nosol-

ogy, commented on the close relationship between epilepsy and schizophrenia (which he called “dementia praecox”). “As in dementia praecox epileptiform seizures occur, the malady may be taken for epilepsy . . .” (Kraepelin, 1919, p. 274).

Seizure disorders have always been of interest to psychiatrists. Kraepelin noted that there were three types of psychotic conditions: dementia praecox, manic-depressive illness, and the psychoses associated with epilepsy. As psychiatrists have become more aware of the multiple medical conditions that can cause behavior change, and particularly psychosis, they have become increasingly aware of the behavior changes associated with seizure disorders. For psychiatrists, the study of seizure disorders not only is important for diagnosis and treatment of psychiatric disorders but also has many theoretical implications for the understanding of behavioral disorders in general. (Neppe & Tucker, 1988, p. 263)

Prior to the development of EEG by Hans Berger in the 1930s, seizure disorders were regarded as mental disorders (Neppe & Tucker, 1988). The recognition that certain subgroups within epilepsy present with a schizophrenia-like psychosis at a higher rate than the general population has led numerous researchers to investigate this relationship (e.g., Slater & Beard, 1963; McKenna et al, 1985; Clancy et al., 2014). Oyeboode & Davidson (1989) went so far as to designate a category of epileptic schizophrenia: “*The clinical features of schizophrenia with epilepsy are reported as being indistinguishable from the pathognomonic features of functional schizophrenia*” (p. 327). Roberts et al. (1990) view temporal lobe epilepsy as a “mock up” of schizophrenia.

Through epidemiological studies, the comorbidity of schizophrenia and epilepsy is now well established (Qin et al., 2005; Wotton & Guldacre, 2012). With regard to etiology and pathophysiology, the comorbidity of epilepsy and schizophrenia may reflect a shared susceptibility (Casella et al., 2009; Scharfman et al., 2018) with cortical and subcortical involvement resembling the structural and functional connectivity found in temporal lobe seizures (Okada et al., 2016; Zhao et al., 2016;

Koshiyama et al., 2018). As has been noted in a previous section documenting significant autonomic nervous system (ANS) involvement in epilepsy, likewise numerous studies have revealed a notable ANS role in the pathophysiology of schizophrenia (e.g., Schulz et al., 2016; Kimhy et al., 2017; Cella et al., 2018).

After decades of focused research into complex disorders such as dementia, schizophrenia, and epilepsy, it has become clear that there are overlapping components. Often, this interrelationship is simplified by stating that seizures are a “comorbidity” of what is considered to be “another” disorder . . . The implication is that “neurology” and “psychiatry” are less divided than one might think, and our approach to research and treatment should be adapted accordingly. (Scharfman et al., 2018, p. 303)

For those interested in a further elaboration of the comorbidity of epilepsy and schizophrenia (from the predominant perspective of schizophrenia), see *“The Treatment of Schizophrenia: A Holistic Approach”* (McMillin, 1991a, pp.4–8; 237–253). That text discusses some of the nosological challenges (such as comorbidity, variability, and nonspecificity) that are inherent in the abstract, human-conceived categories imposed on organic pathophysiology during diagnosis and classification (of any illness).

Key Points to Remember

- Advances in neuroimaging techniques have revealed remote functional connectivity of neural networks, allowing a broader, more flexible framework for classification that more readily acknowledges subcortical involvement in epilepsy.
- This is reflected in the “network inhibition hypothesis” that includes an integrated cortical/subcortical “consciousness system” to explain impaired or lost consciousness during seizures.
- There is substantial experimental and clinical support for subcortical and peripheral involvement in the expression of motor events associated with seizures.
- The six recognized categories of etiology (structural, genetic, in-

fectious, metabolic, immune, and unknown) allow plenty of room for subcortical and peripheral factors in the causation of epilepsy.

- Understanding comorbidity in epilepsy (both somatic and psychiatric) provides new avenues for exploring epilepsy etiology, pathophysiology, and treatment options.



Part Two

The Cayce Readings on Epilepsy

2.1 Overview

2.1.1 Background

Edgar Cayce (1877–1945) was a prominent figure in the development of the *holistic medicine* movement in America. The association of *holism* with Cayce has become widely recognized, culminating in this reference from an editorial in the *Journal of the American Medical Association*:

The roots of present-day holism probably go back 100 years to the birth of Edgar Cayce in Hopkinsville, Ky. By the time he died in 1944 [sic], Cayce was well recognized as a mystic who entered sleep trances and dictated a philosophy of life and healing called “readings.” His base was established at Virginia Beach, Va., now the headquarters of the Cayce Foundation. Closely associated with that foundation is the Association for Research and Enlightenment, Inc. [A.R.E.®],

which also runs a medical clinic under physician direction in Arizona. (Callan, 1979, p. 1156)

Practicing as a medical clairvoyant, Cayce is reported to have voluntarily entered an altered state of consciousness (trance) in which he gave psychic dissertations on various subjects including the health status of individuals who sought his assistance (Stearn, 1967; Bro, 1990). Cayce gave over 14,000 psychic readings, with about 9,600 for health problems, including over 200 that discuss various aspects of epilepsy. There were about 95 actual cases, with some individuals receiving multiple readings (Pahnke, 1983). Selected case studies from this group of readings will be presented in a later section (2.2).

The collection of Edgar Cayce readings is available to the public in print form at the A.R.E. headquarters (215 67th Street, Virginia Beach, VA 23451). The complete Edgar Cayce database of 24-million words is available online to all members of the A.R.E. at EdgarCayce.org.

Recognizing the need for confidentiality, each reading is assigned a number corresponding to the person or group requesting information. The identifying number is followed by another number designating the sequence of the reading. For example, a reading cited as 182-6 indicates that it is the sixth in a series of readings for an individual or group designated as 182. In this manuscript, citations for material from the readings will simply provide the reading number.

Among the various types of readings given by Cayce, some provided guidance for the organization that was formed (the Association of Research and Enlightenment—A.R.E.) to carry out the work of the readings. As indicated by the name of the organization, research was to be emphasized:

Let there be outlined each phase that is to be studied, each phase that is to be a research. It's often stated that the work IS a research and enlightenment program; but how much research have you done? Isn't it presented rather as enlightenment without much research? Then, don't get the cart before the horse! It doesn't work so well! (from reading 254-81; 254 was the number assigned to the A.R.E.; this was the 81st reading in that series).

The next reading in the series followed up on this theme, making this observation:

Again we would insist that we have asked that it be taken as a study, as a thing or condition in the experience of mankind—that this organization may give much to the world on one particular disturbance that has baffled the wise and the foolish. This study on that called epilepsy—for **THREE YEARS!** and you will be undefeatable! 254-82

Presumably, the strong recommendation given in reading 254-82 for epilepsy research would have required a focused three-year period of study in which a series of readings would be given on epilepsy and the organization would have interacted with the medical establishment of that era (as was noted in the discussion that followed reading 254-82). Such a series of readings were never given, and although there have been (and continue to be) attempts at following through with the initial recommendation to research epilepsy from the perspective of the readings, the entire process has been somewhat sporadic and scattered.

One of the more significant efforts in this direction was made by Walter Pahnke (1983), a medical doctor who studied the individual cases of epilepsy in the readings, wrote commentaries, and organized the material in a very useful format. A later section will make use of Pahnke's work by reviewing some of the more representative cases of epilepsy in the readings, including some of Pahnke's observations and commentary. Meridian Institute also investigated the Cayce approach to epilepsy, culminating in a research report (Meridian Institute, 2004). Others have made similar contributions (King et al., 2017).

2.1.2 Classification

The Edgar Cayce health readings tend to focus on individuals, rather than diagnostic classifications (which are occasionally mentioned, almost as an aside). Information on etiology, pathophysiology, and treatment forms the core of each reading. For example, a reading for a young woman suffering from auditory and sleep problems stated that both conditions were produced by an "incoordination between sympathetic and cerebrospinal systems." (3074-3) The woman asked for

a medical diagnosis for the hearing problem:

(Q) By what medical name is the ear condition known?

(A) You name it what you want to! It is the incoordination between the nervous systems.

3074-3

Because incoordination between the sympathetic and cerebrospinal nervous systems is cited as a primary pathophysiological factor in nearly all the readings on epilepsy (and in many other conditions as well), it is the manner in which the incoordination manifests in the body of each unique individual that makes the difference in the pathological presentation. Typically, rather than label the condition as a diagnosis, the readings describe the etiology and pathology in sufficient detail to explain and justify the treatment regimen recommended. Thus, it is a person-centered approach wherein each individual is addressed from the standpoint of uniqueness. This idea has taken root in modern medicine's pursuit of personalized medicine that is unique and specific for each individual (Vogenberg et al., 2010). Essentially, that is what Edgar Cayce was doing with each individual that sought his assistance—providing an individualized assessment and treatment plan for that person at a specific point in time and place.

Conceptually, the Cayce readings tend to use a systems model where incoordination between systems is a common source of illness. In complex systems (such as the human body) there is inevitable variation in the precise nature of the incoordination (imbalance, dysregulation, etc.) and how it manifests as signs and symptoms. Thus, in the Cayce readings, the problems associated with variability and nonspecificity are addressed (as well as comorbidity) on a case-by-case basis within the context of general patterns of systemic incoordination. Common pathological patterns are sometimes acknowledged with a diagnosis, but the uniqueness of etiology and pathophysiology for each person is the primary emphasis in the Cayce health readings.

With all of this in mind, there are several epilepsy readings that do include diagnostic and classification information. For example, the question of what is and is not epilepsy was sometimes explained as a matter of differential diagnosis. For a woman experiencing convulsions, Cayce observed:

These [conditions] are not what is commonly called the epileptic.
 True, there is the semblance of same and we find that these are
 not being controlled in the best manner. 5386-1

Note the use of the expression “called the epileptic.” The readings recognized that the process of medical diagnosis of epilepsy was (and still is) largely a matter of labeling, naming, or calling that which is not understood. Interestingly, the previously cited comment in reading 254-82 about epilepsy being a “disturbance that has baffled the wise and the foolish” still resonates with the current approach to epilepsy classification. While noting the desirability of creating a science-based classification, it is acknowledged that “our understanding is not sufficiently advanced to construct a classification on a scientifically rigorous basis” (Scheffer et al., 2017, p. 513). Understandably, the readings were careful in using medical classifications when discussing epilepsy.

Once the question of differential diagnosis is resolved and a case meets the criteria for epilepsy, the next question concerns classification. What type of epilepsy is it? In one reading, the standard terminology of “petit mal” and “grand mal” is used to describe the clinical condition and provide a prognosis:

. . . we will make for greater or better gradual coordination and
 alleviation of the causes of the spasmodic reaction—or the petit
 mal (or the grand mal that it would become, unless these correc-
 tions as indicated are considered necessary). 1683-1

With regard to epilepsy classification, the primary concern in the several readings in which this is discussed pertains to the category of “true epilepsy.” It was in the nineteenth century that Todd (1855) created this classification for what would later be regarded as generalized, idiopathic epilepsy (section 1.2.4). Actually, in most of the readings that use the term “true epilepsy” it is mentioned to state that the case is not “true epilepsy” (but perhaps one of the various other types of epilepsy). For example, a twenty-five-year-old man had suffered a head injury at about age three and was experiencing periodic convulsive seizures. His reading recommend brain surgery, commenting:

. . . outside influences which have caused, to a portion of the brain, an adhesion or lesion, that under stress, as too much of certain foods or overtaxation, prevents the normal reflexes by that pressure produced where this scar tissue or adhesion produces a pressure on a portion of the brain. It is upon that portion of the medulla oblongata that this pressure is caused. These, then, are not epilepsy, though there is some similarity in the character of the seizures. But it is not true epilepsy. 5234-1

The case studies included in a later section will consider the role of classification in the Cayce readings, provide much more detail, and, most importantly, make the connection with etiology and pathophysiology.

2.1.3 Etiology and Pathophysiology

Consistent with modern mainstream medicine, the Cayce readings recognize that there are various types and causes of epilepsy:

There are various characterizations in those that are termed epileptics. Some arise from one condition, some from another. 281-4

. . . what is KNOWN as epileptic, produced from the various causes. These, you see, have a variation. 1800-16

In contrast to mainstream medicine that focuses almost entirely on the brain as the dysfunctional organ in epilepsy, the Cayce readings focus on peripheral systems (especially the endocrine system, autonomic nervous system, digestive tract, and lymphatic system), which in turn produce “reflexes” resulting in brain seizures.

The discussion of reflex epilepsy and reflex seizures in section 1.4.4 is relevant to the patterns of etiology and pathophysiology in the readings, particularly somatosensory (1.4.5) and viscerosensory (1.4.6) seizures. In many instances the peripheral etiology and pathophysiology were linked to dysfunction in the lymphatics of the digestive tract (lacteal duct adhesions) or nerve centers along the spinal cord. Typically this led to nervous system incoordination in the medulla oblongata, eventually producing a seizure in cerebral cortex. Conceptually, such triggers for seizure production would fall somewhere along the continuum of

reflex and spontaneous seizure phenomena as discussed by Koepp et al. (2016) and would most often be unobservable, resulting in “apparently spontaneously occurring seizures” (p. 101). Here are some of the more common patterns of etiology and pathophysiology in the Cayce readings that address epilepsy.

2.1.3.1 Lacteal Duct Adhesions

Specifically, the readings insist that many cases of epilepsy are caused by “adhesions” in the lacteal ducts that line the upper intestinal tract. Lacteal ducts are part of the abdominal lymphatic system that absorb lipids from the small intestine as digested food passes through the gastrointestinal tract. An adhesion is “a holding together by new tissue, produced by inflammation or injury, of two structures which are normally separate.” (*Taber’s Cyclopedic Medical Dictionary*)

The readings discuss various causes of abdominal lacteal duct adhesions in epilepsy, including injury or trauma directly to the abdomen, fever, spinal injuries (with reflexes to the abdomen), and pregnancy and birth complications. Such adhesions are typically associated with decreased circulation and lower temperature that can manifest as a “cold spot” over the primary lacteal duct area between the point of the rib and caecum on the right side of the abdomen:

From EVERY condition that is of true epileptic nature there will be found a cold spot or area between the lacteal duct and the caecum. 567-4

Appendix C provides detailed information on the lacteal system, lacteal duct pathology, and the associated abdominal cold spot in epilepsy. Lacteal duct adhesions were sometimes associated with abdominal symptoms (such as discomfort or vague feelings of distress along the right side of the abdomen) sometimes linked to digestion following meals (where specific foods were consumed) or colon problems associated with bowel movements. When such symptoms are more severe, the clinical presentation may be suggestive of abdominal epilepsy (section 1.5.3).

2.1.3.2 Nervous System Incoordination

The irritation produced by lacteal duct adhesions can reflex through the peripheral nervous system to the upper cervical nerve centers and medulla oblongata (at the base of the brain), resulting in an incoordination between the sympathetic and cerebrospinal nervous systems, manifesting as epileptic seizures. One of the various causes of lacteal duct adhesions is aberrant nerve impulses from spinal centers (particularly the lower spine):

Now as we find, there are disturbing conditions which prevent the best normal reaction in the physical forces of the body.

These as we find are hidden, in a nature, and the causes arise from an injury received some years ago, in the coccyx area, and then a contributory cause later in the area above the lumbar axis.

These caused a slowing of the circulation through the areas of the lacteal ducts, thus producing a COLD area there, that has produced a partial adherence of tissue.

With the activity of the lymph through the area, we find that periodically, when there is the lack of proper eliminations through the alimentary canal, there occurs a reflex to the coordination between sympathetic and cerebrospinal system area; that takes the governing of the impulse, as it were, to the brain reactions; OR a form of spasmodic reaction that might be called epileptic in its nature.

1980-1

Thus nervous system incoordination (sympathetic and cerebrospinal) is a primary factor cited in the Cayce readings on epilepsy. Appendix C (section 3.3) provides historical context for the meaning of these terms with regard to anatomy and physiology. In some cases the nervous system incoordination extends to the sensory nervous system, resulting in “reflex epilepsy” or “reflex seizures” (section 1.4.4) and sensory system dysfunction (section 1.4.3):

While there is much yet to be desired, in making for the proper coordinations through the activities of the system—and between the sensory reactions and the impulses through the cerebrospinal system, we find that with these changes other conditions arise that

apparently become greater disturbing factors in some directions.

(Q) Please explain why the [epileptic] attacks come on always from a slight shock of some kind; as unexpected noise, stumbling, etc.?

(A) As indicated, there is a breaking; or a non-coordination between the sympathetic and the cerebrospinal systems. And it is almost the same effect of a shock, of an excitement, that would be produced in a wire that is partially broken; when set in a certain way the current passes through, but a turning of same causes sparks or a disconnection and a reaction that makes for a flashing. So with the nervous system. Hence the continued use of all those things as indicated, that will enable the body to make for the more perfect coordination between the cerebrospinal and the sympathetic nervous systems—and especially in relationship to those centers and ganglia where there are the particular clogging conditions between the nervous systems in the lumbar and the dorsal areas.

1025-3

Epilepsy is sometimes compared to an electrical storm in the brain (e.g., Epilepsy Foundation, 2019). Some Cayce readings also draw similar common analogies as in case [1025] above, comparing the neurological pathology in the brain to a short circuit in an electrical system.

2.1.3.3 Reproductive System Dysfunction

As part of the etiological patterns in seizure production, the reproductive system and sex hormones may play a role in epilepsy (such as catamenial epilepsy) as noted in section 1.6.2 of the literature review. From the readings, seizures in cases 571 and 3606 were linked to menstruation (i.e., catamenial epilepsy). The readings also sometimes described a pathophysiological association between lacteal duct adhesions and the reproductive system leading to seizures:

Pathologically we find there are those adhesions in the lacteal duct area as associated or connected with the pubic [genital] centers in this body. These cause, when there is the digestion or when there are activities of certain elements or environs, what might be called seizures, falling sickness, epilepsy or the contrac-

tion or spasmodic condition in the area of the 1st and 2nd cervical, where the emotions through the superficial circulation or the sympathetic and the cerebrospinal system do not coordinate in their entrance to brain reflexes. 3306-1

Often in such cases, the Leydig (also called lyden) gland is mentioned as an important etiological factor, usually in conjunction with the pineal gland in the brain.

2.1.4 The Pineal System and Soul Dimension

The connection between each of the etiological and pathophysiological factors cited above is that they are (in some manner) associated with the pineal gland and its system (section 3.2.2). Anatomically, the pineal system extends throughout the entire body, including glands and nerves. Here is a list of the primary components of the pineal system:

- pineal gland (proper),
- Leydig (lyden) gland,
- pineal branches, especially in the lower cerebellum,
- pineal cord or thread,
- pineal nerve,
- pineal centers, especially at the base of the brain and along the spine.

The Cayce readings provide a truly holistic perspective based on spiritual, mental, and physical interaction. In a word, this relates to the *soul* dimension of human experience. The pineal system represents the body-soul connection with the pineal and Leydig glands as the “seat of the soul”—the pineal/Leydig axis.

The pineal system serves a coordinating and integrating function—coordinating mental and spiritual dimensions with the physical body (and particularly with specific glands and nerves):

. . . for this action in sympathetic and coordinating system, which occurs through the action of the lyden [Leydig] gland with that of the pineal, in its recurrence to bring forces along those of the sympathetics coordinating with cerebro-spinal centers . . . The basis, the seat of the soul, then, in that of the lyden [Leydig] gland, with the pineal reaction in the system, and this the activity that brings about psychological conditions. 3969-1

The cord that is eventually known or classified as the pineal is the first movement that takes place of a physical nature through the act of conception; determining eventually—as we shall see—not only the physical stature of the individual entity but the MENTAL capacity also, and the spiritual attributes. 281-46

Appendices A and B (available as supplemental resources in the last part of this manuscript) focus on the various aspects of the pineal system. Also, the case study section that follows provides detailed examples of all of the above as it relates to epilepsy.

When considering the soul and its connection with the body, certain “transpersonal” aspects arise with regard to the larger context of illness and healing. The word “karma” is used in numerous readings for cases of epilepsy (e.g., 1001, 1527, 1916, 2153, 3057, 3156, 3210, 3302, 3438, 3569, 5232). For example:

First, physically, as indicated—there was lack of certain elements through the period of gestation. Now these find their expression in the lack of ability of the nerve flexes to create in the system that which would keep counter-balanced to environmental forces, as well as the spiritual and mental purposes of an individual entity . . .

(Q) What causes the convulsions?

(A) The inability of the cerebrospinal and sympathetic systems to coordinate impulses to the flexes of the brain. This takes place from a convulsion that begins in the lacteal duct areas.

(Q) Why does she have such a fear of falling?

(A) This is part of its karma—for it made many others fall far!

3057-1

Note the presence of the common pattern of lacteal duct pathology causing nervous system incoordination resulting in brain seizures with convulsions. And yet, there is a larger context that relates to the soul dimension of the human experience with regard to reincarnation.

In another case of epilepsy where a “life reading” (that includes specific personal information on reincarnation) was provided, this larger perspective of the soul experience is explained more philosophically:

In giving that from the [akashic] records as we have here, we find much that might be said concerning what has been written in many quarters respecting heredity and environment. For these, whether the individuals will or not, go much deeper than ordinarily seen from reasoning in one plane, one experience, one environ. Yet oft, as we find here, individuals again and again are drawn together that there may be the meeting in the experience of each that which will make them aware of wherein they, as individuals (individual entity and soul), have erred respecting experiences in materiality or soul life even. For the soul lives on, and unless that which has been the trouble, the barrier, the dissenting influence in the experience is met in self's relationships to Creative Forces, it must gradually make for deteriorating experiences in the expression of such a spirit influence in matter—or materiality. 693-3

Typically in cases involving significant karma, the pathology begins very early—during gestation, at birth, or soon thereafter. Thus, the forces of “heredity and environment” are the channel for cause and effect at the soul level. In particular, heredity is an effective means for the soul to meet its karma:

Karma is cause oft of hereditary conditions so called. Then indeed does the soul inherit that it has builded in its experience with its fellow man in material relationships. 3313-1

Thus the reality of genetic factors in disease has deeper implications than simply biological aberrations. The soul level of human experience becomes relevant and requires attention with regard to the mental and spiritual aspects of healing, for all involved.

2.1.5 Therapeutics

The case studies (section 2.2) provide detailed information on the therapeutic recommendations for each case. This is where the individualized approach of the readings comes fully into play by addressing the uniqueness of each person with regard to variations in etiology and pathophysiology. Within the inherent variability of human illness, there

are general patterns of pathology and treatment that are consistent with the above information as it applies to epilepsy.

2.1.5.1 Abdominal Castor Oil Packs

For example, the recommended treatment for lacteal duct adhesions typically involved hot castor oil packs applied over the area of the adhesions followed by massage:

Have sufficient periods of the Castor Oil Packs. To be sure, they are disagreeable, but they will break up lesions as no other administrations will. The best time to take these is the evening, to be sure. These should be given in series; applied for an hour each evening for two or three evenings BEFORE each osteopathic adjustment is to be made, see? At least every OTHER series, follow same with at least a tablespoonful of Olive Oil taken internally . . . Keep these up until this coldness AND the lesion in the right side is removed,—which is just a hand's breadth below the point of the rib, or over that area of the ducts.

To be sure, there may be many questions as to the exact area of the ducts, even according to some anatomists for they have changed their ideas of people, and yet people haven't changed a very great deal!

There are, to be sure, lacteal ducts. There are the strings or ducts all through the upper portion of the alimentary canal, or jejunum; but the larger patch or area is that lying just below the lower end of the duodenum, and where same EMPTIES into the jejunum, see? THIS patch is not only an INTERNAL activity but an EXTERNAL, that makes for the production of assimilation.

The adhesions in these ducts here were produced by an excess temperature, which the body suffered at some period when there was too SUDDEN dropping of the temperature (which they may check and find to be correct), and NOT sufficient water, or manipulations, or activity, through the alimentary canal.

This has gradually caused the disturbances to the general breaking of coordination in the nerve systems, and brings about—for this body—the SOURCE of the attacks. 21534)

Appendix D (section 3.4) contains information about the lacteal duct dysfunction and the associated cold spot, including various patterns of etiology and pathophysiology. McGarey (1993) has provided an excellent resource on all aspects of castor oil treatments as recommended in the readings.

2.1.5.2 Manual Therapy

Readings that cite spinal nerve dysfunction usually prescribe manual therapy such as osteopathic or chiropractic manipulations and adjustments to assist with establishing nervous system coordination (between sympathetic and cerebrospinal systems). For example:

Then, for specific instructions or directions in making the adjustments, or the movements and pressures on those segments from which impulses arise to coordinate activities with the cerebrospinal and the sympathetic impulse through which the disturbance gives manifestation in the spasmodic reaction:

Treat more with the body lying upon its face, with the hands above the head,—the area in the dorsals, from the 4th to the 9th; first one side, then the other, of the cerebrospinal system. Not so much adjustments in this area as stimulating the activities of the body itself.

Then, with the body upon the left side, with the limb drawn high up, treat the 7th and 8th dorsal upon the LEFT side, with the left hand of the manipulator keeping in touch with those reactions in the right area about the lacteal duct—or that below the rib and to that area of the gall duct center. This will indicate to the operator the taut areas that are to gradually be broken up.

Now: After this adjustment or relaxing—with the body upon the back, the feet drawn up,—gently knead that area about the liver, the gall duct, and extending even to the caecum; gradually breaking up this tension that has been seen or felt in this area by the movements from the left side of the body.

After THIS application, then have the body on the RIGHT side, with the right limb drawn high, hands above the head—on both sides, to be sure,—and treat those areas from the lumbar to the 7th dorsal, especially on the right and left areas of the cere-

brospinal system, for the activity of the coordinating of the genital system to the activity created in the lacteal duct AND caecum area. 2153-6

2.1.5.3 Diet

Frequently, dietary recommendations were provided in cases of epilepsy. The approach in these cases contains one striking recommendation in several readings: no sugar (or very little). Otherwise the basic Cayce diet was usually recommended which comes close to what we now call the Mediterranean diet. There are numerous books and other resources available on the basic Cayce diet for those wishing more information (e.g., McGarey, 2002; Gabbay, 1999). The case studies will provided much detail as well.

With regard to the caution about dietary sugar, this may relate to the role of glucose metabolism by brain neurons. Glucose is the fuel for brain cells. Perhaps an excess of dietary sugar (that gets converted to glucose by the liver) could contribute to brain neurons becoming hyper-excited during seizures (section 1.7.4.4).

One of the theories about the efficacy of the ketogenic diet for epilepsy is that it replaces glucose as a fuel with ketones. Thus brain cells are less prone to become hyper-excited. The readings did mention the ketogenic diet when asked about the appropriateness for a twelve-year-old girl with epilepsy. The reading responded positively with a qualification:

(Q) Is the Ketogenic diet as given, proper?

(A) Very good, if there will be more reactions in the air with same. That is, exercises. It takes a great deal of oxygen for this to co-ordinate, or to become ASSIMILATIVE for reaction in the system. 5562-2

2.1.5.4 Medication

Many Cayce readings recommend various medicinal compounds, including some of the epileptic medications available during that era. For example:

(Q) Advise if it will be helpful to eliminate the small doses of phenobarbital and substitute Dilantin, discovered by Dr. Merritt

of Boston. If Dilantin is satisfactory, how much of it should be taken and how often?

(A) Dilantin will be helpful here, but DON'T GIVE IT TOO OFTEN! The dosage should be under the direction of the one who discovered same, or a physician who might administer same. But just consider it in the light of that given here. Reduce the dose. Rather than the maximum dose, give the minimum. See?

2153-7

The readings often prescribed Maypop (also called mayapple or passion flower), an herbal remedy to assist with healing the glandular system—at times in conjunction with other medications:

In taking the Luminal [phenobarbital] naturally this will at times work a hardship; that is, the reaction, as the body attempts to adjust itself, makes for the more severe reaction in the contraction, in the falling, in those activities through the system, but with the use of the Maypop—after one or two severe attacks that will come at a period of three to five weeks apart—then this should gradually decrease, IF the properties of the passion flower [Maypop] are kept as an element building in the system; for these properties will work with the glands of the body in PREVENTING THESE CONDITIONS. Hence after the third or fourth month we may gradually DECREASE the quantity of the Luminal; not wholly, but gradually decrease same.

543-20

2.1.6 Comorbidity

Not surprisingly, the cases of epilepsy in the readings exhibit a high degree of comorbidity with other conditions (especially somatic comorbidity) that is consistent with the literature (section 2.1.6). The extensive involvement of peripheral and systemic etiological factors such as the ANS, lymphatic system, endocrine and GI-tract dysfunction naturally produced a wide range of somatic symptoms directly associated with the epilepsy etiology, including kidney dysfunction (4678, 5736), liver problems (1001), gastrointestinal symptoms (34, 251, 814, 1025, 1527), and back pain (5736).

There are also examples of psychiatric comorbidity. For example, the

reading for case 241 provided this explanation for the comorbidity of epilepsy and depression where the woman was experiencing significant post-ictal depression:

(Q) How may the body best overcome the morbid feelings after these spells? [Epileptic seizures]

(A) By removing the pressure and that that produces the pressure to the brain's reaction itself, as has been given. With the applying of those impulses to the activity of the gray forces in the nerve tissue itself; that is, as the condition as has been given. Impulse in brain forces, or its reaction, are of two natures - the white and gray matter, as is ordinarily called. One an impulse, the other the active force that carries on same. In the body, when the impulses come from the pressure as has been created in the forces seen to the brain itself, we have that of the activity without the impulse to carry same forward. Hence we have what is commonly known or called melancholia, or depression, or the inability to carry out the impulses of the body.

241-1

Note the similarity to contemporary views of neurobiology in depression (section 1.7.5.2). This reading is describing a breakdown in the way the nerves transmit impulses. Keep in mind that this reading was given to a lay audience years before the discovery of neurotransmitters and the development of modern models of neuropathology. *The Treatment of Depression: A Holistic Approach* covers the extensive information on depression in the Cayce readings (McMillin, 1991b).

Consistent with the medical literature on the comorbidity of epilepsy and psychosis (e.g., schizophrenia—see section 1.7.5.3), there are also some cases of epilepsy in the readings with psychotic symptoms such as “visions or has extra perception of sense reaction” (1683-1) and “hallucinations” (885-1). Furthermore, numerous readings were given for individuals with schizophrenia (then called dementia praecox) where the etiology and pathophysiology were similar to many cases of epilepsy (with regard to ANS incoordination and pineal system involvement). *The Treatment of Schizophrenia: A Holistic Approach* is a scholarly work that explains the Cayce model as it relates to the comorbidity with epilepsy (McMillin, 1991a, pp. 4-8; 237-253).

Key Points to Remember

- The holistic approach of the Cayce readings integrates spiritual, mental, and physical dimensions of human experience, especially in cases involving significant health problems such as epilepsy.
- The readings explicitly encourage a research emphasis on epilepsy and provide a body of considerable information on etiology, pathophysiology, and treatment.
- Subcortical and peripheral involvement in epilepsy is described in most cases of epilepsy in the readings, a perspective consistent with the literature review provided in Part 1 of this text. Lacteal duct adhesions and spinal nerve dysfunction can be a source of peripheral irritation and aberrant reflexes to the brain in cases of epilepsy.
- The pineal gland and system represent the body-soul connection and play an important role in the etiology, pathophysiology, and treatment of epilepsy.
- The Cayce readings on epilepsy can contribute to a systemic view of the comorbidity of epilepsy and the numerous other illnesses and medical conditions that tend to co-occur.

2.2 Case Summaries

Walter Pahnke, a Harvard-trained physician, reviewed the Cayce readings on epilepsy, arranging them into three groups based on documentation of the diagnosis (Pahnke, 1983, p. 132). Group I contains cases in which the diagnosis was most certain (i.e., the readings named the condition as epilepsy, correspondence supplied a medical history as documentation of the diagnosis, and information relating to a description of the convulsions or seizures could be ascertained).

Group I (46 cases): 34, 80, 161, 251, 543, 561, 567, 571, 663, 693, 814, 885, 1001, 1025, 1527, 1625, 1683, 1699, 1784, 1836, 1916, 1980, 1994, 2019, 2149, 2153, 2292, 3057, 3082, 3156, 3210, 3302, 3426, 3438, 3569, 3606, 3688, 3790, 4678, 5232, 5234, 5379, 5386, 5562, 5642, 5736.

Group II contains cases in which the diagnosis was less certain because no information is available other than that the patient had some

type of convulsions, seizures, or spells.

Group II (33 cases): 22, 54, 179, 395, 521, 769, 1495, 1653, 2155, 2286, 2441, 2991, 3133, 3217, 3362, 3428, 3465, 3521, 3565, 3568, 3603, 3690, 3788, 3801, 3891, 4091, 4677, 4798, 5033, 5094, 5128, 5333, 5732.

Group III contains cases in which the diagnosis did not seem to be epilepsy based on the readings or correspondence. However, the information in these readings may be useful for differential diagnosis and understanding comorbidities between epilepsy and other illnesses.

Group III (16 cases): 146, 241, 436, 758, 1198, 1289, 1465, 3071, 3905, 3918, 3995, 4080, 4503, 4844, 5204, 5391.

Pahnke's report (Pahnke, 1983) summarized data from Groups I and II, providing a solid overview of the Cayce approach to epilepsy. The detailed case summaries that I have developed below are representative of Group I, in which the diagnosis of epilepsy is most certain. Although paraphrasing and summaries are provided, extensive use of excerpts directly from the readings and associated documentation are also included so that the material may be studied and evaluated on its own merit—to be allowed to speak for itself, as it were. The quoted comments from Pahnke's review of each case can be found in the Report section of the last reading of the series for each individual.

Due to the evolution of Edgar Cayce's psychic process over a period of almost four decades, readers of this material may notice variations in style and presentation. The earlier readings tend to be loosely organized and rambling. During the early 1920's a standard, highly structured format for the physical readings was adopted. During the late years of his life, when Cayce became nationally recognized and was overwhelmed with desperate requests for his assistance, the reading format changed again, becoming very brief and concise so as to increase output to help more people.

One further point regarding Cayce's process is that although most of his readings were "physical" (dealing with health issues), other types

of readings were also provided. Thus in the cases that follow, a few examples from “life” readings (dealing with soul patterns such as re-incarnation) are provided, which add another dimension to the *holistic* study of epilepsy.

Case 34

Background

Eight physical readings were given for this man (age unspecified) between 11/7/1910–8/9/1911. A sister confirmed:

. . . my brother [34], who, by the way, has been an epileptic for more than twenty-five years, and we have spent hundreds of dollars and have employed noted physicians, but all the efforts put forth proved utterly useless and futile, save that he was given temporary relief, but no marked change was made in his awful condition.

Symptoms

Symptoms included abdominal muscle spasms, drowsiness, dizziness, “falling any place he might happen to be, oftentimes sustaining painful injuries,” “contraction of the muscles all through the body,” loss of consciousness.

Medical Diagnosis

Dr. Pahnke noted: “There is good possibility that the diagnosis is epilepsy, but the type of epilepsy cannot be definitely established.”

Etiology and Pathophysiology

Considering that eight physical readings were given, each with explicit description of pathophysiology, there is an abundance of information for this case. So several excerpts are provided to convey the content and style of this very early series of readings. As is typical, the beginning of the first reading lays out a broad view of the condition. Note particularly that spasmodic contraction of the muscles is described:

We have a lack of the supply of blood to the brain in its proper condition that produces a contraction of the muscles all through

the body, especially, through the facial and upper part of the trunk of the body. They produce a contraction of the muscles spasmodically and the supply of blood to pass through the whole system, pass with the nerve, muscle and tissue of the body in unison.

With regard to etiology, a lesion in the upper stomach is cited as a primary cause:

We have a lesion formed here in the body of [34] at the upper cortex of the stomach, produced from over congestion into the stomach here, at time back, when small, in the development of the body. Then the developments of the brain and forces in the body were such that it produced an abnormal condition into the brain . . . Hence the conditions we have at times of spasmodic condition of the flow of blood to the brain.

Nervous system pathology is noted in both the periphery and the brain:

We have two matters in the nerve tissue, the white and gray; the gray is more here than the white. We have here in the system a tie-up at the nerve centers, here at the seventh dorsal [thoracic], which suppresses these forces here that govern the heart, that govern the secretions from the whole system and govern the supply of the whole head, until it is lost, the supply itself of the spasmodic condition of the head or the state of coma.

The nervous equilibrium of this whole system has been poor; the nerve forces have been lacking in power through the cerebrospinal and sympathetics, alike . . . the brain action of this body has never developed properly; in other words, the brain action or brain matter is non-developed. The other lobes of the brain have not developed properly in consequence of the trouble in this body. These lesions have produced these conditions to the nerve force and the nerve stimulation has been impaired. This condition has produced then in the stomach an engorgement of the stomach walls, also, a spasm or quivering of the muscles of

the stomach; through the cardiac plexus the same spasms and, in turn, to the whole system this spasmodic contraction is extended.

As is often the case in epilepsy where ANS involvement is significant, there was a systemic aspect of the disorder associated with the spine, cardiovascular and even the reproductive system:

We, also, have a lesion at the first lumbar, which is at the connection between the sympathetic and the cerebrospinal, which is in direct relation with the generative [reproductive] organs of the system. These generative organs have been directly or indirectly responsible, through their misuse, for part of this trouble. We have a lesion, also, above the stomach that governs the hepatic circulation; the circulation of the heart is governed through the cardiac plexus largely.

Note that the contributing role of the “generative” organs in this case seems almost incidental, yet worth noting by the entranced Cayce. Other cases that will be examined will feature glandular and reproductive system involvement more prominently.

Prognosis

This body can be bettered, if it will stick to it. If it gives itself away here to itself, then he will have one of these fits, and will die.

Treatment

The treatment plan was relatively simple and direct (as was often the case in very early readings):

1. Potassium bromide taken internally
 2. Static electricity along the spine (violet ray appliance)
 3. Initially ice or cold compresses along the spine
 4. Light diet, mostly fruit, not too acid
 5. Moderate exercise
 6. Positive mental suggestion from others around this man
- The rationale for the treatment plan was described as follows:

Increase more of this quantity of bromide potash, to take away

the inflammation externally and to act on the generatory system at the first lumbar, last dorsal. We want more of this cold, down lower. We want more here at the first lumbar to take away this trouble. We have nerve centers here at the cervical (upper and lower), then we have sixth and seventh dorsal (upper and lower), then the first lumbar (upper and lower, external and internal). The sixth and seventh dorsal come in contact with the lesion at the cortex between the diaphragm and stomach. This is the beginning of the trouble. Take more gathering of the forces together, more of the electricity into the system . . . With the electricity along the spine, along the same nerve centers will put life into them, into the whole thing. The external for the electricity and internal for the potash or bromide. We want them in the system as we have the electricity in it.

Outcome

The man's sister noted:

. . . a course of treatment was instituted, since which time he has improved wonderfully, and seems to be on the road to ultimate recovery. He scarcely, if ever, has any more spells and they are hardly perceptible, while he formerly had quite a number each day, falling any place he might happen to be, oftentimes sustaining painful injuries.

The readings themselves also noted improvement. For example, at the beginning of the third reading:

He is better than he was; he is considerably better. There is a better equalization of the circulation through the entire body, particularly, along the spine and lumbar region, where the greatest difference was at first. The strain of this nervous system has relaxed . . . We have a better flow of blood to the head and not so much congestion to the cortex of the stomach, nor between the stomach and diaphragm. We still have this deep lesion in the abdominal cavity . . . We have a better equalization of the white and gray matter [in the nervous system], too.

A later reading also noted that the abdominal lesion had not been removed. There is no long-term follow up documentation of the outcome for this case.

Comments

This case has several features that are common in epilepsy. Abdominal visceral symptoms are frequently noted in epilepsy. The corticocentric assumption is that seizures in the brain either produce the peripheral symptoms or cause the patient to hallucinate the symptoms. In this case, the readings clearly affirmed abdominal dysfunction as the cause of the seizures.

The vasomotor influence in the chain of causation (which was directly linked to the loss of consciousness and falling) may indicate syncope, which can mimic epilepsy. As Gowers noted: "... the same nerve process may underlie the loss of consciousness in both fainting and epilepsy." (Gowers, 1907, p. 4) Although he was unable to prove it, Penfield was convinced that "Some undiscovered secret of cerebral circulation is the ultimate cause of epilepsy, I fancy." (Penfield, 1971, p. 126) The evidence for autonomic nervous system (ANS) mediated circulation abnormalities in epilepsy has been reviewed previously (section 1.5.4.4).

The description of brain pathology during development could also lead to a diagnosis of symptomatic (lesional) epilepsy. The presence of spinal lesions (to which the therapeutic measures were primarily directed) brings the sympathetic branch of the ANS into the broader picture of ANS abnormalities (which are also a well-documented feature in the various types of epilepsy). Sympathetic involvement could explain the circulatory and vasomotor manifestations that could result from a brain disorder or peripheral pathology (as noted in this case). Depending upon the extent and location of the abnormal brain development (whether a relatively simple hippocampal sclerosis in the temporal lobes of the brain, or perhaps some more extreme form of pathology), any seizures would likely be regarded as indicative of either complex partial epilepsy (TLE) or a more pronounced symptomatic epilepsy.

This case raises the possibility of bidirectional neuronal interaction between the periphery and cerebral cortex in epilepsy. Not only can the cerebral cortex influence or create peripheral symptoms or pathology related to seizures, but peripheral activity can affect the brain, particu-

larly during childhood development when there is more neuroplasticity within the brain. Hence, the possibility of sympathetic neuroplasticity (or in Galenic terms, “sympathetic epilepsy”—section 1.2.1) wherein a peripheral irritant (stomach and spine) produces brain dysfunction and seizures.

With regard to diagnosis—often in epilepsy, abdominal symptoms can be extremely unpleasant (or at least clinically noteworthy) so that modern clinicians would probably utilize gastrointestinal assessment for differential diagnosis. However, in this case, other than some abdominal spasms, the stomach lesion did not seem to be particularly noteworthy. Even using current technology and diagnostic criteria, *abdominal epilepsy* would not likely be suspected, and GI tract evaluation would probably not point to seizure disorder secondary to a GI tract condition. Likewise for the spinal lesions. The spine is considered to have nothing to do with epilepsy in today’s medical model, and would likely be ignored (except for the possibility that any spinal problems were an effect—due to falling—rather than a cause or contributing factor for seizures). Even for a modern clinician, if the brain damage is not detected by MRI, the neurologic symptoms in this case might be considered secondary to the cardiovascular features. The numerous peripheral systemic factors in this case might be ignored or misunderstood—thus the relevance of a systemic, integrative model for epilepsy.

There was a psychological (or even psychosocial) aspect to the case as mentioned in the readings and indicated by the recommendation for positive suggestion. But this would probably not be considered psychogenic epilepsy by modern standards, due to the brain pathology that would likely have been picked up during assessment. It seems to have been more a matter of situational depression, which is understandable. Those around this man were also apparently affected at times:

We are losing more of the hope in the body itself; not individually, but expressions from the outside. We need to be stronger; with a suggestion of the power within itself. It is not lost in itself. You see we have here now, [34] in the body, the impressions received through other bodies of the same nature around this body, has its bearing or effect on the system in the retarding of the system and the body . . . Plenty

of suggestion to the body, and stronger from the individuals around.

Interestingly, the documentation for this reading contains no indication of obvious developmental disorder or retardment in mental development. So the brain pathology (and its psychological manifestations) could have been subtle, as is often the case in epilepsy.

Case 161

Background

An eleven-year-old boy was given five readings between 5/21/30–8/2/30 while a patient at the Cayce Hospital in Virginia Beach, VA. Previously, two surgical procedures on the child's brain had been performed. His parents acknowledged that he was "physically AND mentally deficient."

Symptoms

The primary seizure-related symptoms were convulsions and convulsive tremors over the entire body. Other symptoms (presumably related to brain damage) included loss of normal talking, inability to walk, left side paralysis, and rapid painful breathing of an asthmatic type.

Medical Diagnosis

Dr. Pahnke noted:

I classified this case in Group I. Convulsions were recorded in the hospital records when the patient was cared for in the Cayce Hospital . . . There was scar tissue of the brain. Therefore, this case was probably grand mal epilepsy, but not of the lacteal duct type.

Etiology and Pathophysiology

The basic cause of this child's pathology was described as a neuro-endocrine dysfunction due to lack of proper assimilation of nutrients for the normal development and maintenance of nerves. This led to incoordination of the nervous systems (sympathetic and cerebrospinal) with reference to the white and gray nerve tissue responsible for voluntary and involuntary activity:

These conditions, as we find, are produced from those incoordination of centers as are related to the circulatory system, as affecting that assimilated and that distribution of that as BRINGS the resuscitating forces to the body. Being, then, affected through the glands in the system as related to that division, for with the pressure in the pituitary body—as well as that through the lyden [Leydig gland], GOVERNING this relationship of the sympathetic system with the coordinating of the cerebro-spinal, the INACTIVITIES of the body as TO the coordinating centers become distorted in THEIR activity.

Appendix C addresses sympathetic/cerebrospinal nervous system incoordination in the readings with regard to voluntary/involuntary motor symptoms during seizures (section 3.3).

Apparently there was abnormal development of this child, but not of a hereditary nature. Two brain interventions were performed very early, beginning in the first year of life, which may have caused or contributed to scars in the brain:

(Q) Dr. Funkhouse of Atlanta, eleven years ago, made fluid injections into the fontanel of the baby's head. Were any brain cells destroyed so as to cause permanently any loss of function in voice, walking, or side paralysis?

(A) The pressure as produced by the air, as well as of fluid itself, has its portions in the condition existent . . .

(Q) Dr. Sharpe of N.Y., about eight years ago, operated on the right temple of the head and removed a watery sack, did this cause any permanent injury?

(A) No.

A fontanel is a soft spot where bones of a baby's skull haven't yet fused. The reason for the medical procedure (fluid injection in this instance) is not known, but presumably there was sufficient concern about the status of the brain to justify the procedure. The readings indicated that the procedure did have a negative impact that was part of the developing child's diverse problems.

Despite the apparent brain damage as an obvious etiological and patho-

physiological factor in this case, the readings consistently maintained that nervous system incoordination was the direct cause of the convulsions:

(Q) What is the cause of the convulsive tremors that come over his body frequently?

(A) Incoordination, as it was given in the beginning here.

Incoordination of the sympathetic and cerebrospinal nervous systems was cited a basic cause of seizures in most of the Cayce readings involving epilepsy.

Prognosis

(Q) Can he be brought to be a normal child?

(A) Almost entirely normal! Take time, but we can bring it almost to entirely normal.

Treatment

1. Wet cell battery with gold and silver solutions
2. Milk of bismuth and essence of pepsin (to improve assimilations)
3. Osteopathic manipulations
4. Sand, salt, and sun baths (to improve capillary and lymphatic circulation)

The rationale for the wet cell battery treatment was that through electrical stimulation the brain cells could be assisted in establishing new connections ("throwing out that as feelers, or as new lives of activity") to coordinate voluntary and involuntary nerve reactions. This regenerative process was described as a "RE-organization." Over 900 Cayce readings recommended the wet cell battery, mostly for neurological conditions requiring regeneration. In such cases, the use of gold chloride and silver nitrate in the wet cell battery circuitry was intended to work with white and gray nerve tissue (gold for the gray nerve cell body and dendrites and silver for the white myelin sheathing that surrounds some axons):

. . . when it becomes necessary for a physical body to be builded as respecting tissue . . . as of the brain cells . . . where scar tissue in same has formed . . . these conditions must necessarily arise

. . . throwing out that as feelers, or as new lines of activity [i.e., new dendrite connections] through that of the voluntary and involuntary nerve reactions from those plexuses . . . especially that, that must of necessity resuscitate or regenerate itself—so does the brain cells themselves, for the LIFE of a brain CELL is only according to the activity of a body physical and mental, and is MULTIPLIED according to the ACTIVITIES of same as related to the assimilation of resuscitating forces. Then, as the vibrations are made within the system, as break up the various cells in their electric energy—as is seen in both white and gray nerve tissue, from the activity of those vibrations as come through from the applications of those vibratory forces [via the wet cell battery] that give off into the system those of the basic buildings of nerve energy itself, in that of the gold and the silver vibrations . . . for building brain cells is quite different from building that of muscular forces in an ORGANIZED system—for this is as of a RE-organization . . .

Information on nerve regeneration with the wet cell battery is available in books about this technology (e.g., McMillin & Richards, 1994; McMillin, 1995).

Outcome

The child's mother "said they were not able to follow out the reading; [161] died when he was seventeen years old; that is, six years after the readings were given."

Comments

Without more information (such as EEG and MRI data) on the exact nature and extent of the brain pathology and its relation to the convulsions, it is difficult to classify this case from a medical standpoint. Epilepsy is common in children who have developmental disabilities.

From Cayce's broader, integrative perspective, it is even more complicated due to lyden (Leydig gland) involvement. Modern medicine does not provide an explanation for why seizures are caused by (or more precisely, associated with) brain trauma or disease (such as tumors). One explanation is based on the concept of diathesis/stress. In

this model, a diathesis (an underlying vulnerability due to diverse factors such as heredity or an acquired weakness) is activated by a stressor (a specific trigger such as peripheral stimulation—as in reflex epilepsy). This could explain the Leydig gland involvement in this case, as a peripheral trigger causing nervous system incoordination in the brain. See the discussion of reflex seizures in the literature review (section 1.4.4).

Keep in mind that the readings insisted that the basic cause of this child's seizures was nervous system incoordination brought about by Leydig gland dysfunction. In the chain of causation in this case, perhaps the brain "scars" were part of the diathesis (vulnerability) that could be triggered by nervous system incoordination, which itself resulted from a dysfunction in the Leydig gland.

The treatment plan in this case was intended to improve nervous system coordination by "the stabilizing of the nerve energy itself, or that within the FLUID itself, of the STABILIZATION of impulse . . . These coming through these portions of the system, STABILIZES the equalization—as comes through the lyden gland, as acts with the brain centers—which will produce the coordination between the sympathetic and cerebro-spinal . . . "

Perhaps the "FLUID" produced by the Leydig gland for the "STABILIZATION of [nerve] impulse" would now be called a neurotransmitter (or maybe a chemical precursor) in modern biochemical terminology. The role of the Leydig gland is significant (perhaps even essential), as noted in a reading that included Leydig gland involvement as a core factor in epilepsy:

These [fainting spells with spasms] are not epileptic reactions in the present, for they are not controlled by the activities from the lyden (Leydig) glands . . . 4072-1

Many of the cases that follow will discuss Leydig gland involvement in epilepsy, and Appendix B provides additional information on the Leydig as part of the pineal system (section 3.2.2.2).

Case 251

Background

A single reading was given on 1/27/33 for a male child whose parents

were desperate for help: “The medical men have been unable to find the cause of his attacks, or convulsions, and have been giving sedatives in an attempt to relieve the attacks, without results. My wife and I are frantic, and we come to you grasping at a last straw that might offer hope.”

Symptoms

“The boy [251] was having convulsions one right after the other.” A reading described a cold spot on the lower right side of the abdomen (due to poor circulation). The adhesions in that area were described as “strangulations” that could be felt as a tension or “pulling” sensation. The poor eliminations through the colon would probably be evident as constipation.

Medical Diagnosis

No information is provided as to a specific medical diagnosis or type of epilepsy for this case.

Etiology and Pathophysiology

This case focuses on spinal injury that produced intestinal dysfunction. The spinal injuries occurred during birth (to the lumbar region) and fourteen months prior to the reading (at the 8th and 9th thoracic vertebrae). These spinal dysfunctions impeded nerve impulse to the lower portion of the jejunum (small intestine) and in the first portion or caecum area of the colon. The result was poor eliminations and toxicity. All of this caused nervous system incoordination (sympathetic and cerebrospinal). However, in this instance the incoordination was along the spine rather than the medulla or lower brainstem as was typically the case in the readings on epilepsy. Here are a few excerpts from this child’s reading that provide details of the cause and pathology in this case:

These are . . . a combination of disorders; for in times back—or fourteen months back—there was an injury to the spine, in those centers that are affecting—and do affect—the activity of the eliminations from the system, especially that related to the caecum and to the colon area.

(Q) How did the accident referred to occur?

(A) From the child leaning far back when someone was holding it

in the arms! and if the body is held in about that position it will be seen as to where the condition occurs—8th and 9th dorsal area!

Then, with a tendency already existent of a strangulation [vasoconstriction?] in the area—from pressure produced in the LUMBAR area at presentation or birth of the body, there has been made an adhesion in the area; so that—when there is a filling up or a dilation in the caecum and ascending colon—there is a COLDNESS that exists, which interferes with the coordination between the sympathetic and cerebro-spinal nerve reactions in the lower portion of the cerebrospinal system.

This brings about those spasmodic conditions that produce to the whole system an improper reaction, as to make for the disorder that is existent. See?

As to the activities of this (that is, the incoordination): The pressure exists specifically in the 8th and 9th dorsal area, and acts upon the draining or relieving of the pressure in the lower portion of jejunum and in the first portion or caecum area of the colon. This may be found by holding the hand (when warm, of course) over the caecum area, and SEE the difference in the temperature of that particular area from the lack of circulation.

Prognosis

. . . [by following the treatment plan] we will bring a normal condition for the body. There will be at first some recurrent conditions, or attacks, unless the body is kept in an excess of eliminations through the alimentary canal; but these will be found to be less severe—and in six to ten weeks the body should be rid entirely of that which causes or produces the disturbances.

Treatment

1. Osteopathic adjustments of the spine
2. Milk of Bismuth
3. Enemas (as needed to relieve pressure in the colon)
4. Diet: strained oatmeal, beef juice, dry milk, vegetable juices (at first)

The diet seems to have been for the immediate condition of the intestinal tract (until “the system cleanses itself”). The number and timing

of the osteopathic treatments would be dependent upon the response of the body as indicated by relief from the seizures.

(Q) How long should these treatments be given, and how often?

(A) As will be seen, it will be necessary to follow this rather by how EASILY the adjustments are made—and as to how well the system cleanses itself from those STRAINS it HAS undergone, and that it must for a time still undergo until those strangulations are removed—that are produced by the congestion in those centers, of pulling up on the sides, see? for they are as strangulations. As to the number of treatments, this will depend upon how READILY the body responds—and how the BUILDING is required. If necessary, treatments should be given EVERY day—until the body is relieved—which would require a lesser period; than they may be made farther and farther apart—which would cover a period of some thirty to sixty days.

Outcome

Significant progress was made after the child was taken to the osteopathic physician M. L. Richardson for treatment and was said to be “perfectly normal” in documentation dated 5/28/37.

Comments

Note the abdominal cold spot in the lower right abdomen which was often cited in cases of epilepsy in the readings. The manual assessment of an abdominal cold spot by a warm hand over the area of the caecum has research implications (section 2.3). Although there is no mention of lacteal duct adhesion in this case, the pattern of spinal injury leading to abdominal adhesions is common in the readings for epilepsy. Also, there was no recommendation for castor oil packs, so perhaps the adhesion in the area of the caecum and ascending colon was more functional (i.e., sympathetic vasoconstriction) than structural and would be removed by correction of the aberrant nerve impulses.

This could be considered a case of “enteric” or “colonic” epilepsy—or perhaps even abdominal epilepsy, dependent upon the severity of the abdominal discomfort (section 1.5.3). It is not clear to what extent the intestinal “strangulation” was unpleasant or even painful.

Case 543

Background

Thirty readings were given from 7/9/30–6/23/43 for a woman who was twenty-one years old when the first reading was given. The background information included for the first reading states:

Miss [543] was admitted to the Cayce Hospital by Dr. L. A. Lydic to be treated for epilepsy which she had had since the age of 14. To that time she had apparently been a normal girl. Many doctors had been consulted, much time and money spent with apparently no definite results, the attacks still persisting.

Symptoms

She lost consciousness and was liable to injure herself in falling at such times.

Medical Diagnosis

Based on the documentation, Dr. Pahnke classified this case as grand mal epilepsy.

Etiology and Pathophysiology

This is a case of pineal system etiology, focusing on the Leydig gland and reproductive system as the seat of the disorder pathologically, while the deeper-seated cause is hereditary (and karmic).

These, as we find, are of a deep-SEATED nature, and have to do with conditions as of a prenatal condition, and the effects are to the incoordination between the physical and the mental forces of the body, as is related to those of the glands as have to do with gestation, and the effects as are created in the system through those of the pineal and of the lyden [Leydig] glands.

(Q) What type of epilepsy is this condition?

(A) From the removal of the causes, why this might be easily presumed. This is produced from those of prenatal conditions, the affection of same, as that gathered through those forces of the genital organs. This may be determined by the plasms in the blood test.

(Q) Give cause of attacks.

(A) As has been outlined, this produced from the active forces from the genitive system, through those conditions of a prenatal [hereditary] nature, as has been outlined.”

(Q) Why do spells occur more often in early morning than at other times during the day?

(A) That period is the cycle of the activities in the system from which the source of the oppression arises, and naturally this, then, would be that period when this would be the most likely to happen. This a most favorable indication.

With regard to the effects of the Leydig gland (reproductive system) pathology, the effect to the nervous system (incoordination) that is the typical pathophysiological pattern in epilepsy as explained in the readings, was reinforced, even eight years later in reading 543–27 given in 1938:

There has recently been the experience of almost the CONTINUED convulsions from the incoordinations between the deeper nerve circulation and the superficial, or the sympathetic and cerebrospinal.

Prognosis

(Q) How long before body will become normal again?

(A) That will depend upon the RESPONSES as are made to those conditions in the system.

Treatment

The initial treatment plan was intended for symptomatic relief (from the seizures) and to prepare the body for surgery. The use of luminal and bromides was encouraged to help suppress the seizures until the surgery could be performed:

(Q) What type of operation should this be? Just what specific organs should be removed?

(A) Organs of gestation.” [Hysterectomy?]

The recommended surgery was never performed, and the numerous readings given over the years were intended to relieve the symptoms and provide general health care advice. Due to the severity and frequency of the seizures, the readings did recommend the use of some of the typical anti-seizure medications of that era including bromides, Luminal (phenobarbital), and Dilantin. With regard to some of the typical Cayce treatments for epilepsy, the following were among the recommendations (not as curatives but as palliatives):

1. Balsam of tolu with saltpeter added
2. Mayblossom bitters
3. Osteopathic manipulations
4. Apply ice at base of brain (once the seizures had started)
5. Basic diet, but avoid specific foods (no coconut, nuts, bananas or apples)

Outcome

In a letter dated 1/7/47, Hugh Lynn Cayce provided a report on the process and outcome for this case:

The young woman described in these readings was one of the patients at the hospital for a time, and while she was following treatments, made remarkable improvement. As you will see from the readings, the first suggestion was for an operation. This, the family would not agree to, and hence other suggestions and a line of treatment were sought through the readings, and for a time, followed. You will notice in the information that the affliction in this life came from the parents [heredity]. The home environment was never conducive to following any line of treatment consistently. More than once, this young woman was called back to her home and her treatments interrupted because of some disagreement between the mother and father. She is, at the present time, in an institution. We have kept in touch with her and I believe that she understands just what she is going through in this life.

Comments

The association of epileptic seizures with reproductive system activity is well documented (section 1.6.2). The surgery to remove the reproductive organs (recommended in her first reading) was never done. There were, however, at least two surgeries performed in 1935 by a Dr. Crile in Cleveland, Ohio. Apparently Dr. Crile specialized in a surgical treatment for epilepsy that involved denervation of the adrenal glands. "Dr. Crile is considered by the medical profession the 2nd best in the world in this line of work . . . He has operated on about 500 so far for epilepsy . . . he's only been doing this line of work for 3-4 yrs. The surgeries did not cure the epilepsy."

Interestingly, when [543] died in 1954 at age 45, an autopsy revealed a "small tumor so situated as to have been the cause of ALL her trouble, the doctor said." The obvious question is whether the tumor was present all along? Or did it develop over the decades as a result of the seizures? Was the nervous system incoordination (produced by the Leydig dysfunction) a trigger for the seizures, directly, or indirectly (via the tumor)? The corticocentric view would prefer a simple and easy solution, but it may be more complex than that—"of a deep-SEATED nature."

The following bit of mental/spiritual advice was given, with the subtle hint that there was a karmic (soul) dimension to this affliction (as is usually the case when heredity comes into play):

Keep the correct mental attitude. Know that even with the trials, the temptations, all the troubles that disturb the body, there is a reason. Do not condemn self nor others for that in which the body-mind and body-physical has found itself; for these are as the mysteries in nature, but are necessary that the soul be not separated from its Maker.

Case 561 Background

Three readings were given for a sixteen-year-old male between 5/28/34-9/26/34. He had experienced epileptic attacks for two years prior to the first reading. His sister [671] also developed similar seizures.

Symptoms

The attacks were described by the mother as a sudden collapse similar to fainting and lasting only a minute. There was also a tightness in the right side of the abdomen just below the ribs to a point just above the hip bone. It was not painful, but just taut as if needing to be stretched.

Medical Diagnosis

Navy doctors diagnosed the condition as epilepsy. Dr. Pahnke noted: "... petit mal epilepsy seemed like a fairly certain diagnosis."

Etiology and Pathophysiology

This case fits the pattern of abdominal lacteal duct adhesions cited in many readings that address epilepsy. The problem began as a baby or very young child when illness with high fever produced a stricture or adhesion in the lacteal ducts near the caecum and ascending colon on the right side of the abdomen. The typical cold spot was noted in that area (due to improper circulation):

We find that in times back, or when the body was at that stage or age when—as it may be said—the first solid foods were given, or the more astringent foods; and there was during that period an illness that affected the body through the temperature and—through the properties given—the lacteal ducts; which has caused a stricture there that affects primarily the caecum and the area as in the ascending colon. And when there is the spasm to the head, or when the circulation between the liver and the heart is affected, if the hand is placed upon the caecum and the area about the lacteal ducts it will be found that there is a COLDNESS there—though the body may not be aware of same.

(Q) Should any of his physical activities be curtailed?

(A) As given, during the first portion of the treatment there should not be a great deal of physical activity, else we would strain or irritate the very lesions we are attempting to break up! For strictures, we remember, are as places in the portion of the internal system that adhere or stick, so as to prevent normalcy. Curtail activities, then, that would make too much irritation in such directions, see?

With treatment, the lesions and adhesions were broken up:

In those areas where there has been the indication of the lesions and adhesions, these have been broken up; while there are still in the lacteal area and in the caecum indications of what may be called stringy nature, or the tendons and tendencies still show that they EXISTED.

Prognosis

Unless the flow of lymph and the muco-membrane circulation is increased to the extent as to re-enliven this activity, the spasmodic condition must gradually grow—and rather than being of shorter duration it must necessarily become longer; for more and more is the tendency for the condition to grow. It is more in the form of that which may be called an adhesion, or like a stricture, in the area [of the lacteal ducts] . . . Follow these, as we find, and we will bring for this body normalcy; normal developments, normal activities throughout the body.

Treatment

The treatment plan contained many of the standard therapies for the lacteal duct adhesion type of epilepsy in the readings.

1. Lactated pepsin tonic
2. Abdominal castor oil packs
3. Abdominal massage with electric vibrator
4. Osteopathic adjustment and massage
5. Diet: Not too heavy, principally of citrus fruit and vegetable juices.

The lactated pepsin tonic was recommended to help coordinate the nerve forces with the pineal, reproductive system, and circulatory system:

It would be well at times that there be taken internally a few drops of this combination—this we would take ONLY about once or twice a week, to keep the coordination between the activities of the system as related to the nerve forces that coordinate with the pineal, the genitive system, the circulatory system, and especially the nerve plexus. To 2 ounces of Lactated Pepsin, add:

Sweet Spirits of Nitre	15 minims,
Glycerine	5 minims,
Honey (Strained honey)	½ ounce.

Shake this solution together. The dose would be, say Tuesdays and Fridays, half a teaspoonful should be sufficient.

The intended therapeutic effects of the abdominal packs and massage were described:

Nerve ENDS in the ganglia in the emunctory and lymph circulation are “feeling out”, as it were, their ends through the tissue that HAS been IN-active, you see. Hence the softening of tissue, the breaking up of tendencies for adherence and for the stricture that occurs—or the adhering of portions, and the massage that the circulation and nerve impulse throughout the system is carried through such portions, PREVENTS such conditions reoccurring and helps the body to adjust itself to normalcy.

Outcome

A standardized followup report from the mother (12/7/35) stated:

In your opinion did this analysis cover the condition? “Yes.”

Give symptoms of condition described correctly. “A sudden collapse similar to fainting—lasting only a minute or so. Followed by a feeling of nausea—and tightness in right side near appendix. Sometimes a headache.”

Have the suggestions for treatment been followed exactly as given? “Yes.”

For how long? “For exact period recommended in readings.”

Have improvements resulted? “Yes.”

To what extent? “At first the fainting spells were farther apart—then ceased. He went for about eight months, then had one fainting spell. The tightness in the right side left and never returned. He has been in splendid shape ever since.”

Comment

Documentation with this case notes: “We had tried all kinds of treatments—and gone to several doctors—but got no results until we followed the instructions given in the readings.” Followup information with this file states:

In 1942 young [561] received his appointment as aviation cadet and served in the U.S. Army for the duration of the war.

Oct. 1944, a hero home from the wars, he got married.

All the Navy doctors and others who examined the boy had pronounced it a type of epilepsy; could suggest nothing to do.

At the time of the first reading from Mr. Cayce the boy could not go swimming or enter into any of the other sports because he might have one of the spells at any moment.

As of 1959 “case [561] has remained cured. He is today completely well and normal in every respect.”

Comments

This case is a good example of relatively early intervention and positive outcome in a case involving abdominal lacteal duct adhesions. The typical cold spot was noted. Although the childhood illness with fever was sometimes cited in these cases as a causative factor, spinal injury was also often cited—but did not seem to be a major influence in this case. Therefore, the osteopathic treatment was more of a general relaxing and balancing of the nervous system rather than specific adjustments to correct spinal lesions or relieve specific pressures. The osteopathic treatment was only to be given after the abdominal treatments had begun to relieve the tension there.

Interestingly, there was no mention of pineal/Leydig axis involvement or cerebrospinal/sympathetic incoordination in the medulla oblongata, as was frequently the case in this type of etiology and pathophysiology (particularly when the seizures were severe and the illness longstanding).

The seizure type in this case (sudden collapse similar to fainting) appears similar to cardiac syncope, but more sudden and of shorter duration. As noted by Gowers:

It is doubtful whether true cardiac syncope ever causes absolutely sudden loss of consciousness, except when this is due to a fatal arrest of the action of the heart. It is seldom, if ever, so sudden as to cause a hurtful fall. As a rule, the deliberate onset enables the sufferer to lie down, when gravitation ceases to hinder the flow of blood to the brain . . . Gradually consciousness returns, and with it correct perception of surroundings, never the mental confusion and erroneous ideas or action that are common after minor epilepsy. (Gowers, 1907, p. 5)

Case 567

Background

Nine readings (between 6/1/34–11/6/35) were given for a man who was twenty-five years old when the first reading was given. In correspondence prior to that first reading his mother noted: “[567] has had 2 yrs. of university work and is an exceptionally fine young man, and I am really exhausted trying to find the trouble. Do help me!” A friend of the family familiar with the situation commented: “[567] seems to have some kind of peculiar ailment that takes the form of faints or ‘going out of the picture’ for a minute or two at a time. This he claims happens quite often . . .”

Symptoms

Apparently there may have been an abdominal cold spot: “From EVERY condition that is of true epileptic nature there will be found a cold spot or area between the lacteal duct and the caecum.” The colon dysfunction was marked by constipation, which could contribute to a “loss or lapse of the memory” and “falling conditions.” The second reading in this series (given on 6/27/34) mentioned “some very hard seizures,” perhaps referring to some type of generalized convulsive attacks. However, some years later (2/2/37) the man’s father observed that: “. . . the turns are painless and they must be comfortable as he comes out of them with a smile.”

Medical Diagnosis

Although this man was treated at various clinics and programs over

the years, no formal diagnosis was included in the background and report documents for this case. Dr. Pahnke simply concluded that it was epilepsy. The inclusion of the criteria for cases of “true epileptic nature” (abdominal cold spot) suggests “true” or idiopathic epilepsy as documented in historical accounts covered in the literature review. This typically indicates loss of consciousness, falling, and convulsive seizures (which is consistent with the readings observation of “some very hard seizures” and “falling”). However, the less extreme seizure experience (“comes out of them with a smile”) is sometimes associated with certain types of temporal lobe epilepsy (e.g., Jackson’s “dreamy state”). Thus complex focal seizures that sometimes generalize is a possibility in this case. Apparently the clinical presentation was complex and diverse, perhaps evolving over time as is sometimes the case with the various types of epilepsy.

Etiology and Pathophysiology

The readings indicated that spinal subluxations caused a neuroendocrine (pineal system) disorder resulting in seizures. After the first few readings that focus on the spine, abdominal lacteal duct adhesions were discussed and tied into the pathophysiology (with the subsequent recommendation for castor oil packs to break up the adhesions). The beginning of the first reading in the series indicted a lack of nervous system coordination (as was so often the case in the epilepsy readings).

As we find, these are of the nature that affect the coordinating system—are physical; and while there may be much gained through the activities of the mental attitudes of the body, there must be those physical adjustments and physical changes in the anatomical processes in the activity of organs as related to the responses in the nerve system to the brain to make for coordinations.

From the readings’ perspective, the pineal (as a system, section 3.2.2) is the primary coordinating mechanism in the body that coordinates not only the nervous systems but integrates the spiritual and mental with the physical (as reflected in the previous excerpt). At a physical level of pathophysiology, the neuroendocrine aspect of this case was evident in the blood supply:

In the **BLOOD SUPPLY** we find the lack of those elements necessary for a proper balancing for the functioning of organs in the relationships to the activity of glands in the body . . . these have **GROWN** in their activity from the lack of proper impulse in the lyden and the pineal centers; for the **PINEAL** center is engorged, especially at the 3rd and 4th **LUMBAR** and the 1st and 2nd cervical . . . As to the **NERVE FORCES** of the body, here we find—as has been indicated—one of the basic conditions that has caused this pressure on the pineal, as to make for the incoordination at periods; from times past when there were those subluxations produced in certain portions of the cerebrospinal system, namely in the lower part of the dorsal and upper lumbar area. For this is when the mental capacities as related to the imaginative [mental] system refuse to coordinate with the rest of the activity of the body, and thence comes this reflex that has been disturbing and does disturb the body at times.

Note that the pineal is described as more than a discrete anatomical entity in the center of the brain—rather it is systemic governing activity that includes centers in the brain, along the spine and within the body cavity—and particularly the Leydig/lyden gland in the lower abdomen.

. . . as we have indicated, a constitutional condition, you see, which affects the glands of the body, as related to the pineal—which runs all the way through the system and is the **GOVERNING** body to the coordinating of the mental and physical. The inactivity of the glands causes the incoordination; the lyden [Leydig] gland, the ones above the kidneys and, naturally, affect those in the thyroid area to the extent that these **DO NOT** secrete properly.

With regards to epileptic seizures, the dysfunction in the pineal system eventually affects the “**GOVERNING** center” through the medulla oblongata in the lower brainstem.

(Q) Can you locate the status of the atlas?

(A) This, as we have indicated here at the top, you see, is that portion where the engorgement or enlargement of the pineal—

as it enters—makes for the periods when the **REPRESSIONS** react upon the system; though the engorgement area in the lower dorsal—that is, the 12th dorsal and upper lumbar—is **MORE** to be **ADJUSTED** than those centers in the upper cervical; for with the removal and repulsing of the condition through the glands' activity, these will be made to coordinate and hence the atlas—or that **GOVERNING** center of the body here, where it enters through the medulla oblongata here—will be near normal. See? We will have to **REDUCE** its pressure.

As has been indicated in portions of the body, as given in specific ways and manners, there are subluxations that have caused—and do cause—contributory conditions; making for engorgements where there should be the tendency for the influx or flow from impulses through the cerebrospinal and sympathetic system to enter the brain's reaction [via the medulla oblongata], and the impulses as they come from the sensory system or centers in the brain to respond normally in the body. And there has been outlined that there should be certain corrections with the coordinating of those portions of the body in its structural force, as well as in the muscular or nerve ganglia along various portions of the body that should be brought into a nearer subjugation or coordination, for there to be brought about the more normal condition.

So we are brought back to a fundamental incoordination of the sympathetic and cerebrospinal nervous systems via the medulla oblongata resulting in muscular contractions and “loss of conscious coordination.”

While there are still those reactions where and when the incoordination between the sympathetic and the cerebrospinal systems causes and produces the contraction of the nerves and muscular forces as to bring the loss of conscious coordination, these are on the decrease in the number and in their severity. However, we still find these **DO** react.

In addition to the spinal center involvement in the production of the seizures, the abdominal lacteal duct adhesions also contribute to the incoordination:

From EVERY condition that is of true epileptic nature there will be found a cold spot or area between the lacteal duct and the caecum . . . [with the consistent use of the hot castor oil packs] We will break up this tendency for the lymph ducts, in the ducts of the lacteals and in the caecum and colon (ascending here), that tendency for contraction and for the activities that help to bring on the conditions that produce incoordination to the nerve forces of the body.

The readings cite various causes for the intestinal/lacteal duct pathology that is often described as a core component in many cases of epilepsy. Spinal nerve dysfunction (usually from injury) and childhood illness with high fever are the most common. In this case the spinal nerve dysfunction is obvious, but there is mention of another possible contributing factor—intestinal worms:

(Q) Any indication of tape worm?

(A) No indication of tape worm. There is an indication that there has been stomach worms and intestinal worms, as indicated from the walls of the intestines—especially in the caecum and lacteal duct areas; but not tape worm. These indications are from those cohesions and adhesions, this drawing of tissue or tendency of tissue to be disturbed is from the infectious forces of such conditions, not from tape worm.

As noted by Gowers:

Intestinal Worms.—Acute convulsions frequently result from the irritation of various forms of intestinal worms in children, and sometimes in adults. Usually, however, they cease when the worms are expelled. In rare cases, the attacks, set up in the first instance by the intestinal irritation, recur and continue after the irritation is at an end. In six cases the first fit was apparently due to this cause; the attacks had continued, although the worms had been expelled, and a renewal of the vermifuge treatment had no influence on the disease. (Gowers, 1885, pp. 28-29)

Isn't it fascinating how a simple, direct (apparently unrelated) question can elicit such curiously relevant information from a psychic source. For more information on worms as an etiological factor in epilepsy, see section 1.74.3.

Prognosis

Be persistent and be consistent, and we will RID the body of these conditions . . . Don't expect to be cured in a day of that which has been builded for years, for it requires that not only the [anatomical, structural] condition but the [physiological, functional] impulses be corrected towards normalcy.

Treatment

The treatment plan evolved over time. Apparently, some form of medication was being prescribed, and the first reading recommended continuing with it until the seizures could be eliminated by more natural means:

It will be necessary for the time being that there be kept the active principles that have allayed and do allay the reactions spasmodically, but these should be gradually diminished in the system.

In terms of the standard treatments for epilepsy in the readings, initially the emphasis was on the glands and spine. Then the focus shifted more to the abdomen (while still requiring spinal treatment). Over the course of the nine readings given for this man, the primary therapies recommended were these:

1. Atomidine
2. Spinal adjustments
3. High enemas
4. Diet (for better eliminations and increased alkalinity)
5. Abdominal castor oil packs (followed by massage)
6. Exercise to work up a sweat

The Atomidine (an iodine supplement) was recommended not only for its direct effect on the glands, but also to improve eliminations and coordination (systemically at the physical level and holistically for spiritual, mental, physical integration):

The active forces within the system itself through the Atomidine would be taken in the order or manner given, gradually increasing until we get the proper GLAND reaction—and THEN we may find, by their coordination and keeping the eliminations and drainages necessary, we will create a balance in the blood supply and a balance in the coordinating activity of nerve impulses; and hence coordination in the mental, physical and spiritual being of this body, [567].

Specific instructions for the spinal adjustments were provided, with emphasis not only on anatomical (structural correction), but also physiological or functional regulation (i.e., balancing or coordination):

Now, we make the adjustments, you see, from the RIGHT side; not a lateral, you see, not so much from the left, but from the RIGHT side. Make the coordinations to all the various plexus and ganglia along the system with these treatments, which would be about three times each week . . . While the adjustments have in a measure been at times helpful, these have NOT been—as we find—as CORRECTLY given as some that have been had heretofore. To make simply an adjustment and not coordinate same with the sympathetic centers along the spine at times makes for a strain and a lack of coordination, see? In making these adjustments, then, we would make an adjustment in the upper cervical—as in the 1st, 2nd, 3rd and 4th cervical; and then MASSAGE, by rotary movements, the nerves and centers and the muscular tendons that react from same in the head, the jaw, side of the face and the like, see? especially the vagus nerves and the 5th and 6th nerves that come to portions of the head in the exterior forces, or in the neck here and across to the head. Also, as indicated, it is necessary to make some adjustments or rather MOVEMENTS in the lower dorsal and throughout the lumbar area. These we would coordinate with the muscles and nerve ends about the coccyx end, or along the lower spinal end, see? close to the orifices that make their connections with the cerebro and the sympathetic nervous systems in the brush end of the spine.

Olive oil was recommended in this case, both at the conclusion of each castor oil pack series, but also in small doses as a dietary supplement for healing the intestines. High enemas for constipation were also encouraged:

Olive oil, so it does not become rancid in the system, taken in small enough doses to assimilate, is helpful to any intestinal disturbance—which is a greater portion of the conditions as in this body. Where there have been tendencies for the caecum and the lacteal ducts and the connecting forces in the areas of the intestinal system to become dried, or lack of flow of the lymph, these produce such disturbances for the loss or lapse of the memory, or produces the falling conditions, see? These, then, need to be stimulated. Olive Oil is well. The high enemas two or three times a week in the first, as we find, would be MOST helpful. Then later we would have these at least once a week, until we correct this colon and allow those influences that have disturbed the body from constipation to be entirely removed. Simply because there is an evacuation through the alimentary canal each day does not indicate at all times, or especially in this body, that there is being a cleansing or a healthy condition throughout the intestinal tract. If this were true, we wouldn't have these pains, we wouldn't have these reactions!

Outcome

The report section of this man's readings state: "Some improvement was noted but the treatment was not followed thoroughly. There are no follow-up reports [on the application of the information in the readings], since 1935." The ninth and final reading noted that—had the treatment plan been followed completely—there would have been a "better and nearer normal reaction."

Many changes have taken place in the body since last we had same here. We DO NOT find that there has been any MATERIAL change in the BASIC CAUSES of the attacks or of the reflexes upon the system, from that which we have given as the cause—and that as we have found or given would be the pref-

erable manner to handle same. And, as we find, if those things as FIRST given through these sources would be adhered to in toto, these would bring for the body the better and nearer normal reaction . . . With the laxness in following these [recommended treatments], there has been the tendency to increase the activities through those areas where the segments have hindered the activity through the system—and the lesions in the ducts of the assimilating system, or the lacteal ducts. So, there is a little more severe—or a more constant reaction; or the return more often of the contractions, or the turns, or the spasmodic reaction to the glands that are affected in their activity to the sympathetic and cerebrospinal system in coordinating through the glands and ducts in the medulla oblongata and in the ducts at the end of the spine.

Comments

From the perspective of the readings, this could be considered a case of “true epilepsy” with the abdominal cold spot (due to lacteal duct adhesions), pineal system dysfunction, and “very hard seizures” characterized by loss of consciousness and convulsions. For historical information on the meaning of “true epilepsy” see section 1.2.4.

As noted above, there are also some features suggestive of temporal lobe epilepsy (TLE) manifesting as generalized complex focal seizures. The role of the “imaginative system” as a mental factor associated with pineal involvement is not directly elaborated in this series of readings, but is suggestive of TLE with “psychic symptoms” (section 3.2.5.2) involving excessive sensory system activity: “. . . so that [psychic] influences from without may be seen, heard, felt or experienced by the body during such experiences [seizures].” (567-1)

Over the years after trying the Cayce approach, the parents of this man continued to seek help from numerous physicians and institutions:

We have tried out several things to our dismay. The L.A. Specialist said it was the glands as you [Edgar Cayce] did. He has treated [567] for several months. When he did not get results as he wanted he put him to the Kitogenic [ketogenic] diet, which we tried without ANY benefit and at huge expense.

The parents also sought relief for their son at the Scripps Clinic, La Jolla, California, where treatment with luminol was tried, with some positive results. "My friendly doctors have told me it was too bad to use luminol. Not habit forming but with an awful let down. [567] is better." Treatment (with insulin, metrasol and fever therapy) was attempted at the University of Illinois research hospital in Chicago in May of 1938. The parents were hopeful, but no long-term follow-up for this case is provided.

Finally, with regard to the Cayce readings, the mental and spiritual aspects of this case were addressed in very practical terms:

(Q) Should the body keep a record of his turns [seizures]?

(A) Forget em'! For you won't have any if you'll do these things! Let it be rather someone else that would ever have to think of them, for you are going to forget 'em, if you're going to act and do and be that which is thy birthright! Let not the spiritual within thine self be neglected. Be purposeful in all that thou wouldst do. Thou hast an obligation to many. Thou hast much to be given thee from many. These, thou meet thine own part—and look to a Wise, All-Merciful God to do that within THEE, within thine mind, within thine body, that will enable thee—as a child of the living God—to make the WORLD a better place for THOU having lived in same. Keep that before thee constantly: I, [567], will so live my own life as to make the world, those about me, those I contact, GLAD they have known [567].

Case 571

Background

This young female was twelve years old when she received the first of four readings (6/4/34-12/21/39) for nocturnal seizures with bed-wetting. Her brother [561] had been having epileptic seizures for two years when she began to have similar attacks, but according to the initial report provided by the mother, she only experienced them at night. It is not clear if the seizures continued to occur only at night as she grew older because some of her own statements (and the readings, as well) seem to indicate a conscious state in which there was a loss of balance and consciousness.

Symptoms

The seizures always occurred during the night or early morning, followed by headache. During the attack the patient wet her bed. The terms "spasmodic condition" and "shakes" were used by the young woman to describe the seizures. To describe the condition, the readings mentioned: "... contractions in the muscular activity, the loss of balance or consciousness in the reactions in the nervous system."

Medical Diagnosis

No formal medical diagnosis is included in the documentation. She was taking Luminal (trade name for the anti-epileptic drug phenobarbital) prior to the first reading, so she must have been under a physician's care, probably for epilepsy.

Etiology and Pathophysiology

The chain of causation in this case has several important links beginning with childhood fever affecting glandular secretions and the blood supply (which was thrown out of coordination by poor eliminations through the intestinal tract and reproductive system—i.e., menstruation). With a rush of blood to portions of the body, nerve reflexes to the head were cut off, producing muscular contraction and spasmodic conditions. Although a tendency for lacteal duct adhesions was described, the pathophysiology in this case also focused attention on the area of the caecum and appendix as related to eliminations through the colon.

These [conditions] have to do with the coordinations in the eliminating systems, and produce in the nerve forces of the body a rush of blood to portions of the body, cutting off the reflexes to the head; thus producing the contraction and spasmodic conditions at periods in the system. As we shall see, these are of a specific nature, and had their inception in a type of fever that was contracted by the body at some times past—which affects the glands and the secretions from same, causing this disorder. In the BLOOD SUPPLY we find there are the indications of the character of the suppression, for this deals with the eliminations as related to the developments of the sex organs of the body—or

the genitive system. For, with these reactions those glands in the pelvic organs **MUST** produce their coordinations with the nervous system, the activity throughout the functioning of elimination coordinated with the respiratory system, the activity of the liver and kidneys with the glands in all portions of the system. For, each must furnish its portion of activity to the body. Hence the blood shows a heaviness in its circulation through the hepatics. In the **NERVOUS SYSTEM** this coordination is more specific, as we see from the glands in the genitive system that produce the activities of the organs in their functioning. As to the pressure caused by the contraction, we find this in the head, the neck—that is, the axis—and in the lumbar area.

As with most cases of epilepsy in the readings, incoordination of the nervous systems associated with problems in specific spinal nerve centers was cited as part of the pathophysiology, particularly with regard to the poor eliminations and a “short-circuiting as it were between the nervous systems in the lacteal duct area.”

However, there is still that incoordination at times between the impulses in the cerebrospinal and in the sympathetic or vegetative system. As we find, the lesion nor the coordinating centers have been eliminated; neither has the coordination been set up as thoroughly as it should be. However, there have been periods when there was a great deal better coordination, owing to the connections as made in the lumbar and the coccyx plexus with the 9th dorsal or the solar plexus as related to those lesions in the areas about the emptying of the duodenum to the jejunum. As we find, then, in the present: There should be those applications that will make for the relaxing of the system sufficiently to break up those inclinations for the short-circuiting as it were between the nervous systems in the lacteal duct area; by the use of the [Castor] Oil Packs as combined with the taking internally of the Passion Flower as an addition to the activities of the system to overcome these tendencies indicated in the system through the lack of coordination—or the breaking up of coordination in the nerve forces of the body; thus producing the contractions in the

muscular activity, the loss of balance or consciousness in the reactions in the nervous system . . . And then be very mindful there is a full evacuation of the alimentary canal each day. And these disturbances will disappear.

(Q) What should be done about the slight return occasionally of same spasmodic condition?

(A) As just indicated, this is a part of those same conditions, but is more acute in the caecum area in the present.

Prognosis

Continue with this [treatment] as long as it would be necessary, but—as we find—in the four months we would find near normal conditions developing . . . Do this and, as we find, we will overcome and we will create a normal balance. Without this, to be sure, there may be produced such strains in organs or the nerve forces as to become a constitutional condition.

Treatment

1. Abdominal castor packs over the lacteal duct area
2. Passion flower compound (also called “Mayblossom bitters”)
3. Osteopathic adjustments
4. Diet: “WHOLESOME well-balanced diet, tending toward the alkaline.” “Not too much sweets, ever. Not raw apples. No bananas, ever. No fried foods at any time.”
5. Serutan (laxative) as needed
6. Ice at the back of the neck at the beginning of convulsion

Outcome

A report (September, 1940) by the mother stated: “Discontinued Lumlinal from the first rdg. and gave Mayblossom Bitters instead. Attacks gradually diminished and finally ceased altogether. Hasn’t had one in a long time now.”

Comments

Having a sibling with similar epileptic attacks naturally raises the question of a genetic component in this case (although it was never mentioned in the readings for either individual). If there was a genetic

vulnerability, was it in the brain (as a weakened nervous system easily triggered into a seizure state by a peripheral reflex)? Or could it have been a predisposition for the production of abdominal adhesions in the area of the lacteal ducts? Or perhaps simply a tendency for abdominal (enteric) reflex epilepsy similar to the case reported by Gastaut and Poirier (1964). Note that in both cases (571 and 561) the etiology began with high childhood fever that affected the intestinal tract along the right side of the abdomen. Abnormal blood circulation linked directly to seizure production was also described in both cases. Thus, if genetic predisposition was a factor in these cases, there are several possible vulnerabilities that could be associated with hereditary tendencies.

For example, paroxysmal extreme pain disorder (PEPD, previously “familial rectal pain syndrome”) is an inherited sodium channelopathy with sympathetic nervous system dysfunction. Tonic seizures of PEPD could be regarded as syncope, as some of their clinical features arise as a consequence of a temporary reduction in the cerebral supply of blood (Fertleman et al, 2007). The case under review here [571] is definitely not PEPD, but merely illustrates the point that genetic vulnerability to seizures need not be limited to the cranial brain, but can be associated with bowel and nerve dysfunction in the enteric nervous system that regulates the GI tract.

Also note that there is no specific mention of the pineal or Leydig glands in this case (or the brother’s), although the glands of reproductive system were a factor in this case (apparently related to the monthly cycle of menstruation). Thus, the etiology and pathophysiology are primarily abdominal lacteal duct adhesions and poor eliminations through the colon and reproductive system, producing nervous system incoordination.

The use of ice at the back of the neck was recommend in several epilepsy cases in the readings, not as a curative but simply to stop (or reduce the severity of) a seizure once it had begun. Hence the following reply:

(Q) Can anything be done at the time to relieve the convulsions?

(A) Ice at the back of the neck will relieve. But she mustn’t have any more, or very slight—if any. These may come about those [menstrual] periods. DO NOT resort to sedatives!

Interestingly, the question seems to indicate that the individual

was conscious (i.e., aware) at the beginning of the seizures. If they were entirely nocturnal, she must have awoken just prior to the seizure—or perhaps the seizure patterns had evolved to include waking (daytime) episodes with more complex seizures. The readings indicated that if the treatment plan was not followed, it could become a “constitutional condition,” perhaps indicating a transition from less severe seizures to more serious and chronic generalized convulsions (e.g., Gastaut et al., 1986).

The association of epileptic seizures with menstruation is well documented in the literature (i.e., catamenial epilepsy, section 1.6.2) and apparently was a factor causing increased risk of seizures for this young woman:

So, continue with the [Mayblossom] Bitters compound; being mindful of the diets and of keeping the eliminations in and through the alimentary canal, and especially until after the periods of eliminations as begun from the menstrual periods.

The problem of nocturnal enuresis (bed-wetting) associated with the seizures in this case can be explained as an incoordination between the conscious/voluntary (central) and unconscious/involuntary (peripheral) nervous systems:

Micturition [urination] is a highly complex process synchronized by multiple centres of the central and peripheral nervous system and involves the coordination of functions that are under both involuntary and voluntary control (Rosenzweig et al., 2011, p. 662).

Thus, the peripheral autonomic nervous system can perform urination solely as an unconscious, involuntary activity (as appears to have been the situation in this case, due to the seizures). Yet if the conscious, voluntary central nervous system (associated with the cerebral cortex) can be coordinated with the peripheral system, urination can be consciously controlled as the seizures are eliminated. This appears to be the meaning of this excerpt:

(Q) Usually when I have a “shake” I wet my bed. Why is that?

(A) The natural reaction of that very condition as has been indicated of incoordination between the [involuntary, peripheral, unconscious] sympathetic and the [voluntary/central/conscious] cerebrospinal system. And with the removal of the pressures and the removal of the incoordination between the nervous systems, then the controlling of the organs or the activities of same may be CONSCIOUSLY a reaction, see?"

Appendix C contains a discussion of voluntary/involuntary motor control as it relates to sympathetic/cerebrospinal nervous system incoordination (section 3.3.3).

Case 663

Background

A single reading for a four-year-old girl was given on 9/18/34. The background document states that the reading was requested by a friend of the family for a "little girl who has epilepsy, according to the doctors." Without direct family involvement, no other background or follow-up documentation was available.

Symptoms

The reading mentions "*spasmodic contractions that draw the body.*"

Medical Diagnosis

(Q) Is this condition one of epilepsy, as diagnosed by the doctors?

(A) This is the condition which will PRODUCE epilepsy, if it is allowed to BECOME constitutional to the body!

Etiology and Pathophysiology

This case involves a prenatal etiology of underdeveloped lacteal ducts affecting the pineal system at 4th lumbar spinal center, thence to the brain. The condition would become epilepsy if allowed to become constitutional (fully established in the anatomy and physiology of the body). In the following excerpts, notice the relationship between the lacteal ducts, caecum and colon, the fourth lumbar (a major pineal center along the spine), and resulting incoordination of the sympathetic and cerebrospinal nervous systems, thus producing seizures. All the

core components of true epilepsy are present in an early developmental stage in this young child.

Now, as we find, this is a developing body, and there are conditions that disturb the better physical functioning of the body. While these are in a manner the effects of prenatal conditions, and thus have the effects of an undeveloped condition, as we find—if taken in time, and with the proper precautions—they may be eliminated and eradicated from the system; thus bringing about normalcy in the development of the body in the mental, material and physical. This condition that we find here is the effect from an undeveloped condition in the lacteal duct area, and we find produces a congestion in the caecum and transverse colon area; thus producing from the lumbar plexus, through the activities of the pineal gland, incoordination between the sympathetic and cerebrospinal system. These reactions or contractions of the muscular forces drawing the body at such periods are effects, and—as many a condition that manifests itself in a physical organism—are only the **INDICATION** of a disturbance. And as we find, during those periods of gestation when the development of the fetus brought not the proper amount of blood supply through the umbilical cord and umbilical plexus, there was brought about that which made for this contraction in the area over or about the lacteal ducts. Hence the developments that have been, or the spasmodic contractions that draw the body.

Prognosis

Be persistent; be consistent, and we will bring the normal forces for this body.

(Q) Should the entire quantity [of the passion flower compound] be taken right straight along?

(A) Should continue to take this, even though it is required for the next two years; it will eradicate and relieve and **RID** the condition from the system.

Treatment

1. Diet: Semi-liquid, not great quantities of sweets, sufficient iron

through the proteins and vegetable forces, with not too great a quantity of meats (particularly fats)

2. Passion flower compound (Maypop)
3. Osteopathic adjustments

The therapeutic effect of the Passion flower compound was described as follows:

We would begin immediately then with the use of those properties that will make for the creating of the proper activity in the system as related to the development of the assimilating glands and the associations with those connections between the flow from the jejunum to the colon area, or the effects that will be had upon the body as it passes from one portion of digestive area to the other; that these contractions and these coordinations may be made.

Only after beginning with the diet and passion flower compound, the osteopathic treatments were to be given for the “pineal reaction” to the brain centers as influence the “imaginative” forces of the body:

After this has been begun, and after the third or fourth week, every WEEK have an adjustment made along the cerebrospinal system, that we keep all the segments of the cerebrospinal system in accord; for the tendency for the contraction is to produce in the brush end of the spine—or from the 4th lumbar to the lower end of the spine—contraction of the muscular forces there; for here we contact during the periods of development especially the activity of the pineal reaction to the brain centers, which makes for the differentiation of the actions of the imaginative forces in the body.

Outcome

There is no follow-up documentation for this case, and the outcome is unknown.

Comments

Notice both pineal system and lacteal duct pathology in this case.

The condition was still in the early stages and much easier to heal. Hence the need to focus on children and early intervention in epilepsy, as recognized by modern physicians. There was no need for castor oil packs at this stage for there was only “congestion” in the lacteal ducts and intestinal tract (rather than adhesions or strictures and the characteristic cold spot that would have been produced had the pathology been allowed to fully develop).

There is no explicit indication of a hereditary factor in the failure of full development of the lacteal system during gestation in this case. So it appears to simply be a matter of a subtle pregnancy complication.

There is an anatomical and physiological association between the lacteal ducts, the umbilical cord, and the pineal that begins with fetal development. The relationship continues after birth as the body matures. The following extract for another person discusses fetal development in relation to the pineal, umbilical cord, and pathological conditions that may be produced when there is pressure upon the pineal centers (such as the fourth lumbar in this case):

(Q) Please discuss in detail the functions of the pineal gland.

(A) If this is discussed from the anatomical viewpoint, in the fetus as is begun in first of gestation, we find this may be termed as the Builder. As is seen, the location of same is in the beginning in that of the center or the nucleus about which all of the matter takes its first form, and becomes the brain as is guiding or directing the building of the body as its development in the womb takes place. As it then reaches from the umbilical cord to the brain, there is builded that as is centered about same by the physical attributes of that progenerated from those bringing such an action into being. When there has reached that stage when there is the separation of same, the [umbilical] cord then being broken, this forms then its own basis in the lower portion of the brain, or cerebellum, and through the medulla oblongata to the central portion of the cerebrospinal cord itself is held intact, and with the removal of same, or pressure on same, the various forms of hallucinations are evident, whether in the developing stage or when it has reached the elderly or older years in an experience. Its function-

ing, then, is as that, of that, which makes for—or known as—the impulse or imaginative body. (294–141)

Note the association of the “impulse or imaginative” aspect of pineal functioning with mental functioning in the above excerpt. The reading in case 663 also mentions “the actions of the imaginative forces in the body” in association with the pineal system. This relates to the role of the pineal system in the coordination and integration of the spiritual and especially mental with the physical body (section 3.2.5).

Case 693

Background

Two physical and one life reading were given for an eleven-year-old male between 10/13/34–3/13/35. In addition to seizures, the boy apparently suffered some form of paralysis (left side) affecting his speech and ability to do simple activities of daily living.

Symptoms

Nocturnal seizures were noted, but it is unclear whether there were any daytime (waking) seizures. During the most severe phases of the illness, “attacks” were reported as frequently as twenty to thirty minutes apart. The mother provided an example of a typical seizure: “He was asleep just 15 minutes when he had a hard attack, and that is the way it goes, just as soon as he goes to sleep.” The mother also described a peculiar effect (perhaps a sympathetic vasomotor phenomenon): “There is one condition that I don’t understand and that is, he will come to me 3–4 times a day and say he has a funny feeling yet he cannot describe it. His color changes and in a few minutes he gets very warm and breaks out with a sweat.”

Medical Diagnosis

Dr. Pahnke concluded that this case was probably petit mal epilepsy. The readings refused to name a diagnosis, simply preferring to describe the etiology and pathophysiology and what could be done to correct it:

(Q) What caused the trouble, and what is the name of it?

(A) As given. Read that given. There has been a fusion of tissue

in ganglia, and in the ganglia along the cerebrospinal system between the sympathetic and cerebrospinal; also in those [lacteal] ducts where assimilation and eliminations are active in the forces of the body—as in those centers indicated, and as in those portions of the body indicated. The name? Name it yourself! This is the condition that exists!

Etiology and Pathophysiology

Although a metaphysical aspect of causation is described in this case (to be addressed in the Comments section), from a strictly material perspective, the etiology was traced back to childhood fever that resulted in adhesions and lesions along the spine and in the abdominal organs:

. . . a fusing of tissue that is as scar tissue to the ganglia in the nerve centers, as well as in portions of the system where the activity of glands and their relationship to the functioning of the system in its replenishings are affected.

The typical pathophysiology of nervous system incoordination was noted:

In the NERVE FORCES we find the distortions in the reactions of the body. Along the ganglia of the sympathetic and cerebrospinal system there have been produced adhesions and lesions, that—with the activities that arise in the natural forces of the body—cause the incoordinate reaction of the senses . . . Here we find the specific conditions that exist may be ferreted out and found by the closer [manual] examination by those whose touch is familiar with normal conditions in the centers and ganglia along the system, and in the segments of the cerebrospinal system. We find in the 1st and 2nd cervical a lesion that is of a circular nature, or a ridge where tissue has been injured by the reactions in the system. Again we find a specific center in the 7th cervical and the axis of the plexus where the coordinations in the brachial centers are indicated. Hence the effect that is produced at times to the locomotories, to the arms, to the head, to these portions of the body itself. Again we find a specific in the 9th dorsal. Again

we find the same in the caecum and the lower portion of the lacteal duct centers where these adhesions, these lesions, these fusions of tissue itself, as it were, has been injured, that make for or produce this incoordination. Their activity to the system is to produce along the course of the pineal center to the duct in the lower portion of the brain center itself where through the medulla oblongata there enters the coordinations between sympathetic impulses and the cerebrospinal system, and through the duct or gland of the lyden [Leydig] that makes for the GOVERNING of impulse in reaction to the torso or body from the brain centers themselves.

Thus the basic features of epileptic pathophysiology (as described in the readings) are listed: spinal and abdominal (lacteal duct and caecum) adhesions and lesions producing nervous system incoordination in the medulla oblongata via the pineal coordinating system (pineal and Leydig) that governs brain nerve impulses. Interestingly, with regard to brain pathology, the readings explicitly stated:

There is NOT scar tissue in brain. There is only an impeded IMPULSE to the centers in the brain. But rather do they exist in the centers that have been indicated, in the ducts and glands that have been indicated; and the effects to these are the disturbances to the organic functionings at times of the organs that are in, or receive their impulses from, activities of those centers through which the impulse in the nerves' reaction passes for its activity. Hence the spasmodic contraction that occurs from VARIED causes; not always producing the same.

Prognosis

These [conditions] . . . may be corrected in such ways and manners that will produce or bring about—in the changing cycles of the body [seven year cycles]—such measures that we may have a perfectly normal reaction and coordination between the nervous forces and the functioning organs, and the activities of the impulses in this body.

Treatment

1. Hot packs over the abdomen and spine (with combination of castor oil and oil of pine needles)
2. Spinal manipulations (not adjustments)
3. Fletcher's Castoria (laxative)
4. Watermelon seed tea
5. Diet: Alkaline reacting, not too much sweets or starches, rather body and nerve building, with one meal each day only raw vegetables

In this case (with its metaphysical/karmic dimension) the mental and spiritual application of the treatments and the attitude of the caregivers were emphasized:

Do these things and, as we have given, be consistent and persistent. Do not make the applications as rote, but rather with that conviction that the proper applications are being made; for it will be seen that there will be relief in the general condition by the time the sixth to eighth application is made. But rather do these things with the knowledge that the vital forces in nature itself are being used to correct an unnatural condition in a normal, natural body that may be brought to same by the union of forces that will bring about normalcy for this body. It's WORTH it, to all who may apply themselves!

Outcome

As Dr. Pahnke noted: "Some improvement was reported at first, with attacks only once per week, but then the severe condition recurred." No long-term follow-up documentation is available.

Comments

In certain respects this case is representative of the Cayce approach to epilepsy in terms of etiology and pathophysiology—and yet there is another, more expansive form of integration that takes in the full mental and spiritual dimensions of the soul and its journey through materiality. This has been called karma, or the law of cause and effect over multiple lifetimes as portrayed in Eastern traditions, especially. A life reading was given that explained this aspect of the condition as

it related to the soul development of the individuals involved. First, a general introduction to the concept of cause and effect as it relates to karma in a physical experience (commonly known as heredity and environment) was provided:

In giving that from the [akashic] records as we have here, we find much that might be said concerning what has been written in many quarters respecting heredity and environment. For these, whether the individuals will or not, go much deeper than ordinarily seen from reasoning in one plane, one experience, one environ. Yet oft, as we find here, individuals again and again are drawn together that there may be the meeting in the experience of each that which will make them aware of wherein they, as individuals (individual entity and soul), have erred respecting experiences in materiality or soul life even. For the soul lives on, and unless that which has been the trouble, the barrier, the dissenting influence in the experience is met in self's relationships to Creative Forces, it must gradually make for deteriorating experiences in the expression of such a spirit influence in matter—or materiality.

Then, some past lives were discussed, with the most recent one in New England during the Salem witch trials being most influential with regard to the meeting of self through karma:

As to the expressions of the entity in the earth, we find: Before this it was in those environs when there were the activities in the land now known as Salem, and the experience about Providence Town when there were the expressions and activities that made for the suppression of the expressions of individuals in meeting those experiences that came as the expressions of spiritual manifestations in the experiences of others. The entity was not only among those that made for the belittling of such but induced the material activity in the suppression, in the expression; and not only took advantage of those that were being oppressed but used same in such a manner as to gratify, satisfy, the passions of the body in associations with same. These made for the expres-

sions that have brought in the experience of the entity in the present [seizure disorder] that which makes for the more often the attempt of expression of self during that sojourn, or during that experience; and almost a possession takes place within the body when there are those touchings upon those things when the MIND of the body attempts to rest [sleep], such that others creep close to the border; making for those manifestations that bring into the experience the uncontrollableness within its own self. Yet much of that which may make for the corrections in same lies within those abilities of those [parents] that are responsible for its physical entrance in the present.

Thus the entire family constellation, including the attitudes and responsibilities of the parents, required attention as part of the healing process:

(Q) Could any advice be given to the mother at this time that would help her to carry on?

(A) In meeting those conditions in a material way that surround the body, let those activities in self as relations towards others be in that same manner—through the analyzing of the situations and conditions—as the body would be done by. If this requires that there be those activities necessary to insure self's own actions in relationships to the conditions surrounding the body, then act; but only as the body would be done by. Do not pray one way and act another! Do not speak unkindly; for art thou viewing from thine own perspective or from thy neighbor's?

The mention of "almost a possession" as part of this condition refers to "discarnate possession" or "discarnate influence" as was described in various forms of illness (particularly neurological and psychiatric) and is explained in Appendix E of this report. The close interactive relationship between sleep and epilepsy is discussed in the literature review of Part I (sections 1.7.2.2 and 1.7.3).

Case 814

Background

The first of three readings was given on 11/23/26 for a thirty-two-year-old man who had been having “spells” for about one and a half years. A second reading was given about a year later on 11/22/27. Apparently, there were no more seizures for several years, at which point the third reading was given on 2/5/35 to address unspecified lingering concerns.

Symptoms

There were “. . . spasmodic conditions or contraction in the nerve and muscular forces” in addition to digestive system dysfunction including poor digestion, poor assimilation, and bad breath.

Medical Diagnosis

In his review of this case, Dr. Pahnke noted: “Doctors gave a diagnosis of epilepsy.”

Etiology and Pathophysiology

The first two readings show little indication of typical epilepsy pathophysiology or treatment—just spinal adjustments and an herbal tonic for assimilations and eliminations. The third reading several years later does contain typical epilepsy pathophysiology with lacteal duct involvement and 4th lumbar reflexes with mention of reversion to previous conditions involving spasmodic conditions of nerve and muscle contractions, etc. There was no explicit mention of pineal system involvement, although the spinal reflexes to the medulla oblongata do fit that pattern.

This tendency for the poor digestion and poor assimilation, with the resultant effect of bad breath, should be the indication to the body that there have been and are those reversions in the lacteal duct area as well as in the gall duct for a stoppage, which—reverting to former disturbances at times—prevents the normal reaction, or there is caused a discordant reaction in the cerebrospinal and the sympathetic nerve system; reverting at times to the spasmodic conditions or contraction in the nerve and muscular

forces. Thus there is caused or produced a lapse of coordination through the nerve energies in the medulla oblongata, where these coordinate with the sensory forces of the body itself.

Prognosis

. . . follow out these conditions as have been given, and we will bring the normal forces for this body, [814].

Treatment

1. Herbal tonic (for digestive problems)
2. Abdominal castor oil packs
3. Alcaroid (digestive aid)
4. Caroid and Bile Salts (laxative)
5. Atomidine (atomic iodine)
6. Neuropathic adjustments
7. Basic Cayce diet: Whole grains and fresh green vegetables, no fried foods, little meat

The application of the castor oil indicates that the pathophysiology involved "congestions" in specific abdominal areas:

First we would apply over the lacteal duct and gall duct area the Castor Oil Packs. These should be as warm or hot as the body can stand, and applied directly to the area from the lower portion of the liver to the caecum and the beginning of the transverse colon; of course, over the ascending colon and a portion of the transverse colon—for there again are those congestions indicated. Apply these for an hour each day for three days in succession.

The neuropathic adjustments also reveal some of the underlying pathophysiology to be corrected:

We would also begin with the adjustments in the caecum area, or the 4th dorsal, the 4th lumbar, the 4th cervical. These would be made as in the neuropathic manner, or of the nature that makes for the massage as well as the adjustments in the segments themselves. For those tendencies for the contraction in the lumbar area affect the caecum directly; those in the 4th dorsal the plexus that

governs the emptying of the stomach or pylorus end; those in the cervical the coordinating center between the sympathetic and cerebro-spinal. To be sure, at such treatments and adjustments we would coordinate from the 1st cervical to the coccyx or end of the spine. These we would have in periods of two to three weeks, treatments given every other day; then a rest period, and then begin again.

Actually, [814] and his wife chose to rely on the services of a naprapathic physician (Dr. Kapple, who was an uncle), instead of the recommendation in the readings.

Outcome

A letter from Dr. Kapple to Edgar Cayce (dated 3/7/34) stated:

I feel it my duty to send you information relative to the case of Mr. [814] of this city who came to my office with your letter of suggestions that he might regain his lost health. I had formerly treated this patient, and had informed him there was nothing I could do for him, however he so urged me to try again, and following your outline of treatment to the letter he received a permanent cure of the worlds most dreaded ailment—epilepsy.

Despite Dr. Kapple's declaration of cure, the wife of Mr. (814) acknowledged that, although her husband had been helped, she felt he could still benefit from another reading. Hence the third reading given in 1935. There is no documentation for this case after the third reading in 1935.

Comments

This is a curious case with digestive system symptoms (which are common in epilepsy), yet no mention of pineal system involvement. Dr. Kapple had treated [814] prior to the first reading (without success). But when the Cayce treatment plan was applied, much better results were obtained (as noted by Dr. Kapple). Considering the motor symptoms in this case and mention in the first reading of nervous system incoordi-

nation in the medulla oblongata affecting the sensory forces, the pathophysiology may have been of a somatosensory or viscerosensory reflex nature as discussed in sections 1.4.5 and 1.4.6 of the literature review.

Case 885

Background

The first of two readings for a twenty-one-year-old male was given on 8/23/26. His sister (a neuropathic physician) arranged for the reading and provided this background:

[885] was a 14½ lb. baby—injured at birth—was not expected to live. He has a large scar at base of skull. He has had 3 x-rays of his spine made—one spinous process is gone as result of injury. He has taken MANY Chiropractic treatments. I am not at home to give him Neuropathic treatments . . . While at home this summer I gave him about 1 weeks treatment. He said that I did loosen the scar a bit. Physicians have refused to operate on scar—because of possibility of paralysis. He did take Bromide but is . . . [now taking] Luminal. About 6 wks. is as long as he goes without a nervous spell of nature of epilepsy. Usually coming on waking.

In a letter dated 4/3/35, the sister reported:

Some 9 or 10 years ago I had a reading for my brother, [885]. It was not very definite but he improved along lines the reading gave. Just now he is in a very serious state and we do not know what is best to do. The situation is so acute that I write hoping to get an immediate reading . . . Would you advise institutional care for this patient? or is it dangerous for him to be cared for in the home? Give name and address of any institutions that could benefit this patient . . . A few days delay might find him in some institution and we want to do the best for him.

Apparently [885] had attempted suicide (intentional overdose of Luminal) and was dangerous to self and others. About a week later

(4/10/35) a very brief emergency reading was given which included a referral to the Still Hildreth Osteopathic Sanitarium.

Symptoms

Symptoms included nervous spells of an epileptic nature, usually on waking from sleep.

Medical Diagnosis

Pahnke placed this case in Group I with likely brain pathology. Abdominal and spinal dysfunction were noted.

Etiology and Pathophysiology

Poor eliminations (through the GI tract) produced toxicity and pressure in the region of the lacteal ducts. The primary cause of the condition was linked to the nervous system that caused imbalances (particularly circulatory) and incoordinations throughout the body, resulting in pressure on the brain, producing hallucinations and abnormal reactions. All of this was orchestrated by spinal nerve dysfunction that was the “effects of conditions as have been brought about by outside influences—that is, in injuries to the body” (perhaps the birth injury described by the sister).

IN THE BLOOD SUPPLY, this very good in many respects, yet carrying the effects of a poor elimination, and at times the effects are shown of the toxic condition, as is produced by improper functioning—that is, with the elimination being toxic in itself, improper creation of elements that flow into blood stream are shown also; such as is seen from those that produce the pressure as is created in the region of the lacteal ducts.

IN THE NERVE SYSTEM, this we find the greater cause of the trouble, both in specific manners, also in the reaction as shown from same in the general system, and in that way of producing improper expression, or improper incentive, to the position and the manner of functioning in various organisms, overcharging some, undercharging others, as is seen by the pressure as produced in that that leads directly to the brain, wherein those impressions of hallucinations, or tendency to produce ab-

normal brain reaction. In the specific centers and cause of these, we find some produced by the pressure first formed in the lumbar and lower dorsal region. Again these show effects of conditions as have been brought about by outside influences—that is, in injuries to the body, and these express themselves most in the action of the extremities [probably sciatica, based on a report from a physician], see?

IN THE FUNCTIONING OF THE ORGANS THEMSELVES, these show the effect of that improper incentive of nerve plexuses that are under the strain of the condition existing in dorsal and lumbar, as is seen in that of the mesenteric system, that of the reflection of blood flow from spleen to the head, and the hypogastric and pneumogastric plexus, and the effect as is produced in this portion of the body, where the blood changes from or through the assimilation in the building and rebuilding body.

The brief second reading acknowledged the seriousness of the condition (which had deteriorated during the intervening decade) and reiterated the basic theme of nervous system incoordination:

Yes, we have the body here, [885]; this we have had before. Not so good are the reactions in the physical forces of this body in the present, from that as we last had same. There has not been the entire adherence to the applications that have been suggested. There are the necessities for changes; for there are the tendencies for the alterations in those periods when there are the incoordinations between the sympathetic and cerebrospinal forces. For since the first approach, the spasmodic conditions, we find—or those tendencies for the epileptic or cataleptic conditions that concur one with another in the reactions of the body—are more violent, not only with self but for those about the body.

Prognosis

The first reading provided this guarded prognosis:

With this correction, we will find that the incentive for nerve reaction, the incentive for the proper rebuilding, through proper

assimilation, and eliminations stimulated to near normal, we will have a bettered condition.

Treatment

The first reading treatment plan included these:

1. Combination of chiropractic, osteopathic, and neuropathic spinal adjustments given with wet heat (hots packs along the spine)
2. A combination of Calcidin (calcium iodine) and Bromidia

The second reading given about nine years later, provided a very simple treatment plan to be followed at the Still-Hildreth Osteopathic Sanitarium:

1. Abdominal castor oil packs
2. Spinal adjustments
3. Referral to Still-Hildreth Osteopathic Sanitarium

The specific manual therapy recommendations provided in the first reading required a very unusual integration of the treatments provided by three professions, each with their own specialization: Chiropractic adjustments for the specific vertebral correction, general osteopathic manipulations for relaxation of the muscular tissue, and neuropathic treatment to coordinate the nervous system.

To meet the needs of these conditions at the present time would be to relieve, through application of heat to the cerebro-spinal system, so that we have full relaxation, and the correction of those centers, or those vertebrae proper, where lesions are formed, by adjustment, as well as by reducing the lesions—which are shown to be internal and circular in nature, these being the harder to form and harder to reduce—then the necessary relaxation, through wet heat, hot packs, or such nature, to the lumbar and lower dorsal, correcting these conditions, taking, as we would say, at least some twenty-six such adjustments, with the general treatment, as would be applied either chiropractically, osteopathically, or neuropathically, or ALL COMBINED, for the muscular tissue, the nerve tissue, and the adjustments, are all necessary to be stimulated by the adjusting and manipulation, USING ALL in their proper way and manner.

In the second reading, the manual therapy recommendation was much simpler, with an emphasis on calming the system:

Also make the adjustments that will be found necessary, not only for the quieting of the body—in the coccyx and the lumbar area, but from the 3rd and 4th dorsal to the base of the brain.

Outcome

Based on the report provided by the sister, “he improved along lines the [first] reading gave.” But according to the second reading given about nine years later, the treatment plan was never fully implemented. The second reading acknowledged the severity of the situation and made a referral to a sanitarium. The sister made the arrangements, but [885] refused to go, choosing instead to get medical treatment from a neurosurgeon. A brain operation was performed, but the seizures persisted, and [885] died during a seizure several months after the surgery.

Comments

It appears that the “spasmodic conditions” (which had become more severe and violent since the first reading) may have been a blending of epileptic seizures and cataleptic fits. Catalepsy is a nervous condition characterized by muscular rigidity and fixity of posture. It may accompany any of several different mental illnesses and is common in catatonic schizophrenia but may also occur in epilepsy, hysteria, and cerebellar disorders (Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, Seventh Edition, 2003). Considering that the first reading mentioned “hallucinations” produced by pressures on the brain, perhaps there was a comorbidity in this case between epilepsy and schizophrenia as recognized in the modern medical literature (section 1.7.5.3). The correspondence between Edgar Cayce and A. G. Hildreth, D. O. (administrator of the Still-Hildreth Osteopathic Sanitarium) did discuss “dementia praecox” (now called schizophrenia).

The literature on the imaging and genetics of schizophrenia and epilepsy suggests that neurodevelopment and its abnormalities might represent an organizing framework to understand the co-occurrence of epilepsy and schizophre-

nia. Specific forms of epilepsy, whose genetic underpinning have been above described . . . can lead the way to a novel understanding of the molecular pathology of positive symptoms of schizophrenia. The old hypothesis that epilepsy with chronic psychotic symptoms might represent a model for understanding the pathophysiology of schizophrenia still retains its validity today and can help shed light on some causes of a yet obscure disease like schizophrenia. (Cascella et al., 2009, p.232)

The pathophysiology of this case is also fascinating, from the standpoint of the probability of organic brain disease associated with a tumor. According to a letter from the sister, in late 1935 Dr. Moore, a neurosurgeon in Birmingham, Alabama, diagnosed the condition as a brain tumor. "[885] was in operating room 4 hrs.—subdural hydroma and much atrophied hemangioma was removed." Subsequently the sister reported that " . . . he continued to have occasional convulsions on going to sleep or waking. He died in one of these convulsions" less than a year after the operation.

Subdural hydroma is a common post-traumatic lesion usually resulting from head injury and cerebrospinal fluid accumulation in the subdural space. Despite its common occurrence, the pathogenesis and clinical significance are uncertain, and the complexity of the condition depends on various factors including the dynamics of absorption and expansion (Lee, 1998). "As time goes by, subdural hydroma either resolves, or it becomes a chronic subdural hematoma. Neurosurgical evacuation is only required when mass effect creates neurologic symptoms." (Deltour et al., 1999, p. 155) Hemangiomas are usually a harmless type of lump, a noncancerous tumor, produced by an abnormal growth of excess blood vessels.

The documentation provided by the sister cited mentioned "a large scar at base of skull. He has had 3 x-rays of his spine made—one spinous process is gone as result of injury," which was apparently due to birthing injury. She believed this to be the origin and source of the tumor that was surgically removed many years later. If that was the case, the tumor would likely have been subcortical, perhaps in the region of the brainstem or cerebellum. As noted above, catalepsy is associated with

cerebellar disorders. Cerebellar seizures can be produced by tumors (Boop et al., 2013).

Perhaps the brain tumor was the result of birth trauma (as suspected by the sister) that gradually expanded (due to circulatory imbalances creating pressure on the brain as described in the first reading). But the brain pathology may also have been acquired later in life. Persons with seizures have significant risk of head injury and brain trauma. The incidence of spinal cord injuries and head trauma in patients with refractory epilepsy is at least 30 to 40 times higher than the normal population. The injuries occur after seizure-related falls (Kruitbosch et al., 2006).

The first reading for this man did emphasize circulatory imbalances causing pressure on the brain, resulting in hallucinations. Perhaps that was a cause (or a contributing factor, in addition to a pre-existing condition due to birth injury) for the tumor. In many cases of tumors (of various sorts) the readings tended to emphasize the body's ability to absorb same when supported by specific therapy to produce drainage through improved circulation (e.g., osteopathic drainage). The Cayce readings even provided a formula for rebuilding the brain (in cases of dementia—see McMillin, 1995) based on this premise.

Although many readings for various conditions addressed organic brain disease and its treatment, very often the brain dysfunction was linked to peripheral causes. For example, in numerous cases of schizophrenia, the readings cited spinal lesions and gland dysfunction as primary causes (or contributing factors along with heredity) of brain degeneration (McMillin, 1991a). The treatments invariably focused on addressing the peripheral causes and reducing toxicity before attempting to heal the brain (usually by electrotherapy and related modalities). The first reading appears to have been addressing peripheral factors that were producing pressure on the brain, but follow-up readings were not requested until nine years later during a crisis.

Case 1001

Background

This fascinating case includes ten physical readings and one life reading all given between 5/7/30–11/10/30 when this man was twenty-two years old. The background information from his mother stated that her son was afflicted with epilepsy, the petit mal type. They had

tried the regular medical options. He had been having frequent hard convulsions for some time and was taking Luminal. The impression was that his epilepsy began in early teens.

Symptoms

Symptoms included “frequent hard seizures.”

Medical Diagnosis

Petit mal epilepsy.

Etiology and Pathophysiology

Most of the readings were given while this man was a patient at the Cayce Hospital in Virginia Beach. They tended to be relatively brief “check” readings, scheduled more frequently so that the physician could adjust the treatment plan as needed. One benefit of this arrangement was that the pathophysiology could be described in more detail. So several key excerpts are provided to give a sense of the nature of the pathology. Note that although there were notable digestive system problems (particularly the stomach), there is no mention of lacteal duct adhesions or castor oil packs in this case. The solar plexus is listed as part of a broader pineal system involvement tied to reproductive system dysfunction. Pathology in the spinal nerve centers is described in relation to the pineal cord in its relation to the brain as a *governor* of brain impulses.

IN THE BLOOD SUPPLY—This shows in itself the lack of elements as go to make up for a perfect blood . . . as related to the eliminations in the functioning system, especially as regarding the effect produced in the generative or genitive [reproductive] system, and the incoordination produced in the effect of the change in the vibrations, or variations in vibrations as go to the brain forces THROUGH sympathetic and cerebrospinal. Hence the SPASMODIC conditions as exist THROUGH the activity of the body at times.

IN THE NERVE SYSTEM—Here we find the incoordination of the sympathetic and cerebrospinal. Especially is this seen in the lower dorsal and lumbar region, where—in periods

back, during the seventh year—there was an injury to the spine, as caused a lesion and the plethora in the gland as coordinates through the pineal, affecting then the pituitary as well as those of the lyden [Leydig]. This effective both in the conditions in the lumbar and lower dorsal, as well as when the contraction is seen physically in the region of the 1st and 2nd cervical, through the plexus to the brain center itself.

IN THE FUNCTIONING OF ORGANS—The BRAIN forces are very good. The coordination BETWEEN the brain forces of the body proper and the cerebrospinal, incoordination.

In the functioning of the organs of the sensory system, these show the effect of those properties GIVEN in the form of bromides—as WELL as the effect of incoordination between the SYMPATHETIC nervous system AND the cerebrospinal; so that when under the stress or strain portions OF the brain forces become accentuated or dulled BY the change in the vibrations to the brain proper . . .

The digestive system, sympathetically finds nausea when there is TO be, or has BEEN, the inactivity through the cerebrospinal and sympathetic; for with the disturbance of the lesion in the upper lumbar and lower dorsal, these bring—through the solar plexus—that effect to the hypogastric as to cause the STOMACH to be SMALLER than normal in the body.

In the functioning of the organs of digestion: When these are under strain—which does not occur at all times—there are thrown into the system too much of, or the lack of, the proper balance BETWEEN the ASSIMILATED and assimilating of the digestive system, or the liver in itself becomes torpid in its activity. Hence the tendency towards the disturbance through the alimentary canal; also the disturbance of the organs of elimination in lower hepatic circulation; the disturbance in the character OF the urine; irritation in the bladder, and naturally the affecting of the organs OF gentation [genitation] THROUGH this period.

(Q) When may body expect a cessation of attacks?

(A) When those pressures in the upper cervical and in the 11th and 12th dorsal are entirely eliminated. There is seen at times, that those contractions in the dorsal and cervical region, apparently at

times come from stomach; at others from genitive system; at others from purely imaginative forces. These all of the coordination between sympathetic and cerebrospinal, and by the continued reactions as may be brought about by the manipulations, by the vibrations, by those forces as are set up in system, create a normal equilibrium. Hence the activities of the mental forces of the body, and the applications to self and to others, plays such an important part in the conditions as exist in system, and will AFFECT the system—as regarding the cessation, or as regarding the activity of those conditions that bring about or CAUSE the attacks.

The pineal cord (that runs through the system and connects to the pineal gland in the head) was affected by the pressures on the spinal centers. Also, apparently there was a lack of development of the pineal center in the lower portion of the brain.

(Q) Have the pressures in the upper cervical and 11th and 12th dorsal been reduced?

(A) Been reduced, but not wholly the pressure taken off; so that there ARE concurrent effects from impulses along that of the cord as runs THROUGH the system to that of the gland in the base of the brain [pineal]. This is still existent, when this SHOULD have been—in the 13th or 14th year—almost WHOLLY a center in the lower portion of brain.

Glare from the sun could have been a sensory reflex trigger in this case:

(Q) Does the heat of the sun incite said attacks?

(A) Too strong a heat of the sun, but more the glare than the heat incites same.

The sexual aspect of the case was explained in terms of the lack of mental control of such impulses that could be aided through the use of an herbal tonic (maypop bitters).

(Q) What can eliminate the contractions brought on from the genitive system?

(A) Those of the properties as will aid in reducing impulses.

(Q) Can the contractions in the dorsal and cervical regions be made less by sexual association?

(A) This has just been explained. There must either be control through the mental forces, or through the control OF such relations.

A mechanical analogy was used to describe the seizure mechanism:

The changes or alterations are very individual, especially when meeting the conditions as exist from such a disorder as an improper pulsation through the nerve system, or in that state where there may be termed that the governor's belt of the nervous system slips off.

The psychological dimension was related to the forces in the "imaginative body" (as a causative factor) which was also linked to the loss of consciousness during the seizure event:

(Q) What is it that brings on or incites said attacks?

(A) The attempt of the physical body—through the forces in the imaginative body—to coordinate through that condition existent in the lyden [Leydig] gland, or in the base of the brain itself. Hence the contraction, and the lack of coordination in such conditions.

(Q) From what part of the body do the attacks originate? and why does body lose consciousness during attack?

(A) From the solar plexus to that of the lyden [Leydigian] gland, or through the pineal. The lyden [Leydig] is IN the pineal, see?

(Q) Why does body lose consciousness?

(A) That's just what we have been giving! It is the imaginative forces and the cerebrospinal forces, or the nerve supply through the cerebrospinal system cuts off—through the lyden [Leydig?] forces—which is sealed gland, see? they lie within those of the pineal themselves, see? When these become of such an activity, through conditions as excite in the system—as thrown out from those of the genitive forces, acting through those of the solar

plexus, and the attempt to coordinate—they push in so much it pushes out consciousness.

Prognosis

(Q) Will a complete cure be effected?

(A) If the body is persistent enough!

Treatment

1. Osteopathic manipulations
2. Maypop bitters
3. Wet cell battery with gold solution
4. Bicarbonate of soda
5. Codeine (small doses occasionally as needed to relax the body)
6. Basic Cayce diet
7. Ice at base of brain (to stop a seizure once it has started)

Outcome

The documentation indicates noncompliance with the treatment plan and no improvement in the condition:

The treatment was not continued . . . The boy himself never seemed to grasp the spiritual significance of his affliction. At times he would go away for days at a time, on drinking sprees and riotous night life excursions. His mother would finally locate him in some hotel, foot the bills, and bring him home.

Comments

The reincarnational (karmic) aspect of this case was described in the life reading provided. The present-day epilepsy was traced to a past life as Louis 15th of France, who was known for “aggrandizing of self interests” (which apparently was a prominent tendency carried over into the modern incarnation).

In those environs from which many of the experiences in the present come, we find from those of the experiences of the entity in the earth’s plane—for in the one as before this may there be said in the present, how has the mighty fallen—yet that as is in-

nate, that even in feature of expression, that innately held, may be seen and met in the present; for in the one before this we find as Louis 15th the entity reigned in France, and in a mighty manner—being of those that sought for the gratification of many of selfish desires, gaining and losing. Gaining in the service as GIVEN TO many, in the consideration as was given to many. Losing in the aggrandizing of selfish interests in self, in bodily desire, in the intemperance of those elements of mind AND body—these brought destructive forces in the experience of the entity, and in the fulfilling of the desires of the flesh in the present does the entity find a breaking away and losing of self in that as becomes rational that the body holds must be the element as pertains to the activity of every individual, of every act of every individual, as of a RATIONAL activity, with reason the basis of same behind same . . .

Karmic conditions often have a psychological aspect, as was noted in this case, particularly in a lack of rational self-control of a voluntary nature. There was a cutting off of supply of impulse to the cerebrospinal (voluntary) system, resulting in loss of consciousness and involuntary reactions. This aspect of pathophysiology bears some semblance to the “network inhibition hypothesis” with its “consciousness system” explanation for loss of consciousness during seizures (sections 1.5.4 and 1.7.2.3). This also relates to the pineal as the governor (like a throttle, regulator, or pacemaker) of brain activity as explained using a mechanical model of the pineal system (Appendix B, section 3.2.4). Likewise, various other aspects of pineal system involvement in this case (such as *imaginative* influences with regard to deeper psychological manifestations; the *pineal cord* along the spine with its subcortical connections at the base of the brain; the *Leydig (lyden)* gland and *solar plexus* components of the pineal system) are discussed in the various sections of Appendix B (3.2).

Case 1025

Background

Between 10/22/35–2/11/36, three readings were given for a young adult male (described as a “boy” in the background reports).

Symptoms

Mr. [1025] described his “spells” as follows:

. . . severe attacks and afterwards I had some pain on the right side of my abdomen. I have some trouble with gas in the abdomen and I notice that this occurs after meals; also I have some trouble in getting to sleep at night principally because of my nerves. I am nervous at times during the day and I get so that I am not able to sit still and composed, instead I am tense and can't seem to control myself.

Nocturnal emissions (“wet dreams”) were also mentioned in the documentation (“night losses, having had five in five successive nights”).

Medical Diagnosis

Dr. Pahnke's review of this case noted: “Convulsions were described as resulting from nervous shock. There is a good chance that this would fit the diagnosis of epilepsy.”

Etiology and Pathophysiology

The readings mention two specific causal factors that contributed to lacteal duct adhesions: 1) an infectious process (bacilli) that produced an “adherence of tissue through the drying of portions” and 2) an injury (“pressure, or a lick”) to the abdomen in the area of the lacteals. Congestion in spinal nerve centers was mentioned. Reflexes to the medulla oblongata (via the “solar plexus nerve centers”) caused nervous system incoordination. There was no explicit mention of the pineal system or glandular dysfunction in this case.

The BLOOD SUPPLY indicates there has been existent in the body an infectious force, that has arisen from a bacilli which became destructive to tissue. In the applications for same this has been aided considerably in some directions; yet that condition has been left wherein there is the adherence of tissue through the drying of portions of the body—especially as related to those things having to do with the mental reactions in the body. Hence the incoordinations between the cerebrospinal and the sympa-

thetic or vegetative nerve forces of the body . . .

As indicated, the lesions—or adhesions AND lesions—in the lacteal ducts are the basic cause for the disturbance in the nervous system. And these arise from the inability of the assimilating system to function with the sympathetic nervous system in its reaction to the nerve reflexes or impulses. For these conditions, as we find, exist:

When there is an expression or activity from the sympathetic nervous system, or the sensory system that responds through the sympathetic nerve system, we find there is the movement or impulse to and from the brain centers themselves. Then with a lesion or adhesion, the impulse is cut off—or deflected. For, as indicated, we have lesion in the lacteal duct area, from an injury there in times back; this the right side, just below the liver area.

Hence we have first an intestinal disturbance through the activity of the assimilating system, producing at times disturbances to the liver; at others producing to the pancreatic secretions, at others to the activities through the peristaltic movement; not only in the lower intestinal tract but to those activities through the jejunum itself.

Then this coordinating or connection with the solar plexus nerve centers, making for an incoordination with the cerebrospinal nerve system, produces at the base of the brain—or through the medulla oblongata—and incoordinant reaction.

(Q) Do you find any condition existing in the brain, or is it reflex?

(A) As we find, and as indicated, the accumulations that have been there are rather reflex—and are PRODUCED by the condition in the lacteal duct area.

(Q) Of what nature was the injury that caused or brought about this condition in the lacteal area?

(A) This was a pressure, or a lick.

(Q) Please explain why the attacks come on always from a slight shock of some kind; as unexpected noise, stumbling, etc.?

(A) As indicated, there is a breaking; or a non-coordination between the sympathetic and the cerebrospinal systems. And it is almost the same effect of a shock, of an excitement, that would be produced in a wire that is partially broken; when set in a cer-

tain way the current passes through, but a turning of same causes sparks or a disconnection and a reaction that makes for a flashing. So with the nervous system. Hence the continued use of all those things as indicated, that will enable the body to make for the more perfect coordination between the cerebrospinal and the sympathetic nervous systems—and especially in relationship to those centers and ganglia where there are the particular clogging conditions between the nervous systems in the lumbar and the dorsal areas.

Prognosis

With constant care and persistence, a guarded prognosis of “nearer normal reactions” was given:

As we find, conditions are rather of a serious nature with the physical forces of this body. There are rather the complications of disturbances and disorders through the physical activities. However, as we find, these may be brought to a nearer normal reaction through the constant care and persistence upon the part of those that would make applications of influences in the activities of the body; not only the physical forces, as to sustain the life activities, but the better mental AND physical coordination may be made throughout the system.

Treatment

1. Ultraviolet light with animated ash
2. Spinal adjustments and abdominal massage
3. Diet: No meat, little starch and sweets—do include more salt in diet than usual
4. Valentine's Liver Extract
5. Abdominal castor oil packs
6. Luminal (as little as possible when necessary)
7. Radio-Active Appliance for insomnia
8. Physical activity that works up a sweat
9. Lactated pepsin compound

The continued use of the anti-seizure medication was recommended, but only as needed:

- (Q) Should the Luminal taken before first reading be continued?
If so, in what quantities?
- (A) Luminal is a sedative of a hypnotic nature, and is habit-forming. Not as much so as those of the poppy nature, that form greater congestion. When necessary, this may be taken—but keep as little of this as can be accomplished without the body suffering under the congestion.

For the digestive system and genitive system, a special compound was prescribed:

For those conditions that become disturbing at times, which make for the losses, or that show a reaction through the genitive system (and these, as we find, are the natural results or effects of the changes taking place) (hence the necessity for a mental and a physical reaction that the energies and the strength of the body may be utilized), we would—when these become the more disturbing—use a compound prepared in this manner:

To 1 ounce of Elixir of Lactated Pepsin, add—in the order named:

Compound Simple Syrup	1 ounce,
Saltpetre, well dissolved	10 grains,
Syrup of Rhubarb	½ ounce,
Tincture of Stillingia	½ ounce.

Shake the solution well before taking. The dose would be a teaspoonful just before retiring. But do not take same unless there becomes more and more a disturbing factor in this direction. But when necessary, these properties may be used to allay; and yet to act upon the system in aiding a release through the lacteals and those portions of the system where the disturbing conditions have caused and do cause distresses through the alimentary canal.

Outcome

No outcome documentation is available for this case.

Comments

This young man was apparently chronically nervous and stressed. This case might be considered *reflex epilepsy* (or at least *reflex seizures*), as the attacks were often triggered by sensory input such as an unexpected noise (section 1.4.4). Note that there was no explicit mention of the pineal system in this case, and the reflexes from the abdomen to the brain were mediated through the solar plexus.

Epilepsy is sometimes compared to an electrical storm in the brain (e.g., Epilepsy Foundation, 2019). Note the electrical symbolism used in this reading to portray the nervous system incoordination: “that would be produced in a wire that is partially broken; when set in a certain way the current passes through, but a turning of same causes sparks or a disconnection and a reaction that makes for a flashing. So with the nervous system.” The use of mechanical analogy for pineal system function is discussed in section 3.2.4.

Case 1527 Background

A nineteen-year-old male received three readings between 2/2/38–5/4/38. His mother wrote:

At varying periods of his life, from a tiny baby on, he has seemed to take convulsive attacks. There have been years with none—some with . . . Is in some respects very advanced mentally—others such as math, etc—behind. Too jittery for the past few years to finish high school—consequently his life plans are standing still . . . Fine physique. But has fallen badly and once in the bathroom burned across the back by the radiator. A year ago, wakened in the night and ‘fought invisible people’—hit thru a mirror and hurt a hand badly—went into psychopathic hospital. Came out after tests—PERFECT mentally according to doctors . . . I do not feel that medical help is the answer for everything he ever had wears out, or off, either way, after awhile.

After the first reading, the mother provided some additional background for this case:

[1527] has gone through what a dozen or two doctors call a 'process of elimination',—X-Rays, this and that examination, etc. Tonsils out, treatments for this and that and so on. Well, now listen to this. About two years ago last August (in August, 1935) I had him take a Fluoroscope of the abdomen and the thing showed 'some trouble in the region of the lower stomach' OR 'somewhere in the region of his appendix'. Imagine that! The doctor said 'I think it MIGHT be a good idea to take out his appendix anyway'. So, hopefully, it was taken out!!!! Of course, not helping him at all . . . We need more research don't we? For several months [1527] has complained of pains somewhere near the stomach also and we had thought it must be adhesions.

Symptoms

Symptoms included "convulsive attacks," "spasmodic reactions," and abdominal pain.

Medical Diagnosis

Dr. Pahnke's review indicated epilepsy, but no particular type was specified.

Etiology and Pathophysiology

The first reading for this individual began with a strong emphasis on the karmic aspect of the problem, "each soul must meet its own SELF its deeds done in the body!" The body-soul connection was entangled, preventing a full expression of mind and spirit through the physical body. As might be expected with karmic conditions, the problem (at the physical level) began as a prenatal condition during development of the embryo:

In the prenatal experiences of this entity, in the embryo, there was the forming of lesions that hinder in the normal activity and equal balance of coordination between consciousness and unconsciousness . . . That in man there is the threefold self—body, mind, soul (or spirit)—is significant; when there are the manifestations of such disturbances that exist in the experience of this

entity . . . Then, in the entanglement in the **BODY**, we find a soul, a condition, where there is the break in this coordination of mind and spirit with the activities of the physical body. That these have remained as inactive portions of the body-physical for a long period makes the necessity then for the greater precautions, but the more consistent application of that which may bring into the experience the untangling as it were of this skein, this matting of the **ENDS** that carry impulse to the nerve systems of the body; that produces this incoordination, this breaking of consciousness, this spasmodic reaction to the nerve centers and fibres along the cerebrospinal system as it attempts to coordinate the impulses broken in its associations with the vegetative or sympathetic system, thus bringing those spasmodic reactions . . . In the right side, about the portions where there is the emptying of the lower stomach or duodenum into the jejunum or the smaller intestines, where the lacteal ducts draw the greater forces from the activities of the secretions from the liver, the spleen, the pancreas, the gall ducts and the like—when these in the body become as it were emptied, or there is an overgorging of this flow, there is physically the recurrence of the spasmodic reactions.

Owing to the lack of coordination in the connection between the cerebrospinal and sympathetic nervous systems, especially through the sacral and lumbar areas, the connections or ends are being impoverished by or through the lack of circulation in the areas over which there have been the applications for the lesions—or adhesions, rather—in the caecum and lacteal duct area. Then now, as the adhesions are being broken up, rather than creating coordinant forces between those nerve ends in the sacral and lumbar where they connect with the brush end of the cerebrospinal system, they become rather inclined to be bulbous. Thus a more perfect coordination is prevented in the impulses from the cerebrospinal to the centers responding to same in portions of brain that become a part of the natural reaction or refraction from nerve impulses as received for activity in same.

Thus, although it was described as a karmic condition, the etiology and pathophysiology were similar to many other cases reviewed in this

section: lacteal duct adhesions and spinal nerve dysfunction producing an incoordination between the sympathetic and cerebrospinal nervous system, resulting in seizures in the brain. Pineal system involvement was not explicitly indicated.

Prognosis

And by the latter portion of the year, the body **SHOULD** be able to return to school; but we would change rather to the vocational schools than to the **REGULAR** schools.

Treatment

The treatment plan for this reading was actually rather simple and straightforward:

1. Continue with bromide medication until progress is made, then gradually decrease
2. Abdominal castor oil packs followed by massage with olive oil
3. Osteopathic adjustments

The rationale for continuing the medications (and other treatments) is stated in this excerpt:

Then as we find, there may be applied (not leaving off those bromides that are being taken to allay, to assist in the digestive forces, until there are) those influences that make for the enlarging of this opening, the breaking up of this tissue that **PHYSICALLY** causes the spasmodic reactions in the area (then gradually decrease the bromides) . . . Gradually, leave off the capsules or [Dr.] James' medicine. One time leave off one type, the next time leave off the other type. And as the body responds to the manipulations, and the activities of the body are more normal, these may be gradually left off entirely as we find—all of them. With the first periods of leaving these off there will be the inclinations for a reversion to contractions and spasmodic reaction, owing to the very nature and character of the drug included in same. Hence it will be found that this will require some little time, and the keeping up of the [castor oil] Packs even after the finishing of the adjustments; for the body to coordinate in all of its relationships in the nervous forces of the body.

The readings provided explicit recommendations for the osteopathic treatments based on the stated pathophysiology:

Also we would have at least ten to fifteen gentle osteopathic adjustments; with particular attention to the lesions in the caecum area. These adjustments should be given about twice a week for two weeks, left off for a week, and then the rest of them given about once a week. But have sufficient to insure the breaking up of the lesions and adhesions in the area, as well as to insure the full coordination of all portions of the cerebrospinal system; or that all segments are in their proper relationship one to another. There should be particular attention through the lumbar, sacral and coccyx area . . . As indicated, there must be first the aligning of each segment in the cerebrospinal system, see? There must be, then, the coordinating of each area as it cooperates with the others; that is, as the upper dorsal coordinate with the digestive forces as WELL as with the reaction of the SENSORY forces. As indicated, the PARTICULAR attention—too—to the sacral and coccyx area, as well as the lumbar axis.

The documentation for this case suggests that there were some problems getting the proper osteopathic treatment. The osteopath resented a psychic diagnosing the problem and telling him how to give the treatments. Also, there was an increase in seizures associated with the osteopathic treatments. They may have been too severe, and the later readings insisted that the adjustment be “gently” given. With regard to the resentful attitude of the osteopath, the readings suggested a cooperative approach:

As we would find then in the present, we would—with this information—take the body to Dr. Thompson [the osteopathic physician], as indicated; have the examination, you see, for just these conditions that have been indicated. But before the applications or treatments are begun (unless there will be the cooperation with the suggestions made) let the doctor then examine and ask the questions—and then we will undertake to give the direction as to what is to be done.

Each member of the family held a strong belief in Christian Science and the power of the mind to heal (which the readings included in the treatment plan through visualization during meditation as the castor oil packs were applied):

And keep, through each application, that period of the deeper meditation; SEEING, knowing that what ye ask is being accomplished in this body!

Outcome

In his review of this case, Dr. Pahnke noted: "Some improvement was noted but there have been no follow-up reports since 1938."

Comments

One can naturally wonder if the prenatal (defective embryonic development) had a genetic basis. The readings did insist upon an inherent association of karmic conditions with heredity. If so, perhaps the genetic tendency for weakness involved the tissue in the lacteal duct area—a predisposition to adherence and clogging. The karmic aspect of this case was laid out clearly at the beginning of the first reading:

In giving an interpretation of the disturbing forces—and in giving that as we find that may be applied in a material and mental and spiritual angle, we find that the condition may be well likened unto an entangled skein of the thread of life which manifests in a material body. Hence things and conditions mentally, materially, spiritually, enter in. And the effects that are here produced are the entanglement of soul-matter in mind-expression in materiality, in this body. There is, then, the necessity of understanding and interpreting the law of matter—or cause and effect [karma]—as related to the mental and spiritual expressions in matter. As has been given of old, when there are disturbing or harmful or detrimental influences, there is error at the base or the cause of same. For ever does that injunction stand, as the promises of the divine forces in the experience of man, that 'Whatsoever ye sow, that must ye also reap' . . . each soul must meet its own SELF its deeds done in the body!

Apparently the castor oil packs did produce an improvement in the seizures, but the readings cautioned that the full treatment plan must be followed (including the medication and spinal adjustments). [1527] resented taking the medication, and the mother wished to cease the osteopathic treatment. According to a report by Gladys Davis: "The mother . . . was trying to heal him through Christian Science and never could understand why it was necessary to use material applications." The following excerpt was directed toward this limited approach to healing and advised a more comprehensive, cooperative approach that is the essence of holism:

Do not let up on the applications of the [castor oil] Packs as yet, nor the tablets that have been taken from time to time. But that these spasmodic reactions have been allayed, there must be—for the better mental coordination through the submerged forces and distribution of energies—the mechanical or mechanotherapy [osteopathic] treatments gently given, as well as that which is for the general mental and spiritual influences in the body, see? Each soul, each entity—as was given from the beginning—should gain this, as in relation to the activity of spirit through bodily forces: Is there more of God or Life in a brainy individual adult than in the babe without ANY direction whatsoever? IS there? It is then a growing condition. The body with a broken structural condition will heal, but unless it is mechanically set in proper accord it will NOT set of itself! The manifestation of spirit in materiality is to use WHAT IT HAS and to do the best it can with same! But the PHYSICAL is to use cooperative natures; cooperating with nature, cooperating with spirit, cooperating with mind, to make for that which will be the WHOLE!

Case 1625

Background

Three readings were given for this seven-year-old male between 7/1/38–11/13/39. The mother provided this background in a letter dated 2/19/39:

I am writing you to give a report on [1625]'s conditions . . . I

first noticed signs of spells when [1625] was between 3 and 4 years of age. He would look wild, laugh and draw to the right side. Finally, through the years these spells grew worse until he would become unconscious and fall out—he would have them all times of the day and during the night. He has had as high as 24 spells in a period of 12 hours. When he became the age to begin school, they would not take him in public school, and had to put him in private school. After taking him to a nerve specialist and several other doctors, the spells continued and seem to grow worse and more frequent. The medical doctors diagnosed his trouble as epilepsy and there was no improvement in his condition from their treatments . . . [1625] was at his worst condition having so many spells that I could not keep account of them . . . When I received the reading, I went to work with treatments and he got along fine. And haven't had a spell since . . .

Symptoms

Over the years the symptoms evolved. In the early years there was notable stomach discomfort during the seizures ("He would look wild, laugh and draw to the right side"). But later there was more of a drawing to the back with loss of consciousness and falling.

Medical Diagnosis

Epilepsy.

Etiology and Pathophysiology

Abdominal lacteal duct adhesions were formed from the healing of the umbilical cord after there was fever from infection. As a result, spinal reflexes from the fourth lumbar to the brush end of spinal nerves, thence to the first cervical and medulla oblongata produced seizures. The pineal system was involved.

Now as we find, there are definite adhesions which prevent the normal reaction between impulse and the activity of the cerebrospinal system—or the voluntary and involuntary nerve center, or the ungoverning by the adhesion and its effect upon the cere-

brospinal nervous system and the sympathetic of that governor of the impulse through the medulla oblongata . . . In the activity of the nervous system we find the source or the causes of the disturbance. First, as we find, there was a disturbance during those periods when there was the healing of the umbilical cord; cold, contraction, and some infectious forces that caused or produced great heat or temperature. The lymph and the emunctory activities through the areas about the lacteal ducts as related to the gall duct and its activity upon the system produce an adhesion in the right portion and side . . . And this produces these reactions upon the chyle through the system, and this in reaction between the cerebrospinal and sympathetic system causes a contraction through the areas from the 4th lumbar, 12th dorsal. These reflex to the brush portion of the cerebrospinal system, and when this impulse rises to the brain center, or through the lack of coordinating to the brain center through the sympathetic and the cerebrospinal, the contraction is at the 1st cervical.

After initial positive results, there was a relapse and request for a check reading that described the nerve reflexes involved in the seizure production:

Now as we find, owing to those activities in which there was a strain to some lesions which exist in the area ABOVE the kidneys, as well as in the lumbar and sacral area, there has been a reverting to the effects from the pressures in the lacteal ducts upon the activity of the [adrenal] glands in the areas above the kidneys. Thus the reactions that have been caused are to the nerve forces along the pineal nerve axis or gland; producing a spasmodic reaction . . .

(Q) What caused the relapse?

(A) As just indicated, a strain upon the subluxations existing in the areas outlined.

Prognosis

Hence this character of condition, unless removed, will gradually grow very much worse. For it will tend to draw the head and body

backward, and these of such sudden natures would tend to make injuries the more common by the fall or the like. The applications here of internal medicines, as we find, or applications, would only be effective in use of sedatives, which would only hinder; though they might allay the condition if applied.

These [treatments] kept, we will remove the causes AND the effects of these disturbances.

Treatment

1. Abdominal castor oil packs followed by gentle abdominal massage
2. Radio-Active Appliance (with massage and suggestive therapeutics during session)
3. Osteopathic spinal adjustments
4. Basic Cayce diet with an abundance of steel cut oats, okra and salsify—never any white bread, white potatoes or fried foods.

These as we find will respond to the applications first of the Castor Oil Packs over the lacteal duct and caecum area, and then the removal of the pressures—osteopathically—in the 9th dorsal, the 11th and 12th dorsal, and the coccyx and lumbar area. In the beginning the osteopathic adjustments should be given about twice a week, until five or six are taken, and then these may be farther apart; but give sufficient that there may be the perfect alignment throughout the lower portion of the cerebro-spinal system. The greater portion of the adjustments would be in the areas indicated, but coordinate—of course—the plexus in the upper portion of the dorsal and through the cervical areas, AFTER these adjustments are made in the lumbar, sacral, and especially the 9th dorsal, as indicated. The Castor Oil Packs should be given especially on the two days just before the osteopathic treatments are taken, see?

Outcome

Documentation by the mother and two physicians (Dr. Curtis Hudgins and Dr. Frank Dobbins) familiar with the case indicates that the readings' "analysis of the conditions and the suggested treatments were accurate and effective."

Comments

This case presents another possible cause of lacteal duct adhesions (improper healing of the umbilical cord due to infection and fever). The association of lacteal duct adhesions and reflexes to the fourth lumbar (a key pineal center) and thence to other pineal centers (along the spine and to the medulla oblongata—section 3.2.2.7) is a common pattern in seizure production in the readings. This series of readings specifically mention the role of the “pineal nerve axis or gland; producing a spasmodic reaction.”

Case 1683

Background

Two readings were given for a forty-two-year-old unmarried woman on 9/10/38 and 1/1/39. Her father provided this background on the day of the first reading:

She was under the sole care of her mother for twenty years, until her mother's death about five years ago. She is now 42 years of age. I have had to keep her under medical care in a private institution, because of her nervous condition which she cannot control, and her failure to realize her condition. She is now under the care of Dr. Wm. Ray Griffin at Appalachian Hall, a private institution for nervous cases, at Asheville, N.C. She is given sedatives to reduce paroxysm called “Petit Mal”, which I understand she receives several times a week. She seems to be physically strong . . . but she doesn't seem to read intelligently. She is restricted from all privileges and kept in room except when taken by nurse for exercise, walks two hours daily and occasionally given automobile rides . . . She blames me for keeping her at the institution and insists that she is not ill. Also complains about the treatment she receives and wants to see life, such as social exchange with friends she knew in years past. She may want to marry and have a home. As I haven't any home, she seems to be better off at the institution. My earnest hope is to get her in a normal condition. I would like to know the exact cause of her disability . . . She was

operated upon five years ago [by Dr. Charles Elsberg] at the Neurological Institute (Medical Center) New York City. They opened a water cyst on her brain in order to relieve pressure, but it was only a temporary relief.

Symptoms

Symptoms included hearing problems (approaching deafness), nervousness/anxiety, "supersensitiveness" (that the readings described as "visions" and ESP, but would probably be regarded as psychosis from a medical perspective), and "spasmodic reactions."

Medical Diagnosis

In his review of this case Dr. Pahnke notes:

The diagnosis of petit mal epilepsy seems justified from the medical work up given by doctors both before and after the patient was admitted to Still-Hildreth Hospital. The reading also confirmed the diagnosis of petit mal epilepsy. However, it appears that the patient also had a type of psychosis in addition to epilepsy.

Etiology and Pathophysiology

The etiology in this case begins with brain pathology (presumably a brain cyst as described by the father) that was surgically removed to relieve pressure on the brain. The readings stated that the after-effects of the operation produced lesions along the spine and in the abdomen (lacteal duct area), resulting in petit mal epilepsy. The sensory nervous system was affected by the original brain cyst as well as the peripheral lesions that were formed. Unspecified reproductive system dysfunction was also mentioned.

Now as we find, the disturbances are lack of coordination between the impulses of the central nervous system and the sympathetic or vegetative system. We find that these originally arose from pressures that affected the sensory impulse. And with the removal of the pressure [brain surgery] there has not been the removal of the tissue involved in such pressure, producing that in

the form of scar tissue—which, along the cerebrospinal system congested areas or centers, has gradually—through this incoordination—produced a lesion in areas of the cerebrospinal system as well as one about the lacteal duct center. The hypnotics [medications] that tend to prevent the recurrent reactions between the cerebrospinal and sympathetic, or the spasmodic reactions, do not RELIEVE the disturbances but only tend to lighten same. Hence these are gradually causing a sedative reaction that is producing greater disturbances in the eliminating system. Thus, with the pressures produced by these stresses, the periods when there may be said to be more RATIONAL reaction are at the expense of other portions; so that there are more violent reactions in the activity of the sensory forces . . . when there are the spasmodic reactions arising from lesions produced from original brain pressure, or the ganglia about segments along the system, these produce greater disturbances in the nervous system. As may be indicated from the general conditions, the nervous system then is the source of the disturbance in the present; though a thickening of the tissue in the cranium cell itself was the first cause. This pressure removed [by the brain surgery], there were not those precautions to remove the effects as had been produced by same, by building the circulatory forces sufficient to set up drainages through the eliminating systems to alleviate and produce permanent results in the activities of the body.

The psychological (or psychopathological) aspects of this woman's experience was described as "visions" or "extra perception of sense reaction" (extra sensory perception—ESP):

As to the effect being produced, gradually, in the functioning of organs, we find that these become exaggerated under varied effects—as to a supersensitiveness in the sensory forces, when the body-mind visions or has extra perception of sense reaction. These become a part of the disturbances.

Based on the readings' perspective, this would likely indicate pineal system involvement. There was significant sensory system involvement

in this case, which resulted in not only hearing problems (section 1.4), but also the psychological experiences that would have been regarded as a form of psychosis by attending physicians. The lesions to the spinal nerve centers and umbilical centers were described as follows:

. . . there would be consideration given as to the lesions along the cerebrospinal system. The first we find in the upper cervical areas—base of brain, or first and second cervical; next in the areas about the secondary cardiac plexus, or the 2nd, 3rd and 4th dorsal centers; and then the lumbar axis. With the removal of these—by removing the pressures caused [in the spinal nerve centers], and THEN the care for the system that there is less and less NECESSITY for the sedatives or hypnotics to produce greater congestions, and then the alleviation of the lesions in the lacteal duct center and the lacteal duct as combined with umbilicus center—we will make for greater or better gradual coordination and alleviation of the causes of the spasmodic reaction—or the petit mal (or the grand mal that it would become, unless these corrections as indicated are considered necessary). As we find, these would BEST be administered in the Still-Hildreth institution; where the conditions will be cared for that are the SOURCES of the disturbance.

Prognosis

With proper treatment, a guarded prognosis of “much nearer to normal conditions” was given.

Then we would relieve the disturbances, and we find that the system would respond to more sympathetic reactions, and in six to nine months make for much nearer to normal conditions—rehabilitating the mental and physical reactions, and bringing almost to NORMAL coordination between the nervous systems.

Treatment

1. Referral to Still-Hildreth Osteopathic Sanatorium
2. Spinal Adjustments
3. Abdominal castor oil packs
4. Colonic irrigation

The osteopathic treatment of the spine appears to have been addressed effectively, but the abdominal castor oil packs were probably not given as prescribed in the readings. A report from the attending physician at Still-Hildreth commented that they have been applying “olive oil” packs. A letter dated 3/29/39 from Edgar Cayce to the Still-Hildreth physician reminded him to use castor oil packs, rather than olive oil packs. Nevertheless, the readings insisted on continued care at Still-Hildreth:

DO NOT remove the body from this environ [Still-Hildreth], but do INSIST that these be carried out fully as has been indicated.

(Q) How often should the Oil Packs be given?

(A) As indicated, sufficiently often to gradually break up those adhesions through the areas about the gall duct and the lacteals. Whether this requires every day for a year, or once a day or a week—DO IT!

Outcome

In his review of this case, Dr. Pahnke notes:

While undergoing the Cayce treatments at the Still-Hildreth Hospital there was some improvement in the epileptic condition but not in the psychotic. However, for the first part of the hospitalization it was not clear that the patient was receiving any more than osteopathic treatments. Later the full treatment was supposedly given.

A report filed by the attending osteopathic physician at Still-Hildreth stated:

At the time she left the institution her condition was improved, but still occasionally had seizures; however, they did not influence the mental attitude as much as they did in the past. I am sorry this case did not make a complete recovery but we are glad to report there was some benefit during her stay. Sincerely yours, [signed] F. M. Still, D.O.

A letter from the father dated 5/25/40 reports that she had been moved to another institution (Brattleboro Retreat of Brattleboro, VT).

Comments

There are several interesting aspects to this case beginning with the brain pathology and surgery that apparently produced lesions along the spine and abdomen. The modern medical corticocentric model of epilepsy could explain how brain pathology could produce peripheral symptoms. The production of multiple lesions (that in themselves could produce aberrant nerve impulses resulting in epileptic seizures) goes well beyond any mainstream medical models of seizure production (but is consistent with the numerous Cayce readings' descriptions of etiology and pathophysiology in epilepsy). It is also representative of the bidirectional nature of central and peripheral nervous system interactivity.

Note the likely progression of the seizures from petit mal to grand mal if effective treatment is not provided. Although absence or petit mal epilepsy is generally considered a childhood epilepsy syndrome and seizures generally disappear by mid-adolescence, approximately 10–15% of the children will later develop other seizure types, usually generalized tonic-clonic or myoclonic seizures (Crunelli and Leresche 2002).

The psychological symptoms (with mystical features) is actually not uncommon in epilepsy, but is usually associated with temporal lobe involvement. Furthermore, in the Cayce readings, such paranormal experiences are usually also associated with pineal system activation (beginning with the Leydig gland in the reproductive system) and the raising of the vibratory life force energy called "kundalini" (in the yogic literature—see Appendix A, section 3.1.3). Involvement of the sensory system allows the experiences to become conscious (to some degree or other) as visions or ESP. The comorbidity of psychosis (such as schizophrenia) and epilepsy is well-documented (section 1.7.5.3) and is also noted in some of the cases in this section.

Case 1699

Background

A single reading was given for a thirty-four-year-old female on 10/3/1938. A letter from the woman's father dated 9/6/38 stated: "One

of married daughters [1699] has been afflicted with epilepsy for about two years and so far doctors and medicine hasn't done much good."

Symptoms

Symptoms included "spells" and "spasmodic reactions" with constipation and possible abdominal and genital organ symptoms.

Medical Diagnosis

Dr. Pahnke's review of this case as epilepsy states: "Diagnosis made by inference from the reading and in addition to the father's initial letter gave epilepsy as the diagnosis."

Etiology and Pathophysiology

The pathophysiology was described as a "combination of reactions" involving the genital organs, digestive system, and particularly an adhesion in the lacteal duct area. This (in combination with unhealthy mental attitudes) produced an "UNGOVERNING" of nerve reactions between the sympathetic and the cerebrospinal system in the upper cervical centers leading into the medulla oblongata, resulting in "spasmodic reactions." Although the pineal system is not explicitly mentioned, this is a typical pathological pattern for seizure production in the readings.

There has been rather a supersensitive system, with a weakness towards a disturbance in the pelvic as well as the eliminating systems of the body.

Then, with the conditions where the high sensitive nature was overpowered with the activities through associations as related to the genital reactions of the body, these have produced an overpowering of those conditions in the caecum and the lacteal duct centers.

Thus, with this combination of reactions, owing to the very upsetting conditions that arise with the activity of digestive forces, there is an adhesion in the lacteal duct area.

The removal of this would temporarily relieve the body, but unless the attitudes towards those things are changed as related to the activities of the coordinating of the mental self and body with the genital reactions, there would only be temporary conditions.

The general system, of course, is under the subjugation of those things that tend to allay the spasmodic reactions, through the cerebrospinal contractions that are caused at times; and the UNGOVERNING as it were of the nerve reactions between the sympathetic and the cerebrospinal system in the first of the cervical centers—or through the medulla oblongata.

Prognosis

We find that a great deal better condition may be brought for this body if there is the ability of the mental attitudes to be so changed as to allow same. And as we find, autosuggestion would be the manner through which this might be the better accomplished; combined with the applications for the physical disturbances, which we will give. WITHOUT the mental attitude changed, as we find there may be only temporary relief brought for the body.

Treatment

1. Abdominal castor oil packs
2. Auto suggestion as may be had through hypnosis (to change the mental attitudes towards self, its environs, and its surroundings)
3. Diet: Meats should be almost tabu; rather have vegetables and fruits
4. Enemas (as needed)

Outcome

No information is available as to whether the treatment plan was implemented, and if so, what results were obtained.

Comments

Due to the strong mental/psychological aspects of this case, it might be regarded as psychogenic by modern clinical standards. The differential diagnosis would likely come down to EEG data on brain activity during the “spells” or “spasmodic reactions”—as to whether they were true seizures or purely psychological reactions. The physical pathophysiology (particularly the lacteal duct adhesions with nerve reflexes to the medulla oblongata producing nervous system incoordination) suggests a diagnosis of epilepsy, as noted by Dr. Pahnke.

Case 1784

Background

A single reading was given for a twenty-one-year-old male on 1/6/39.

Symptoms

Symptoms included disrupted sleep (possibly nocturnal seizures).

Medical Diagnosis

The diagnosis of epilepsy was made by Dr. Hudgins, D.O., who gave the patient the treatments suggested by the reading.

Etiology and Pathophysiology

A childhood injury to the lower spine (sacral and coccyx) caused disturbances through the medulla oblongata in association with the activity of the pineal system.

As we find, there has been an injury to the cerebrospinal system.

In the coccyx area there is the lesion in the present. This has prevented and does prevent the coordination between the impulses and the activities. And with the drain this has produced upon the glandular system, we find the abilities for the activities in directing the influences and impulses become disturbing to the body, as well as the recurrent disturbances especially in sleep and when there is the closeness of the higher spiritual forces to the border conditions.

These all as we find work together upon the imaginative forces of the body-physical at times, and thus causing those periods when there is greater incoordination.

As we find in the general physical, from the material-physical standpoint,—these function very well; but without the coordination we find there is the lack of those elements to keep the right balance . . .

(Q) How long ago did the injury occur?

(A) During the third or fourth year—in this experience.

(Q) Was it from a fall, or just what was the nature of it?

(A) It was straddle of something.

Prognosis

Now as we find, the disturbing conditions should have been adjusted long, long ago. While there may be a great deal of help brought to the body in producing a better physical and mental coordination, under the existent conditions this will require time, patience and persistence.

Treatment

1. Osteopathic spinal adjustments
2. Atomidine
3. Dry Cell "B" Battery electrotherapy

This case required nervous system regeneration and rehabilitation over a long period of time:

In the changes as will be necessary, these would run near a [seven-year] cycle of physical change.

Hence as we find, in six to eight months a different application would be necessary, owing to the changes as would be wrought as well as the natural and physical changes to the body.

First we would begin, then, with that adjustment as would greatly relieve those tensions upon the coccyx and the sacral area; so that the disturbances that have been indicated through the medulla oblongata in the activity of the pineals may be nearer in accord.

These should be given about twice a week for three or four weeks, and then left off for a week; then given three weeks again, then a rest period of a week; and so on throughout the period of six to nine months.

Also during each week of rest from the osteopathic treatments, but NOT during the time the treatments are kept, you see, we would take one minim of Atomidine internally, in half a glass of water each morning before the meal is taken. Continue this throughout the period, but only during each week of rest from the treatments, see? This will purify the system.

Throughout the entire period we would also use each evening the very low electrical vibrations. It is best for the body that there be prepared a Dry Cell Battery, with two connections of metal,—

preferably steel bars,—upon wires that would be attached to either pole of the Dry Cell Appliance. Let the body hold these in the hand for about five minutes each evening. Well that the body's feet be placed in water; but be sure the water is in a crock and NOT in metal of any nature.

Do these regularly for a period of six to nine months. Then we will give the changes as may bring the much nearer normal forces for this body.

The long-term requirement for treatment was even included in the recommendations for physician care:

(Q) To whom would you suggest he go for the osteopathic corrections?

(A) Anyone that would be in sympathy with those things being attempted, who will take into consideration the length of time necessary. But do this **OSTEOPATHICALLY**, NOT chiropractically!

Outcome

A report provided by F. C. Hudgins, D.O. states: "He was under my care for the osteopathic treatments for one month. I observed some results but patient stopped treatments." There was no follow-up.

Comments

This case has a definite karmic quality to it (although not explicitly stated as such):

Let the attitudes of those about the body, and those making the applications, be **NEVER** those of censure, but rather that there is given each the opportunity for ministering to a soul seeking its course to its Maker.

It appears to have been a long-standing disorder requiring regeneration of the nervous system and spiritual application on the part of those responsible for this individual. Possible nocturnal seizures might suggest a mystical or metaphysical dimension to the clinical presentation (i.e., as is sometimes present in temporal lobe epilepsy—section 3.2.5.3). This

is reinforced by the pineal system involvement—in this case—effects to the imaginative forces (section 3.2.5).

. . . the recurrent disturbances especially in sleep and when there is the closeness of the higher spiritual forces to the border conditions. These all as we find work together upon the imaginative forces of the body-physical at times, and thus causing those periods when there is greater incoordination.

Case 1836

Background

A single reading was given for a sixty-two-year-old male on 3/2/39. A letter from his wife dated 2/26/39 stated:

He began having spells curious to us and the Dr's about 6 years ago. I have had four Dr.'s with him at different times and none have found his trouble. At first he would go to bed apparently feeling alright and then this would come on him and was not conscious of it when he woke his night clothes was all wet—then he would want to know about himself and would feel alright except weak. He had those kind of spells for three or four years. Now they come on in the day and does not last long. He pops his teeth together and sucks his tongue and wrings his hands—and groans but low.

Symptoms

Initially (for three or four years) he experienced nocturnal “spells” with night sweats and confused consciousness. These transitioned into daytime episodes of briefer duration in which he “pops his teeth together and sucks his tongue and wrings his hands—and groans but low.”

Medical Diagnosis

In his review of this case, Dr. Pahnke noted: “The description made a diagnosis of petit mal epilepsy quite probable. However, no doctor's diagnosis was included . . . ”

Etiology and Pathophysiology

The pathophysiology of this case focuses on lacteal duct adhesions producing the typical epileptic nervous system incoordination that could cause a clot or brain damage if not treated. No mention of pineal system involvement. Note the reference to “an overflow of the nerve impulse through the cerebrospinal system” (i.e., abnormally excessive neuronal activity), which is an accurate description of an epileptic seizure (section 1.72.1).

There having been a disturbance in the lacteal ducts, there has been a disturbance that causes an adhesion in this portion of the body; and at times a drawing in the side (right) just below the liver and gall duct area.

This disassociation causes a breakage in the coordinating of the cerebrospinal and sympathetic nervous system, until there are the tendencies and impulses for an overflow of the nerve impulse through the cerebrospinal system.

And these, unless some measures are taken, may form a clot or a break on the brain . . .

(Q) Is this the cause for the curious spells he has been having off and on for the last six years?

(A) This causes the spells,—the losing of consciousness and the like.

Prognosis

As we find, unless there are measures taken the conditions here may become very serious.

Do these [treatments] and as we find we may aid in ELIMINATING these disturbances. Then, at the end of the twenty to thirty days of following these directions, we would give further instructions.

Treatment

1. Abdominal castor oil packs
2. Spinal massage (away from the head)
3. Diet: No fried foods, no hog meat, especially no sausage

Outcome

No outcome data is available for this case. This man's wife and daughter requested the reading and asked that the man not be informed, so there is a reasonable likelihood that the treatment plan was never implemented.

Comments

The description of the waking seizures ("pops his teeth together and sucks his tongue and wrings his hands—and groans but low") indicates automatisms, which are unconscious (involuntary) repetition of simple actions, gestures, or verbal utterances. Automatisms are usually associated with focal seizures but may also occur during absence (petit mal) seizures (Sadleir et al., 2009).

Late-onset epilepsy is often associated with brain tumors or cardiovascular events, although as many as 25% may not have a clear causation. In this case, the reading warned of the possibility of "a clot or a break on the brain" if the condition were allowed to persist. In this case, the etiology for the brain pathology would have been peripheral.

Also, note that the seizure activity was initially nocturnal. Epilepsy and sleep are closely related (sections 1.7.2.2, 1.7.3, and 1.7.5.1).

Case 1916

Background

The first of six readings (5 physical and 1 life reading) was given on 7/25/27 for a seventeen-year-old female. As part of the background documentation, Gladys Davis noted that "It seems that the parents' main concern was epileptic attacks which had been occurring since the child was four and one-half years old."

Symptoms

Symptoms included abdominal and pelvic discomfort.

Medical Diagnosis

Dr. Pahnke's review of this case indicated "a probable diagnosis of grand mal epilepsy."

Etiology and Pathophysiology

Glandular (karmic) etiology with lyden, adrenal, and pineal involvement mentioned and reflexes to abdominal organs and spine. No lacteal adhesions or castor oil packs mentioned in this case, although some digestive system and elimination problems were noted. Purely pineal system pathophysiology was described with an excellent discussion of nerve reflexes.

These deflections and these pressures as are produced in centers in the body are seen in the first of the lumbar plexus and in the last dorsal plexus.

This began in the early period of the life here, and has grown with the body, and in the changes as have been brought about, these are—in the physical changes of the body—normal for the body; yet with such deflection there comes the pressure that produces to the body in the nerve reaction—especially in the sympathetics—that which gives distress, and gives the excess of the nerve action in the body.

These affect, and are affected in the present conditions through those of the glands as are affected by this pressure, that have to do with the endren [adrenal] glands and with that of the gland [pineal] that operates direct to the base of brain. This in an enlarged condition in the 2nd lumbar and in the 12th dorsal, giving then a spasmodic reaction to the system . . .

Brain forces good. Brain reaction, at such pressure, not coordinating—though not defective . . .

The digestive system very good, **THOUGH** there is often seen, felt—and sometimes the cause of the peculiar contraction as occurs with the digestive system. This a reflex condition. Not a cause, nor is it the direct result of other conditions, than the reflex to the cerebrospinal plexus as is governed through the plexus in the last dorsal plexus and its connection with the solar plexus, which gives contraction to the hypogastric and pneumogastric plexus. Hence the deflections, or the causes of contraction, and the nausea as occurs at periods . . .

In the glands and in the organs of pelvis we find the seat or the cause of those conditions as have been disturbant to the physical

organism of the body. The pressure caused here to the glands, by the pressure in the 1st lumbar and in the lower dorsal, has produced enlargements that bring about—with the contraction of the organs of the pelvis—this reaction, or this regurgitation to the gland in the system lying at base of brain [pineal], extending entirely through the system and connecting with the lyden [Leydig] gland of the pelvis . . .

(Q) What was the cause of this condition, and when?

(A) As a child, or baby—pressure produced by fall here, striking at the 12th dorsal, see? Thirteen to sixteen months. [1/25/72 See husband's ltr. under 1916-5 Reports saying she had skull fracture which required the operation at Johns Hopkins.]

(Q) Why did they have an operation at Johns-Hopkins?

(A) Of exploration, rather than of intent as to the cause of same.

Although there had been an improvement in the condition from the earlier readings, the fourth reading in this series was given on 8/9/29 to address a relapse. There was an addition of May blossom bitters to the treatment plan and encouragement to resume osteopathic treatment of the spine (which had not been fully corrected):

We have the body here, [1916]. This we have had before. Now, changes are taking place in the physical forces of the body. Here we will find an opportunity for the application of those properties as have been given for such conditions, where there is improper coordination of the nerve forces and system through injury, or through that wherein the pineal gland, with its correlation of the cerebrospinal and sympathetic system, do not coordinate. These medicinal properties as has been given in these bitters—May Blossom Bitters—will aid in creating that vibration, with the proper ADJUSTMENTS made—these that have been made have not wholly contacted in the lumbar, sacral, and watch closely there in the coccyx—this hasn't been looked after fully yet . . .

CORRECT those conditions in sacral and look after the end of the coccyx! That isn't being raised properly, and a pressure is created. To give these properties and not relieve the pressure will be to bring on another spasm. Don't do that! Relieve these pres-

tures, and—as it is **RELIEVED**, these properties will assist nature in **BUILDING** that necessary to **HOLD** this in place—see?

Prognosis

Do as given—persistent, consistent—and we will bring about the normal forces for this body in at least sixty to a hundred and twenty days.

Treatment

1. Osteopathic corrections of the spine (last dorsal and first lumbar)
2. Ultraviolet ray treatment over lower spine
3. Diet: mostly vegetables that grow under the ground; no meat except fish or fowl
4. Luminal (medication)—gradually decrease as condition improves
5. May blossom bitters

Outcome

Dr. Pahnke's review of this case states:

The case was classified in group 1 with a probable diagnosis of grand mal epilepsy. The patient received treatment at the Cayce Hospital and while there several convulsions were noted on the record. Follow-up report in 1960 from the patient indicated that she had no more convulsions after 1934. Treatment was apparently followed. This case could be considered an apparent cure.

Comments

A childhood accident to the spine was cited in the readings as a prime etiological factor with no mention of the head injury and subsequent surgery. In fact, the readings stated that the "Brain forces [are] good" describing the problem as more of a functional brain reaction rather than a structural or organic disorder of brain tissue.

The karmic aspect of this case was addressed in the life reading:

In the one [incarnation] before this [incarnation] we find during that period of the history in the land now known as the French.

The entity was then among the household of Louis the 15th, when those were as mad periods in the entity's sojourn, as well as in the development of the continuity of energies rendered in service for others, or for the aggrandizing of selfish interests in the entity and in the affairs of the period in that land. In the name Elois, and as a companion—or as a companion for those companions (for there were both) to the king, the entity lost and gained, and lost, through the experience; for the entity was given much to the gratifying of the desires of the flesh, and of the position of ease irrespective of how it was accomplished, which has brought that harmful condition that is apparent in the entity's present experience. There was the love of the positions that wrought rather the easier way, or ease for self and self's surroundings, rather than being able to meet the vicissitudes and the troubles. In the service rendered under stress and strain, the entity gained; losing most in this experience—and the [epileptic] conditions are manifested in the entity in the present.

The pathophysiology of this case focused heavily on the reproductive system with no apparent lacteal duct involvement. Thus the glands of the pineal system and associated spinal nerve centers (section 3.2.2) were the primary pathological influence in this case—apparently, as part of the karma of the individual.

Case 1980

Background

Two readings were given for this young man between 8/23/1939–10/15/1940. He was eighteen years old when he received the first reading. On 7/31/39 his aunt wrote to Edgar Cayce stating that he had lost a job because of convulsions but the company would give him the job back if he could guarantee not to have any more seizures. He had been to several medical doctors who were not able to provide relief. She provided a list of dates for his spells: "for 1938 are Jan. 3, Jan. 31, June 4, Nov. 4,—In 1939 Mar. 2, June 14, July 3."

Symptoms

Convulsive seizures

Medical Diagnosis

Grand Mal Epilepsy.

Etiology and Pathophysiology

A childhood injury to the coccyx (tailbone) and then later to the area above the lumbar axis caused reflexes to lacteal ducts, resulting in adhesions. Diet and poor eliminations were triggers for seizures. There was no explicit mention of pineal system, but a cold area on the skin over the lacteal duct adhesions (due to decreased circulation) was described.

These as we find are hidden, in a nature, and the causes arise from an injury received some years ago, in the coccyx area, and then a contributory cause later in the area above the lumbar axis.

These caused a slowing of the circulation through the areas of the lacteal ducts, thus producing a COLD area there, that has produced a partial adherence of tissue.

With the activity of the lymph through the area, we find that periodically, when there is the lack of proper eliminations through the alimentary canal, there occurs a reflex to the coordination between sympathetic and cerebrospinal system area; that takes the governing of the impulse, as it were, to the brain reactions; OR a form of spasmodic reaction that might be called epileptic in its nature . . .

(Q) What was the nature of the original accident?

(A) Striking the end of the spine—on bannister.

The second reading stated that the abdominal adhesions had not been corrected:

As we find, conditions appear to be more aggravated; owing to those disturbances which have come about in relation to the adhesions through the intestinal or caecum and the lacteal duct area.

Hence there is more disturbance with the eliminations, more disturbance from the incoordinations in the sympathetic and cerebrospinal system.

Prognosis

If this is allowed to remain, or if there are the attempts to allay by or through the applications ordinarily in such cases (medication), we will not only continue this reaction but cause greater destructive forces in the areas along the impulses to the sympathetic and cerebrospinal centers in lumbar and coccyx area; thus increasing and making more severe the attacks that occur from this deflection of impulse.

Treatment

1. Abdominal castor oil packs
2. Neuropathic adjustment and massage of the spine and abdomen
3. Diet: Plenty of raw, fresh vegetables, little starches or sweets, no white bread or white potatoes

Outcome

In his review of this case Dr. Pahnke noted: "The treatment did not seem to give improvement but from the correspondence it would appear that the treatment probably was not carried out too well. Dilantin was also tried but that did not seem to help either."

Comments

Note the abdominal cold spot and lacteal duct pathology in this case, very typical pathophysiology except no mention of pineal system involvement. Reflexes from the coccyx and lumbar area of the spine were emphasized in the production of seizures.

Case 1994

Background

Three readings were given between 9/6/1939—2/14/1940 for a boy who was fourteen years old at the time of the first reading. A letter to Edgar Cayce from his mother dated 10/18/39 stated:

[1994] was born as you know in Egypt and I was full of albumin before his birth and he was a 30 hr. & instrumental delivery weighed only five pounds and extremely emaciated. Third day almost died and was fed with tubes—& not moved

from cot for 2 weeks. Then cried again. Extreme difficulty with feeding—had a predigested water in all bottles. At 2 years went to Japan where vitamins in food is practically nil. At 5H commenced convulsions and has been in and out of hospitals with the usual encephalograms, one trephining etc. and drugs—until in desperation I brought him home from school in April where he had been, on account of my husband's job abroad, and took him off the 3H gr. of drugs daily which they had seen fit to give him. During the summer he had radionics and adjustments but rapidly getting worse until we went to Dr. Taylor [neuropathic physician] and got your reading. At the present time there is definite improvement, but we are almost afraid to hope too much. With our gratitude and many thanks.

Symptoms

Symptoms included convulsive seizures and constipation.

Medical Diagnosis

Epilepsy.

Etiology and Pathophysiology

Lacteal duct adhesions affected glands in the pineal and genital system, producing "a combination of disturbances."

As we find, the disturbances that cause the irrational activities—at times—as may be termed—arise from influences and forces that produce incoordination, or prevent the coordination between the cerebrospinal and sympathetic impulse.

Hence we have these periods, and these activities which cause the disturbances to the emotions as well as the impulses of activity between the coordinant forces of the system.

As we find, through the lacteal duct center, this is affecting the activities of the glands in the pineal as well as the genital system, and in the **ORGANS** of the body.

Here we have a lesion—in the lacteal duct center.

This is a combination of disturbances, then.

The effect of the lacteal duct adhesions was described as “tissue that may become involved, or has already been involved in producing strain or forming what is similar to scar tissue in the LYMPH circulation.”

Prognosis

Do this [treatment plan] and we will find we offer the better advantageous corrections for this body.

Treatment

1. Abdominal castor oil packs
2. Neuropathic adjustments and massage of spine and abdomen
3. Diet: Avoid any foods that produce constipation such as fats and sweets
4. Avoid drugs as much as possible

There was a problem in getting compliance with the dietary recommendations:

Keep these up, and as we find we may bring the better forces for the body, if there is NOT the tendency to allow the body to break over too much to sweets or those foods that cause a clogging in the lower portion of the duodenum, or about the lacteal center. Keep away from the sweets, and the fats so much.

There was very specific treatment recommendations for the neuropathic adjustments and massage:

And after each of these [castor oil pack] applications (on the days they are given, you see), we would gently but thoroughly massage the area,—especially just below the liver and gall duct, and extending to the caecum area on this right side. This would be done thoroughly, or in the nature as to break up these; making the corrections in the coccyx, the sacral AND in the lumbar axis, as well as in the 10th and 11th dorsal centers. These massages and corrections would be done in a neuropathic manner, or in the nature to break up these lesions.

It will be found that it will be most beneficial, after such applications of the Packs, to give the Olive Oil; then those adjustments

more about the coccyx area, coordinated with the vagus center—on first one side and then the other—close to the upper portion of the collar bone and thorax center, and on the opposite side to the centers about the 3rd or 4th cervical.

Outcome

Apparently, there was some initial improvement, but based on the admonitions in the third reading, the treatment plan was not followed consistently, and follow-up reports are not available for this case:

As we find, there needs to be kept a little closer application of those suggestions which have been made, IF THERE WOULD BE the eventual elimination of the causes, and the proper mental and physical development toward the nearer normalcy. Else, these pressures will continue to deflect the normal coordination between the impulses of the subconscious, as well as the mental self, and the reactions from the normal physical development; thus continuously producing greater warring influences to be dealt with by an already disturbed and troubled mental reaction. The Castor Oil Packs, as well as the massages, SHOULD be kept much closer in outline with those suggestions which have been made,—if the eventual results desired would be obtained.

Comments

There appears to have been some developmental problems with this individual probably resulting from the difficult birth and early childhood abroad. His mother requested advice for the future development of her child. The reply appears to suggest a high level of support will be required and perhaps even some type of institutional care:

(Q) Is it best for him to live at home or away?

(A) This will depend upon the environs and the influences or purposes of the home, and the abilities of those in other environs to cope with or to carry on the suggestions indicated. Where these can be BEST handled is the best environ.

(Q) What sort of life should he have?

(A) As much in the open as practical, and with those things that

are of a building or constructive nature; especially in that of weaving, whether in cloth or in basket making, or of such natures . . .

(Q) Should he be made to learn to read and write again?

(A) These should be created as the DESIRES in the mental self as related to the needs for better communication and associations with others.

Case 2019

Background

A single reading was given for a fifty-two-year-old Catholic priest on 10/6/39. The man provided his background information:

For the past 25 years since my ordination to the priesthood in the Catholic Church, I have been engaged in the work of young missions. About 15 years ago, while at the altar, I suffered an attack that had all the appearances of Epilepsy. There is no Epilepsy to my knowledge in our family. About every 3 to 4 years since that time I have had (at the altar in all cases but one) a similar attack. You can understand life under these circumstances is very trying. The uncertainty of never knowing when an attack will come on makes life very trying. I feel like one caught in a trap. The attack is always preceded by a trembling of the hands and body, which I cannot control. Then follows a period of unconsciousness. Knowing of the amazing gift which is yours, I am asking you to diagnose and cure my case . . . An early answer would be greatly appreciated by one, who has been a constant sufferer from fear these past few years.

Symptoms

Symptoms included " . . . a trembling of the hands and body, which I cannot control. Then follows a period of unconsciousness." Constipation was also mentioned in the reading for this man. "Tautness" over the lacteal ducts was also cited as a symptom in this case.

Medical Diagnosis

None provided.

Etiology and Pathophysiology

Periods of fasting (associated priestly cycles of consecration) produced lacteal duct adhesions, nervous system incoordination, and seizures (a pattern found in many of the epilepsy readings). The solar plexus is mentioned as part of the reflex from the abdomen to the medulla oblongata, where nervous system incoordination produced seizures. An abdominal “cold spot” is also mentioned.

In times back, there were periods when there was a depletion of the physical forces through the lack of supplying full nutriment to the system [fasting]. This caused, in those areas about the lacteal and umbilical plexus, a form of lesion,—a tautness.

Not that it affects, as yet, the liver or the spleen, or even the gall duct’s activity; though eventually, without its removal, it may cause disturbances through that area.

But with the periods of activity [priestly rituals] in which there is the refraining from foods [fasting], this becomes a retro-active condition in the physical force of the body; thus producing a spasmodic reaction in the nerve forces about the area,—causing a reaction through the sympathetic and cerebrospinal center, from the lower portion of the solar plexus center.

Thus there is an inclination for the losing of control of the sensory forces; for it produces, from the reaction, a condition at the 1st cervical, or through the medulla oblongata,—an unbalancing, as it were, of the reflexes to the sensory centers.

This as we find also produces in the general eliminating system the inclinations at times for the lack of proper or full eliminations [constipation].

When there has been, and is, the better or perfect accord in this direction, there is not such a great stress upon this disturbance in the right portion of the upper abdomen,—as has been indicated,—about the umbilical and lacteal duct center. Here we would find, upon examination, a COLD spot.

Prognosis

This is a physical condition that, as we find, may be removed or eliminated; and thus removing from the system the causes of those disturbances, also removing the necessity or cause for fear of ANY nature in relationship to same.

Treatment

1. Abdominal castor oil packs
2. Osteopathic spinal adjustments
3. Vegetable-based laxative (such as Inner Clean)

The very simple treatment plan was laid out as follows:

After the two days of applying the Packs, we would begin then with the osteopathic adjustments,—with particular reference to a subluxation as will be found indicated in the lower portion of the 9th dorsal center, or 9th, 10th and 11th. Coordinate such correction with the lumbar axis and the upper dorsal and cervical centers. There should not be required more than six adjustments to correct the condition. Two of the Castor Oil Packs should be sufficient, but if in the administration of the adjustments it is found that this has NOT relaxed nor removed the cold spot, then apply the Packs again. Then, be mindful that there are good eliminations, or a perfect or full evacuation of the alimentary canal each day.

Note that removal of the abdominal “cold spot” was the criteria as to whether additional cycles of treatment were needed.

Outcome

In a letter dated 4/28/41 this man reported:

I am just in receipt of your letter. Let me state that I am sure my cure is permanent. To say I am grateful to you is only half stating my feelings . . . In my opinion the analysis of the reading covered the condition. Attacks over a period of 9 years which seemed or looked like Epilepsy. They occurred about twice a year for the period stated in my letters, and had all the appearance of Epilepsy. I followed the sugges-

tions in my reading just as outlined, for the period stated in the reading. I have been completely cured, as far as I can judge, after the lapse of almost 2 years. I wish to state my deep gratitude to Mr. Cayce.

Comments

This is, apparently, another case of lacteal duct adhesions (from yet another etiological source—fasting). There was a reflex from the abdomen (via the solar plexus) to the medulla oblongata where nervous system incoordination is produced, resulting in seizures. There is even the abdominal “cold spot” so often noted in such cases.

Alternatively, this case has certain features that suggest a psychogenic source of the “attacks.” This is most apparent in that the attacks most often occurred during a specific religious ritual at specific times of the year. Without modern EEG data, a definitive diagnosis is not possible.

Certainly the Cayce readings were very open to mental and spiritual factors in the etiology of many disorders, including epilepsy. Yet the physical explanation provided in the reading for the connection between the religious ritual and the seizures was that the initial period of fasting that caused the lacteal duct adhesions was repeated in cycles (according to the church calendar) and “becomes a retro-active condition in the physical force of the body; thus producing a spasmodic reaction . . .” Thus, the system reverted to the original dysfunctional pattern that had been established during each subsequent fasting period that was part of the regular cycle of consecration for the priest. Very likely the fear that had grown surrounding this pattern was very stressful and could have contributed to the episodes (or at least acted as a trigger). Stress is commonly associated with seizure activity and has a neuroendocrine basis (section 1.6.3).

With regard to the type of epilepsy this might have been, the “attacks” have features characteristic of focal seizures with impaired awareness. There was an aura (“The attack is always preceded by a trembling of the hands and body, which I cannot control”) followed by loss of consciousness. The readings emphasized that the “sensory forces” in the brain were part of this pathological process, perhaps allowing the conscious awareness of the aura as it manifested in the body at seizure onset (section 1.4.2).

Case 2149

Background

A single reading was given for this adult female on 3/18/40. Prior to the reading, a letter from the son stated that she “had obtained no relief from doctors who could neither diagnose or treat his mother . . .”

Symptoms

Symptoms included “nocturnal fits” with “contraction or spasmodic reaction” especially when reclining.

Medical Diagnosis

None provided in the documentation.

Etiology and Pathophysiology

Apparently, this is a case involving nocturnal “fits” with the typical lacteal duct pathophysiology associated with epilepsy in the readings. A psychopathological aspect was also noted.

In the blood supply we find there are hindrances to the nerve impulses and to the blood flow in keeping a normal balance. This is partially psychopathic [mental]; the greater portion being, however, from the physical standpoint, from adhesions which exist in the right side,—in the area about the lower portion of the lacteal center, and partially a submerged gall duct.

Hence the poor eliminations, and the necessity for cathartics; and with more of the sedatives, more and more disturbances have arisen.

These cause an unbalancing in those areas where the cerebrospinal and sympathetic nerves enter the base of the brain; thus causing a contraction or spasmodic reaction to same,—especially this has been true for the body at periods when reclining. These bring anxieties through the body . . .

(Q) What causes the nocturnal fits from which she sometimes suffers?

(A) As has been indicated.

Prognosis

As we find,—if there will be the administration of these appli-

cations in a CONSISTENT and persistent manner, as we will indicate, we may relieve these tensions and bring about a much nearer normal condition for the body. This will require, as indicated, that there be persistence and patience on the part of the body regarding those desires for certain foods and for those conditions which have allayed in part the nerve tensions.

Treatment

1. Abdominal castor oil packs
2. Osteopathic adjustments of the spine
3. Diet: include Jerusalem artichoke in diet; "keep away from sweets"

Outcome

Dr. Pahnke's report for this case noted: "In follow-up reports, the patient seemed to believe that the diagnosis given by the reading was correct. There was no follow-up report on the results of the treatment."

Comments

A strong mental ("psychopathic") aspect of this case was noted in the reading in addition to the typical lacteal duct pathology in epilepsy. The seizures ("fits") were sometimes at night when the body was reclining. Sleep and epilepsy are closely related (section 1.7.2.2).

Case 2153

Background

Twelve readings were given between 3/23/40–7/28/42 for a young female who was twelve years old at the time of the first reading.

Symptoms

Symptoms included predominately nocturnal seizures during sleep and just before arising in the morning.

Medical Diagnosis

Grand mal epilepsy.

Etiology and Pathophysiology

This is a case involving karma for the daughter and the parents, as

reflected in a strong mental and spiritual emphasis that was a problem, particularly for the mother. At a physical level, lacteal duct adhesions with cold spot pathophysiology was particularly resistant to healing with castor oil packs and manipulation. Although pineal system involvement was noted, no pelvic or Leydig gland problems were noted. The pathophysiological process in this series of readings described a role for the adrenal glands in mediating between the lacteal duct dysfunction through the medulla oblongata to the pineal centers at the base of the brain. At the physical level the disorder began with the following:

. . . conditions brought about by injury [of an unspecific nature] and the high temperature[fever] as produced, with the general conditions of prenatal natures and first causes to the body.

Partially, as we find, this has been a prenatal condition, that has affected—or did affect—the nervous system of the body; which, combined with those reactions caused in the lacteal duct—in the right side, has caused those reactions to the sympathetic system as to prevent at times the perfect balance or coordination between sympathetic and cerebrospinal system. Thus there is caused the spasmodic reaction at the base of the brain, or through those connections where these systems each enter the brain. Hence the incoordination that is produced . . .

(Q) Do any special foods or drinks have a tendency to bring on these attacks?

(A) As indicated, sweets—or carbonated waters [soda pop].

As has been indicated—and should be noted by the masseur or osteopath—the lesions that cause attacks are in the lacteal duct and those areas about the assimilating system and the upper portion of jejunum and caecum. There are NO brain lesions, but there is that which at times hinders the coordination between the impulses of the body and the normal physical reactions—or that break between the cerebrospinal and the sympathetic or vegetative nerve system, that coordinates from the lacteal duct through the adrenals and their reaction to the pineal; causing the spasmodic reaction in the medulla oblongata, or that balance at the base of the brain.

There was a nocturnal pattern to many of the seizures:

(Q) Why have the attacks occurred mostly during her sleeping hours, and just before arising in the morning?

(A) Read just what has been indicated, as to the effect of those properties as were indicated, and what they act upon as from the anatomical structure of the body! These are functionings that are a portion of the activities of the body through such periods of relaxation in sleep, and now it has been brought to be a part of these outward experiences.

The fourth reading in this series contains an important description of the lacteal ducts (generally) and the specific etiology in this case:

Keep these [castor oil packs] up until this coldness AND the lesion in the right side is removed,—which is just a hand's breadth below the point of the rib, or over that area of the ducts.

To be sure, there may be many questions as to the exact area of the ducts, even according to some anatomists for they have changed their ideas of people, and yet people haven't changed a very great deal!

There are, to be sure, lacteal ducts. There are the strings or ducts all through the upper portion of the alimentary canal, or jejunum; but the larger patch or area is that lying just below the lower end of the duodenum, and where same EMPTIES into the jejunum, see? THIS patch is not only an INTERNAL activity but an EXTERNAL, that makes for the production of assimilation.

The adhesions in these ducts here were produced by an excess temperature, which the body suffered at some period when there was too SUDDEN dropping of the temperature (which they may check and find to be correct), and NOT sufficient water, or manipulations, or activity, through the alimentary canal.

This has gradually caused the disturbances to the general breaking of coordination in the nerve systems, and brings about—for this body—the SOURCE of the attacks.

Prognosis

Do these [treatments], being patient, being persistent, and we should bring much help and aid to this body . . .

(Q) If all treatments are followed, what length of time should be

required for results and complete restoration of her health?

(A) Results? A CURE should be had in six months!"

Treatment

1. Abdominal castor oil packs
2. Spinal massage
3. Table salt (on the tongue)
4. Diet: Keep away from sweets and pastries but have plenty of vitamin-dense foods such as raw vegetables
5. Passion flower compound (May Blossom Bitters)
6. Ice at the base of the brain when seizure begins

Here are the instructions for the use of table salt on the tongue (as well as the admonition to avoid anti-seizure medication):

Each evening, as the body is prepared for sleep, put a pinch (that is, between the thumb and forefinger) of plain table salt (dry) on the tongue. Let this dissolve and be swallowed; THEN a drink of water would be taken. Do this once each day, at bedtime. Refrain from sedatives, or ANY of those combinations of the sodas that have been given the body at times (as indicated here) to prevent the violent attacks which have occurred; for if these applications are adhered to as here indicated, they should keep down such attacks.

The use of ice along the upper spine and base of the brain was encouraged to reduce the severity of the seizure, especially the "spasmodic contractions":

Little or no way except close observance may determine as to when the attacks will occur, and there should be someone with the body most of the time—who would be able to see or indicate when seizures would occur. Then a small piece of ice rubbed along the base of the brain, at the 1st, 2nd and 3rd cervical, would cause IMMEDIATE reaction; enabling the body NOT to produce the spasmodic contractions that so often occur with seizures . . .

(Q) Could dry ice be used in any form to keep a cold pack handy for use at any time at base of brain, as last Reading suggested?

(A) Ice in ANY form may be used to allay or stop an attack. But why prepare for attacks? Why not ELIMINATE the causes?

(Q) Is there any way one could be prepared for the attacks, to prevent the falling?

(A) ELIMINATE THE CAUSES! It's just necessary, to be sure, that there be those close to the body, or with the body, to prevent those activities that would cause injury to the body—when or should such reoccur.

This series also contains an excellent discussion of the therapeutic effects of the Mayblossom bitters (passion flower compound) and why the use of sedatives was to be avoided as much as possible:

(Q) Please advise just what the effect is of the Mayblossom Bitters, and what it is supposed to accomplish.

(A) The passion flower effect is upon the sympathetic nervous system. It is to relinquish the congestions that are produced in the attacks of incoordination at the base of the brain, through the flexus as indicated which is produced through the areas along the spine, and in the adhesions in the area indicated.

Those properties in the passion flower compound were given for a reaction, and have had definite effect upon the body. The reaction of these is to the pyloric and the activities of the glandular systems within the functioning of the lacteals, about the gall duct area itself. These have apparently produced greater spasmodic [seizure] frequency. This was to be expected, when there have been those activities under the sedatives to allay same. For, these are as two natures within the system warring one against another; both active upon the same atomic influences within the activity of this portion of the body itself.

Outcome

A letter dated 2/25/47 from Dr. Frank Dobbins states: "The results in her case were very disappointing and to the best of my recollection there was no improvement . . ."

Comments

Obviously, this was a serious case of epilepsy. Usually, cases in which the karmic dimension is emphasized are particularly challenging. A soul lesson is being learned, and the outcome depends upon how much mental and spiritual development is achieved through the process (as well as the physical level of healing).

The karmic aspect of this case was described in a life reading that described the karma of the child but also emphasized that the karma was also that of the parents who were to be responsible for the care of the child:

In giving the interpretations of the records as we find them, these are very much dependent upon the application of the wills of those about the entity, and the obligations as well as opportunities others about the entity have toward the entity. And those responsible for this entity as an individual expression of a soul in this experience, should parallel their experiences showing those opportunities and those obligations with this entity. For, with such a paralleling (through their own Life Readings, you see), there would be a much greater comprehension of purposes as come into the experiences of those who oft are inclined to pass off such disturbances as chance, or as conditions that are unavoidable.

The karma of the individual [2153] was most evident in a recent incarnation, although no specific details were provided with the "self-aggrandizements or indulgences" that were linked to the current illness:

Yet each soul as it visions the experiences, the hardships in the experience of this entity, should realize that indeed each soul meets itself, and God is not mocked but whatsoever a soul soweth, that shall it also reap . . . [thus] the relationships through the material or earthly sojourns may give a vision of the self, and self-aggrandizements or indulgences that find their expression in a physical condition in the experience of an individual entity [2153] who also is reaping that of its own whirlwind.

Before this [present incarnation] the entity was in the land of the present nativity [USA], but closer to those activities about

the founding or settling of the land. Then as Marjorie Desmond, the entity was active in the associations with many, as to relationships which excited the fires of the physical being of many. Thus the inability in the present of coordinating the emotions with the mental attributes. But, as indicated, those who are now responsible for the entrance of the entity into this material plane were those who were then responsible in the greater measure for the lack of exercising due consideration to the activities, and allowed same in measures for the greater material gains. Consequently they, too, in the present are meeting much that may be overcome in this experience.

Note that in that past life as Marjorie Desmond the individual “excited the [lustful?] fires of the physical being of many” while the irresponsible parents “allowed same in measures for the greater material gains.” Although the exact nature of the “self-aggrandizements or indulgences” of the daughter were not spelled out, the parents apparently gained financially from the situation. Hence, it was their karma as much as their daughter’s that was being met in the modern incarnation. During the question and answer portion of the reading, the current conditions were addressed:

(Q) Have her past experiences anything to do with her present physical and mental condition?

(A) As indicated in that given.

(Q) Has the condition of the body for the past ten years had any effect upon it physically and mentally?

(A) Necessarily, these have not been—nor are they yet—coordinated . . .

(Q) What effect has destiny on the present appearances?

(A) This depends, as indicated, upon the application of those who have brought the entity into its present environs; and the greater DESTINY may be according to how well there is the application of the obligations due the entity.

The karmic aspect of this case (for the parents, as well as the child) became a very practical matter in the application of the treatment plan:

For, as has been indicated for the body, not only in the physical reactions but in its life's span, **THIS** should be a developing period for **ALL**—through the administrations made, in **PATIENCE**,—yea, in anxiety and suffering; meeting those things that are a part of the consciousness of each.

(Q) Does the mother's attitude, or hesitance in full belief as to the ultimate cure of the child, retard the treatment in any way?

(A) This can best be answered by the mother. For, the body is very sensitive, and grasps and gathers the attitudes of everyone about the body; the anxiety as well as the doubts and fears.

(Q) Is there any special attitude the mother can take that will help the body recover quickly, and completely?

(A) **DO NOT** be inconsistent, nor be too overanxious, or **AS-SUME** attitudes not conscientiously felt . . .

(Q) Would it be satisfactory to continue—

(A) (Interrupting) You see, it is not that there are just so many treatments to be given and they can all be gotten through with and that's all there is to it! **NO** application of **ANY** medicinal property or any mechanical adjustment, or any other influence, is healing of itself! These applications merely help to attune, adjust, correlate the activities of the bodily functions to nature and natural sources!

All healing, then, is from life! Life is God! It is the adjusting of the forces that are manifested in the individual body.

These directions as we have indicated take these conditions into consideration.

Then, there must be periods of reaction of the bodily forces, the bodily functionings, the bodily response to influences without and within; and then the necessary attuning again and again.

The **BODY** is a pattern, it is an ensample of all the forces of the universe itself.

If all the rain that is helpful for the production of any element came at once, would it be better? If all the sunshine came at once, would it be better? If all the joy, all the sadness in the life experience of an individual were poured out at once, would it be better?

It is the cooperation, the reaction, the response made **BY** the individual that is sought. Know that the soul-entity must find in

the applications that response which attunes its abilities, its hopes, its desires, its purposes to that universal consciousness.

THAT is the healing,—of any nature!

The theme of “healing ALSO in the minds and purposes of those upon whom the body is dependent” was emphasized again in a later reading as a partial explanation for why the physical healing was “apparently slow”:

As we find, while conditions are apparently slow,—as we have indicated,—DEFINITE changes are taking place. As we see from the physical reactions, the seizures arise now—the greater part—during the rest periods.

Then, there needs be used this as a channel of change of expectancy in the attitude of those ABOUT the entity as RESPECTING the final outcomes,—as relief from the disturbing conditions, see?

For, this has been touched upon before,—that there is to be a healing ALSO in the minds and purposes of those upon whom the body is dependent in the present for the seeking FOR corrections in a spiritual and mental manner; that the physical expression may be the greater channel for manifestation of the spiritual laws.

Then, this indicates the general PHYSICAL condition is improved; but that there must be kept this same attitude and this constant development for better expression from the physical to the mental and the spiritual, as well as the attitudes of THOSE ABOUT THE BODY; leaving off doubt and fear; and there will be brought aid.

(Q) Why has not the body responded as indicated in Rdg. of last August that she would?

(A) As indicated here, while there has been improvement there has NOT been all of the attitudes, all of those things that are a necessary part of the treatment for the improvement. When that information was given, it was precluded that what was suggested would be done in the manner indicated by ALL concerned . . . And so long as those attitudes are kept that are necessary in the

relationships to those about or responsible for the body, there are better conditions. When there is any resentment, or emotional or material upset, there is an irregularity to the tendencies—and irritations arise. These find a reflection in the activities in the body as indicated.

Thus “resentment or emotional or material upset” on the part of the parents was reflected in the mental and physical condition of their daughter. In summary, the treatments were provided for a little over two years. At several points in the process, the readings noted there was gradual healing occurring at the physical level, but that patient and persistent application would be required—as well as a healing of a mental and spiritual nature within the parents themselves (as part of their karmic healing). Thus, healing of the karmic aspect of the condition (for all concerned) appears to have been lacking, resulting in disappointing results at the physical level. This aspect of “Multidimensional Healing” (McMillin, 2002) is the basis for soul development as assessed by the “Healing Questionnaire” developed by Meridian Institute:

Soul development was added to the *Healing Questionnaire* because many of the Cayce readings explicitly referred to this form of healing in a way that was not included in the other types of healing. Cayce insisted that the context of the human experience is that of the soul making its way through eternity, finding its way back to the Source. The various experiences along the soul’s journey, whether health or illness, are opportunities for soul growth and development.

With regard to the multidimensional nature of soul development, healing often involves family members and caregivers. In numerous cases, Cayce asserted that the healing process was as much for caregivers as for the identified sick person. In a reading for a young man with epilepsy, the caregivers were told, “Let the attitudes of those about the body, and those making the applications, be never those of censure, but rather that there is given each the opportunity for ministering to a soul seeking its course to its Maker.” (1784–1) Thus, healing can be a spiritual initiation for all involved. (McMillin, 2002, p. 4)

Case 2292

Background

A single reading was given for a twenty-nine-year-old woman on 6/29/40. She was operated on for appendicitis five years previously. Apparently that's when the trouble started.

Symptoms

Symptoms include "fainting spells," abdominal pain, and pain at the base of the brain and back of the head.

Medical Diagnosis

Dr. Pahnke's review of this case noted: "The convulsions were described as 'fainting spells.' The reading gave cause as abdominal adhesions, causing the spells plus pain. An operation was advised."

Etiology and Pathophysiology

As an after-effect of appendectomy, adhesions ("knots") were created in the area of the caecum. These became a tumorous growth. Reflexes to the back of the head produced fainting spells and pain.

As we find, conditions are gradually growing rather serious for this body. Where there has been a mass of adhesions, this has gradually taken that turn for growths within themselves, through a partial circulation passing through same. These pressures upon the nervous system have caused the intense pain, especially if the body has for any period been upon the feet or active.

As soon as there may be the preparations for same, we find that these had best be removed through operative measures. Though it may necessitate transfusions, under the existing conditions, we find that this is necessary if there would be the corrective measures so as to be any period of relief.

There has been a period when this might have been corrected without operative forces. Conditions in the present warrant, and will necessitate such measures, if there would be the full corrective forces for the body.

To be sure, this is to be the abdominal operation, and is about the caecum and a portion of the right ovary . . .

(Q) Has this become of a malignant nature as yet?

(A) There would not be the position or condition in which there would be the possibility of full corrective measures, if it were malignant.

(Q) Any special preparation necessary for operation?

(A) This is to be under the supervision of those who would do the operating; hence it should be carried on in that way and manner.

(Q) How soon should the operation be performed? Is it advised immediately?

(A) As soon as the body is prepared for same, so that the coagulation of the blood supply is sufficient. For, this growth will continue,—and is getting to be more and more disturbing to the whole system. Do not let it become such as to attach itself too much to other portions, or in its reaction become of a destructive nature. Watch the temperature and the pulse.

(Q) To what are the adhesions due? What has produced this growth?

(A) Some of the knots that never dissolved,—and there are those conditions which should not have been left there.

(Q) Will the removal of this growth relieve the incessant pain in the head?

(A) As given, this growth is the CAUSE of the pain,—hence the removal will relieve it.

(Q) Does this also produce the fainting spells?

(A) The upper portion of this, where it is beginning to be more attached, causes the fainting spells. These came on a little bit later than the headaches, or the pain through the abdomen and through the back and base of the brain.

Prognosis

Do these things, as we find, if we would bring the better forces for this body.

Treatment

1. Abdominal surgery to remove tumorous growth near caecum.

Outcome

It is not known whether the surgery was performed and, if so, what was the outcome.

Comments

This brief reading did not discuss any of the typical pathophysiology for epilepsy (i.e., reflexes to the medulla oblongata, incoordination of the sympathetic and cerebrospinal nervous systems, pineal involvement, etc.), although such could have been present. The intent was very focused on getting immediate surgery. The reading noted that, normally, abdominal adhesions could be removed without surgery (i.e., castor oil packs), but that the condition had gone past that point and become a tumorous growth (not yet malignant) that would require immediate surgery to prevent a more serious outcome (spreading and becoming malignant).

In a modern clinical setting such a case could probably be diagnosed easily using imaging technology if the clinician focused on the right side of the abdomen instead of the pain in the head and loss of consciousness. Naturally, use of the term “fainting spells” in this case immediately brings to mind the possibility of syncope as a source of the attacks. The apparent association of surgery to remove the appendix and epilepsy is noted in the epilepsy literature (Gastaut & Poirier, 1964—see section 1.5.3.1) The location of the abdominal pathology in this case is an area where adhesions are noted in many epilepsy readings where reflexes to the brain result in seizure activity.

Case 3057

Background

A single reading was given for a fifteen-year-old female on 6/24/45. A letter from the mother prior to the reading stated: “[3057], our daughter, does not coordinate properly, altho she does not fit into the general pattern of a retarded or defective mind.”

Symptoms

Convulsions and musculoskeletal incoordination due to developmental disorder were described.

Medical Diagnosis

Not provided.

Etiology and Pathophysiology

This is a case of karma in which convulsions were part of the larger complex condition of developmental disorder. As with many cases of epilepsy in the readings, the origin of the convulsions was from the lacteal duct area, which produced *incoordination* in the brain. The general condition (being karmic) naturally manifested early (during gestation) due to calcium deficiency that prevented normal development.

The incoordination indicated in the limbs is from the lack of elements, or of calcium of sufficient nature in the body, through the periods of gestation.

The developments that have become a part of the constitutional outlook, or the outward physical activity of the body in varied periods, are the result of those things in which the entity is meeting itself.

Pathologically, there is the lack of certain elements that go to make up stamina in nerve reflexes in the spinal cord as well as along the sympathetic nervous system . . . Thus there has been the inability of the body to overcome this reflex that occurs from a lesion in the lacteal duct area . . .

First, physically, as indicated—there was lack of certain elements through the period of gestation. Now these find their expression in the lack of ability of the nerve flexes to create in the system that which would keep counter-balanced to environmental forces, as well as the spiritual and mental purposes of an individual entity . . .

(Q) What causes the convulsions?

(A) The inability of the cerebrospinal and sympathetic systems to coordinate impulses to the flexes of the brain. This takes place from a convulsion that begins in the lacteal duct areas.

(Q) Why does she have such a fear of falling?

(A) This is part of its karma—for it made many others fall far!

Prognosis

While from many angles the convulsions make the condition appear hopeless, as well as this inability of coordination in the muscular and structural portions of the body,—we find that much may be done to meet these conditions. Though the distresses may not be entirely alleviated, they may be changed—as to intent and purpose, if the spiritual and mental life experience of the body is considered in the applications of a material nature that may be made . . . Do these things, being patient and persistent, and we will find help; not a cure, but all who touch—or all who try—will find a blessing.

Treatment

1. Relaxing massage
2. Wet cell battery alternating gold and silver solutions
3. Suggestive therapeutics during wet cell battery session
4. Well-balanced diet with calcium supplement (Calcios)

The use of positive suggestion to reprogram the mind during the wet cell treatment was to be of a conversational nature (natural hypnosis) rather than a formal hypnotic induction:

Then, as to the matter of the psychological [karmic] effect upon the body: This requires patience, persistence. But through the period of following these applications, let there be someone that would stimulate the mind to look definitely for a manifestation in the body of the spiritual promises made to the children of men. And let the conversation be such to the body. Thus it should be done at the same period each day, and for thirty to forty minutes—during the time the Appliance is being used.

Outcome

No data is available as to whether the treatment plan was implemented or any outcome that may have resulted.

Comments

The karmic aspects of this case were laid out at the beginning of the reading:

As we find, there are many phases of existence to be taken into consideration, in giving that as might be helpful for this body, [3057] not merely the pathological conditions that exist but as to how—from the spiritual and mental phase of existence also—the body now called [3057] is meeting its own self; as well as the effect of the character of conditions presented as problems for those responsible for this entity—and the opportunities—that the administrations for physical and mental welfare of the body present to these bodies, as well as those that may be influenced by them. These, then, are karmic—or cause and effect; psychological as well as pathological.

As with most karmic conditions, the mental and spiritual are emphasized as a means of soul development, and the outcome is not measured by merely material measures of success.

Case 3082

Background

Two readings were given for a twenty-five-year-old male between 7/3/43—12/22/43. The man's wife provided this background:

My husband has, for several years, had attacks that are now being treated as epilepsy, altho at the onset of the symptoms about 6 yrs. ago were thought to be due to a deficiency of blood calcium. The treatment he is now under [Dilantin Sodium and Phenobarbital combined 3 times a day] has, for the last 8 months, controlled the symptoms. The last attack was suffered while at work and any future attacks might subject him to greater danger and permanent injury or worse . . . He has been treated for a blood calcium deficiency.

Symptoms

Severe headaches and stomach ailment preceded and followed the convulsive attacks, which may be triggered by overeating. "Occasionally there is a sudden brief blankness of mind at irregular intervals and this is noted several weeks before the attacks, and in periods of concentration."

Medical Diagnosis

Epilepsy.

Etiology and Pathophysiology

This case contains an excellent description of lacteal duct pathophysiology with lacteal duct adhesions, castor oil pack treatment, and neuropathic adjustments. The pineal is cited, as well as the role of the lymphatics, in the pathology. Note that the abdominal cold spot over the lacteal duct is present during the seizure (as it begins). There was also mention of a cold spot over the hypogastric center. The convulsions were caused by improper lymphatic flow (through the lacteal duct and also at the base of the brain).

As we find, in many respects conditions are very good. But the administrations [anti-seizure medication] that have been made for the reactions through the nerve center to the head, when the body has these convulsions, are gradually building a bad condition through the activity of the alimentary canal—as well as the reflexes in brain, to the activity of glands relating to the pineal . . .

In some time back there was an injury to the side of this body, in the right side below the liver, where a lesion has formed in the lacteal ducts—through a portion of duodenum and through the alimentary canal.

The lesions affect, especially, the emunctory and lymph centers that control these in the area just at the lower edge of breast bone.

When these reactions come—which are gradually builded as bursa, and then as a flow through the congested area—a contraction is caused to the center at the base of the brain, where the lymph and the sympathetic and cerebrospinal center activities enter the brain.

Thus we have loss of memory, as a reaction, and then a contraction of the muscular forces about the head and through the upper portion of body.

First a tremor is caused through the body. At the time a very cold spot may be found at the lacteal duct—the main lacteal duct center. Also there may be found then a cold spot at the hypogastric center.

Thus the contractions are caused, as there is the flow of this lymph through the congested area—or the creation of the bursa and the attempt to eliminate same through the system.

As we find, there should be the application of heat, followed by a gentle massage to these bursa, to break up the lesion in the lacteal duct center. This is about a hand's breadth from the navel center to the right, and two fingers up on the body from that point,—that is, the congested area.

Of course, this has something to do with the lack of proper digestion, at times, and the over amount of food that is required at times.

Also the assimilations are being affected by the sedatives that are a part of the administrations in the present . . .

(Q) What causes severe headaches and stomach ailment which follow and precede these attacks?

(A) As indicated, it is the filling of those bursa, and then the pressures on the nerve system at such times.

(Q) Does strain of the eyes have any importance in occurrence of a convulsion?

(A) This, of course, tires the body, but is not a cause. As indicated, the cause is a lesion in the lacteal center—that causes the bursa in the ducts through the areas indicated to become filled.

After each [castor oil] Pack have a massage, neuropathically given. These should be scientifically given, else we may injure those areas by the type of pressure that should be used to break up the lesions, where there is the filling of the bursa that are a part of the lacteal duct area, as to produce pressures on the brain centers, or to the sympathetic and cerebrospinal system that forms the heaviness and the filling at the base of the brain . . .

(Q) How can the body know when the bursa fill before an attack comes?

(A) Why let the bursa fill, if you do just what we have indicated for you may keep them from filling! You will know they are filled by the series of nervous spells that occur.

(Q) Is it advisable to discontinue Dilantin Sodium Capsules?

(A) Gradually do this, as indicated for the body; not all at once, but let them get farther and farther apart if possible.

Prognosis

Do these things, and we will bring bettered conditions for this body, [3082].

Treatment

1. Neuropathic treatment
2. Abdominal castor oil packs

The recommendations for neuropathic treatment were detailed:

These [conditions] may be materially aided, in the relaxings, through the means of a NEUROPATH who understands how to follow these nerves along the frontal portion of the body, as well as along the centers where cerebrospinal and sympathetic coordinate in the spinal area. This would be not so much on the spine itself as at those centers indicated,—the 1st, 2nd and 3rd cervical, 4th cervical, 1st, 2nd and 3rd dorsal, and the lumbar axis, and the coccyx center—especially on the right side of the coccyx areas. These areas relaxed, we should prevent these contractions occurring again in the body,—especially when the lesion is removed, or when the bursa are released—and kept released—in those areas indicated.

About every other day, then, we would first relax the body by applying wet heat, as from heavy toweling or the like wrung out of hot water and applied over these areas, until there is a thorough relaxing of the body—followed by the neuropathic massage, you see, as indicated. After the body is thoroughly relaxed, these applications may be made once a week, until those periods every two or three months, or three to four months apart, when these bursa fill.

Outcome

The neuropathic treatments were never obtained. A letter from the wife dated 7/10/44 stated:

After many months of silence from us you will no doubt be surprised that we are still intent on finding a physician or other person who can cooperate in carrying out your plan

of treatment for my husband, [3082]. His last reading was given in December, 1943 and since that time no treatments have been given. We are very much handicapped in our present place of residence in securing the help we need in carrying out the instructions.

Another letter from the wife dated 9/1/71 stated:

We were deeply troubled at the time [of the readings] by his condition and prospects for much of a future seemed remote indeed. The readings—given by Edgar Cayce gave us much hope and inspiration and helped us to keep going. Even though we were never able to obtain the services of a neuropathic physician as recommended, we did the best we could to carry out what parts of the treatment which we could . . . Over the years the attacks which concerned us gradually abated and he has been free of them for about eight years.

Comments

Both of the readings for this case were given near the end of Edgar Cayce's life when he was overwhelmed with requests for readings. So the readings are relatively brief but very focused on the pathology and treatment. Some of the clearest and most succinct information provided on pathophysiology and treatment of disease (of any type) is found in these late readings (before Cayce's death in 1945). In this case the description of lacteal duct pathology is exemplary but also unique in at least one respect. The convulsions were caused by improper lymphatic flow (through the lacteal duct and also at the base of the brain). Whereas most cases involving lacteal duct adhesions were associated with nerve reflexes to the medulla oblongata, in this case it appears to have been simple mechanical pressure within the lymphatics that produced the nervous system incoordination at the base of the brain.

The description of the seizures suggests focal seizures with impaired awareness (possibly of temporal lobe type) due to the presence of auras (the headaches and stomach ailment that preceded and followed the attacks). The "sudden brief blankness of mind" is a feature of absence

(petit mal) seizures, but in this case they appear to have been more of a premonition or aura preceding the attack. Perhaps there was a mixed nosology in this case or the seizure types evolved over time, as is sometimes the case in epilepsy.

Case 3156

Background

Two readings were given between 8/14/1943–4/22/1944 for an eight-year-old boy. A letter from his grandmother (who requested the readings) dated 4/28/43 stated:

Since he was five, he has been subject to epileptic attacks, some in the night, often in the daytime. About once a month or six weeks he will have a bad attack causing him to lose consciousness for a few minutes—the more frequent attacks are light, just a sudden twitching all over and drawing up of the facial muscles. He is extraordinarily bright mentally, reads everything and has a marvelous understanding of many things beyond his years. His mind is overactive and he can't relax. For a year he has been on a special diet of fats, no starches or sugars [ketogenic diet], to form a natural sedative, but it does not seem to have helped much. He has been kept out of school this past year, his food carefully weighed, 1800 calories per day, and everything possible done to help the condition. This diet was recommended by Johns Hopkins, where my daughter took him for a check-up. Regular physicians have not been able to help him. We know of no cases in the family history.

Symptoms

Seizures (both nocturnal and during the day) sometimes produce loss of consciousness but more often are light with “sudden twitching all over and drawing up of the facial muscles.”

Medical Diagnosis

Epilepsy.

Etiology and Pathophysiology

The readings for this child cited karma for the child and parents. The two brief readings noted the typical lacteal duct etiology with reflexes to the pineal.

As we find, there are conditions that disturb the physical, the mental, and the soul entity. This we find is a prenatal condition; and must be met by the body as well as by those responsible for the body [i.e., karma].

It should not be delegated too oft, then, to someone else to administer those influences in the body-physical or mental for the correction of the disturbance.

We find that there is a lesion in the lacteal duct area affecting the activities of the pineal gland; causing those periods of incoordination at the 1st and 2nd cervical, causing spasmodic reaction to the mental body or those losses of hold on self, or the control of the rational body-mind . . .

The rest of the body we find responding very well. Brain reflexes are good. At times, as indicated, there are some reflexes to the organs of the sensory system; the eyes hurt the body, the hearing is not so keen after some of these spasms.

Prognosis

The prognosis was guarded and linked directly to the shared karmic responsibility of the parents:

We will bring help if there is persistence and if, in the lives of the mother and father, there is consistent living of that they pray for.

Treatment

1. Abdominal castor oil packs
2. Osteopathic spinal adjustments
3. Diet: "keep away from too much starches"
4. Pre-sleep suggestions by the parents that there will be no recurrent condition of the spasms
5. Salt on tongue

Here is the explanation for the use of salt on the tongue:

With the beginning of these treatments, should there occur during the day one of the spasms, put a good big pinch of dry salt on the tongue—no water but the dry salt. This will relax the body quickly, and should—with these treatments—bring the body out of such lapses.

Outcome

The grandmother reported:

My daughter—the child's mother—followed the instructions religiously for six months. There was slight improvement but [3156] continued to have attacks . . . For the past year he has been taking dilantin, two capsules one day and three the next, and is free from the attacks. But the dilantin affects the gums, which have grown down over the teeth in a most disfiguring way and seriously affecting mastication.

Comments

There was no life reading for this individual, so details about the nature of the karma (for the child and parents) is not available. The typical pattern of epilepsy etiology and pathophysiology is present in this case (lacteal duct adhesions and pineal system involvement). Note the mention of sensory system symptoms (vision and hearing) which can be associated with epileptic seizures (section 1.4.3).

Case 3210 Background

Two very brief readings were given between 9/12/1943—11/21/1943 for an eleven-year-old boy. A letter from the father dated 8/20/43 stated:

[3210] has been having convulsions for ten years. He was born a normal baby and was very healthy until he was ten months' old when he suffered his first attack. There is no history of epilepsy in our family and, while we have been unable to locate the source of his attacks (after many trips to good doctors and hospitals) we still believe there is a cure for his trouble. Brain examinations (by means of air and electroencephalograms) have failed to show a brain lesion

and the supposition is that his trouble lies in the chemical make-up of his blood—possibly improper functioning of his glands and other body functions. Just where the trouble lies and how to go about correcting same, however, is still just as much a mystery as was the case ten years ago when we began our search that has carried us to more than seventy doctors. The boy's attacks average about one per day and last approximately one minute; he can spell about thirty-five words and count but cannot make any progress in his learning. Our impression is that his brain is unimpaired and if a cure for his condition could be found, that he would be a very intelligent boy.

Symptoms

Convulsive seizures averaging about one per day (one minute in duration) were described.

Medical Diagnosis

Dr. Pahnke's review of this case concludes: "The diagnosis would seem to be mental retardation plus petit mal or psycho-motor epilepsy."

Etiology and Pathophysiology

The brief readings for this case simply pointed out a karmic etiology manifesting with typical lacteal duct pathology.

We find that these seizures, these convulsions, arise from definite lesions in the area about the lymph and emunctory pockets about the digestive system. Apply, then, the Castor Oil Packs over the area about the lacteal ducts of the right side. This would include the whole liver area even to the caecum on the right side, extending to the navel center . . .

(Q) Have the continued convulsions brought about any material injury to his brain?

(A) The giving of certain drugs brings more deterioration than the convulsions, as yet.

The sources of these disturbances should be as much of a problem, not so much as to cause too great a concern but to know

that these are for those responsible for the body as well as for the body itself. Hence these are karmic . . .

(Q) What originally caused our boy's convulsions and what is continuing to cause his convulsions and mental dullness?

(A) As indicated, karmic.

Prognosis

. . . these are very serious attacks. These conditions have reached those proportions where they will become more serious unless there may be applications that will enable the administrations to keep away from so many sedatives.

Treatment

1. Abdominal castor oil packs
2. Osteopathic or neuropathic massage first, then later adjustments
3. Diet: Keep away from sweets and fried foods with more foods carrying iodine (sea foods)

Outcome

Apparently the treatment plan was not applied. A letter dated 4/11/61 from a minister at the church attended by the family stated: "Only this morning [[3210]'s father], a vestryman, spoke of having taken his son to [Edgar Cayce] for diagnosis. They did not accept his diagnosis of intestinal trouble and THIS PAST WEEK have discovered, after so many years, he was right!" No other follow-up information is available for this case.

Comments

The karma of the parents (as well as the child) was emphasized in this case:

But the attitude of the parents, too, is to be in that direction of making the paths straight; for themselves first, and for him—as to his purpose in the earth.

Apparently the parents were more focused on faith healing with little or no interest in applying the physical treatments for their son's condition:

It is true that healing of body, of mind, of the effects, can be accomplished in faith alone. Yet, as in every individual experience that is a manifestation in the earth, there is the physical and the mental to be dealt with.

Case 3302

Background

A single reading was given on 10/19/43 for an eighteen-year-old female. A sister commented: "[3302] can't walk or talk—has had convulsions since 2 years old—been taken to many doctors—no one knows the cause."

Symptoms

Convulsive seizures and lack of normal mental and physical development were noted.

Medical Diagnosis

The review of this case by Dr. Pahnke stated: "This is probably another case where epilepsy was complicated by mental retardation, because at the age of 18 the patient still could not walk or talk. This was apparently due to birth injury."

Etiology and Pathophysiology

This is another case involving karma and a serious developmental disorder associated with the convulsive seizures. Naturally the inclination is to look to the brain for the source of the seizures, but as with most of the cases involving seizures in the readings, the source was traced to abdominal lacteal duct adhesions.

As we find, there are disturbances that may be helped; though some of these conditions are karmic and must then—be met in the individual self.

These arise from mental and spiritual conflict with the flesh. The manifestations become in the form of adhesions and lesions that were produced from an injury received when the body in this experience was quite young.

The administrations of various natures that have been given

have at various times worked hardships upon the mental control of the body. During those periods when the changes came about—from twelve to fourteen—better experiences were had. These suddenly changed, for the [seven-year] cycle at fourteen would not remove those disturbances in the areas where re-creation in glandular forces would create normal physical beings. Thus shadows again overcame the body. These became suddenly more violent—and these lasted a while, then the change wrought helped momentarily (in a life experience) or for a few periods at the time . . .

(Q) What was the nature of the injury received?

(A) This was during birth.

Prognosis

(Q) Is it possible for her to be able to walk and talk?

(A) It will be if these massages and applications are made.

(Q) Is it possible for her to become normal?

(A) It is possible. The probability depends upon the sincerity. Don't grow weary of well-doing in making the applications here suggested. Because it may require the whole period of a [seven-year] cycle, don't grow weary with it but do it—and it'll be worthwhile for all.

Treatment

1. Abdominal castor oil packs over the lacteal duct and caecum area
2. Abdominal massage
3. Passion flower compound
4. Medication as needed for a time

The seriousness of the condition and responsibility for a long period of treatment was impressed upon the family:

It will be necessary for a time to continue to administer the sedatives, but unless this treatment we will outline is to be carried through exactly as given, don't begin it.

Outcome

No follow-up reports are available for this case.

Comments

It is significant that even in a case involving such a serious developmental disorder, apparently abdominal lacteal duct adhesions were a primary factor in the production of convulsive seizures (rather than a brain disorder as one might expect). As a late reading, it was very brief and to the point. If the parents had chosen to commit to a long-term treatment plan, a regenerative regimen (including electrotherapy with the wet cell battery, etc.) might have been advised at some point.

Case 3426

Background

A single reading was given on 1/3/44 for a twenty-three-year-old male. Information provided by an aunt prior to the reading states:

He had an illness when a child—they thought it was meningitis, but he got alright and had no trouble until this condition developed 2 or 3 yrs. ago when he went into the Army. For no apparent reason he just ‘folds up’, doesn’t remember anything—about a year ago he was medically discharged from the Army, though he has not received any papers officially yet. They apparently think it is a form of epilepsy. He is quite nervous at times, but otherwise there is nothing to indicate that a spell will occur.

Symptoms

He was very anxious; “folds up” and loses consciousness with no memory of the event afterwards.

Medical Diagnosis

In his review of this case Dr. Pahnke stated: “There is a good chance that this case was petit mal epilepsy, from the description in the correspondence.”

Etiology and Pathophysiology

This late and very brief reading focuses on a coccyx (tailbone) injury as the source of the problem. No lacteal duct pathology or pineal system involvement is mentioned.

Now as we find, there are definite disturbances that are causing many of those unusual reflex activities to the mental body as well as the organic reactions that become disturbing to the body.

These are produced from an injury to the coccyx end of the spine. This has formed a reflex in the brain center that makes for the disorders, lapses of the activity—almost amnesia, but it is not altogether of that nature—merely the semblance of same at times . . .

(Q) Does exertion bring on my trouble?

(A) Yes, activities—for it brings about greater pressures on the whole cerebrospinal nervous system.”

Prognosis

If these pressures to the coccyx are corrected, we find that those conditions will disappear that have occurred in various other portions of the body, in reflexes to the activity of organs.

Treatment

1. Osteopathic or chiropractic adjustment of the spine
2. Radio-Active Appliance (during meditation)

Outcome

No information is available.

Comments

The coccyx injury formed a reflex in the brain center responsible for the unspecified symptoms throughout the body. Many readings describe the diverse and varied effects resulting from coccyx injuries, as noted in this excerpt from another reading:

There are then, as we find, in the NERVE SYSTEM subluxations existent in the lower end of the spine, in the coccyx area . . . most any condition may arise from injury or swelling or plethora (as more of this is here) than from most any portion of the body, unless in the head or brain itself. 577-1

Case 3438

Background

A single reading was given on 12/1/43 for a five-year-old boy. A letter from his grandmother dated 11/25/43 stated:

Prior to last August, [3438] was a healthy, normal child. In a period of 3 or 4 weeks, we noticed him becoming irritable, extremely nervous short of patience and nasty. Then, these attacks began, very very slight at first & gradually getting worse, although none lasted longer than a minute. His eyes would become expressionless, head turning to the right and his right arm jerking. He is not unconscious, although his mind is sluggish and response slow. He may suffer innumerable attacks in one day, & weeks go by without any. He has been taking sedatives for four months.

Symptoms

During a brief seizure his eyes were expressionless, head turned to the right and his right arm jerked. The reading described it as a "spasmodic contraction."

Medical Diagnosis

Dr. Pahnke's review of this case stated: "From the description of the case given by the grandmother it would appear that this boy had petit mal epilepsy."

Etiology and Pathophysiology

This is another case with a coccyx injury, this time resulting in lesions in the lacteal ducts. It was said to be a karmic situation for child and parents. The seizures were triggered by certain foods (especially sweets and fats).

Here we find there is an injury that is a contributing factor. This, we will find, is in the coccyx and the sacral end of spine. This is more to the left side, and thus a lesion is gradually forming—or a pack—in the right area of the larger lacteal duct center, just below the liver and gall duct area, where there is the first great

quantity of patches of the ducts that drain the chyle as it passes into the activities from the gastric flow from liver, spleen, pancreas and all of these activities.

Then, when there is food taken, or sweets especially, or fats, this causes the spasmodic contraction.

The taking of sedatives will gradually cause this to become heavier and heavier. For sedatives tie-up, contract all of those activities of the general ducts and glands through the system, making the body—the brain forces—dull, heavy, as they react.

Prognosis

“This may be corrected. Do it.”

Treatment

1. Osteopathic adjustments
2. Hot Glyco-Thymoline packs followed by massage
3. Prayer and application by the parents (for their karma)

Here we would correct the conditions in the sacral and the coccyx area by direct osteopathic adjustments, and break up the lesions in the lacteal duct area. Each time before such an adjustment is to be made, apply heavy Glyco-Thymoline Packs with heat, and then massage the area.

The mental/spiritual aspect of application was linked to the parents, ,karma:

Then have a great deal of prayer, and live like you pray. Don't pray that you will forgive, and then say hard things about your neighbor. This is part of the activity of father and mother. These are parts of their karma as well as of this body developing.

Outcome

No documentation is available.

Comments

Due to the pattern of digestive system symptoms preceding seizures,

this case could be considered a form of reflex epilepsy or reflex seizures (section 1.4.4).

The metaphysical perspective underlying the Cayce approach was explained at the beginning of this very brief reading, perhaps due to the karmic nature of the condition and religious views of the family. It represents a “holistic” model that seeks to integrate the spiritual, mental, and physical dimensions of life in a practical way when dealing with serious illness.

There is quite a difference of opinion in the minds of individuals respecting the sources or causes of a disturbance of this nature. Parts of these are tendencies or inclinations, and part are accident. Of course, questions arise, disputations as to those who were physicists, or those who are realists, or those who are spiritualists. But what is needed in all is to coordinate the best in each into spirituality, and we will approach what's needed then for correction of conditions here. When there are such disturbances we as individuals either believe, or think maybe it will happen, or just don't know, that the Book [Bible] is correct. Who healeth thy diseases? Who is life? What is life in the earth? What is it that the physical being uses as its way of animation? He doesn't control it—it was never given to him—it happened—it came into being. Why? If man would think of these and from these points he would get a different vision of the relationship of himself to God and more as to that manifestation of God in the earth in the Christ-Consciousness, manifested by the man Jesus.

Case 3569

Background

A single “life” reading was given on 1/16/44 for a twenty-month-old male child who was adopted by foster parents at birth (apparently from an unwed mother). Questions submitted prior to the reading included: “What causes the spells in which [3569] loses consciousness, and how can they be corrected? Does he have any unfavorable hereditary tendencies which should be curbed? If so, please give advice.”

Symptoms

“Spells” in which there is a loss of consciousness.

Medical Diagnosis

In his review of this case Dr. Pahnke stated: "A diagnosis of petit mal epilepsy seems justified."

Etiology and Pathophysiology

The very brief life reading indicated karma for all involved. Physically, the seizures were caused by a gastric condition produced during gestation, resulting in incoordination between the sympathetic and cerebrospinal nervous systems (as was typically cited in cases of epilepsy).

In giving the interpretations of the records as we find them here, many things and conditions should be taken into consideration; both as that as will apply from those of urges,—latent and manifest from the experiences of the entity in the earth, as well as those of physical aspects as exist in relationship to the body.

There are those tendencies from those of a gastric condition as existed during the period of gestation that are responsible for disturbances existent in the physical forces of the body.

There should be those of corrections made, not only by mechanical application or adjustment; but those of electrical vibrations, where those of the low, wet cell is used as a coordination for establishing those of connections between the sympathetic and cerebro-spinal systems.

Prognosis

But the greater opportunity is to those that may contribute to the entity, meeting its own self in and through those periods of its preparation in mind and in body for those opportunities as await the entity. The spirit here is indeed willing; in the present the flesh is weak. Thus, there must be, through these periods, that dependency upon those responsible for contributing that that they, themselves, lacked in other experiences. When the entity is eight to ten, then may it be given those of its appearances in the earth; and those associations with individuals who may be a part of the experience,—those who owe that to self; and that to the entity. Do something about it!

Treatment

1. Mechanical (probably osteopathic) adjustments
2. Wet cell battery used as Radio-Active Appliance (no solution jar with disks alternated to opposite wrists and ankles)

Outcome

No information is available.

Comments

It is very unusual for a life reading to contain medical information and treatment recommendations. The circumstances near the end of Edgar Cayce's life did affect the way the readings were given (beyond simply making them more frequent and brief).

In those of the records much, of course, depends upon what is to be those administrations. For there is responsibility upon those as are responsible for the entity's entrance into this experience—as to what the opportunities may be for the entity to meet those varied experiences and opportunities as the entity may yet have. These will require some serious considerations.

Case 3606

Background

A single reading was given on 1/28/44 for a twenty-year-old female. A letter from her mother dated 9/22/43 stated:

My daughter, now twenty years of age and married one year, has been afflicted with epilepsy, her first seizure occurring when she was thirteen years of age. She has been taking the usual course of treatment which the average doctor gives, namely phenobarbital and bromides. She has been taking this treatment for about five or six years. The child became moody, attempted suicide on several occasions, was depressed, would tell of incidents that never occurred. Recently, she had occasion to see a doctor because of an eye infection, and the doctor immediately asked her what she was taking, and thought she had come for 'dope'. He talked with her after

being assured that that was not what she came for, and gave her treatment for her eye, also asked her to stop the treatment she had been taking, as it was impairing her health, also her eyesight. She promised him faithfully that she would not take the treatment and to this date she has not taken any medicine, and she says she feels like a different person, she looks better, and in fact is more like she used to be. The doctor told her that 'of course you will jerk and have seizures,' but he seemed to think they would wear off. The child does jerk, but she hasn't been home long enough I imagine to have a seizure, as they usually appear at her menstrual period.

Another letter dated 11/30/43 was more urgent:

As I wrote you sometime ago, my daughter is, as the doctor diagnosed it afflicted with epilepsy . . . May I ask that she be given a Reading as soon as possible, or an 'emergency reading', as she does not want to lose any more time at her work . . . I do want to say, and perhaps it will give you a better idea of the case, that even on her best days her arms will jerk or shake, and her feet also will jerk if she is laying down, and if she is standing at times her knees seem to give way and sometimes she will fall to the floor, and at those times, if she is talking, her conversation is cut off. Now this all happens in just an instant and then she goes on as tho nothing happened, but yesterday morning she was so jerky that she couldn't go to her position . . . Then at her menstrual periods her trouble is more apparent, she may have seizures which last a few minutes, her whole body jerking at the time, and saliva flowing from her mouth, recently she has had as many as three in one day.

Symptoms

Symptoms included jerking, shaking, and loss of consciousness during seizures which were more common in association with her menstrual periods.

Medical Diagnosis

In his review of this case Dr. Pahnke noted: "From the mother's description the diagnosis would seem to be petit mal epilepsy."

Etiology and Pathophysiology

There was a spinal injury (coccyx) just before puberty, which caused lesions in lacteal ducts. The episodes were more common during menstruation.

As we find, there are disturbances that are gradually becoming more and more aggravating to the physical and mental activities of the body. These are very definite as to their sources.

In times back, just before puberty, the body had an accident on skates and the end of the spine—the coccyx, 1st segment—was injured. From this, as there came the menstrual periods, disturbances arose and reflexes to the medulla oblongata have been uncontrolled.

These, then, are not in the form of spasms but the loss of control of the reflexes of the body. To be sure, these occur the more often closer to the menstrual periods; thus in a manner they are associated or connected with same.

We would take those measures to have this [coccyx] segment replaced—don't remove it, but have it placed in its proper position, and correct those lesions that have been formed through the areas of the lower sacra and through the lumbar areas, also breaking up the tendencies for those lesions in the lacteal duct area.

Prognosis

Do these [treatments] and we will relieve this body entirely . . .

(Q) Will this tend to ward off the attacks?

(A) As indicated, it should remove the causes, not only ward them off, but do away with them.

Treatment

1. Osteopathic treatment of spine and abdomen
2. Passion flower tonic

Outcome

No outcome information is available for this case.

Comments

Note that there was no recommendation for abdominal castor oil packs although lesions were noted there. Perhaps the lesions were not well established and could be removed through manipulation.

Approximately half the women of childbearing age with epilepsy experience an increase in seizures around the time of their monthly menstrual period (which may be called catamenial epilepsy).

Case 3688

Background

A single reading was given on 2/22/44 for a six-year-old boy. A letter from his mother stated:

I have a boy who is now six and a half years old. At the age of 2½ in January, 1939 after an apparently normal life, he was suddenly stricken with convulsions. At the outset, the attacks were mild. Then in June 1939 they became quite strong and frequent. He has been hospitalized and observed over long periods of time. The medical profession has given me little if any aid. Various drugs that were administered had detrimental effects on his mentality. On various occasions I have been advised to institutionalize him. But I have worked with him—disregarded the greater part of the medical advice given me, and I have succeeded in giving him mental stability and normal habits. In fact I have reached the point where he can attend the kindergarten. For some five months he was free of all attacks. Suddenly on the 12th of December the attacks recurred and he has since had a few more.

Symptoms

Convulsive seizures.

Medical Diagnosis

Dr. Pahnke's review of this case noted: "In this case there was a his-

tory of convulsions since the age of 2½. The reading describes lesion in the brain center itself and not in the lacteal duct area. The reading did not give too much hope for improvement."

Etiology and Pathophysiology

Brain lesions in this case that was partly karmic, partly birthing accident. Manual therapy and electrotherapy were suggested. With modern neurological resources this might be diagnosed as symptomatic epilepsy.

Yes—we have the anxieties about the body. And well may it be! For here we have an undeveloped reflex from the brain forces of the body. It partly comes from karmic conditions, partly from what might be called an accident at the time of birth.

For there are lesions through the brain center itself. Thus there is quite a variation as to how the reflexes react with the body. For there comes certain cycles. All portions of the body come under varied cycles as changes are wrought. For the body fully and completely changes in seven years. Yet this is something continually going on, and various portions change at various reflex periods. And from astrological aspects (so called) it might be said that it gets about all the good there is in it. For various individuals, under various cycles of course, are subject to changes as they pass through the various periods of the Zodiac. But most astrological reflexes are about three to four degrees or periods off with many individuals, as we have indicated before.

This is not belittling astrological influences, just showing the inconsistency of such at times.

This, however, has much to do with this body, and it will be found that there are certain periods when there is a great deal to be desired in the ability to control the body, in its brain reflexes as well as in the sympathetic nervous system.

Prognosis

These as we find, will bring better coordination and we may eventually bring better conditions for this body. These we would do for six months, and then we would give further instructions . . .

(Q) Can his life be adjusted to a normal, physical and mental one?

(A) Read what we have just given. You can try.

Treatment

1. Neuropathic massage
2. Wet cell battery without solutions (used as Radio-Active Appliance)
3. Suggestive therapeutics during wet cell sessions

Outcome

Dr. Pahnke's report on this case concluded: "There is reason to suspect that the parents did not follow the readings at all."

Comments

The astrological (so-called) influences in this case are interesting from the standpoint of cyclical patterns in the pathophysiology of the case.

Case 3790

Background

A single reading was given on 7/22/26 for a twenty-three-year-old woman. A letter from this woman dated 6/10/26 stated:

I take some kind of spells and the Doctors all say it is Etplectic [epileptic] fits when I take one I chew my tongue and don't no [know] anybody for an hour or two and I have taken them for 3 years and it was a while I would just have 1 a month but now I take 1 about every 2 weeks. I have been married 9 years and am the mother of 5 children.

Symptoms

Seizures with altered consciousness and chewing of tongue.

Medical Diagnosis

In his review of this case Dr. Pahnke noted: "The patient described her epileptic fits as a 'loss of consciousness and chewing of her tongue'. These attacks could very well be Grand Mal Epilepsy."

Etiology and Pathophysiology

This very brief reading presents a case with pineal gland etiology complicated by tonsillitis.

We find there are two specific causes that produce this condition, while there are many minor conditions connected with same. These all must be considered, taken into consideration when those conditions are applied to the body for the correction of physical defects that are of the nature of a prenatal affection [pathology] in the glands that have to do with the equilibrium of the body—pineal gland—that runs through the body, from the base of the brain. The condition that must be met, then, is to create that in the system in the rejuvenation of those portions that go to make up, from the physical standpoint, that atomic force through which each gland, or each organ, rejuvenates or rebuilds itself. Then, as the nature of the condition is seen, the necessity of a consistent and a persistent application, with all conditions considered, would this be overcome.

Prognosis

Now, we find there are those abnormal conditions with the body that may be assisted, and that these same conditions may be eradicated, were those conditions followed out in a persistent and consistent manner to overcome this physical change necessary to prevent the re-occurrence of this incoordination as exists in the body at times . . . Do this, and we will find that by the end of the ten months we will be free of these spells and conditions.

Treatment

1. Surgery to remove tonsils
2. Diet: Principally fruits and vegetables
3. Maypop tea (bitters)
4. Violet ray electrotherapy

First in the treatments, REMOVE THE TONSILS, see? Operation. Then build the system to a general health condition through the diet, which should consist of a very mixed diet—principally

of vegetables and fruits; as much GREEN as is possible for the body to assimilate.

Taking (all of this to come after the operation, see?) those properties in medicinal manner of Maypop Tea or Bitters, see? that as is prepared in the same way, or that as may be prepared in this manner: Take Maypop Root and the Maypop Bulb or Fruit when just ripe—the root and the fruit at the same stage, see? To 6 ounces of the root and of the fruit add 32 ounces of distilled water, and reduce to 16 ounces, see? by simmering. Strain off. Cool. Then add sufficient of the alcohol to preserve same, which would be, to the 16 ounces, 6 ounces of the grain alcohol, see? The dose would be (and this must be kept constantly taken for at least ten month), 4 times each day, teaspoonful in half a glass of water, before each meal and before retiring.

After these have been taken for two to three months, begin then with the Violet Ray. Especially apply this each day to the base of the brain, or the center or seat of gland, see? Following the whole track, which is down the cerebrospinal system to those glands situated in the lower portion of body, or in and about the genitory (genital?) organs. Following the system, however, along the cerebrospinal system, down each side, which rejuvenates, especially, those branches of the sympathetic nerves that connect in their various forms to the various organs as are affected by the sympathetic system, and as are centers for the functioning of the ductless glands, of the reproductive glands, within system.

Outcome

No outcome information available for this case.

Comments

The pineal system dysfunction was described as a “prenatal affection [pathology] in the glands that have to do with the equilibrium of the body—pineal gland.” Although equilibrium could refer to a literal physical balance (since the main branch of the pineal system is in the lower portion of the cerebellum)—in this context it probably has a more general meaning of systemic coordination (of nerves and glands) that is an integrative function of the pineal system, especially with regards to

epilepsy. In the Cayce readings the activity of the pineal is also closely tied to fetal development, rejuvenation, and the building of the body. Thus, the meaning of equilibrium also suggests the ability of the body to maintain itself through "that atomic force through which each gland, or each organ, rejuvenates or rebuilds itself."

The "prenatal" designation naturally brings to mind the possibility of a karmic condition, perhaps manifesting through heredity. The pineal system dysfunction was one aspect of the dual etiology with the tonsil problem as the other condition to be dealt with. *Tonsillitis* can trigger seizures in children. In this case the implication was that it was a contributing factor in this woman's epilepsy and needed to be addressed to prevent a "re-occurrence of this incoordination as exists in the body at times."

Case 4678

Background

Two readings were given between 7/26/1926–9/21/1926 for a nine-year-old girl. A letter from the parents dated 7/30/26 stated: "She has been having convulsions for almost three years apparently caused from something she had eaten and sometimes from acids in the kidneys. She cannot digest anything she eats . . ."

Symptoms

Symptoms included kidney dysfunction and convulsions triggered by eating.

Medical Diagnosis

Epilepsy.

Etiology and Pathophysiology

Injury of the spine (C1) at birth affected the glands (pituitary and pineal) preventing proper development of the child. The pressure at C1 affected the pneumogastric nerve and influenced blood flow to the brain ("overflowing"), resulting in relaxation and contraction to nerve centers throughout the body. There is an interesting discussion of the pineal nerve in its course along the spine and through the system.

Now, we find that which produces the abnormal conditions in this body has to do with specific conditions that have existed in the physical body since the birth, for at that time there was an injury to the 1st cervical that, as the body has developed, the impaired condition, by the improper distribution, especially to that of the pituitary gland, has prevented the full-normal development in every manner, so that the equilibrium in the action of the nerve system in the system has been impaired, and this causes these conditions in the body that occur when the body is unable to keep its equilibrium.

Now, these are the conditions as we find them in this body.

IN THE BLOOD SUPPLY, this shows the heaviness for one of its age and development, produced, principally, by the impaired condition that exists in the plexus of the pneumogastric by this pressure in the 1st cervical.

The nerve system shows the strain as is brought to all centers by this inability of the system to keep its equilibrium, see? That is, when this condition of blood supply to the brain becomes overflowing, or over pressure, all the centers in nerve system relax, or contract, according to their own inflection from conditions under which that plexus is operating at the time such occurrence takes place. Hence, in this condition there are taut conditions along the spine, from the base of the brain to the brachial plexus. There are relaxed conditions in many frontal muscles, from the waist line down, see? Taut conditions in arms, drawing in all of those of the sensory system; affected at times, apparently, by eating; at others by those of the digestive system, or of the kidneys. ALL of these show how that this central nerve, from the pineal gland, runs through with the cord, as it were, in the spinal system, running outside, though, the spinal cord itself, though connected with same at the base of the brain and to the brain itself.

Without the correction, then, of this condition as has existed there from the time of the birth of the child (for, as we see, it was presented wrong when it was born), we will find that, were those properties given that submerge the condition, we create that which will take away from the mental development of same; though we find in a mental fashion the developments as normal, or super-

normal, in some of the same age and same development.

Prognosis

We will find this body will be brought to the normal, will persistence and consistence be kept with these conditions—be met as the conditions arise, see?

Treatment

1. Maypop tea (bitters)
2. Osteopathic or neuropathic adjustments
3. Diet: Easily digested foods of mostly fruits and vegetables but not too much of apples or bananas, beet sugar rather can sugar
4. High enemas to cleanse the colon

The treatment rationale for the herbal tonic was given as:

. . . the Maypop is for the nerve system and for the blood supply, as is hindered by the improper incentives through the connection between the glands at the base of the brain and the hypogastric nerve center, which governs the digestion and the assimilation in portions of the system) . . .

Outcome

A letter from the mother dated 12/20/26 stated: "Our little girl is beginning to show signs of great improvement at last. We are giving her treatments three times per week . . . "

In his report of this case Dr. Pahnke noted: "There was improvement after the first reading and more after the second reading. Instead of 5–6 attacks a day they dropped to only two per week within three months. However, three months after the second reading no more follow-up reports were obtained."

Comments

This case could be regarded as a form of reflex epilepsy (or perhaps simply epilepsy with reflex seizures) based on the background information and comments in the readings. The description of pineal system anatomy and physiology is interesting. Possible association of the pineal system with the pneumogastric (vagus) nerve in causing an

overflow of blood to the brain was noted.

Case 5232

Background

A single very brief reading was given on 6/8/44 for a twenty-five-year-old female.

Symptoms

Symptoms included convulsive seizures with lapses of memory, particularly before menstrual periods.

Medical Diagnosis

A letter dated 5/23/44 from Dr. George stated that this was a case of grand mal epilepsy.

Etiology and Pathophysiology

This case involved karma and a lesion to the coccyx area (tailbone) with tendencies for adhesions in the lacteal ducts.

Yes, as we find, there has long been a lesion in the coccyx area of the cerebrospinal system. There are the after-effects of shocks to the system. There are the results of indiscretions of parents of the entity. These are, then, partially karmic conditions. But if there are the spiritual attitudes and aptitudes, the breaking up of the lesion in the coccyx area and those tendencies for adhesions in the lacteal duct area, the relaxing in the upper cervical areas, these gradually worked together, osteopathically, these as we find can change the periods of these convulsions, lapses of memory, lapse of coordinations.

Prognosis

And keep the breaking up of lesions until we establish the better coordination. This will produce better conditions for this body.

Treatment

1. Osteopathic adjustments
2. Passion flower fusion

There will come 1 or 2 very severe periods with some of these changes. When these occur we would administer a heavy fusion of Passion-Flower. That would be the fruit, the leaves, the vine, a gallon by measure. Put this in a 2-gallon container and fill with water. Reduce by slow boiling to a quart and a pint. Add sufficient grain alcohol to make a preserving of the solution; then this would be strained off, of course, or filtered off. When there are those close periods, and these will come just before the menstrual periods, for two or three days give a teaspoonful, night and morning, see?

Outcome

In a reply to a questionnaire dated 9/26/49, Dr. George reported: "Duration of treatment, 8 months. Result of treatment, cured. When last heard from, 1 year ago, she had been free of seizures for nearly 4 years, and had had another child in that time. I consider this a helpful sign."

Comments

The coccyx injury/lacteal duct adhesion pattern is present in this case. It is interesting that no castor oil packs were prescribed, although there were only "tendencies" for the lacteal duct adhesions. So perhaps that aspect of the pathophysiology had not become firmly established so that correction of the coccyx lesion was sufficient to allow the system to come back into balance. This was an extremely short reading given near the end of Cayce's life.

Case 5234

Background

A single reading was given on 6/15/44 for a twenty-five-year-old male. Comments from his mother just previous to the reading state:

The trouble is no doubt due to the accident he had when he was 3 years 9 months old. He was run over by a street car and dragged 75 feet before it stopped. One doctor at Duke Hospital advises operation to remove scar tissue from the head and putting in metal plate. Could not do that when he

was a baby, as his head hadn't stopped growing . . . He has regular epileptic attacks, loses consciousness at times quite often. At other times goes 6 months without having them.

Symptoms

Epileptic seizures with loss of consciousness.

Medical Diagnosis

Epilepsy.

Etiology and Pathophysiology

By modern medical classification this would probably be regarded as symptomatic epilepsy produced by accidental brain trauma—thus not “true” (idiopathic) epilepsy. Brain surgery was recommended.

As we find, there are conditions which prevent the better physical functioning of this body. As we find, there are some outside influences which have caused, to a portion of the brain, an adhesion or lesion, that under stress, as too much of certain foods or over-taxation, prevents the normal reflexes by that pressure produced where this scar tissue or adhesion produces a pressure on a portion of the brain. It is upon that portion of the medulla oblongata that this pressure is caused. These, then, are not epilepsy, though there is some similarity in the character of the seizures. But it is not true epilepsy. Thus operative measures might bring conditions which would remove the fear of, as well as the sources of, these pressures. These we would have accomplished. The effects may be kept more quiet by refraining from too much sweets, getting over-excited or taking any foods or drinks which cause any spasm to the diaphragm, that is a part of the brain flexes through sympathetic reactions . . .

(Q) Any physical activities which would aggravate his condition?

(A) It is more mental. Whenever the body gets mad or gets thoroughly disappointed or gets aggravated, these bring on such disturbances.

(Q) Will this condition eventually affect my mentality, causing me to be less alert?

(A) It already affects in this direction and this manner. Yes, of course, it prevents the full or complete reaction from sympathetic or from the imaginative system, see?

(Q) Is there any nerve severed?

(A) No nerves severed. These are, as indicated, fractures and adhesions and a thickening of the capsule, and this upon the flexes in the lower portion. Look for it there. This should show a thickening with the shadowgraph.

Prognosis

(Q) Would this operation affect a complete cure?

(A) As just given, it should remove the sources of these pressures which come from flexes and reflexes which occur with the body.

Treatment

Brain surgery at Johns Hopkins or Mayo Clinic was recommended.

Outcome

No follow-up reports are available for this case.

Comments

The brain injury was to the lower brainstem (medulla oblongata), which is so often discussed in the epilepsy readings as a primary location for nervous system incoordination triggered by peripheral pathology and afferent nerve impulses. In this instance, the pathology was limited to that area of the brain but could be triggered by peripheral irritation. So even in a case of brain injury in which surgery was recommended, the pathology and treatment was subcortical rather than cortical.

Note the observation that the condition (if allowed to progress) would cause further decline in his mentality, causing him to be even less alert. This would be due to the effect on the sympathetic nervous system, which the readings also called the "imaginative system" or greater impulsive system of the soul and spirit forces within the body (sections 3.2.5 and 3.3.4).

Case 5379

Background

A single reading was given on 7/25/44 for a ten-year-old female. A verbal background report was given by the parents to Gladys Davis on the day of the reading, stating:

Born at 7 months and weighed about 3 pounds. Raised on buttermilk. Doctors didn't hold any hope for her. When she was about 4 or 5 years old she would have shaking spells that would come on in the morning. Attended by Dr. [...] from birth. He said she would outgrow this condition. August 1943 she was found unconscious in bed from a spell—convulsion. Dr. [...] at ..., Virginia didn't know just what to do. Talked to Dr. [...], brain specialist and took her to Richmond to Dr. [...], also brain specialist, who found nothing wrong with her brain. They tapped her spine and still found nothing harmful. After this she had headaches for about two weeks—doctors told the mother this would wear off in a couple of weeks. When she has these spells she gets tickled and nearly goes into hysteria . . . Took her to Dr. [...] in Norfolk who said he could cure her—that something was wrong in her spine—upper part—said that she had been injured when she was born. Didn't follow through with this suggestion from him [a chiropractor]. She went to school until September 1943. Couldn't attend after this, due to spells. Has had about 10 bad spells when she would lose consciousness. Falls out when there is any excitement, or when she touches anything hot, or when a door slams. Has these spells several times a day. Getting constantly worse.

Symptoms

Symptoms included seizures with contractions, spasmodic reactions, and loss of consciousness triggered by excitement, startle reflex, or touching anything hot. She would get "tickled and nearly goes into hysteria."

Medical Diagnosis

(per Dr. Charlton, M. D.): 1. Epilepsy. Grand Mal 2. Hysterical seizures
3. Anxiety Reactions

Etiology and Pathophysiology

A childhood coccyx injury produced lacteal duct lesions with reflexes to the medulla oblongata, resulting in seizures.

Now, as we find, there are disturbances in the developments of this body. In some time back there was an injury to the end of the spine so that the coccyx end of the spine is turned in to the side and this causes the conditions which develop in the right side, especially in the area of the umbilical and lacteal duct, and these at certain periods will increase unless corrected because the spasmodic reaction is to the medulla oblongata, the larger nerve center in the base of the brain, which causes contractions and spasmodic reactions . . .

(Q) Did this condition come from injury at birth or just what caused it?

(A) She was set down too hard.

Prognosis

Do these and we should bring corrections for this body . . .

(Q) Any advice to the parents in aiding the child?

(A) Don't be impatient. Do follow through. You have a great soul here.

Treatment

1. Osteopathic corrections
2. Abdominal castor oil packs
3. Diet: No quantity of sweets at any time; include leafy vegetables but not too much fats

As we find, we would first begin and remove the lesions which have been and are indicated existent in the lacteal duct area. We would have these corrections for the spine made osteopathically by such as Ober [Vincent H. Ober, D.O.].

Then use Castor Oil Packs over the gall duct or the right side. Put them on about three thicknesses of flannel, then apply electric pad or heavy salt heated and then apply over the oil; this should be applied directly to the body. Sponge off the body, after taking this off, with a weak soda solution.

When there are the attacks, until there are the corrections made, hold a cold cloth back of the head along the neck and we will find it will be much easier for the body. But these adjustments and packs should correct these conditions.

Outcome

A verbal report from the mother to Gladys Davis in December, 1949 stated: "The mother of [5379] says she discontinued the treatments because they were so expensive and the Packs so messy, but she thinks the child was helped for a while."

Comments

This is another case of coccyx injury producing lacteal duct adhesions. The reflex triggering of seizures with hysterical features is unique in this case.

Case 5386

Background

A single reading was given on 7/22/44 for a thirty-four-year-old woman. A letter from a sister dated 5/19/44 stated:

She started having convulsions at the age of 31 years. After tests and many weeks spent in hospitals the diagnosis was a form of epilepsy, the cause unknown. The seizures are frequent and the many falls sustained are causing a deterioration of the mind. She is a trained nurse and well aware of the harm being done by the continuance of such seizures. Her outlook is very morbid and the constant drain on Mother's strength is very alarming. We feel that time is a very important factor.

Symptoms

Symptoms included seizures with falling and loss of emotional control.

Medical Diagnosis

Epilepsy.

Etiology and Pathophysiology

This is an interesting case of convulsive disorder that (according to her reading) was not epilepsy. The pathophysiology is similar to some other cases reviewed here with coccyx injury and reflexes to the lumbar and upper cervicals producing stress in the lacteal duct area (but no adhesions mentioned and no castor oil packs prescribed). No pineal system involvement was noted.

As we find, there are disturbances and these cause a great deal of anxiety at periods for this body. These have been brought on by an injury to the body. For at some time back there was an injury to the end of the spine and the pressure which is produced from the coccyx end of the spine reflects to such a nature that at the 1st and 2nd cervical there comes periods when there is not control of the emotions to the brain forces. Convulsions are the result.

These are not what is commonly called the epileptic. True, there is the semblance of same and we find that these are not being controlled in the best manner.

There would be first the correction of the position and the manner in which there is the position of the body in the structural portions more erect, and thus relieve these stresses from the areas in the lumbar and coccyx as well as those conditions produced in the lacteal duct area, and those in the cervicals.

Prognosis

These corrections will bring about changes for the whole body, in posture for the structural portions, and we should bring help for this body.

Treatment

1. Spinal adjustments
2. Passion flower tonic
3. Diet: Keep away from sweets or quantities of foods which too easily remain in the alimentary canal

Outcome

There are two reports on this case. A letter dated 8/7/44 from Dr. Dick (who did the adjustments) stated: "... I have just started with Miss [5386] ... The osteopathic lesions in Miss [5386]'s case were as you said, after her first treatment she said she was able to look over her left shoulder for the first time in three years. She came today to stay at Mrs. Foehl's Nursing Home so would be near me while taking the treatments. ." A letter dated 8/28/44 from [5386]'s stated: "... Through Dr. Dick carrying out the suggested treatments, I have improved vastly in every way. . ."

Comments

Considering the description in the reading pertaining to emotional impact as a trigger for the convulsions, perhaps this could be a case of psychogenic non-epileptic seizures. Yet there is a physical cause (or at least contributing factor) for the lack of control of the emotions associated with the seizures—injury to the coccyx with various nerve reflexes sometimes noted in cases of epilepsy.

Case 5562

Background

Twelve physical readings were given between 2/4/1930–7/28/1930 for a twelve-year-old female. She was treated at the Cayce hospital in Virginia Beach. A simple background comment in her record noted: "Epilepsy apparent since 1921 and for which she had been treated medically to present time."

Symptoms

Convulsive seizures

Medical Diagnosis

Epilepsy.

Etiology and Pathophysiology

Now, we find there are specific conditions as cause the suppressions and incoordination through the system, though this may be termed more suppression than of incoordination; for, were the suppressions and the pressure relieved in the system, we would find that the reactions as experienced by the physical in the nerve system would become the near normal in their functioning . . . for the suppressions have to do with those conditions in the head, in throat, and in the glands of the system. In the GLANDS, this the first cause . . . as is seen in thyroid, as is seen in the LUMBAR regions. These are the centers that are UNDER distress from these repressions. The repression being, then, those in the system that have to do, first, with the glands that supply to the brain forces those of the activity through the sympathetic system. Hence the incoordination. The repression a cause, the incoordination a result. While often we may find, in such conditions, INCOORDINATION the cause and REPRESSIONS of FUNCTIONING being the result. Repression, here, being the cause, and the incoordination the result.

In later readings the following explanation of the effects of treatment provide insight into the nature of the pathophysiology in this case. Note that the incoordination between the sympathetic and cerebrospinal nervous systems is not simply within the brain, but particularly in the nerve centers along the spine:

. . . as the coordinations through the system in those connections as are made by the [osteopathic] adjustments—as will stimulate the proper co-active forces in the lyden [Leydig] and in the coordinating through the lower portion of the brain proper, will bring the bettered conditions for the body. Ready for questions.

(Q) When will attacks lessen?

(A) When closer coordination is made between the sympathetic and cerebrospinal. When will THIS be? That would naturally be the question. Now, as has been explained respecting conditions in the body, in those centers through the pelvis, through the dorsal and through the cervical, where there are direct coordi-

nation centers between sympathetic and cerebrospinal—these, at such times as attacks come, show engorgements, see? Then, the manipulations are to be so subservient—that is, to bring the subjugations to a **NORMAL** reaction. No, that's not wholly explanatory. **STIMULATING** some portions of the system, especially through the lumbar and sacral region, **BRING** a reaction in the upper portion. Then stimulate these, so that when they act **WITH** those of the upper portion, that they coordinate with the sympathetic and cerebrospinal outlets . . .

(Q) How should the osteopathic treatments be given?

(A) In the manner as has been outlined for the body. As has been seen, the coordination of the conditions with this body are as those active forces in the glands as direct the nerve energy between the sympathetic and cerebrospinal system, as they enter the brain, the defective coordinations coming from the genitive [reproductive] system. In the manipulations, when there is too severe treatments given in the upper cervical and not a proper coordinating treatment given in the lumbar and lower dorsal, we **MUST** have then a reverse reaction, very much in the same manner as we have from an electric vibration when there is short circuit, or voltage is in contact with that which **RAISES** the vibration, see? So, when the manipulations are given, give them with the idea, and with the active forces as producing the same coordination in all centers from which sympathetic and cerebrospinal radiate; so that their active forces to the brain will be in coordination.

Prognosis

(Q) How long should it take to bring body to normal if advice is followed?

(A) In six to ten weeks.

Treatment

1. Osteopathic adjustments
2. Ambrosia weed tea (to reduce sugar in the system)
3. Wet cell battery with iodine
4. Diet: Beware of sweets, nuts, and tuberous vegetables. Do not overeat at any time

5. Plenty of outdoor exercise, in the open
6. Mayblossom bitters
7. Bromidia (with Calisaya, Valerian, and Capsici added)

In making, then, the applications for these corrections—these, we would find, should be made through those of the corrective measures, osteopathically given, in the activity of the cerebrospinal system, and **ESPECIALLY** as they relate to the functioning of the organs in pelvis, in digestive system, and as a **COORDINATION** through the hypogastric and pneumogastric as they cross in the system **TO THEIR** activities in brain—the repression then being the active force, that of the **STIMULATIVE WITH** that of the corrective of the cerebrospinal centers would be the treatments. Stimulative first, corrective as conditions progress . . .

(Q) Is it permissible to use Luminal as a sedative when attacks are active?

(A) Use this other [Mayblossom bitters], and let's get rid of the Luminal! It's permissible to use it when **NECESSARY!** Let's make it unnecessary!

(Q) Is Dr. Morrison giving osteopathic treatments correctly?

(A) About one time in three they are correct!

Outcome

A letter from the mother (December, 1930) stated: "I know you will be happy to hear [5562] is better than she has been in twelve years. Just think, Mr. Cayce, she hasn't had a spell in over three months. She looks, feels and acts better than she ever did." No additional follow-up information is available.

Comments

This series provided much information on the pineal system and how it functions through the Leydig gland and nerve centers through the system—especially the coordinating aspect of treatment. The psychological/interpersonal aspect of this case is also fascinating with regard to the dynamics of suppression and repression—and how that plays out physiologically in the production of the incoordination resulting in seizures. For example:

(Q) Are all treatments being given properly?

(A) Treatments as TREATMENTS, purely physical, properly. Treatments as for the MENTAL, for the SPIRITUAL, not in that of the proper relationships . . .

(Q) Would it be well for the mother to go home and leave her alone?

(A) Were she left UNDER the care of one that took the proper precautions; NOT severity, but as one that will—in act, in deed, in thought, in precept—give that NECESSARY for the body; for the body—physical VERY good; the body—MENTAL VERY good, the body—spiritual above normal. Make same COORDINATE! The suppressions in one, and the over excitement or over activity in another, produces the incoordination . . .

(Q) In what way could the mother help her?

(A) Find self first, and apply that in the activities as in aiding the body . . .

(Q) Why is body so irritable with mother?

(A) The suppressions of the body, and the body attempting to find self-expression.

Progress was made in both the physical and mental phases of this girl's condition:

Many changes for the betterment in the physical and mental body. The responses as are being builded in THIS body, from a state of subjugation to that of finding the EXPRESSIONS other than being repressed IN the expressions—but rather being guided, counseled, reasoned with from within, by precept and ensample—is TELLING MOST in the conditions with THIS body. Repression and suppression, as has been given, has been the greater cause OF the conditions being over active, or responsive, during certain periods . . .

(Q) Is it advisable for body to go home for a few days visit?

(A) Would be alright, though the body should not be allowed—This does not mean, by 'ALLOWED', to FORCE an issue—but counselled with, that not too much excitement nor too much undue worry, nor too much—'just go as you please'.

Case 5642

Background

Seven readings were given between 12/31/1926–7/23/1929 for a thirty-one-year-old male. Mr. [5642] provided this background on his condition:

I am a World War veteran and have been given up by some of the best Government hospitals as incurable. I am rated by the Veterans' Bureau as a permanent total disability of 100%. I am an epileptic caused by a compound fracture of skull during war. My case grew worse and worse until present time.

Symptoms

My attacks consist of a few moments of daze through which I retain my consciousness and remember my surroundings and the attack perfectly. The best I can describe it is to say I momentarily lose control of my faculties.

Medical Diagnosis

Epilepsy.

Etiology and Pathophysiology

Most of the readings for this man appear directed toward respiratory and digestive system problems he was experiencing. The apparent seizure disorder was described as follows:

... the inability of nerve centers to coordinate between the nerve system, the brain forces, and the laxness throughout the functioning organs.

A later reading described the effect of nervous system incoordination as a "backflow of blood to the head" producing "dizziness."

Now, we find the physical forces of the body responding much nearer to the normal way and manner, and the coordinating of the sympathetic and cerebro-spinal forces nearly normal. While there are re-occurrence at times of a dizziness, yet the tendency

of the backflow of blood to the head has almost disappeared. With the changing of these conditions, necessarily the body has to gain strength and vitality necessary to PREVENT the re-occurrence of these conditions.

There was no mention of actual organic brain injury in any of these readings.

Prognosis

Now, we find there are those conditions that may be assisted. There are others [the “attacks”] that are of such nature that the effects will remain and be to this body the normal conditions, though abnormal to others.

Treatment

1. For the respiratory system, a compounded medicine (in capsule form) containing Eucalyptol, Canadian Balsam, Rectified Oil of Turp, Benzosol, and Heroin
2. For the digestive system, an herbal tonic containing Sarsaparilla, Tincture Yellow Dock Root, Iodide of Potassium, Elixir Celerena & Tincture of Capsici
3. Spinal massage with olive oil and myrrh
4. Diet: beware of meats
5. Reduce stress and nervous tension

Some general health-related suggestions were provided:

Keep the intestinal tract open. Do not use CATHARTICS for this. Enemas may be taken when necessary. In the diet, beware of meats; for these add to the distresses of the system. Do not overtax self mentally or physically. Keep in the open as much as possible . . .

(Q) Does heat or excitement affect the body? If so, how?

(A) Nervous tension, or nervous condition excites especially the digestive system. Hence keep the body as little from overtaxation mentally or physically as possible.

Outcome

In a letter (March, 1927) from Mr. [], he noted: “I followed your

directions of December 31st, 1926, to the extent of using spinal massages of Olive Oil and Myrrh which were prescribed with very satisfactory results and intend to continue using same . . . Am going to continue it but I should like to experiment with medical prescription [containing the Heroin] which I have not been able to secure." No follow-up data is available for this case.

Comments

This may have been a case of symptomatic epilepsy caused by a war injury (fractured skull during World War I). Curiously, almost nothing was recommended specifically for the epileptic symptoms other than general mental/spiritual advice about dealing with the affliction. There was no mention of brain injury or organic structural problems in the brain itself.

The readings referred to the episodes of altered consciousness as "dizziness," which sounds suspiciously like the "border-land" of epilepsy described by Gowers (The border-land of epilepsy; faints, vagal attacks, vertigo, migraine, sleep symptoms, and their treatment; Gowers, 1907). Remember that this man described his episodes of altered consciousness as "My attacks consist of a few moments of daze through which I retain my consciousness and remember my surroundings and the attack perfectly."

With this in mind, the Cayce approach of relieving respiratory, circulatory, and digestive symptoms (along with stress reduction) while relaxing the spine makes sense, particularly with regards to relieving "the backflow of blood to the head" said to be producing the "dizziness." This could also explain the readings' tendency to downplay (or even ignore) the diagnosis of epilepsy in this case so as not to create a further mental obstacle to be overcome in the healing process.

Case 5736 Background

A single reading was given on 7/8/32 for a thirty-seven-year-old male. The reading was requested by a brother who was present for the reading and who described the problems as "convulsions, intense pain in back—jerking of limbs, etc."

Symptoms

Convulsions were described as including intense pain in back together with jerking of the limbs.

Medical Diagnosis

Not provided.

Etiology and Pathophysiology

As we find, there are specific conditions that are producing disturbances in the physical functioning of the body. These are from hindrances that come in the eliminations in the system, from adhesions that exist from disorders that disturbed the body in some times back. These, as we find, bring about these accumulations in the system, affecting the body in the eliminations, so that poisons being thrown into the system affect first the locomotions in extremities, as in limbs, hands; at others affecting the organs of elimination, bringing disturbances then to the kidney and the liver in their activity. These make for spells of dizziness; at times nausea, and incapacitating the body through the general system.

These conditions, as we find, exist primarily in the caecum area, with the effect extending—by dilation—in the ascending colon; and bring about those acute pains that affect the body at times . . .

(Q) What should be done when he has these spells, or convulsions? What causes this?

(A) This, as has been outlined. These should be applied as given, in that area from which that portion of the system receives its impulse. As across the small of the back, at the base of brain, and head and neck—these, you see, will relieve these PRESSURES that carry these to the impulse in the system. These are produced, as we find, from those POISONS as ACCUMULATE. In times back there was an injury to the body. This first formed the lesion here in this area, and these are concussion reactions—see? of poisons, or pressures in system. CLEANSE the system with these properties as given, USING these when SPECIFIC conditions arise, or in the extremity—whether head, arms, or lower limbs. These will clarify the conditions.

(Q) Is there any brain tumor or brain trouble?

(A) Rather the pressure that exists in the sacral area, as given, or caecum area, that makes a pressure on the sacral. These bring those reflections to the activities of the system. No brain tumor. Rather the pressure.

Prognosis

Follow these [recommendations], and—as we find—we will bring about a bettered condition for the body, [5736] . . .

(Q) Approximately how long will it take, following this, to bring—

(A) That depends, to be sure, upon the response. As given, in at least three courses—which would be in three to four months.

Treatment

1. Torus compound (laxative)
2. Solution of aconite, iodine, and laudanum applied to lower back
3. Hot Epsom salts packs to lower back
4. Diet: Balanced diet with little grease and no fried foods

Outcome

There is no outcome data for this case.

Comments

Apparently, spinal reflexes from a back injury produced seizures. This could perhaps be considered a form of reflex epilepsy (or reflex seizures) associated with severe back pain and autointoxication from the colon. There is a mention of “concussion reactions” from an injury, but it is unclear whether this refers to the brain itself (or from the spine that is producing the reactions). The readings specifically rejected “brain tumor or brain trouble” as a causative factor in this case. Curiously, there is no recommendation for manual therapy (such as spinal adjustments or massage) that would normally be included in the treatment plan for such cases.

2.3 Research Implications

2.3.1 Background

The Cayce readings contain a substantial amount of information

about epilepsy and related conditions (i.e., comorbidities and differential diagnoses). The readings encouraged a strong research emphasis.

Let there be outlined each phase that is to be studied, each phase that is to be a research. It's often stated that the work IS a research and enlightenment program; but how much research have you done? Isn't it presented rather as enlightenment without much research? Then, don't get the cart before the horse! It doesn't work so well!

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This section will review what has been done and suggest future areas of research for consideration.

2.3.2 Previous Research

There are many ways of going about research at various levels. The initial stages usually involve a collection of the available information including a literature review. This may be regarded as scholarly or academic research. With regard to the Cayce material, the readings themselves have been indexed (by topic), assembled into various formats (e.g., circulating files, research bulletins, and condensed into reports). Of note, Pahnke's epilepsy research report (1983) was used as the basis for the case studies reviewed in section 2.2. *The Abdominal Brain and Enteric Nervous System* is a peer-reviewed medical article that includes basic information on the Cayce model of epilepsy and other neurological conditions (McMillin et al., 1999) in a comparative studies context. Likewise, the literature review in Part I of this manuscript is an attempt at scholarly research.

Meridian Institute (Mein et al., 2005) did a basic research project on the transdermal absorption of castor oil from abdominal packs (as frequently recommended to break up lacteal duct adhesions in cases of epilepsy). Looking for possible clues as to how castor oil is metabolized in the system, the study (n=3) measured specific epoxydicarboxylic acids known to be excreted via the urine when castor oil is administered orally as compared to transdermal administrations (abdominal hot castor oil packs). Oral administration of castor oil resulted in high levels of excretion of epoxydicarboxylic acids in all subjects. In contrast, the level of urinary epoxydicarboxylic acids with the external application

(abdominal pack) sessions did not vary from the relatively low endogenous levels of these molecules that are normally present. Castor oil is either not well absorbed through the skin or is metabolized in a way that did not have the effect of significantly increasing the excretion of the specific metabolic byproducts associated with the ingestion of castor oil.

Meridian Institute (1996) conducted a small clinical pilot study to explore the therapeutic potential of the Cayce approach. Three individuals participated in a six-day live-in instructional/treatment program in March, 1996, in which they were taught the Cayce therapies for epilepsy. The therapies included dietary changes, colonic irrigations, castor oil packs, and psycho-spiritual modalities such as prayer, meditation, and purposeful living. The participants then returned home to continue these therapies for six months, submitting daily logs of compliance with the protocol. Epilepsy symptoms were evaluated at the beginning of the program and after six months. One subject followed the protocol consistently and reported improvement in symptoms. There were no adverse effects of treatment reported by any of the subjects in this project.

Two studies have explored the concept of abdominal cold spots in epilepsy as described in the Cayce readings. Meridian Institute collected images of abdominal temperatures using liquid crystal thermography in six persons with epilepsy (exploratory phase) followed up by a more controlled study using infrared thermography ($n=14$). The types of epilepsy varied in each phase of the study. The initial data collected using liquid crystal thermography was promising; however the infrared thermographic results did not support the hypothesis. A detailed report is available on the Meridian Institute website (Meridian Institute, 2004).

A more recent, larger investigation (King et al., 2017) explored the abdominal cold spot hypothesis with positive results. Fifty patients with the diagnosis of focal-onset epilepsy were compared with fifty control subjects with no history of epilepsy for abdominal thermal anomalies ("cold spots"). Under controlled room conditions all subjects had infrared thermographic images made and recorded for analysis:

The results support the hypothesis that individuals with focal onset epilepsy have colder abdominal areas. If substantiated in further research, present study results will require further examination of the

mechanisms of action for epilepsy, and suggest the need for re-examination of older formulations of abdominal epilepsy, including the place of abdominal injury, inflammation, and adhesions in epileptic pathology. The concept of somatovisceral and viscerosomatic neurological interactions is one of the possible mechanisms underlying the “cold spot” findings and warrants further consideration. (King et al., 2017, p. 46)

2.3.3 Future Research

Continued review of the ever-changing epilepsy medical literature as a means of comparative studies to better understand the Cayce information and generate testable hypotheses is a priority. It is a relatively low-cost research plan, and money that is spent on basic or clinical research will be put to best use.

2.3.3.1 Abdominal Thermal Anomalies in Epilepsy

The most obvious area for future research to explore the Cayce approach to epilepsy is the abdominal cold spot. An extension of previous studies would (ideally) address certain specific areas of concern:

- **timing**—because the cold spot was not always present, several readings explicitly encouraged detection of the anomaly immediately before, during, or after a seizure as espoused by Pahnke (1983, p. 137): “This sign [cold spot] was usually only present at the time of the seizure.”
- **population**—the strongest association of the abdominal cold spot in the readings on epilepsy was in cases of “true epilepsy.” The descriptions of this type of epilepsy in the readings is consistent with the historical designation created by Todd (section 1.2.4), which most closely correlates with modern classifications of generalized (from onset) tonic-clonic seizures (formerly called grand mal). Ideally, the population would be drug naive with early onset so as to eliminate possible medication effects.
- **data collection**—some type of noninvasive, mobile thermometry grid that can be attached to the abdomen and worn during seizures would be ideal. The use of thermographic technology that requires a cool room with the patient to be absolutely stationary (i.e., infrared thermography) is not appropriate for collecting data during convulsive seizures.
- **setting**—inpatient video-EEG monitoring is the gold standard

for modern epilepsy assessment and would be ideal for testing the abdominal cold spot hypothesis. The abdominal thermal data could be collected in addition to the regular evaluative process.

2.3.3.2 Autonomic Nervous System Involvement

The autonomic nervous system (ANS) portion of general literature review (section 1.5) detailed the extensive ANS involvement in epilepsy. The expansion of the literature in this area is largely due to the current high level of interest in sudden unexplained death in epilepsy (SUDEP, section 1.5.4.2) and the effectiveness of vagal nerve stimulation as a treatment option (section 1.5.8). Both of these areas of the literature deserve continued monitoring for subcortical and peripheral associations that are relevant to the Cayce material. Additionally, other aspects of ANS dysfunction (such as heart rate variability, section 1.5.4.3) hold promise for exploring incoordination WITHIN the ANS (section 3.3.2). With regard to treatment and prevention of epilepsy, future research involving biofeedback (Nagai & Trimble, 2014) and seizure prediction technology based on ANS activity (Poh et al., 2010) should be monitored. Any ANS-related studies that indicate ANS activity during the preictal period (i.e., suggesting ANS involvement may be of etiological or pathophysiological significance) deserve attention (section 1.5.4.4).

2.3.3.3 Pineal System Anatomy and Physiology

Gaining insights into the pineal system and its components (including the pineal nerve, pineal cord or thread, pineal centers such as the main branch in the lower cerebellum, and the Leydig/Lyden gland as described in the readings) is essential for a full understanding of the Cayce readings on epilepsy. At this point it is a matter of continuing to review the literature for clues that help solve this puzzle.

For example, certain aspects of the work of Michael Levin (e.g., Levin, 2014) bear striking similarities to the readings' descriptions of pineal activity during embryonic development. In particular, the roles of endogenous voltages and ion fluxes as carriers of information regulating large-scale morphogenetic events have some resonance with the role of the pineal system during embryonic and fetal development (section 3.2.2.1). The research involving Reissner's fiber (RF) and the morpho-

genesis of body axis during gestation has a similar resonance (Cantaut-Belarif et al., 2018), as does the more extensive investigations of RF with regard to esoteric traditions and modern physics by Wile (2012). The anatomical proximity of cerebrospinal fluid to the subcortical and spinal components of the pineal system suggests a possible connection with neurogenesis, sleep/wake cycles, and other states of consciousness (Zappaterra & Lehtinen, 2012). With regard to epilepsy, any research into cerebellum involvement (as the anatomical location for the main branch of the pineal system, section 3.2.2.4) is worth monitoring.

2.3.3.4 Lacteal System Pathology

Although further investigation of possible abdominal thermal anomalies in epilepsy (the *cold spot*) is a high priority, basic research into the underlying anatomy and physiology of the lacteal system in humans is important, as well. Such investigations have been done with various species of animals wherein three-dimensional corrosion casts of the lymphatics of the small intestine were made by direct injection of casting materials into a large lymphatic in the submucosal layer, and observed postmortem under a scanning electron microscope (Yamanaka et al., 1995; Fukushima et al., 1998). Because this method is unsuitable for humans, perhaps modern imaging technology can provide similar insights that may be helpful in epilepsy research. Specifically, the distinction between normal healthy lacteal duct anatomy and physiology as compared to possible abnormal (i.e., adhesions) in persons with epilepsy could provide a simple, noninvasive means for ascertaining lacteal duct pathology without the need for thermal analysis during seizures (as proposed above).

2.4 Summary

The Cayce material on epilepsy provides a fascinating alternative to the standard corticocentric model that dominates modern medicine. The readings portray epilepsy as a diverse condition with various types and causes, much as seen in the mainstream model. In contrast to mainstream medicine that concentrates almost exclusively on the brain as the sole dysfunctional organ in epilepsy, the Cayce readings focus primarily on pathology in peripheral systems (especially endocrine glands, the autonomic nervous system, and the abdominal lymphatic

system), which in turn cause or contribute to brain seizures. Treatment options flow naturally from this view of causation and pathology with physiotherapies, diet, and medicine forming the core of the therapeutic approach.

However, even with the strong physical/biological emphasis in the readings, there is also an inherent holistic emphasis that includes spiritual and mental (i.e., soul) involvement in the cause and treatment of epilepsy. The preceding sections have described the *pineal system* as the seat of the soul forces in the physical body—a system that can become disrupted, resulting in epileptic seizures. This aspect of the Cayce approach to epilepsy has correlations with the mainstream medical literature (primarily with regard to involvement of endocrine glands and the autonomic and sensory nervous systems as documented in the Part I literature review). However, for the most part this emphasis falls outside the scope of historical and modern medical views on epilepsy. That is a challenge and an opportunity. For as the readings observe, epilepsy is a disease “that has baffled the wise and the foolish.” That is a totally accurate accounting of epileptology by almost any standard one may choose.

Conclusion

The information contained in the Cayce material represents an alternative perspective that may contribute to a better understanding of the causes and treatment of epilepsy. It is not offered as an infallible source of knowledge or insight, but simply as an interesting body of ideas that can be tested using scientific methodology by researchers and clinicians with an open mind. The material has a fairly high degree of internal consistency, and many of the basic ideas are already in the medical literature (historic and contemporary, per the literature review in Part I).

Most of the Cayce readings were given to provide help for persons suffering from a variety of medical conditions, including epilepsy. Cayce’s psychic process approached a medical condition from the inside looking out, as it were—whereas modern medicine is on the outside looking in. If the Cayce information is valid, the readings may be compared to the *rosetta stone* used to interpret Egyptian hieroglyphics—they contain a relatively modern medical explanation for various physical, pathological conditions in parallel with a metaphysical perspective that

is based on the inner premise of spirit and mind. Not that the Cayce approach is ultimate truth or totally adequate in the clinical sense—but may have some value as an alternate perspective that generates testable hypotheses.





Part Three

Supplementary Resources

3.1 Appendix A—The Pineal—Part 1

The following appendix was originally included in a work titled *The Treatment of Schizophrenia: A Holistic Approach* (McMillin, 1991a). It provides a basic introduction (if perhaps a bit dated) to the scientific literature on the pineal gland and the corresponding information from the Cayce readings. It is presented here to lay the foundation for Appendix B—The Pineal—Part 2, which focuses more explicitly on the pineal system as it relates to epilepsy.

3.1.1 Literature Review

In this initial appendix addressing the pineal, the discussion section will be approached from three perspectives: a brief literature review, Edgar Cayce's view of the pineal, and a look at some contemporary perspectives on the clinical significance of a form of pineal dysfunction designated as "kundalini crisis."

For centuries the pineal gland has been associated with paranormal

phenomena and insanity. Eastern philosophies have tended to view the pineal as an important “chakra” or energy vortex, which, if activated, opened the individual to psychic experiences and cosmic vision (Judith, 1987).

Contemporaneous Western philosophies also attached mystical significance to the pineal:

The ancient Greeks considered the pineal as the seat of the soul, a concept extended by Descartes, who philosophically suggested that this unpaired cerebral structure would serve as an ideal point from which the soul could exercise its somatic functions. Descartes thus attributed to the pineal a prominent function in uniting the immortal soul with the body. Being influenced by this thesis, many 17th and 18th century physicians associated the pineal causally with “madness,” a link that has been uncannily prophetic for the present day. (Miles & Philbrick, 1988, pp. 409-410)

The reference to “unpaired cerebral structure” is an example of one of the many anatomical peculiarities of the pineal gland. The brain exhibits a high degree of bilateral symmetry, a characteristic not shared by the pineal because it is not generally regarded as having left and right divisions. The pineal is a small, cone-shaped gland attached to the posterior ceiling of the third ventricle of the brain, suspended in cerebrospinal fluid. Its location in the center of the brain, combined with its unique proclivity to calcify, make it a valuable landmark for neuroradiologists.

Recognition of the pineal as an active endocrine gland is a recent advancement because the highly sensitive bioassays required to detect pineal secretions are relatively new. Melatonin is the most easily detected of the pineal productions and has therefore received the most attention in current research. Thus, the frequent references to melatonin throughout this review are a reflection not only of its primary biochemical status among pineal secretions but also of its accessibility.

There are numerous anatomical and physiological idiosyncrasies associated with the pineal. “Relative to total body weight the pineal is small (50-150 mg in man; 1 mg in the rat), but its blood flow is second only to the kidney” (Arendt, 1988, pp. 205-206). Morphologically, the

pineal has been considered as a homologue of the “third eye” in certain lizards (Gray’s Anatomy, 1901). The photosensitivity of pineal in humans derives from nerve impulses from the retina and may have a basis in the structure of the gland.

Furthermore, it is interesting to note that some of the pigmented cells were arranged in a rosette-like structure reminiscent of developing retinal structures. When one considers these findings along with the electron microscopic observation . . . it is reasonable to conclude that human pineal glands exhibit transient cellular features reminiscent of developing photoreceptor cells as shown in other mammals. (Min, 1987, p. 728)

The pineal has been labeled a “photoneuroendocrine transducer” due to its photoperiodic influences on reproductive cycles, coat color, coat growth, and seasonal variations in behaviors of many mammals (Arendt, 1988). “Many other seasonal variations both physiological and pathological exist in humans and it will be of interest to consider their possible relationship to day-length and other seasonal synchronizers” (Arendt, 1988, p. 210). Ralph (1984) has reviewed the role of the pineal in thermoregulation and emphasized the “adaptive” nature of the gland.

The key word to understanding the pineal organ probably is “adaptation.” That is, one can argue, with substantial justification, that the pineal organ participates in preparation for future conditions . . . While the literature relating pineal organs to thermoregulation is not nearly as large as that dealing with reproduction, or rhythmicity, it is substantial and compelling. (Ralph, 1984, p. 193)

Pineal involvement in cycles of growth and development during the life span has long been recognized. Pineal tumors have been associated with both precocious and delayed puberty in humans (Kitay & Altschule, 1954; Turner & Bagnara, 1971). Blindness has been linked to earlier menarche in girls, and blind adults also appear to exhibit dysynchronicities related to photosensitivity (Parkes, 1976; Lewy & Newsome,

1983). Melatonin secretions are known to decrease in amplitude from infancy to adulthood (Young et al., 1986) and during old age (Iguchi et al., 1982).

Pineal involvement in circadian rhythms, particularly the sleep cycle within these rhythms, has received considerable attention in recent years. Melatonin secretion increases during sleep and decreases during waking hours (Axelrod, 1974; Arato et al., 1985). Since light both entrains and suppresses melatonin secretion, melatonin has been called a "darkness hormone" (Arendt, 1988). Arginine vasotocin (AVT), another pineal secretion linked to sleep cycles, has been found to induce slow-wave sleep in cats (Pavel, Psatta & Goldstein, 1977) and a specific AVT antiserum markedly increases the number of REM (rapid eye movement or dream sleep) periods while decreasing REM latency (Pavel & Goldstein, 1981). However, the role of the pineal in the modulation of circadian rhythms such as sleep cycles cannot be considered as primary. Rather, it works in conjunction with other systems and has its basis in evolutionary processes.

Among the vertebrates, two areas seem to have assumed major importance in the organization of circadian systems—the pineal organ and the SCN (suprachiasmatic nucleus). The pineal organ of lower vertebrates is photosensory in nature, and it may have been this, presumably ancient, function that caused the pineal organ to assume such a predominant role with circadian systems. Clearly, light is the preeminent entraining or synchronizing stimulus for circadian systems, and the pineal organ may have been involved in the perception of LD (light-dark) cycles. (Underwood, 1984, pp. 245-246)

In addition to being sensitive to variations in environmental light, the pineal appears to possess sensitivity to the earth's magnetic field and various electromagnetic influences.

There is ever-increasing evidence that the magnetic irradiation of a strength equal or approximate to that of the geomagnetic field exerts a variety of behavioral and phys-

iological effects on the organism. Some studies focused on the pineal gland as the most feasible candidate for a mediator of magnetic irradiation on the organism. Such an approach is quite in keeping with the generally accepted concept that the pineal gland plays its physiological role through the modulation of the homeostatic and behavioral responses upon the changes in the living microambient. (Milin, Bajic & Brakus, 1988, p. 1083).

The pineal may also serve as a somatic interface with other sources of environmental energy designated as extremely low frequency (ELF) electric and magnetic-field exposure. Wilson, Stevens, and Anderson (1989) reviewed studies of ELF electromagnetic-field exposure in relation to health risks such as cancer, depression, and birth outcome (e.g. miscarriage, stillbirth). Citing work from their laboratory and elsewhere, which shows that ELF field exposure alters the normal circadian rhythm of melatonin synthesis and release in the pineal gland, the authors present evidence that suggests pineal susceptibility to such sources:

Whether directly affected or not, the pineal is a convenient locus for monitoring dyschronogenic effects of these fields. It appears ever more plausible, however, that the pineal may also play a central role in the biological response to this environmental factor. (Wilson, Stevens & Anderson, 1989, p. 1328)

The link between pineal dysfunction and suppressed immune response highlights another active area of pineal research. In particular, research has focused on melatonin and its relation to cancer. Depletion of melatonin by pinealectomy has been associated with proliferation of cancer cells (Rodin, 1963).

Loss or reduction of oncostatic melatonin in the circulation is only one of the several possible mechanisms for increased cancer risk resulting from pineal gland dysfunction. Melatonin appears to have a stimulatory effect on immune function in the whole animal. (Wilson et al., 1989, p. 1323)

The minireview of this topic provided by Wilson et al. is a concise discussion of pineal research and is highly recommended to readers interested in the pineal/immune interface. In recognition of the role of the pineal in current cancer research, Blask (1984) has referred to the pineal as an "oncostatic gland," and an entire conference was recently devoted to this subject (Gupta et al., 1988).

Pinealectomy has been implicated in the production of convulsive states (Philo & Reiter, 1978). Furthermore, melatonin has been shown to suppress seizure activity in humans and other mammals (Fariello et al., 1977).

Surgical removal of the pineal gland apparently produces rather uniform alterations in EEG activity and, under special circumstances (e.g., when rats are previously parathyroid-ectomized), severe seizures occur when the pineal gland is surgically extirpated. Several other rodent species . . . and certain strains of mice convulse after simple pinealectomy, i.e., loss of the parathyroid gland is not a prerequisite . . . The appearance of the convulsions suggests basic alterations in the biochemical and electrical activity of the CNS which are presumably due to the loss of some pineal constituent. (Reiter, 1977, p. 257)

The role of melatonin in brain excitability is an interesting example of the widespread explorations of pineal functioning, and Albertson et al. (1981) have provided an excellent review, including results of their own research. Their paper is an excellent resource for those readers interested in the relationship between the pineal and epilepsy.

The neuroendocrine functions of the pineal affect a wide variety of glandular and nervous system processes.

Although experimental results suggested many years ago that the pineal may inhibit growth of the gonads, substantial progress in this field has occurred only in the last ten years, since the pineal began to be considered as one of the central regulating mechanisms in charge of pituitary control rather than as an endocrine gland only. (Moszkowska,

Kordon & Ebels, 1971, p. 241)

Evidence that the pineal gland exerts a regulatory influence on several endocrine functions is rapidly growing. (Motta et al., 1971, p. 279)

The prevalence of sigma receptors in the pineal has been noted by Jansen, Dragunow & Faull (1990) and may be an important interface with several systems and pathologies:

The highest concentration of sigma receptors was seen in the pineal gland, an area which has not been previously studied. This is of interest as both sigma receptors and the pineal gland have recently been shown to play a role not only in the nervous system but also in the immune and endocrine systems . . . Haloperidol and some other antipsychotic drugs bind sigma receptors, as do psychotomimetic benzomorphan opiates, suggesting that the receptor may be involved in psychosis. (Jansen, Dragunow & Faull, 1990, p. 158)

Research indicates that pineal involvement in mental health may go beyond psychosis. It is very likely that the pineal plays a significant role in the manifestation of several mental illnesses.

Currently, much interest is focused on the role that melatonin may play in various psychiatric disorders, and pineal research now represents one of the active areas of current psychiatry research . . . Present ideas suggest a positive involvement of melatonin in affective disorders, possible involvement in the schizophrenic psychosis, and potential involvement of this hormone in other psychiatric categories. (Miles & Philbrick, 1988, p. 405)

Reduced nocturnal melatonin secretion has been noted in depression (Wetterberg et al., 1979, 1981 & 1984) and schizophrenia (Ferrier et al., 1982). Brown et al. (1985) found that lowered nocturnal melatonin

concentrations differentiated between melancholic patients and patients suffering from major depression without melancholia. The role of the pineal in depression may be related to neurotransmitters associated with depression.

In that various theories of depression have suggested reduced serotonergic and noradrenergic function, and both of these products are involved in the synthesis of melatonin as a precursor and neurotransmitter, it would not in fact be at all surprising to find low melatonin in depression . . . It is tempting to speculate that all anti-depressants increase melatonin production. (Arendt, 1988, pp. 218-219)

Recognition that the pineal is photosensitive and plays a major role in the regulation of seasonal physiological adaptations has led to speculation that pineal dysfunction may be related to SAD (seasonal affective disorder). SAD is a recurring winter depression presenting with weight gain, hypersomnia, and carbohydrate craving (Rosenthal et al., 1984). Phototherapy has been utilized in this and other forms of depression to ameliorate depressive symptoms (Kripke & Risch, 1986).

Persons suffering from bipolar have been shown to be supersensitive to the inhibiting effect of bright light on nocturnal melatonin secretion (Lewy et al., 1981). Research by Lewy et al. (1979) suggests that during mania (particularly during the early phase of mania) bipolar patients exhibit consistently elevated levels of melatonin throughout the day and night. Because lithium has been shown to affect pineal functioning and may be linked to decreased photosensitivity, some researchers have speculated that some individuals diagnosed as bipolar may be suffering from circadian disorganization (see review by Miles & Philbrick, 1988).

Structural similarities between melatonin and agents of known hallucinogenic potency (i.e., harmine, bufotenine, and psilocybin) have led to speculation about a possible connection between this pineal hormone and schizophrenia (Arendt, 1988). Psychotomimetic agents (lysergide, dimethyltryptamine, mescaline, and harmaline) induce HIOMT, a methylating enzyme, which increases melatonin production in the pineal (Klein & Rowe, 1970; Hartley & Smith, 1973). Furthermore, agents which produce symptoms closely resembling schizophrenic psy-

chosis (i.e., cocaine, L-dopa, and amphetamine) also increase melatonin production. Research into the assimilation of LSD in monkey brains reveals a propensity for LSD concentrations in the pineal and pituitary glands, these accumulations being 7–8 times those found in the cerebral cortex (Snyder & Reivich, 1966). Winters et al. (1973) report that the pineal must be capable of functioning for hallucinogens to have behavioral effects. Although melatonin has direct biochemical effects on dopaminergic function (Wendel et al., 1974; Zisapel & Laudon, 1983; Bradbury et al., 1985) and haloperidol is highly concentrated by pineal tissue (Naylor & Olley, 1959), direct evidence of melatonin involvement in schizophrenia has not been forthcoming (see excellent review by Miles & Philbrick, 1988).

There exists a vast pineal literature which is undergoing phenomenal expansion. As the present discussion is intended to serve as an introduction to the subject, interested readers are directed to these useful reviews for further elaboration: Wilson et al., 1989; Arendt, 1988; Ebels & Balemans, 1986; Miles & Philbrick, 1988; Mullen & Silman, 1977; and Reiter, 1984.

In summary, whereas only a few decades ago the pineal was widely viewed as a vestigial entity, current research has revealed it to be an important neuroendocrine gland involved in thermoregulation, immune response, and the mediation of various cycles (i.e., circadian rhythms involving the regulation of sleep, seasonal rhythms affecting patterns of reproduction and physiological adaptations to the environment, and cycles of growth and development during the life span such as sexual maturation). In consideration of the pineal's influence on the other endocrine glands, it can be viewed as a "regulator of regulators" (Reiter, 1984, p. v). Further, pineal functioning may play an important role in mental illnesses such as schizophrenia and affective disorders. Perhaps the most controversial area of pineal research may involve the gland's functioning as a transducer of environmental energies such as electromagnetic fields. "After years of disregard the pineal has taken its place in mainstream biology and medicine. It is an organ of particular fascination in that it serves as an interface between the environment and the body" (Arendt, 1988, p. 205).

The pineal gland, viewed historically as a "sphincter to con-

trol the flow of thought,” as the “seat of the soul,” as a “third eye,” and depicted more recently as a “neuroendocrine transducer organ,” now promises to portray more complex physiological functions than originally believed and forecasts to reveal more extensive implications in pathological processes than once deemed possible . . . Future investigations should be directed toward comprehension of the functions of numerous neglected neurotransmitters and biological substances found in the pineal gland. The results of these investigations may bring forth multifunctional significance for [the] pineal gland not only in “temporal arrangement of various reproductive events” in mammals, in “rhythmical thermoregulatory process” in some ectotherms, and in “nightly pallor response” in amphibians, but also in major arenas of human suffering such as seizure disorders, sleep disorders, and behavioral abnormalities. (Ebadi, 1984, pp. 1 & 27)

3.1.2 Cayce’s Perspective of the Pineal

The relatively frequent references to the pineal in the Cayce readings reflect the importance which the readings attached to this gland. As previously mentioned, during the early decades of this century, the pineal was widely regarded as a vestigial organ of little physiological significance. The readings acknowledged the prevailing view of medical science by describing the pineal as a “*mass without apparent functioning*” (294–141). However, the readings continued to insist upon the preeminent role of the pineal as a major mediator of physiospiritual processes. The research literature just cited in this appendix suggests that contemporary views regarding the pineal are rather expansive and tend to support the readings’ insistence that the pineal is much more than a dormant, vestigial organ.

To fully appreciate Cayce’s perspective of the pineal, it is necessary to discuss the various ways in which the term pineal was used in the readings. Although pineal was often used to designate a discrete, glandular entity in the center of the brain (a notion consonant with contemporary views of the pineal), the readings also occasionally spoke of the pineal as if it were a system. This is more than just a problem of semantics, for in the readings the “pineal system” represents the interface of men-

tal and spiritual dimensions within the body—it was described as the body/mind/spirit connection.

When viewed as a system, other terms were often associated with the pineal, such as the “cord of life,” the “silver cord,” the “Appian Way,” and the “imaginative system.” In this context, the pineal seemed to be regarded as a life energy system as well as a glandular entity. This perspective is congruent with certain Eastern religions and occult traditions which emphasize the paranormal aspects of pineal activity by labeling it a major “chakra” or energy center in the body (e.g., Bailey, 1952; Besant, 1959). In the Cayce readings, the energies associated with the pineal system carry several designations including “kundalini,” “kundaline,” “life force,” “psychic force,” “aerial activity,” and “creative energy.”

The status of the pineal as a system is established in the readings by noting the diversity and essentiality of its functioning. The pineal system was said to function through nerve impulse (e.g., 2197-1, 4800-1), glandular secretion (e.g., 567-1, 2200-1), and vibratory energies such as the life force or kundalini energy (e.g., 281-53) while mediating numerous processes including fetal growth, sexual development and functioning, and alterations in consciousness. Two brief excerpts from the readings will be provided to portray the physiological and psychospiritual parameters of the system:

. . . for the PINEAL center is engorged, especially at the 3rd and 4th LUMBAR and the 1st and 2nd cervical . . . the mental capacities as related to the imaginative system refuse to coordinate with the rest of the activity of the body . . . as we have indicated, a constitutional condition, you see, which affects the glands of the body, as related to the pineal—which runs all the way through the system and is the GOVERNING body to the coordinating of the mental and physical. 567-1

In this particular body [Edgar Cayce] through which this, then, at present is emanating, the gland with its thread known as the pineal gland is the channel along which same then operates, and with the subjugation of the consciousness—physical consciousness—there arises, as it were, a cell from the creative forces within the body to the entrance of the conscious mind, or brain, operating along,

or traveling along, that of the thread or cord as when severed separates the physical, the soul, or the spiritual body. 288-29

These excerpts contain some important examples of the diverse influences attributed to the pineal system. The references to “the gland with its thread known as the pineal” and “the pineal—which runs all the way through the system and is the governing body to the coordinating of the mental and physical” indicate the anatomical expansiveness of this system. The “thread” or “cord” which emanates from the pineal gland may be physical (e.g., nerve tissue), nonphysical (e.g., “vibratorial” or subtle energy), or both. The readings are particularly vague on the subject. The readings compared the activity of the pineal to an aerial:

In your radio you have what you call an aerial for communications that are without any visible connection. This is not a part of that making up the framework, yet it is necessary for certain characters of reception or for the better distribution of that which takes place in the instrument as related to communication itself.

So in the physical body the aerial activity is the flow through the pineal, to and through all the centers. It aids the individual, or is an effective activity for the individual who may consciously attempt to attune, coordinate, or to bring about perfect accord, or to keep a balance in that attempting to be reached or attained through the process . . . Understand the processes of activity through which there are the needs of the aerial in reception. For, of course, it is a matter of vibration in the body, as well as that illustrated in the physical condition . . . 281-53

This evocative description of pineal activity brings to mind contemporary research into the pineal’s ability to detect variations in geomagnetic and electromagnetic fields (as discussed earlier in this Appendix). Reading 2501-6 suggests a similar phenomenon relating the phase of the moon to behavioral changes—an association apparently mediated by the pineal through the sympathetic nervous system (see the excerpt section which follows).

Regardless of whatever the pineal and its “cord” may represent, the

readings stated that it extended throughout the body and governed the coordination of mental, spiritual, and physical energies (311–4). Note also that the pineal provides the connections of body, mind, and spirit, which was regarded as a prerequisite for the functioning of consciousness (1001–9).

The “pineal system” may be conceptualized as including the endocrine glands (262–20, 281–49, 1001–9, 1593–1). The holistic perspective of the readings was frequently reflected in a systems approach to anatomy and physiology: “. . . there is to be considered ever the whole activity; not as separating them one from another but the whole anatomical structure must be considered EVER as a whole . . . Then we find the endocrine system—not glands but system . . . ” (281–38)

Certain glands within this system were noted as having an especially close affinity—the pineal/pituitary interaction was frequently cited in the readings. The interface between pineal and Leydig gland was also particularly important and deserving of close study (e.g., 263–13, 294–141, 294–142).

The pineal system’s close association with the nervous systems is exemplified by its role as mediator between the “mental body” and the central nervous system (1523–17). There are frequent references to both the pineal and the sympathetic systems as the “imaginative system” and the “impulse system”—expressions intimating the role of mind, in particular the unconscious mind, in the phenomenon of imagination. The readings referred to the sympathetic nervous system as the nervous system of the unconscious mind, while the CNS was identified with the conscious mind. Thus, the readings’ frequent association of pineal dysfunction with incoordination between the sympathetic and central nervous systems may be related to its role as mediator of states of consciousness. In this capacity, the pineal was said to be involved in such common phenomena as imagination and sleep, paranormal experiences such as kundalini awakening and past-life recall, and pathological conditions such as psychosis and epileptic seizures.

The “life force” energy discussed in the readings was said to function in two modes: (1) a growth and development mode (a health maintenance mode) and (2) a “supercharged” mode, which the readings associated with “kundalini” experiences similar to those described in the meditative literature of the Orient (281–53). In the growth and develop-

ment mode, the pineal was said to begin activity within the third week after conception by organizing fetal development (294-141, 281-141). In its activity, the pineal system could be conceptualized as a morphogenetic blueprint for embryonic elaboration, particularly the formation of the brain (294-141). Just as it would later serve as the interface of physical, mental, and spiritual bodies in the newborn child, during gestation the pineal system was said to serve as a conduit for mental and spiritual impulses from the pregnant woman (281-53, 294-141).

Across the life span, the pineal system was viewed as a regulator of cycles of growth and development and was responsible for the maintenance of health. In this capacity, the life force was referred to as *élan vital* (281-24) and was related to youth and vigor. "Keep the pineal gland operating and you won't grow old—you will always be young" (294-141). The life force was said to "strengthen and maintain equilibrium in the system" (1026-1) and "sustain coordination to the organs of the body" (5162-1).

The readings recommended various forms of energy healing to reestablish a healthy state in bodies with insufficient or unbalanced energy. Magnetic healing was one such modality and could be accomplished by raising the life force (i.e., "kundalini") and passing this energy into the body of the afflicted person by "laying on of hands" (281-14). The readings described a specific technique for this intervention and provided guidelines for persons interested in utilizing it (e.g., using the hands in polarity, resting between sessions to maintain vigor, etc.—see Circulating File on magnetic healing for details; available from the A.R.E.).

This life force could be rebalanced by an apparatus called the Radio-Active Appliance (currently referred to as the Impedance Device; see Chapter Five under "Electrotherapy"). The readings stated that magnetic healing and the Radio-Active Appliance utilized the same energy, frequently referred to as "vibratory energy" or the "low form of electrical energy," which was said to be the basis of life. This energy flows through the body and is particularly accessible along the spine at seven "centers" (3428-1), apparently corresponding to the seven chakras of Eastern meditative traditions. Three of these centers were preferentially noted as being key interfaces between the physical and soul forces:

. . . the 3rd cervical . . . the 9th dorsal, and . . . the 4th lumbar . . .

These are the centers through which there is the activity of the kundaline forces that act as suggestions to the spiritual forces for distribution through the seven centers of the body. 3676-1

It is no coincidence that these three centers (and specifically the 9th dorsal) were frequently specified locations for attachment of the Wet Cell Battery utilizing “vibratory metals” (i.e., gold and silver) to stimulate the regeneration of the nervous system in cases of dementia praecox. These key centers were also consistently pointed out to osteopaths and chiropractors making the spinal adjustments. Cayce even gave specific instructions for coordinating these centers using massage and manipulation.

In the “growth and development” mode, the life force was described as a subtle influence which was generally not physically perceptible in its action or effects. In the “supercharged” mode (such as kundalini), the life force was much more easily perceptible (occasionally painfully so) in its action and effects. In this mode, the life force was said to vary its circulation through the body (281-53) by arising along the spinal cord to the base of the brain. The “opening of the lyden [Leydig] gland” was a prerequisite for this activity and could be accomplished by a variety of meditative and pathophysiological processes. The utilization of traditional yogic techniques such as altered breathing (2475-1) and incantations (275-43) were noted as effective means of “awakening the kundalini.”

In several cases of psychopathology noted in the readings, the awakening of the kundalini was associated with somatic dysfunctions such as spinal injury and lesions in the reproductive system. Throughout this book, such cases have been designated as “kundalini crisis.” A further consideration of this topic from the perspective of contemporary sources will be included in the final section of this discussion.

To fully appreciate the readings’ perspective on “kundalini crisis,” one must keep in mind that the pineal system includes a “thread” or “cord” which extends from the pineal gland proper, along the spinal cord to various centers in the body (281-46). Pressure upon this system can produce hallucinations and dementia (294-141, 4333-1). It is unclear whether this pathology resulted from the secretion of a glandular substance by the Leydig gland or as a result of some change in the “subtle

energy" balance within the pineal system. The readings are not explicit about this process, and these two scenarios are not mutually exclusive, nor do they preclude other interpretations of this process. The important psychopathological implication here is that the pineal system is quite vulnerable to somatic insult, particularly along the spinal column.

The psychic readings of Edgar Cayce were said to have resulted from the activation of the kundalini within the pineal system (288–29, 2475–1) resulting in cosmic consciousness (2109–2). In other words, Cayce apparently had a kundalini experience during each reading. The possibility that he could be rendered insane by a misapplication of this process was noted in the readings, and cautions were provided for the maintenance of a healthy physical vehicle for a safe and optimal psychic experience.

If one accepts the plausibility of psychic productions such as the Cayce readings or other such manifestations, which are common within the tradition known as the perennial philosophy, one comes to view the pineal system as the "consciousness system"—i.e., altered states of consciousness such as kundalini experiences are produced by alterations within this system. Psychosis that is produced by pineal system dysfunction (i.e., kundalini crisis) may thus be viewed as one of the alterations in consciousness mediated by this system.

Epilepsy is another major pathology involving altered states of consciousness—a phenomenon which the readings frequently associated with pineal activity. The overlap between epilepsy and schizophrenia has been discussed in Chapter Seven and will not be recapitulated here. However, several excerpts from the readings on epilepsy have been included in this Appendix to provide a context for comparing the role of the pineal in these two major pathologies.

The pineal system is involved in two other major alterations in consciousness—sleep and death. Sleep was said to be a "shadow of, that intermission in earth's experience of, that state called death" (5754–1). According to the readings, the soul temporarily disengages during sleep to "visit" other dimensions and have experiences which are remembered during the waking consciousness as dreams. *"Each and every soul leaves the body as it rests in sleep."* (853–8) The idea that some aspect of the self dissociates during sleep and transits between dimensions (e.g., astral travel) is not original to the Cayce readings. This is a common

theme in the traditions of many cultures (Hanson, 1989). In the readings, sleep is viewed as an opportunity for the mental being to review previous experiences and plan future actions accordingly (hence the retrospective and precognitive function of dreams). During sleep, connection of the physical, mental, and spiritual bodies is maintained by a “silver cord” which sounds strikingly similar to the “thread” or “cord” of the pineal system.

Death involves the severance of this cord (262–20), whereas sleep may be viewed as merely a temporary “stretching” of it. The “projection” of consciousness out of the body during sleep may be related to the projection that Edgar Cayce experienced during his psychic readings. In other words, perhaps everyone has a “kundalini” experience and psychic awakening each night while he or she sleeps. The physiological alterations that occur during “dream sleep” (i.e., REM or paradoxical sleep) seem to parallel those described in the readings as occurring during kundalini arousal.

This may relate directly to schizophrenia research because for several decades clinicians and researchers have recognized the similarities between hallucinations and dreams. This apperception has led to the hypothesis that hallucinations represent dream intrusions into waking consciousness. “Schizophrenia may be characterized by a breakdown in the normal boundaries between the REM-sleep and waking states.” (Wyatt, 1971, p. 46) This hypothesis was bolstered by research confirming that schizophrenics tend to exhibit distinctive sleep patterns (most significantly, decreased REM rebound after deprivation; e.g., Azumi et al., 1967). As with most areas of schizophrenia research, sleep and dream studies have suffered the effects of variability; thus, the sleep anomalies in schizophrenia remain unexplained.

From a transpersonal perspective, many dreams represent a conscious experience of paranormal realities (i.e., not just epiphenomena resulting from brain activation during sleep). Dreams may reflect an altered state of consciousness where the conscious mind has access to other dimensions of reality normally unavailable during waking states (Roberts, 1974). The experience of precognition, direct communications with discarnate entities, past-life recall, etc., during dreams is thus viewed as representing a valid perspective of “reality.”

Hence, some persons experiencing acute psychosis with paranormal

features could be viewed as suffering from a form of “kundalini crisis,” or a pathological activation of the pineal system resulting in psychotic symptoms such as hallucinations. The Cayce readings indicated that such persons were close to the “borderland” and that pathological symptoms such as auditory hallucinations were “real” experiences to those individuals. This pathological aspect of pineal functioning is the focus of the final part of the discussion section and will consist of contemporary formulations of pineal activation that result in psychosis.

3.1.3 Current Perspectives on Kundalini

Numerous accounts of spontaneous “awakening” of the kundalini energy can be found in the modern clinical literature. Gopi Krishna believed that the awakening of the kundalini force could go awry and produce acute psychosis. His personal experience with kundalini provides valuable firsthand information about its effects:

The condition [kundalini awakening] denotes, from the evolutionary point of view, a physiologically mature system ripe for the experience, and a highly active Kundalini pressing both on the brain and the reproductive system. But the activity of Kundalini, when the system is not properly attuned, can be abortive and, in some cases, even morbid. In the former case [when the brain is not ready], the heightened consciousness is stained with complexes, anxiety, depression, fear, and other neurotic and paranoid conditions, which alternate with elevated blissful periods, visionary experiences, or creative moods. In the latter [when the reproductive system is dysfunctional], it manifests itself in the various hideous forms of psychosis, in the horrible depression, frenzied excitement, and wild delusions of the insane. (in Kieffer, 1988, pp. 138-139)

Thus, Krishna’s emphasis on the enlightening properties of kundalini is balanced by his awareness of its destructive potential when awakened prematurely. As Krishna observes, in some cases the difference between the two outcomes is difficult to assess:

There is a close relationship between the psychotic and the mystic. In a mystic, there is a healthy flow of prana into the brain, and in the psychotic the flow is morbid. In fact, the mystic and the psychotic are two ends of the same process, and the ancient traditions class mad people as mad lovers of God, or something divine. (in Kieffer, 1988, p. 110)

Joseph Campbell expressed the same idea poetically by stating, “The schizophrenic is drowning in the same waters in which the mystic swims with delight” (in Mintz, 1983, p. 158). Sannella (1987), a psychiatrist, also notes the dual manifestations of the kundalini experience:

I have also witnessed this regrettable tendency among those who have stumbled onto the kundalini experience. But this says nothing about the experience itself, which is not inherently regressive. On the contrary, I view the kundalini awakening as an experience that fundamentally serves self-transcendence and mind-transcendence. (p. 20)

In 1974 Sannella co-founded the Kundalini Clinic in San Francisco, a facility dedicated to helping persons undergoing sudden kundalini arousal.

The transformative potential of spiritual awakening with psychotic features (which we have designated as kundalini crisis) has been noted by Christina and Stanislav Grof and labeled “spiritual emergency.” Christina’s description of her spiritual emergency and Stanislav’s clinical insight into the transformative potential of these experiences provide a valuable resource in this area. Their criteria for distinguishing between spiritual emergency and psychosis provide a helpful “yardstick” for clinical assessment.

Among favorable signs [indicating spiritual emergency] are a history of reasonable psychological, sexual, and social adjustment preceding the episode, the ability to consider the possibility that the process might originate in one’s own psyche, enough trust to cooperate, and a willingness to honor the basic rules of treatment. Conversely, a lifelong history

of serious psychological difficulties and of marginal sexual and social adjustment can generally be seen as suggesting caution. Similarly, a confused and poorly organized content of the experiences, presence of Bleuler's primary symptoms of schizophrenia, strong participation of manic elements, the systematic use of projection, and the presence of persecutory voices and delusions indicate that traditional approaches might be preferable. Strong destructive and self-destructive tendencies and violations of basic rules of treatment are further negative indicators. (Grof & Grof, 1990, p. 256)

Christina Grof founded the Spiritual Emergence Network (SEN) in 1980 to provide educational information and a referral service for people experiencing transformational crises. It is currently located at the Institute of Transpersonal Psychology (250 Oak Grove Ave., Menlo Park, CA 94025; 415/327-2776).

Mariel Strauss (1985) provides a practical source of information about kundalini awakening in all its aspects. *Recovering from the New Age: Therapies for Kundalini Crisis* documents the symptoms of kundalini arousal and suggests therapies to minimize its distress. Strauss describes "kundalini crisis" from her personal experience, while providing a scholarly review of the kundalini literature. Her familiarity with the Cayce philosophy and frequent citations from the readings serve as valuable stepping-stones between the various sources and perspectives in this literature. Her recognition of the pervasiveness of kundalini manifestations, both clinically in psychosis and subclinically in "disease," accurately portrays the readings' perspective of this phenomenon:

We must remember that Cayce found degrees of kundalini imbalance in many individuals, not just in those with the syndrome of extreme symptoms we have delineated [i.e., kundalini crisis]. His cases ranged from those who were simply nervous and fatigued . . . to those who had been confined to hospitals or their homes for many years, sometimes since early childhood. Therefore, his remedies dealt less with large alterations in diet and more with the other aids . . . such as spinal adjustment and massage, mental

regroupment, and treatments with the electrical appliances he designed. (Strauss, 1985, p. 45)

Another excellent source of information regarding kundalini is John White's *Kundalini: Evolution and Enlightenment*. White's expertise as an editor is evident in this thorough discussion of the kundalini phenomenon.

3.1.4 Summary

In summary, the pineal is an important endocrine gland that is probably involved in a wide spectrum of developmental and health maintenance processes including major mental illnesses such as schizophrenia. Its association with paranormal processes is documented in traditional and current sources and is congruent with the Cayce readings on the subject. Cayce viewed the pineal as the focal point of a system utilizing subtle energies (e.g., kundalini) capable of pathological disruption. Because such disturbances may present with paranormal features, clinicians are advised to become more familiar with the operation of this system and all of its transpersonal manifestations. From the Cayce perspective, the most significant aspect of pineal functioning is its role as the interface of mental and spiritual facets of the self with the physical body. This role has been acknowledged historically, and restated succinctly by Mullen:

The human pineal is now under intensive investigation by various groups throughout the world. In the next few years we can confidently expect the physiological and pathological roles of this mysterious gland to be elucidated. The pineal which for Descartes was the seat of the mind and the immortal soul may yet turn out to be of interest for biological psychiatry. The pineal has been called a neuroendocrine transducer but it could one day be more accurately termed a psychosomatic transducer standing as a mediator on the boundary between soma and psyche. (Mullen et al., 1978, p. 370)

3.1.5 Excerpts from the Cayce Readings

. . . for we have incoordination through the system, in the nerve supply especially, and this disturbs the mental equilibrium, and the locomotion is affected by ganglions in the body at times. These we find affect directly the pineal nerve and gland. Hence the whole system throughout the cerebrospinal system becomes involved in the conditions.

22-1, epilepsy

In the first condition, we find there are some prenatal [karmic?] conditions to be considered, and other conditions as were produced by physical conditions as were seen in the body at the time of birth. These were those conditions, for the pressure as produced in the presentation brought to certain cervicals that nonalignment which produces a pressure, not so much on the cerebrospinal cord as on that of the gland situated at the base of the brain. This, then, is the cause of the character of repression and the variation in their severity, and the apparent cause of that as brings about the cycle of the vibration for, as we see, the pineal gland is affected.

179-1, epilepsy

Q. What caused the extraordinary physical reaction with Edgar Cayce at the close of the reading [254-67] this morning, at the beginning of the suggestion?

A. As was seen, through the seeking of irrelevant questions there was antagonism manifested. This made for a contraction of those channels through which the activity of the psychic forces operates in the material body; as we have outlined, along the pineal, the lyden and the cord—or silver cord. The natural reactions are for sudden contraction when changing suddenly from the mental-spiritual to material.

254-68

In the psychic forces, or spiritual forces (which are psychic forces), there has ever then been a vehicle, or portion of the anatomical forces of the body, through which the expressions come to individual activity, and these may find various forms of manifestations, or MOVEMENTS of—as has been given, that finds its seat in the creative energies and forces of the body. In the body we find that

which connects the pineal, the pituitary, the lyden, may be truly called the silver cord, or the golden cup that may be filled with a closer walk with that which is the creative essence in physical, mental and spiritual life; for the destruction wholly of either will make for the disintegration of the soul from its house of clay. 262-20

Let it be understood as to how each phase of consciousness or experience affects the other; that is, the associations or connections between the spiritual and the mental body, the spiritual and the physical body, and between the mental and the physical and mental and spiritual . . .

Then, there are centers, areas, conditions in which there evidently must be that contact between the physical, the mental and the spiritual.

The spiritual contact is through the glandular forces of creative energies; not encased only within the [Leydig] lyden gland of reproduction, for this is ever—so long as life exists—in contact with the brain cells through which there is the constant reaction through the pineal.

Hence we find these become subject not only to the intent and purpose of the individual entity or soul upon entrance, but are constantly under the influences of all the centers of the mind and the body through which the impulses pass in finding a means or manner of expression in the mental or brain itself . . .

Thus we find the connection, the association of the spiritual being with the mental self, at those centers from which the reflexes react to all of the organs, all of the emotions, all of the activities of a physical body. 263-13

These [incantations] as they make for the raising of that from within of the Creative Forces, as it arises along that which is set within the inner man as that cord of life that once severed may separate, does separate, that balance between the mind, the body, the soul . . . 275-43

. . . it [kundalini/life force] rises from the glands known in the body as the lyden, or to the lyden [Leydig] and through the reproductive forces themselves, which are the very essence of Life itself with an

individual—see? for these functionings never reach that position or place that they do not continue to secrete that which makes for virility to an individual physical body. Now we are speaking of conditions from without and from within!

The spirit and the soul is within its encasement, or its temple within the body of the individual—see? With the arousing then of this image, it [kundalini] rises along that which is known as the Appian Way, or the pineal center, to the base of the BRAIN, that it may be disseminated to those centers that give activity to the whole of the mental and physical being. It rises then to the hidden eye in the center of the brain system, or is felt in the forefront of the head, or in the place just above the real face—or bridge of nose, see? . . . for ye are raising in meditation actual creation taking place within the inner self!

281-13

Q. Please explain the sensations during meditation of vibration running up through the body and ending in a sort of fullness in the head.

A. The various portions, as given, represent the activities that are being set, either when considered from the purely scientific or from the metaphysical standpoint, as an active force emanating from the Life itself within. Then, these become all-embracing; hence the better understanding should be gained, whether used to disseminate and bring healing or for the raising of the forces in self. When one is able to so raise within themselves such vibrations . . . then the body of that individual becomes a magnet that may (if properly used) bring healing to others with the laying on of hands. This is the manner in which such a healing becomes effective by the laying on of hands.

281-14

As we have indicated, the body-physical is an atomic structure subject to the laws of its environment, its heredity, its soul development.

The activity of healing, then, is to create or make a balance in the necessary units of the influence or force that is set in motion as the body in the material form, through the motive force of spiritual activity, sets in motion.

It is seen that each atom, each corpuscle, has within same the

whole of the universe—with its own structure.

As for the physical body, this is made up of the elements of the various natures that keep same in its motion necessary for sustaining its equilibrium; as begun from its (the individual body's) first cause.

If in the atomic forces there becomes an overbalancing, an injury, a happening, an accident, there are certain atomic forces destroyed or others increased; that to the physical body become either such as to add to or take from the *élan vital* that makes for the motivative forces through that particular or individual activity . . .

There is the physical body, there is the mental body, there is the soul body. They are One, as the Trinity; yet these may find a manner of expression that is individual unto themselves. The body itself finds its own level in its own development. The mind, through anger, may make the body do that which is contrary to the better influences of same; it may make for a change in its environ, its surrounding, contrary to the laws of environment or hereditary forces that are a portion of the *élan vital* of each manifested body, with the spirit or the soul of the individual.

Then, through pressure upon some portion of the anatomical structure that would make for the disengaging of the natural flow of the mental body through the physical in its relationships to the soul influence, one may be dispossessed of the mind; thus ye say rightly he is “out of his mind.”

Or, where there are certain types or characters of disease found in various portions of the body, there is the lack of the necessary vital for the resuscitating of the energies that carry on through brain structural forces of a given body. Thus disintegration is produced, and ye call it dementia praecox[schizophrenia]—by the very smoothing of the indentations necessary for the rotary influence or vital force of the spirit within same to find expression. Thus derangements come.

Such, then, become possessed as of hearing voices, because of their closeness to the borderland. Many of these are termed deranged when they may have more of a closeness to the universal than one who may be standing nearby and commenting; yet they

are awry when it comes to being normally balanced or healthy for their activity in a material world. 281-24

Q. Please explain just what took place the night I heard what sounded like a large top spinning—felt a strong vibration sweep through my body and when I spoke saw a bluish spark close to the top of my head and it felt like electricity.

A. As hath been indicated for the group, for members of same, there is that line, that connection, that point of contact in the body—physical to the spiritual forces as manifest through same. There are the centers of the body through which contacts are made, or are physically active . . . [which] finds expression in emotions of varied centers, varied characters. Thus the experience is that of the broader contact. Thus there are the vibrations of the electrical energies of the body, for Life itself is electrical—it manifests itself in its contacts in a physical being in much the same manner. Thus the experience in self of the emotions—physical being contacted by emotions—spiritual manifesting in the body.

281-27

. . . but as ye find your bodies made up of the physical, mental and spiritual, it is the attuning of the mental body and the physical body to its spiritual source . . .

But there are physical contacts which the anatomist finds not, or those who would look for imaginations or the minds. Yet it is found that within the body there are channels, there are ducts, there are glands . . . In many individuals such become dormant. Many have become atrophied. Why? Nonusage, nonactivity! . . . For as has been indicated, there are physical contacts in thy own body with thy own soul, thy own mind. Does anyone have to indicate to you that if you touch a needle there is pain felt? Ye are told that such an awareness is an activity of consciousness that passes along the nervous system to and from the brain. Then, just the same there are contacts with that which is eternal within thy physical body. For there is the bowl that must one day be broken, the cord that must one day be severed from thine own physical body—and to be absent

from the body is to be present with God. 281-41

The cord that is eventually known or classified as the pineal is the first movement that takes place of a physical nature through the act of conception; determining eventually—as we shall see—not only the physical stature of the individual entity but the MENTAL capacity also, and the spiritual attributes. 281-46

That gland [pineal?] a nucleus extending in the shape or form of a moving atom, gathers from its surroundings physical nourishment; and from the mind of the body it takes its PHYSICAL characteristics, or the moulding as it were of its features as related to the external expression of same . . .

It is centered first, then about that known as the cranial center; next the ninth dorsal or that which is the motivative force to other portions through the umbilical cord, that begins then in the third week to give material manifestations in physical development.

Then the centers of the heart, liver and kidney areas begin their expression.

Thus we have first the pineal, the aerial, the adrenals, the thymus—or the pump gland of the heart itself . . .

The seeking here is for that area, that center, in which the system makes its relative relationships or associations with spiritual, mental and physical being.

These areas indicated, that have come through growth into being in relation to the mental, spiritual and physical attitude of the mother, are constantly dependent upon that one from which the body draws its PHYSICAL sustenance; but purpose, desire and hope are through the mental. Thus these centers are opposite the umbilical cord, or those areas through which ALL messages of desire, or of the mental nature, pass; not only to the brain in its reflexes but along the cords to the pineal—that has been and is the extenuation of its first cause. 281-47

In that which has been given there is an attempt to show the necessary coordination of the mental with the physical and spiritual; or, to be exact, the coordinating of the mental with the spiritual

that so alters the characteristics, the purposes, the hopes of the individual entity materialized and manifested. That entity is, however, altered by choices made under its own impulse . . . We find the preparations of the parents, mentally and physically, was such that there was an elongation of activity in the endocrine system of the pineal; so that the stature of the entity then was of a different type, a different nature, and the mental and spiritual so balanced and coordinated that through the experience of the entity there was a physical and mental development equaled and surpassed by few.

281-48

. . . the pineal, through which the brain forces make manifest . . .

281-51

Q. Are the following statements true or false? Comment on each as I read it: The life force rises directly from the Leydig gland through the Gonads, thence to Pineal, and then to the other centers.

A. This is correct; though, to be sure, as it rises and is distributed through the other centers it returns to the solar plexus area for its impulse through the system.

For the moment, let's consider the variation here in this life force—or as respecting this life force. The question is asked not in relation to the life alone as manifested in the human body, but as to the process through which coordination is attained or gained in and through meditation, see?

Hence physically, as we have indicated, there is first the nucleus—or the union of the first activities; and then the pineal as the long thread activity to the center of the brain, see? Then from there, as development progresses, there are those activities through reflexes to the growth or the developing of the body.

Interpret that variation, then, as being indicated here. One life force is the body-growth, as just described. The other is the impulse that arises, from the life center, in meditation.

Q. As the life force passes through the glands it illuminates them.

A. In meditation, yes. In the life growth, yes and no; it illuminates them to their activity in life growth.

Q. The Leydig gland is the same as that we have called the lyden,

and is located in the gonads.

A. It is in and above, or the activity passes through the gonads. Lyden is the meaning—or the seal, see? while Leydig is the name of the individual who indicated this was the activity. You can call it either of these that you want to.

Q. The life force crosses the solar plexus each time it passes to another center.

A. In growth, yes. In meditation, yes and no; if there remains the balance of attunement, yes.

When we are considering these various phases, the questions should be prepared so that they would not crisscross, or so that there would not be a confusion or a misinterpretation as to what is meant.

You see, what takes place in the developing body, or in life growth (which we have used as the demonstration, or have illustrated), may be different from that which takes place as one attempts to meditate and to distribute the life force in order to aid another—or to control the influence as in healing, or to attain to an attunement in self for a deeper or better understanding. These questions or statements are such that they will be confusing to some; but if they are asked properly there will not be confusion.

Q. The solar plexus is the aerial gland.

A. No. By the term aerial we mean that impulse or activity that flows in an upward, lifting, raising or rising movement. It is an activity in itself, you see; not as a gland but as an activity UPON glands as it flows in, through, from or to the various centers of activity in the system itself. It is a function. Let's illustrate—possibly this will give an interpretation such that you may understand:

In your radio you have what you call an aerial for communications that are without any visible connection. This is not a part of that making up the framework, yet it is necessary for certain characters of reception or for the better distribution of that which takes place in the instrument as related to communication itself.

So in the physical body the aerial activity is the flow through the pineal, to and through all the centers. It aids the individual, or is an effective activity for the individual who may consciously attempt to attune, coordinate, or to bring about perfect accord,

or to keep a balance in that attempting to be reached or attained through the process.

As the process begins in the physical body, it is along the pineal; or it is the same movement that is the controlling or attuning influence from the mother with the developing forces of the body through the period of gestation.

That is the manner, or the process, or the way in which the impressions are made. So, if there is beauty about the body of the mother through such periods, there are those influences to bring about accord. It may be indicated in contour of face. It may be indicated in the process of change in the activity of the thyroid as related to all the forces—even to the color of hair or eyes, or the skin's activity; the nails, or more toes than should be—or less, or such activities. Or, the influences existent through such processes might make for a lacking of something in the body itself, pathologically; by the attempt to create a normal balance without the necessary influences being available.

All of this is what we have referred to as the aerial activity, see? . . . Understand the processes of activity through which there are the needs of the aerial in reception. For, of course, it is a matter of vibration in the body, as well as that illustrated in the physical condition. Thus there are activities about a body that is supplying the needs physically and mentally for a developing body, that become a part of the process, see? 81-53

Where is the dwelling place of the soul in the physical body? What is the connection or center through which the mind and soul function, that makes one individual a devil and another a saint? . . . Ye have gained that the first movement of same physically reaches out and becomes the brain, through which the pineal in its activity brings its physical development; and that it is related to the mind of the body and the environs of the body supplying physical activities to that developing physical entity. 281-57

There must be in the physical or material world a channel through which psychic or spiritual forces may manifest. It must become concrete, or definite, with some channel, some manner of man-

ifestation. The anatomical condition of the human body lends itself to such an experience, then, through some portion of the physical organism of a body . . .

In this particular body [Edgar Cayce] through which this, then, at present is emanating, the gland with its thread known as the pineal gland is the channel along which same then operates, and with the subjugation of the consciousness—physical consciousness—there arises, as it were, a cell from the creative forces within the body to the entrance of the conscious mind, or brain, operating along, or traveling along, that of the thread or cord as when severed separates the physical, the soul, or the spiritual body. This uses, then, the senses of the body in an introspective manner, and they are not apparent in functioning in a physical normal manner as when awake. All faculties of the body become more alert. As to the loss of consciousness, how great is the ability of the development of the psychic sources to completely cut off consciousness from the physical or anatomical brain and still retain—in the shell—those abilities of functioning through that such an entity may have experienced in its passage through physical experience.

288-29

Suggestion by Mrs. Cayce: You will have before you the information [in 288-29] given through this channel on April 16, 1932, concerning the psychic development of the entity known as Edgar Cayce, present in this room. You will give further information which may be correlated with the data already on hand to aid those studying this work to better understand this channel and sources of information. You will answer questions.

Mr. Cayce: Yes, we have the information as given as respecting manifestation of psychic forces through these channels . . .

The glands of reproduction in a body gives up something that creation may be reached, or tuned into, when such an one—a psychic—attunes self to the infinite . . .

In the body as given, there are channels through which all forces do manifest. To some there are the voices heard. To others there is the vision seen. To others there is the impression, or feeling of the presence of those sources from which information may

radiate; and then there are those channels that are submerged or awakened during such periods.

The lyden [Leydig], or “closed gland,” is the keeper—as it were—of the door, that would loose and let either passion or the miracle be loosed to enable those seeking to find the Open Door, or the Way to find expression in the attributes of the imaginative forces in their manifestation in the sensory forces of a body . . .

294-140

First, this shows that there is innate in each physical individual that channel through which the psychic or the spiritual forces, that are manifest in material world, may function. They are known as glands, and affect the organs of the system . . .

Q. Please discuss in detail the functions of the pineal gland.

A. If this is discussed from the anatomical viewpoint, in the fetus as is begun in first of gestation, we find this may be termed as the Builder. As is seen, the location of same is in the beginning in that of the center or the nucleus about which all of the matter takes its first form, and becomes the brain as is guiding or directing the building of the body as its development in the womb takes place. As it then reaches from the umbilical cord to the brain, there is builded that as is centered about same by the physical attributes of that pro-generated from those bringing such an action into being. When there has reached that stage when there is the separation of same, the cord then being broken, this forms then its own basis in the lower portion of the brain, or cerebellum, and through the medulla oblongata to the central portion of the cerebrospinal cord itself is held intact, and with the removal of same, or pressure on same, the various forms of hallucinations are evident, whether in the developing stage or when it has reached the elderly or older years in an experience. Its functioning, then, is as that, of that, which makes for—or known as—the impulse or imaginative body. Hence one that may be called demented by others, who has hallucinations from a pressure in some portions, may be visioning that which to him is as real (though others may call him crazy) as to those who are supposed to have an even balance of their senses; which [such visioning?] has been formed by the circulation, or

the activity of the gland—as it is called—in its incipency, until it becomes—or is—as a mass without apparent functioning. If the imaginative body, or the trained body (as is called in a material world) is, trained constantly away FROM the activities of same, it—in natural consequence of things in physical being—draws, as it were, within self. Hence senility sets in. Keep the pineal gland operating and you won't grow old—you will always be young!

In this activity, then, as is seen, there is within the genital organs the activity through that as may be called the lyden gland [Leydig], which has within itself that closed door, or open door, as makes for activity through that to the base of the brain, or the PINEAL gland—as is at the base of the brain itself—which opens up for its activities and associations to those other portions of the brain; that sends out its sensations either through the sensory organism or the sympathetic organism, or the purely physical organism . . .
294-141

Q. What other glands in the body, if any, besides the Leydigian, pineal, and glands of reproduction, are directly connected with psychic development?

A. These three are the ducts, or glands. In some developments these have reached a stage where they do not function as ducts or glands, but are rather dormant; yet much passes through same, especially for the various stages of a psychical sojourn or development. These, as we find—the genitive organism is as the motor, and the Leydig as a sealed or open door . . . Hence these may literally be termed, that the pineal and the Leydig are the SEAT of the soul of an entity.

Ye have gained that the first movement of same physically reaches out and becomes the brain, through which the pineal in its activity brings its physical development; and that it is related to the mind of the body and the environs of the body supplying physical activities to that developing physical entity. 294-142

Q. How can I overcome the nerve strain I'm under at times?

A. By closing the eyes and meditating from within, so that there arises—through that of the nerve system—that necessary ele-

ments that makes along the PINEAL (Don't forget that this runs from the toes to the crown of the head!), that will quiet the whole nerve forces . . . 311-4

[Certain life experiences produce] . . . tiny shivers in the body itself, as they move along those of the pineal that make for the awakening that is in the real heart and SOUL of the entity. For, its psychic forces—from its developments through many sojourns—have made for one that is VERY sensitive . . . 504-3

There will be found that the various portions of the organs as involved—that make for pressures upon the nerve system, which act through those of the pineal direct to the organs of gentation in system—will react in the various ways, as the various stages of activity or impulse are created in the system. Hence these would be followed rather closely by the one USING such applications, and see that there is created—as near as possible—those of positive, coordinating forces in the system. 543-17, epilepsy

. . . for the tendency for the contraction is to produce in the brush end of the spine—or from the 4th lumbar to the lower end of the spine—contraction of the muscular forces there; for here we contact during the periods of development especially the activity of the pineal reaction to the brain centers, which makes for the differentiation of the actions of the imaginative forces in the body. 663-1, epilepsy

Again we find the same in the caecum and the lower portion of the lacteal duct centers . . . Their activity to the system is to produce along the course of the pineal center to the duct in the lower portion of the brain center itself where through the medulla oblongata there enters the coordinations between sympathetic impulses and the cerebrospinal system, and through the duct or gland of the lyden [Leydig] that makes for the GOVERNING of impulse in reaction to the torso or body from the brain centers themselves. 693-1, epilepsy

Q. What is it that brings on or incites said attacks?

A. The attempt of the physical body—through the forces in the imaginative body—to coordinate through that condition existent in the lyden [Leydig] gland, or in the base of the brain itself. Hence the contraction, and the lack of coordination in such conditions.

Q. From what part of the body do the attacks originate? and why does body lose consciousness during attack?

A. From the solar plexus to that of the lyden [Leydigian] gland, or through the pineal. The lyden [Leydig] is IN the pineal, see?

Q. Why does body lose consciousness?

A. That's just what we have been giving! It is the imaginative forces and the cerebrospinal forces, or the nerve supply through the cerebrospinal system cuts off—through the lyden [Leydig?] forces—which is sealed gland, see? they lie within those of the pineal themselves, see? When these become of such an activity, through conditions as excite in the system—as thrown out from those of the genitive forces, acting through those of the solar plexus, and the attempt to coordinate—they push in so much it pushes out consciousness.
1001-9, epilepsy

The vibrations from the Chloride of Gold solution would add to the vitality for blood and nerve building, aiding more specifically the activities through the lyden gland, through the activities of the glands in the system's reproductive activities that make for an expression in the system through the emotions of the body; making for an activity to the glands that strengthen or maintain the equilibrium in the system—that is, as to the pineal's reaction.

1026-1

Q. Have headaches any connection with psychic development?

A. Rather is it the effect of the OPENING centers that are disturbed. Leave off psychic development, or the attempt to RAISE the vital forces, until there has been more of a purifying of the bloodstream.
1387-2

As is understood by the body, there is the physical, the mental, the spiritual. All are one, but with their attributes have their

activity through the one or the individual entity or body. The spiritual arises from the centers in the lyden . . . glandular forces that are as hidden energies, or the very nature of the creative or reproductive forces. There are the abilities of each center, each gland, each atom to reproduce itself within the body—which is the very nature of glandular reaction. 1468-5

Q. Please explain the physical reaction which took place in the movies the afternoon of Friday the 24th, which started with a hot flush, then a sensation of pin pricks that moved up the spine covering the head and terminating in the feeling of a band being tightened around my head, leaving me with a dull headache.

A. This was an emotion arising from the periods and the flow of emotion from the kundaline center, or the lyden [Leydig-Leydigian] gland, to the ones in the center and frontal portion of the head. This was partly a psychic experience, but kept as a physical reaction by the resistances of the body. This is nothing to be fearful of, but keep the emotions better balanced. 1523-15

Q. Why has the heartbeat been so rapid, especially just after retiring?

A. This is the system attempting to adjust itself to the variations in tempo of the physical and the mental body. This is just as described. The impulses arising from centers along the spine from deep meditation, deep imagination or deep thinking, radiate to various portions of the body. With the congestion which has arisen from toxic poisons resulting from cold, it makes everything work fast. You had just as well ask why does it make the liver work faster, the kidneys work faster, the toes work faster! It doesn't the tongue, or the eyes, or the smell, or any of the sensory organs—for these become dull or slow. It's the central nervous system, attuning to the mental system!

Here you may have a very good demonstration of a physical body and a mental body. Tune them together! 1523-17

In the mental reactions as related to body-building, these have become so disturbed as to bring a distortion through the activity

of the coordinating forces or centers along the cerebrospinal system from which awarenesses may be gained by the rising of the spiritual forces through the glandular forces along the pineal to the brain forces themselves. 1593-1

Q. What can be done to clear up the congestion in the fluid inside the spine, called by some the kundalini: Will yogi breaths aid?

A. As we find, rather the influences of the massage that will alleviate the pressures on those centers along the spine from which impulses are received to the superficial circulation from the deeper cerebrospinal impulses, could bring the better assimilated forces in the glandular activity.

The yogi breathing have their place, but when a condition has reached the place where there is the lack of the forces that **PRODUCE** same, then supply them by the release in the system of those centers from which impulse may be had. 1703-2

... there has been the inclination for the body, through activities of the mental self in its anxiety, to raise or open the centers of the body through meditation and activity when the physical forces were not in the condition for such.

This produced upon the nerve system, especially the sympathetic, what might be called a contaminated stream of negative reaction; causing or producing a nervous breakdown. 1749-1

Q. What are the reactions of the kundaline forces—physically, mentally, spiritually?

A. We might write five or six books upon this! Just which one is desired to be known? There are twelve centers acted upon, each in a different manner, and from the varying sources from which these vibrations are raised in and through these centers—and for what purposes? How many characteristics and desires does the body have? Figure those and multiply it by about fifteen, and you'll have just how much variation there may be in such activities in the body! How many dispositions have you seen in the body? These are all activities of the kundaline forces acting upon some reactory force in the centers of the body. 1861-11

... the pineal gland, with its correlation of the cerebrospinal and sympathetic system, do not coordinate. 1916-4, epilepsy

As we find, through the lacteal duct center, this is affecting the activities of the glands in the pineal as well as the genital system ... 1994-1, epilepsy

As indicated—how oft has remaining quiet aided thee in seeing and feeling and experiencing the full cosmic consciousness! Yes!

This is found, as has been the experience, by the opening of those channels within the physical body through which the energies of the Infinite are attuned to the centers through which physical consciousness, mental activity, is attained—or in deep meditation. 2109-2

There are NO brain lesions, but there is that which at times hinders the coordination between the impulses of the body and the normal physical reactions—or that break between the cerebrospinal and the sympathetic or vegetative nerve system, that coordinates from the lacteal duct through the adrenals and their reaction to the pineal; causing the spasmodic reaction in the medulla oblongata, or that balance at the base of the brain.

2153-4 epilepsy

The nerve systems in the physical we find that depression first caused in the lyden [Leydig] gland that pressed, or indentations made on the perineurial and the pineal nerve center connected with the lyden [Leydig] gland. This then gives the hallucinations in the vibration to the brain center or through the cerebellum oblongata, you see. In the impression as this receives, there comes those conditions of melancholia, of self-destructive forces, of aberrations, of depression as received and hallucinations to all the functioning of the sensory organism, through which these nerve connections find manifestations with the pineal nerve in its course through the system. 2197-1

In times back we find there was an accident to the body that

produced a lesion in the coccyx . . . While lesions have resulted from same in the lower lumbar, in the lower dorsal, and with the combined conditions that have been applied, we find SYMPATHETIC lesions in the whole of the cervical region. This produces, through these pressures, those spasmodic conditions to the reaction between the sympathetic and the cerebrospinal system—which has been termed a MENTAL disorder. The reaction is not mental, but a physical—that acts to, or on, the mental so that the reflexes that come through the sympathetic system are those that prevent a normal impulse from their reaction, causing that pressure, that condition in the lower end of brain proper that makes for the tendency of the body to move, to react in a wondering manner, to make as for responses of those forces in self of first condemnation in self, then as of that as to REMOVE those conditions from self. These come through, then, as repressions in first the sympathetic nerve system, from the lower lumbar plexus to the sacrals and coccyx, then to those activities in the glands themselves that secrete for the functioning through the pineal, and making for an engorgement and an inactivity or an ungoverning of the supply of impulse, as well as blood supply to the brain itself proper. Not dementia praecox, nor even softening of tissue. Unless these conditions are changed in the impulses TO the nerve system this deterioration must eventually set in. 2200-1

In the nervous system—here we find PHYSICALLY, or pathologically, some effects of the raising of the kundalini, or the imaginative system, to the reactions along the centers of the cerebrospinal system, without their SOURCES being GRATIFIED . . .

These as we find are much of the sources of the nervous tensions. Not that these—the raising of such forces—should not be accomplished in a body; but their sources, their reactions must of necessity find expression.

For this body we find that these may find the greater expression in just aiding, helping, someone not so fortunate as self—in the mental, the spiritual and the physical balance. 2329-2

As to the activities through the centers, here—for the moment, let's indicate the SOURCES of this disturbance, that arises along

the cerebrospinal system when at times the body OPENS—and has opened—the centers for the raising of the spiritual forces and powers through the body . . .

The soul body manifesting in the physical, as we have heretofore indicated, finds expression in what we call today the GLANDULAR systems of the body . . .

Then, when under stress there has been raised—from the lyden gland (internal), through the activities of sex as well as the gland forces internally—that which has brought this engorgement—which in the natural consequence or sources of activity has formed a lesion in the lower portion of the 9th dorsal center, which reflects both upward and downward to organs of the physical system . . . The mind then moving much faster than the abilities or the impulses, becomes at times confused; and forgetting becomes a part, and superactivity becomes another part of this reflex action. 2402-1

There has been a lesion in the lacteal duct and that as coordinating with the organs of the pelvis. Hence at times such a state is produced as to almost become an obsession, but possession in same. The reaction to the pineal becomes so severe as to short circuit the nerve impulse; carrying or producing a fluttering or an engorgement in static waves to the base of the brain. Thus periods are caused when there is lack of self-control. 2465-1

Yes, we have the body, the enquiring mind, [2475]; and those conditions, those experiences of the body in the use of Yoga exercise in breathing . . .

These exercises are excellent, yet it is necessary that special preparation be made—or that a perfect understanding be had by the body as to what takes place when such exercises are used.

For, BREATH is the basis of the living organism's activity. Thus, such exercises may be beneficial or detrimental in their effect upon a body . . .

There is the body-physical—with all its attributes for the functioning of the body in a three-dimensional or a manifested earth plane.

Also there is the body-mental—which is that directing influence of the physical, the mental and the spiritual emotions and manifestations of the body; or the way, the manner in which conduct is related to self, to individuals, as well as to things, conditions and circumstances. While the mind may not be seen by the physical senses, it can be sensed by others; that is, others may sense the conclusions that have been drawn by the body-mind of an individual, by the manner in which such an individual conducts himself in relationship to things, conditions or people.

Then there is the body-spiritual, or soul-body—that eternal something that is invisible. It is only visible to that consciousness in which the individual entity in patience becomes aware of its relationship to the mental and the physical being.

All of these then are one—in an entity; just as it is considered, realized or acknowledged that the body, mind and soul are one . . .

Then in the physical body there ARE those influences, then, through which each of these phases of an entity may or does become an active influence.

There may be brought about an awareness of this by the exercising of the mind, through the manner of directing the breathing.

For, in the body there is that center in which the soul is expressive, creative in its nature—the Leydig center.

By this breathing, this may be made to expand—as it moves along the path that is taken in its first inception, at conception, and opens the seven centers of the body that radiate or are active upon the organisms of the body . . .

As this life-force is expanded, it moves first from the Leydig center through the adrenals, in what may be termed an upward trend, to the pineal and to the centers in control of the emotions—or reflexes through the nerve forces of the body.

Thus an entity puts itself, through such an activity, into association or in conjunction with all it has EVER been or may be. For, it loosens the physical consciousness to the universal consciousness. To allow self in a universal state to be controlled, or to be dominated, may become harmful.

But to know, to feel, to comprehend as to WHO or as to WHAT is the directing influence when the self-consciousness has been

released and the real ego allowed to rise to expression, is to be in that state of the universal consciousness—which is indicated in this body here, Edgar Cayce, through which there is given this interpretation for [2475] . . .

Q. Is there at present any danger to any particular body-function, such as sex; or to general health?

A. As we have indicated, without preparation, desires of EVERY nature may become so accentuated as to destroy—or to overexert—as to bring detrimental forces; unless the desire and purpose is acknowledged and set IN the influence of self as to its direction—when loosened by the kundaline activities through the body.

2475-1

That physical conditions exist that are accentuated by influences in the entity's experience is apparent, as does also the [Moon] influence most (This would be very interesting to the physician in charge to watch the changes in the moon and watch the effect it has upon the body). Now, when we have the new moon we will find that for the first two days, as it were, following same, a WILD, HILARIOUS reaction of the stronger; as the WANE begins, then we will find the changes will come about, as will of a bettered condition. These are merely INFLUENCES, NOT those that may not be overcome by the activities as may be changed in a physical organism; for with pressure in the lumbar and sacral region, as has been first indicated, there is that activity to those forces as operate to and through the pineal gland to the upper portion of the body, which corresponds to those forces as are spoken of, even in that of the [Book of] Revelation. Be very good for the doctor here to read [The] Revelation and understand it! especially in reference to this body! These forces as applied to this are the activities as are seen in the sympathetic nerve system, and ADVANCE in their activities as the force of same impel through the sympathetic and the cerebrospinal plexus from the 9th dorsal to the brain itself—at top, see? Hence in the changes as are being brought about in the system through the activity of the change, there is seen less pressure is on the solar plexus center. Hence there is less INCOORDINATION THROUGH the pineal FROM the

effect of the sympathetic system. 2501-6

Q. What causes and what should be done for sensitivity to sounds?

A. This arises from the raising of the kundaline influence in the body to those areas from which the auditory forces receive their impulse. And these, as it were, have been congested there.

Hence, as we have indicated, the necessity of relaxation to those nerves AND the centers and ganglia along the area from the upper dorsal throughout the cervical area. 2684-1

. . . the body has these convulsions . . . as well as the reflexes in brain, to the activity of glands relating to the pineal.

3082-1, epilepsy

As we find, there are conditions that disturb the physical, the mental, and the soul entity. This we find is a prenatal condition; and must be met by the body as well as by those responsible for the body . . .

We find that there is a lesion in the lacteal duct area affecting the activities of the pineal gland; causing those periods of incoordination at the 1st and 2nd cervical, causing spasmodic reaction to the mental body or those losses of hold on self, or the control of the rational body-mind. 3156-1, epilepsy

We find that there has been the opening of the lyden (Leydig?) gland, so that the kundaline forces move along the spine to the various centers that open with this attitude, or with these activities of the mental and spiritual forces of the body—much in the same manner as might be illustrated in the foetus that forms from conception. These naturally take form. Here these take form, for they have not in their inception been put to a definite use.

The psychological reaction is much like that as may be illustrated in one gaining much knowledge without making practical application of it. It then forms its own concepts.

Now we combine these two and we have that indicated here as a possession of the body; gnawing, as it were, on all of the seven centers of the body, causing the inability for rest or even a concert-

ed activity—unless the body finds itself needed for someone else. Then the body finds, as this occurs, the disturbance is retarded or fades—in the abilities of the body to exercise itself in help for others. 3421-1

And here we find some of those conditions of which many bodies should be warned—the opening of centers in the body-spiritual without correctly directing same, which may oft lead to wrecking of the body-physical and sometimes mental.

Q. Is the focal center of the disease in the brain or some other part of the body?

A. As indicated, it is in those centers—the seven centers of the body—where sympathetic and cerebrospinal coordinate the more; 1st, 2nd and 3rd cervical; 1st and 2nd dorsal; 5th and 6th dorsal; 9th dorsal; 11th and 12th dorsal; and through the lumbar and sacral areas. These are the sources. This is not an infection—it is the lack of coordination between the impulses of the mental self and the central nerve and blood supply . . .

Q. Does sexual expression or repression cause this condition, or have any effect on same?

A. This was a part of the beginnings of it; for when the lyden (Leydig) glands are opened, which are in the gonads—or the centers through which the expression of generation begins, they act directly upon the centers through the body. Unless these find expression they disintegrate, or through thy association cause disassociation in impulse and the central or body-nerves. 3428-1

Individuals can become too zealous or too active without consideration of the physical, mental and spiritual. True, all influences are first spiritual; but the mind is the builder and the body is the result. Spiritualizing the body without the mind being wholly spiritualized may bring such results as we find indicated here, so as to raise even the kundaline forces in the body without their giving full expression.

The lack of elements is causing such disturbances in this body [vegetarian diet] . . . These, then, are the sources of disturbances here: etherealizing mentally and the lack of materializing physi-

cally in body-forces; from excesses of diets that do not supply the full or complete needs of a body physically active in the vibrations that surround this body . . .

Q. Are the pituitary, pineal, thyroid and adrenal glands working?

A. Overworking! . . .

Q. What is the condition of the female organs?

A. All of these suffer under the disturbances, and the raising of the kundaline forces is causing activities here that are not in keeping with best conditions. 3481-1

Q. What is the condition of the Kundalini now, which was mentioned in my first reading?

A. This depends upon how and in what manner the body attempts to raise same during its meditation. This doesn't change, for it is the seat, or the source of life-giving forces in the body. The effect upon the body depends upon the use to which an individual entity puts same. Thus the warning, as was indicated, as to how and for what, such influences are raised within the body itself. 3481-3

Then, through deep meditation, even leaving the body almost in same, find there the answer—through the raising of the kundaline forces in the body itself, from the cells within the Leydig gland, so as to carry energies through the body. 3498-1

. . . the 3rd cervical . . . the 9th dorsal . . . the 4th lumbar . . . These are the three centers through which there is activity of the kundaline forces that act as suggestions to the spiritual forces for distribution through the seven centers of the body. 3676-1

These all must be considered, taken into consideration when those conditions are applied to the body for the correction of physical defects that are of the nature of a prenatal affection [infection?] in the glands that have to do with the equilibrium of the body—pineal gland—that runs through the body, from the base of the brain. 3790-1, epilepsy

Q. What is the lyden [Leydig] gland and where is it located?

A. Lyden meaning sealed; that gland from which gestation takes place when a body is created through coition, or inception, through conception of two bodies meeting in creating a body. Located in and above the gland called genital glands, see? In the male, above the glands corresponding to testes. In the female, that above gland responding to testes in the male. Here in this particular case, near the size of a wren's egg. Nominally should be about the size of a small pea. 3997-1

We find that there are adhesions in the organs of the pelvis causing definite reactions to the pineal gland. These as they react to and through the reflexes of brain cause those periods when there are the exaggerated repressions, and there enters all of those experiences through which the entity in transition has passed [past-life memories] . . .

Q. What brought on the mental breakdown?

A. As just indicated the adhesions in the pelvic organs, as directly connected or associated with the lyden (Leydig) and the pineal glands. 4002-1

For as we find this entity has more than once been among those who were gifted with what is sometimes called second sight, or the superactivity of the third eye. Whenever there is the opening, then, of the lyden (Leydig) center and the kundaline forces from along the pineal, we find that there are visions of things to come, of things that are happening. 4087-1

The pressure, then, on account of the fall of the body in the sixth (6th) year that injured the spinal center near the lower lumbar and the sacral, produces a pressure in the overtaxed condition that produces reflexes in the pineal gland. Then we have these occurrences of the hallucinations, or the inability for the body to function normal. 4333-1

. . . the gray, the white tissue itself . . . when these become unbalanced, or distorted, the reaction in the brain, and hence the activities to those incentives of the physical forces in body become

distorted also, and to another mind becomes unbalanced. In this body, the pressure as produced at birth was in the presenting of the body itself, in that known as breech birth, and the pressure was produced in the last lumbar, and the 2nd portion or structure portion of the sacral, and the sacral then producing a pressure to those of the generatory system brought about that enlargement in those centers about these organs in pelvis, that direct connect with the base of the brain in this gland situated there [pineal]. The thread of same, which traverses the system from brain to the end of the cerebrospinal cord proper. 4342-1

These conditions began with the period of presentation. For this was a breech or foot, breech and foot presentation. This brought about pressures in the coccyx and sacral areas that have prevented the normal reactions through the pineal. Not that portion having to do with growth but the exterior portions or to the left side, where there are connections in the lumbar axis, 9th dorsal, the brachial center and the upper cervical center. 5014-1

For the entity takes most every experience by intuition. Easily may the entity, by entering deep meditation raise the kundaline [kundalini] forces in body to the third eye as to become a seeress; so that it may see the future and the past. But the law of such is that, unless these are used for constructive and never for selfish motives or purposes, they will bring more harm than good. 5028-1

We would not make or take the exercises as to raise the kundaline forces in the body without leaving that kind of an experience that is of a nature to coordinate the activities of such exercises through the organs and centers of the body. Not that these are not good, but it is not very good to give a child a razor, not very good to use a razor to sharpen pencils and try to shave with same. So it is in the activities of those who disregard the means to an end of bringing coordination to organs of the body. 5162-1

There are pressures in the coccyx end of the spine from an injury

received thirty-seven years ago . . .

Q. What causes the hallucinations and the persisting in wearing a cardboard or metal pad above her right eye?

A. These are the reactions from former appearances of the same entity in the earth.

Q. Why does she imagine she is being abandoned and tortured by people who dislike her?

A. This, again, is the impression from other appearances in the earth. 5274-1

As for the physical forces, the weakness in the nerve tensions through the body has come from periods when there has been opening of centers of the body without direction to the use of the energies that have been and are created in and through the kundaline forces as they act along the spine . . .

This may be better done when there are better coordinations between sympathetic and cerebrospinal systems. Don't overtax the imaginative body to the detriment of the physical being . . .

As has been just indicated, there is progress made but at times to the detriment of the nervous forces. We would, then, correct the physical being and the mental and spiritual forces may manifest the better. 5286-1

Q. Have I ever caught glimpses of past lives, or are these things more dreams and fancy?

A. The entity has caught glimpses of past lives when it has gone out of itself or has allowed the energies of the kundaline force to pass along the centers of the body. Beware unless you are well balanced in your purposes . . . 5399-2

3.2 Appendix B: The Pineal—Part 2

3.2.1 Background

This appendix may be considered as an extension of a previous one (Appendix A: The Pineal—Part 1) that was written as part of a treatment manual for schizophrenia (McMillin, 1991a). The earlier appendix is included to provide context—a general review from the scientific literature and an introduction to the concept of the *pineal system* as

portrayed in the Cayce readings.

This appendix extends the earlier exposition by focusing with greater detail on the *pineal system* concept with specific anatomical and physiological correlations from the readings and scientific literature. The various aspects of the pineal system as a coordinating and integrative influence in the body will be explored. Implications for the study of epilepsy will be discussed.

3.2.2 The Pineal System

The Edgar Cayce readings are unique in portraying the pineal gland as part of an extensive body-wide network that I call the *pineal system*. The specific term (*pineal system*) is never used in the readings. Anatomically, the *pineal system* extends from head to toe, including glands and nerves (and portions of the intestinal lymphatics called the *lacteal system*—see Appendix D). Here is a list of the primary components of the *pineal system* that will be covered:

- pineal gland (proper),
- Leydig (lyden) gland,
- main pineal branch in the lower cerebellum,
- pineal cord or thread,
- pineal nerve,
- pineal centers, especially at the base of the brain and along the spine.

Before discussing each part individually, some general comments on the nature of glandular activity and the relationship between glands and nerves will be helpful. Edgar Cayce was asked to give a discourse on the endocrine glands. That request culminated in an entire series of readings on the subject. Here are some excerpts from the first reading in that (281) series:

. . . they are not present in a dead body . . . [only through] active forces of a physical body . . . ever the whole activity; not as separating them one from another but the whole anatomical structure must be considered EVER as a whole . . . What are the activities of the glands? Most every organ of the body may be considered a gland . . . that which enables it to perform its duty in taking FROM the system that which enables it

to REPRODUCE itself! That is the functioning of the glands! Not as a whole only, but as individual as well the whole. Hence there is then in the system that activity of the soul, that is the gift of the Creator to man. It may be easily seen, then, how very closely the glands are associated with reproduction, degeneration, regeneration; and this throughout—not only the physical forces of the body but the mental body and the soul body. The glandular forces then are ever akin to the sources from which, through which, the soul dwells within the body. Then we find the endocrine system—not glands but system—is that which is disseminated throughout the whole of the body, as related to the physical forces of same; and may be studied or may be followed in their relationship not only to the physical structural forces of the body but to what we call hereditary and environmental forces and how they may be expected to react upon the system. 281-38

In summary: glands are more about function (physiology) than anatomy. A gland is what it does—its activity. Thus to dissect a corpse and identify clumps of tissue does not suffice to understand the meaning of glands. The nature of glandular activity is life—that partakes of and expresses a low form of electrical energy called God (412-9, 1299-1). The life force is the basis for reproduction, degeneration, regeneration—all of which are activities of glands. Thus almost any tissue or organ in the body could be regarded as a gland. The reproductive aspect of glandular activity is particularly important, both for regeneration of the body through cellular division to replace diseased or worn out tissue (mitosis), but also for the propagation of the species through cellular division necessary for sexual reproduction (miosis).

Although glands can be approached as individual units, the whole must also be considered as a system of interacting parts. The glandular system is the primary source of the soul's manifestation and expression in the body. The endocrine system mediates not only the soul expression of the physical structure of the body, but also the forces of heredity and environment. In particular, two endocrine glands can be considered as the seat of the soul: "the pineal and the Leydig are the SEAT of the soul of an entity." (294-142)

3.2.2.1 The Pineal Gland (proper)

As the namesake and conceptual anchor of the *pineal system*, the pineal gland is the logical place to start this exploration. But this can be a little more complicated than it may initially seem. From the standpoint of the scientific literature and common usage, the pineal is a discreet gland in the center the head. One reading does appear to make such an explicit reference when specifying the pineal as “*gland proper*” (4625–1). However in another reading that uses the similar expression “*pineal gland proper*” the implication appears more expansive. That reading prescribes spinal adjustments, with a caution given about the negative effect upon glands that might result from improper manipulations:

... yet the reactions to the glands from the pressure would intensify, unless proper adjustments are made in the cervicals and the proper manipulation in other stimulation from the lower dorsal and lower lumbar reaction to the glands, or the pineal gland proper—that brush end of the cerebro-spinal system . . . ” 3997-1

In this instance, the “*pineal gland proper*” seems more closely associated with the lower lumbar centers along the spine than the pineal as a discrete gland in the head. Incidentally, one of the important “*pineal centers*” mentioned in many readings is associated with the 4th lumbar plexus (as will be discussed below).

Furthermore, in explaining the broader aspects of the meaning of pineal, numerous readings discuss the functional unity of the “endocrine system of the pineal” (281–49). From a neurological perspective, the readings speak of “the pineal—the governing point of the brain impulses.” (5498–1). From a systemic standpoint, consider the implications of “the pineal—which runs all the way through the system and is the GOVERNING body to the coordinating of the mental and physical.” (567–1) These reading excerpts illustrate the basis for the concept of an extensive pineal system rather than limiting the scope of inquiry to a discreet glandular entity in the head (i.e., pineal proper) recognized in the scientific literature.

Some of the best examples of the pineal as a system come from the 281 series on the endocrine system. For example, the pineal is described as an organizing influence during embryological and fetal develop-

ment. Even before the pineal gland proper is formed (from a strictly endocrine perspective), there is a *pineal cord*:

The cord that is eventually known or classified as the pineal is the first movement that takes place of a physical nature through the act of conception; determining eventually—as we shall see—not only the physical stature of the individual entity but the MENTAL capacity also, and the spiritual attributes. 281-46

From a nucleus in the form of a moving atom the *pineal system* begins to manifest:

As the nucleus forms, there begins that activity which becomes the motivating force of the mental, the physical and the spiritual influences as related to GROWTH . . . That gland a nucleus extending in the shape or form of a moving atom, gathers from its surroundings physical nourishment; and from the mind of the body it takes its PHYSICAL characteristics, or the moulding as it were of its features as related to the external expression of same. Then as the mind of the bearer binds those forces that are its natures in itself, its purposes, its desires, its hopes, its fears, these begin gradually to extend themselves through the nucleus; so that as the shape or form begins to find expression, there are also the channels through which the growth of the spiritual being gives its expression.

It is centered first, then about that known as the cranial center; next the 9th dorsal, or that which is the motive force to other portions through the umbilical cord, that begins then in the third week to give material manifestations in physical development . . .

Thus these centers are opposite the umbilical cord, or those areas through which ALL messages of desire, or of the mental nature, pass; not only to the brain in its reflexes but along the cords to the pineal,—that has been and is the extenuation of its first cause. 281-47

In summary: from conception, the developmental process is holistic, engaging mental, spiritual, and physical influences for growth. The pi-

neal *activity* (for a gland is defined more by its activity/function rather than just anatomy) is already at work shaping (“moulding”) physical structure. *Mind is the builder*, and the pineal system is the primary interface of mind with the physical body. Thus the *pineal system* is a coordinating and integrating system. At this early stage of development, the pineal influence is present in the “cranial center” and 9th dorsal opposite the developing umbilical cord. Even in the adult these three areas function as *pineal centers*. As part of the mental interface with the body, the *pineal system* is able to access not only the mind of the soul, but also the mental influences of the mother and those who are close to the developing entity. This psychic activity of the pineal system is called the “aerial activity” that is the “flow through the pineal, to and through all the centers:”

By the term aerial we mean that impulse or activity that flows in an upward, lifting, raising or rising movement. It is an activity in itself, you see; not as a gland but as an activity UPON glands as it flows in, through, from or to the various centers of activity in the system itself. It is a function. Let’s illustrate—possibly this will give an interpretation such that you may understand:

In your radio you have what you call an aerial for communications that are without any visible connection. This is not a part of that making up the framework, yet it is necessary for certain characters of reception or for the better distribution of that which takes place in the instrument as related to communication itself.

So in the physical body the aerial activity is the flow through the pineal, to and through all the centers. It aids the individual, or is an effective activity for the individual who may consciously attempt to attune, coordinate, or to bring about perfect accord, or to keep a balance in that attempting to be reached or attained through the process. As the process begins in the physical body, it is along the pineal; or it is the same movement that is the controlling or attuning influence from the mother with the developing forces of the body through the period of gestation.

That is the manner, or the process, or the way in which the impressions are made. So, if there is beauty about the body of the mother through such periods, there are those influences to

bring about accord. It may be indicated in contour of face. It may be indicated in the process of change in the activity of the thyroid as related to all the forces,—even to the color of hair or eyes, or the skin's activity; the nails, or more toes than should be—or less, or such activities. Or, the influences existent through such processes might make for a lacking of something in the body itself, pathologically; by the attempt to create a normal balance without the necessary influences being available.

All of this is what we have referred to as the aerial activity, see? . . .

Understand the processes of activity through which there are the needs of the aerial in reception. For, of course, it is a matter of vibration in the body, as well as that illustrated in the physical condition. Thus there are activities about a body that is supplying the needs physically and mentally for a developing body, that become a part of the process, see? 281-53

Thus the *pineal system* (with its cord) functions like a radio antenna able to (psychically) receive information from the mother and those close to the developing fetus. The physical development of the fetus is wholly dependent upon the mother from whom it draws physical sustenance, but its purpose, desire, and hope are built up or influenced by the minds of all concerned. Much of this will be recapitulated and elaborated in detail in the following sections that explore the various components of the pineal system.

3.2.2.2 The Leydig Gland (Seat of the Soul)

The concept of soul and its possible location in the body has had an immense influence on Western history, science, and philosophy:

In the history of Western theological, philosophical, and scientific/medical thought, there exist 2 dominant and, in many respects, incompatible concepts of the soul: one that understands the soul to be spiritual and immortal, and another that understands the soul to be material and mortal. In both cases, the soul has been described as being located in a specific organ or anatomic structure or as pan-

corporeal, pervading the entire body, and, in some instances, trans-human and even pan-cosmological. (Santoro et al., 2009, p. 633).

Continuing this tradition, numerous Cayce readings expound on the nature of the soul with its anatomical and physiological presence in the body:

The basis, the seat of the soul, then, in that of the lyden [Leydig] gland, with the pineal reaction in the system, and this the activity that brings about psychological conditions. 3969-1

Having just discussed some of the physiological and psychological aspects of *pineal system* functioning (as mind the builder) during gestation, now consider the other pole of the *pineal system*, the lyden/Leydig gland in its various activities. First, clarification of the terms *lyden* and *Leydig* is helpful:

(Q) The Leydig gland is the same as that we have called the lyden, and is located in the gonads.

(A) It is in and above, or the activity passes through the gonads. Lyden is the meaning—or the seal, see? while Leydig is the name of the individual who indicated this was the activity. You can call it either of these that you want to. 281-53

This is a very interesting and important excerpt for understanding the lyden/Leydig gland and is also fascinating from the standpoint of Edgar Cayce's psychic process. There are two distinct aspects to the question cited above: (1) The synonymous use of *Leydig* and *lyden*; and (2) the *location* of the gland.

The first part is relatively easy: Yes, both terms (*lyden* and *Leydig*) refer to the same gland. And in fact they are used interchangeably in the readings. One might expect that when the biological or strictly physiological aspect of the gland is emphasized, it may be called the *Leydig*, in reference to the man who discovered it and its biological function. Likewise, when the metaphysical or symbolic aspect of the gland is emphasized, the term *lyden* may be preferable to signify the closed or "sealed" nature of the gland in its normal, default state. Although

this pattern of usage can be noted in certain readings, overall there is considerable variability in the choice of terms. Furthermore, several readings contain variations in spelling and usage, suggesting that the individuals conducting and recording the readings were struggling to understand the terminology. For example, a footnote included with reading 5722-1 (given in 1924 where the term "lytic" is used) provides this partial explanation for the variations:

Notice the pronunciation of "lytic" gland which later we discovered perhaps meant "Leydig". Sometimes later the pronunciation seemed to be "lyden" which later we thought perhaps was "Leydigian". (5722-1)

To avoid confusion, the text of most Cayce readings includes both terms (lyden and Leydig; one as spoken by Cayce and the alternate in parentheses) plus any additional variations (such as "leyden" in reading 849-2). For the purposes of this subsection, I will use a similar approach by simply conjoining lyden/Leydig when referring to the gland.

Returning to the excerpt from reading 281-53, the question and answer about the anatomical location of the gland is a bit more complex. The question itself may have contributed to the confusion:

These questions or statements are such that they will be confusing to some; but if they are asked properly there will not be confusion. 281-53

Edgar Cayce's psychic process was affected by many factors, including the consciousness, intent, and understanding of the person asking the question. So the wording and assumptions of the question could bias or influence the answer by Cayce. This effect was described in the readings themselves, with the insistence that people pay particular attention to how and why they asked questions.

Thus the questioner not only assumed that the terms *lyden* and *Leydig* refer to the same gland (a correct assumption), but also that this gland is located in the gonads of the reproductive system (testes in males, ovaries in females). The reply by Cayce appears to try to clarify the assumption while also being influenced by it. Apparently, the an-

atomical location of the lyden/Leydig gland is above the gonads, but its physiological activity passes through the gonads. This subject will require some careful thought and study of other readings and related supplemental resources, beginning with the man whose name is associated with the gland.

Franz Leydig was a famous and well-respected biologist who discovered the *cells of Leydig* in 1850 (Leydig, 1850) and the *Leydig gland* in 1892:

Leydig is also known for the discovery of the gland of Leydig (1892), a portion of the mesonephros in vertebrates, of which the secretions are thought to stimulate the movement of spermatozoa . . . (Leydig, Complete Dictionary of Scientific Biography, 2008).

The cells of Leydig, discovered in 1850 by Leydig, are interstitial cells located primarily in the reproductive glands of males and are best known for the production of testosterone, a sex hormone associated with masculinity. Interstitial means that the cells of Leydig are scattered throughout the tissue rather than being grouped together as a separate, distinct glandular entity. Interestingly, small quantities of Leydig cells have also been found in adrenal gland tissue (Pollock et al. 1986). Also, testosterone-secreting cells similar to Leydig cells (i.e., hilus cells) are found in the reproductive system of females (Ansari et al., 2014). So there is some inherent complexity even identifying the precise anatomical location of Leydig cells. The presence of Leydig cells (or similar types) in the adrenals and reproductive systems of both males and females is relevant in positing that these cells are actually the Leydig gland and meet the requirement of being both “in and above” the gonads (as proposed by Stanford, 1987).

Alternatively, the *Leydig gland*, discovered in 1892, is a distinct unit of glandular tissue. According to Franz Leydig, the Leydig gland is located in the mesonephros tissue in vertebrates. This places it between the reproductive tract and kidneys. Leydig thought its role was to stimulate movement of spermatozoa. So while the Leydig gland is anatomically distinct and separate from the gonads, there may be a physiological connection with regards to its *activity* (at least in males). This is exactly how the Cayce readings described the anatomy and physiology of the

lyden/Leydig gland. It is separate from the gonads anatomically (located above) while its physiological *activity* (presumably via the chemicals it secretes) affects reproductive functioning.

Leydig's discoveries lay dormant for decades, as it was about 100 years before medical science began serious research on the *cells of Leydig* in the 1950s. Currently, there are hundreds of articles in the medical literature documenting the functions of the cells of Leydig. It is certainly understandable why Cayce scholars would have noted this large and growing body of research and made an association with the readings' use of the term Leydig and the cells of Leydig (e.g., Puryear & Thurston, 1975).

In contrast, the *Leydig gland* has yet to be identified in humans. Typically, when the Cayce readings discuss the lyden/Leydig gland, it is designated as such—a gland. The readings do not use the term "cells of Leydig" (or "Leydig cells") although one reading does mention "cells within the Leydig gland" (3498-1). In one particularly explicit instance, a reading observed that this gland (which is normally about the size of a small pea) had become engorged to the size of a wren's egg. The person was suffering from schizophrenia.

(Q) What is the lyden [Leydig] gland and where located?

(A) Lyden [Leydig] meaning sealed; that gland from which gestation takes place when a body is created through coition, or inception, through conception of two bodies meeting in creating a body. Located in and above the gland called genital glands, see? In the male, above the glands corresponding to testes. In the female, that above gland responding to testes in the male. Here in THIS particular case, near the size of a wren's egg. Nominally should be about the size of a small pea. 3997-1

Thus the lyden/Leydig is a discreet glandular entity—a ball of glandular tissue that is normally about the size of a small pea but, in this case, had become swollen to the size of a wren's egg. This description only makes sense in relation to the *Leydig gland* and not the scattered, *interstitial cells of Leydig*. Anatomically, the location (above the gonads) is consistent with the reading 281-53.

Although tracking down the Leydig gland in the writings of Franz Von Leydig has been a challenge, there are references in the modern

biology literature. However, mentions of the Leydig gland appear to be almost entirely in articles about fishes (e.g., Kingsley, 1912; Khanna & Yadav, 2004; Bhatnagar & Bansai, 2008). In that context the Leydig gland appears to function as an accessory organ for the reproductive tract, much as the prostate, Cowper's gland, and seminal vesicle do in humans. Below is a sampling from research articles to provide a sense of the nonhuman Leydig gland literature:

In the elasmobranches sperm released from the ampullae into the efferent canals pass through a mass of coiled glandular tubules (gland of Leydig) which are derived from the anterior nonurinary portion of the mesonephrous. (Hoar and Randall, 1969, p. 15)

In the Greenland shark . . . the cranial part of the kidney forms a Leydig gland which secretes the seminal fluid. This Leydig gland is not homologous with the Leydig cells (which are sometimes called Leydig gland) of the higher vertebrates. (Khanna, 2004, p. 66)

Both the epididymis and ductus deferens receive a viscous fluid produced by the adjacent Leydig gland . . . Leydig gland bodies are large, eosinophilic, non-membrane-bound secretions of Leydig glands. (Hamlett, 1999, p. 450)

Jones and Lin conclude that Leydig gland secretions are the main source of the increase in protein concentration of the luminal fluid in the ductus deferens in *Herodontus* . . . These data suggest that the epididymis and Leydig gland secretions play important roles in ion and water transport, protein secretion, and maturation of spermatozoa. (Hamlett, 1999, p. 453)

After spermiation, sperm pass through vasa efferentia and enter the coiled tubules of the Leydig gland, which is derived from the anterior portion of the mesonephric kidney. It is not

steroidogenic and should not be confused with the Leydig cells. (Norris, 2007, p. 383)

Leydig's gland, a modified region of the kidney, produces seminal fluid. (Wourms, 1977, p. 379)

In transit through the ducts, spermatozoa undergo modification by secretions of the extratesticular ducts and associated glands, i.e., Leydig gland. In mature animals, the anterior portion of the mesonephros is specialized as the Leydig gland that connects to both the epididymis and ductus deferens and elaborates seminal fluid and matrix that contribute to the spermatophore or spermatozeugmata, depending on the species. Leydig gland epithelium is simple columnar with secretory and ciliated cells . . . Secretory activity of both the Leydig gland and epididymis contribute to the nascent spermatophores, which begin as gel-like aggregations of secretory product in which sperm are embedded. (Hamlett et al, 2003, p. 111)

Thus the specific human anatomy of what the Cayce readings call the lyden/Leydig gland remains a mystery. As noted, some authors (e.g., Puryear & Thurston, 1975; Thurston, 1976; Stanford, 1987) have identified the Leydig gland (in the readings) as the cells of Leydig. But this is problematic given the description provided in reading 3997-1 in which its normal size was described as the size of a small pea. Furthermore, as discussed above, multiple readings indicate that the activity of the lyden/Leydig gland appears to pass through the gonads while being located above the gonads.

From the standpoint of the Leydig gland as discovered by Franz Leydig and documented in the scientific literature—combined with the readings' assertion that this gland is normally the size of a small pea and located above the gonads—one might surmise that the lyden/Leydig gland in the readings refers to Cowper's and Bartholin's glands. Cowper's glands (also called bulbourethral glands) are pea-sized exocrine glands in the male reproductive system located posterior and lateral to the membranous portion of the urethra at the base of the penis. They produce a pre-ejaculate fluid secreted during sexual arousal that neutralizes acidity in the

urethra in preparation for the passage of sperm cells. The homologous glands in females are Bartholin's glands located slightly posterior and to the left and right of the opening of the vagina. They secrete mucus to lubricate the vagina and are also about the size of a pea. Although these glands fulfill some of the criteria of the lyden/Leydig gland in reading 3997-1 with regard to sexual reproduction, it is difficult to imagine how these accessory sex glands could fulfill the more expansive spiritual attributes (i.e., "*seat of the soul*") discussed in the readings.

Furthermore, in addition to the readings cited above (281-53, 3997-1) in which the lyden/Leydig is said to be "in and above" the sexual organs, there are numerous other readings that associate this mysterious gland with multiple, diverse locations in the body including these:

- **Pelvis** (1916-1, 2790-5, 4002-1), with one very explicit mention of the "lyden glands in the false [upper] pelvis" (4138-1);
- **Base of the brain** (2372-1, 3873-1, 744-1);
- **Upper (cervical) spine** (5526-1);
- **Gonads or genitals** (3428-1, 281-47, 294-141).

Curiously, a reading for a twenty-three-year-old man recommended wearing an azurite gemstone "around the neck or over the body close to the vibrations from the heart or from the breast itself in its vibrations" (440-11). Although numerous readings encouraged such applications, the interesting (and potentially relevant) aspect of this case is that the young man asked if the beneficial affects of the stone would be enhanced if worn over the *lyden gland*. Apparently, this fellow envisioned wearing the stone with a belt or strap along the pelvis, above the reproductive system. This individual was a close friend of Cayce, having received 21 readings, and would be presumed to be aware of the location of the lyden gland. The entranced Cayce cautioned against that placement, stating that the strong vibratory emanations from the stone might have a negative influence on the body from the lyden gland, but did not comment on the impracticality of wearing it on the testes (assuming that the lyden/Leydig gland is located in the cells of Leydig). Certainly, this is not definitive evidence of the location of the lyden/Leydig gland, but does tend to support the idea of an upper pelvis location.

Some of the apparent confusion over the *precise location* of the lyden/

Leydig gland cited in the readings may be resolved by remembering that a gland is defined by its *activity* (physiology) rather than its structural placement (anatomy). Furthermore, it may be helpful to think of the lyden/Leydig as a *system* similar to the *pineal system* described above—only in this instance the readings actually do make reference to the “leyden system” with various anatomical components and activities. The “leyden system” was mentioned in reading 849-2 for a twenty-year-old male suffering from gonorrhea, a venereal disease. The readings stressed the necessity of preventing stricture of the urethra or the condition being driven into the “leyden system,” resulting in destructive forces elsewhere in the body. Gonorrhea may be associated with unilateral scrotal pain, tenderness, swelling, and—in some instances—periurethral and Littre gland abscesses, with infection of the Cowper’s glands, the prostate, or the seminal vesicles. All of these components of the male reproductive system fall within the general designation of accessory organs of the male reproductive system associated with the Leydig gland in animal studies (as noted above).

Thus, it appears that lyden/Leydig may be considered as a *system* within itself or perhaps as a subsystem within the *pineal system* (much as there are systems and subsystems within the entire nervous system). Whereas the *pineal system* with its components in the brain, along the spinal cord, and throughout the body has a well-recognized namesake as its primary center in the middle of the brain—the lyden/Leydig counterpart is less well defined. Presumably, this hypothetical lyden/Leydig system consists of a pea-sized Leydig gland, either in the pelvis (probably the false pelvis) or elsewhere in the reproductive system in combination with sexual organs (most notably the gonads). Thus, this system interacts with portions of the reproductive system (including the cells of Leydig and sex accessory glands as described by Franz Leydig). Within this systemic framework, certain aspects of lyden/Leydig activity also extend to the upper spine and base of the brain in conjunction with the *pineal system*.

With regard to physiology, the readings indicate that lyden/Leydig gland activity encompasses a variety of processes including sexual reproduction (3816-1, 340-3, 4304-1, 5722-1); rejuvenation of the body (281-63, 1468-5); in conjunction with the pineal and other glands, development of the embryo and fetus during gestation (3997-1, 281-51);

and regulation of the life force energy of the body during gestation and altered states such as deep meditation (281-13, 2475-1, 281-53, 281-54, 2946-4) and psychic experiences (294-140, 294-142, 254-68). Lyden/Leydig activity is associated with coordination of nerve vibratory rates, particularly along the spine and in the brain (161-1, 744-1, 4506-1, 5562-11, 5715-1). In its raised vibratory intensity, the life force is called kundalini. Opening the closed or shut door of consciousness to higher levels is associated with kundalini activation (294-141, 4087-1). These activities are indicative of the soul expression associated with the lyden/Leydig gland (or its system) as suggested by the term “seat of the soul.”

From the perspective of the Cayce readings, pathology of the lyden/Leydig gland (as it affects the *pineal system*) is sometimes associated with psychiatric and neurological conditions such as schizophrenia, manic-depressive disorder, and epilepsy (McMillin, 1991a; McMillin 1991b). Many of the case study summaries in section 2.2 document the prominent role of lyden/Leydig involvement in epilepsy exemplified by nervous system incoordination (sympathetic/cerebrospinal) in the medulla oblongata and excessive neuronal activity in the brain.

The Cayce readings also link the lyden/Leydig gland to psychological and spiritual development and functioning. Hence, opening the sealed or closed door associated with the lyden/Leydig gland is a powerful and sacred process that can sometimes result in unpleasant or even pathological (psychiatric/neurological) conditions if the awakening process becomes distorted (sometimes called *kundalini crisis* or spiritual emergency—see The Pineal—Part 1, section 3.1.3).

3.2.2.4 Main Branch in the Cerebellum

There are branches within the pineal system, to the lobes of the brain (9-1) and along the spine (211-1, 464-4, 3997-1). Most notably, there are “pineal centers in the **main branch**” of the *pineal system* located in the lower portion of the cerebellum where the sympathetic and cerebrospinal systems coordinate—or, at times, fail to coordinate, resulting in major mental illness as described in case 4381. The soul influence through the “imaginative and impulsive system” (associated with the sympathetic system, section 3.3.4) failed to coordinate with the physical attributes of the body (cerebrospinal system). Thus, an engorgement of the pineal centers in the “main branch or center of same in the lower

portion of the cerebellum" was said to have been formed due to improper development:

As we find, there are those incoordinations between the sympathetic (or the imaginative and impulsive system) and the physical or cerebrospinal system. These produce, in reactions at times, those variations and the variableness in the activities of the body as related to the physical and normal reactions; incoordination being produced by pressures that exist in the cerebrospinal system, and those that make for lack of connections directly to those centers in the brain forces as to make impulse coordinate with the normal physical reactions. These are more severe or more disconcerting, and more pressure exists, at times than at others. From the periods that have been passed in the development of the physical body, in its renewing of the physical attributes without the normal renewing of connections with the sympathetic and cerebrospinal, or between the impulse and the reactions from the imaginative to the normal physical or corporal body, necessarily these have left an enlargement of the pineal centers in the main branch or center of same in the lower portion of the cerebellum; forming, then, a definite place of contact with the physical attributes of the body.

4381-1

For a young woman experiencing frequent semi-fainting spells who asked a follow-up question about the meaning of "pineal center," the readings responded with an interesting comment about the *pineal center* in the base of the cerebellum that extends through the whole body and brings "equilibrium" to the body:

(Q) What causes the semi-fainting which overtakes the body frequently?

(A) We have given this—pressure produced by lesions in the dorsal region on the pineal center.

(Q) What is the pineal center?

(A) That gland in the base of the cerebellum that extends through the whole system and gives equilibrium to the body.

140-1

Thus there are two readings identifying an important pineal center in the “lower portion” or “base” of the cerebellum. Apparently, this center is responsible for maintaining *equilibrium*. The question arises as to the meaning of *equilibrium*, for it likely means keeping a balance with relation to posture (as in reading 140–1). However, it could also refer to coordination between the sympathetic and cerebrospinal (another form of balance) that fits with reading 4381–1. Of course the two interpretations are not mutually exclusive.

Approaching the question purely from the standpoint of anatomy, at least three options stand out: (1) the fastigial nucleus, (2) the lingula, and (3) the flocculonodular lobe of the vestibulocerebellum. Keep in mind that reading 4381–1 refers to “pineal centers,” so there could be more than one.

The fastigial nucleus is at the base of the cerebellum and close to 4th ventricle, which seems to be a theme with the pineal system—access to cerebrospinal fluid. The fastigial nucleus is involved in maintaining balance, has close connections with the autonomic nervous system (ANS), and is associated with mental health issues (Zhang et al., 2016).

The lingula is the uppermost lobe of the vermis involved in balance. It is unpaired (like the pineal gland proper) and not associated with other lobes of cerebellum. It is also located close to the 4th ventricle (Freitas & Bispo, 2010).

The flocculonodular lobe (vestibulocerebellum or archicerebellum) regulates postural equilibrium (balance) and eye movements. It is at the base of the cerebellum and is also lower (more caudal) than the other two options mentioned above (Roostaei et al., 2014).

There are some additional clues in other readings that may be helpful in ascertaining the location and function of the major pineal center in the base of the cerebellum. This aspect pertains to its close association with the medulla oblongata. Anatomically the cerebellum is connected to the rest of the brain by six peduncles, three on each side bilaterally: (1) the superior cerebellar peduncles that connect to the mid-brain; (2) the middle cerebellar peduncles connect to the pons; and (3) the inferior cerebellar peduncles connect to the medulla oblongata (Roostaei et al., 2014).

Three readings explicitly indicate a connection of the pineal to the cerebellum through the medulla oblongata. One reading explicitly

mentions sympathetic and cerebrospinal coordination in association with the cerebellum:

Hence we find that the functionings of the glands in the adrenals, and those relationships of the pineal to the gestations in the sexual forces in the system, have become all engorged—or are abnormal in the body; rather than becoming gradually centered to those activities through the base portion—or through the medulla oblongata—to the cerebrospinal system where the sympathetic and cerebrospinal systems coordinate with their activity to the cerebellum and the central portion of the frontal portion of the brain forces themselves. 1104-1

Note the connectivity of the cerebellum to the frontal portion of the brain, an example of network connectivity that could be relevant to the growing literature on cerebellar involvement in cognitive functioning (Watson et al., 2014). Also note that the cerebellum is involved in sympathetic and cerebrospinal nervous system coordination. The importance of the cerebellum in coordinating activity within the ANS is well established (e.g., Reis & Golanov, 1997; Schmahmann, 2000; Zhang et al., 2016). For example, the cerebellar vermis is connected with the spinal cord, brain stem, and the hypothalamus and can regulate autonomic responses such as cardiovascular tone, respiration, and gastrointestinal function (as reviewed by Timmann et al., 2010).

In human and animal studies alike, a growing source of literature has emerged highlighting a number of autonomic functions that appear to involve pathways through the cerebellum . . . The cerebellum projects to several [ANS] brainstem structures, including the nucleus tractus solitarius, parabrachial nucleus and rostral ventrolateral medulla, in addition to, the rostral portion of the inferior and medial vestibular nuclei. (Baker et al., 2019, p. 192)

Another reading mentioning the medulla oblongata describes the effects of failed attempts at therapy to the cerebrospinal system:

. . . the nerve effects or the congestion from those portions that should have had their stimulation for the proper distribution of energy as released from the whole portion of the cerebrospinal system did not! Consequently we have, through the ducts of the system, along the cerebrospinal system, a contraction to the pineal area—the ducts that run through the medulla oblongata into the portion of the cerebellum itself, that makes for a contraction to the very brain centers themselves. 635-5

A third example of cerebellum and medulla oblongata participation in the *pineal system* is found in a reading for Edgar Cayce himself that was dedicated to understanding the pineal gland. The explanation begins with a description of the pineal during gestation:

As it [the pineal] then reaches from the umbilical cord to the brain, there is builded that as is centered about same by the physical attributes of that progenerated from those bringing such an action into being. When there has reached that stage when there is the separation of same, the [umbilical] cord then being broken, this forms then its own basis in the lower portion of the brain, or cerebellum, and through the medulla oblongata to the central portion of the cerebrospinal cord itself is held intact . . . 294-141

This reading seems to be describing the pineal thread or cord that forms its own basis in the cerebellum through the medulla oblongata and extends down inside the central canal of the spinal cord. There are two more readings that discuss the cerebellum in relation to the pineal, and they both contain the curious term “*cerebellum oblongata*.” When I first encountered these readings, I wondered if the entranced Cayce simply mispronounced or garbled the wording, intending to name the medulla oblongata. With further research (as described above), it seems plausible (and probably likely) that the intent was to draw attention to that unique and very special connection between the cerebellum and medulla—in other words, that aspect of the cerebellar functioning that relates directly to the medulla oblongata.

In one reading involving major mental illness, the problem begins in the Leydig (lyden) gland of the reproductive system. The connection

to the “cerebellum oblongata” is through the pineal nerve in its course through the system:

The nerve systems in the physical we find that depression first caused in the Lyden [Leydig] gland that pressed, or indentations made on the perineurial and the pineal nerve center connected with the Lyden [Leydig] gland. This then gives the hallucinations in the vibration to the brain center or through the cerebellum oblongata, you see. In the impression as this receives, there comes those conditions of melancholia, of self-destructive forces, of aberrations, of depression as received and hallucinations to all the functioning of the sensory organism, through which these nerve connections find manifestations with the pineal nerve in its course through the system. The excess of these vibrations are producing the indentation or the lack of those in the sensory system. These finding manifestations abnormally. 2197-1

In a second example employing the term “cerebellum oblongata” there was pressure upon the pineal where it connects with the dorsal sympathetics and sensory facial nerves. This resulted in a lack of full coordination that affected the pineal gland and *cerebellum oblongata*:

The pineal gland’s pressure shows the effect. Where connection is made in the 2nd and 3rd dorsal, that connects with the sympathetic and the nerves supplying the organs of sensory system, below the 6th, 7th and 5th nerve of face there is a lack of the influence or incentive to function in a nominal way. Hence the obstruction. These conditions and accidents first at birth, in the manner of presentation, and in the second year, in the dorsal. These pressures show in the physical reaction to the organs then only reflexly, and not as sympathetic reaction, for the present forces function nominally to suggestion through some of the organism, yet the vibration as is necessary to produce the full coordination is lacking in the system.

IN THE FUNCTIONING OF THE ORGANS THEMSELVES, in brain forces, developing in a nominal way with pressure on the pineal gland and the cerebellum oblongata being

deflated rather than acting in the nominal way, yet impressions are received, or stored, yet the coordinating of same, with the reflex in the sympathetic, does not act normal. 4559-1

Having examined the information in the readings on the *pineal center* in the cerebellum, it seems likely that there is a *pineal system* connection through the medulla oblongata (i.e., inferior cerebellar peduncle) to the lower portion or base of the cerebellum. The precise anatomy and physiology have yet to be determined.

Keeping in mind that the primary function of the *pineal system* is to integrate and coordinate the mental and spiritual with the physical, it is interesting and relevant that modern perspectives on the cerebellum have shifted from “the traditional view of the cerebellum as a mere coordinator of autonomic and somatic motor functions” to a more expansive understanding (Murdoch, 2010, p. 858). Currently, the cerebellum is recognized as playing an important role in a variety of cognitive processes, such as executive functioning, memory, learning, attention, visuospatial regulation, language and behavioral-affective modulation (as reviewed by Baillieux et al., 2008). From a mental health standpoint, cerebellar dysfunction is thought to be involved in psychotic bipolar disorder (Shinn et al., 2017), autism (Becker & Stoodley, 2013), and schizophrenia (Andreasen & Pierson, 2008; Yeganeh-Doost et al., 2011).

The role of the cerebellum in the *coordination* of physical movement is well established. Pathologically, cerebellar dysfunction may result in an *incoordination* of movement called *dysmetria*. Similarly, considering that the cerebellum is also involved in mental activity, cerebellar dysfunction may contribute to an *incoordination* of cognitive functioning called “cognitive dysmetria” (Andreasen et al., 1998).

Dysmetria of movement, or ataxia, is matched by dysmetria of thought, including the cerebellar cognitive affective syndrome, abnormalities of affect, and psychotic thinking. (Schmahmann, 2000, p. 189).

As a hallmark of the pineal system, *coordination* (whether physical or mental) is paramount. The pineal centers within the cerebellum, as a major branch of the pineal system, play a crucial role in maintaining

coordination of both mental and physical activity.

3.2.2.5 The Pineal Thread or Cord

As part of the *pineal system*, many readings mention a pineal cord or thread that connects and extends through the body:

. . . the pineal gland in the base of brain and its cord or thread, or connection, as traces itself through the body. 4862-1

. . . the pineal as the long thread activity to the center of the brain . . . 281-53

The cord that is eventually known or classified as the pineal is the first movement that takes place of a physical nature through the act of conception; determining eventually—as we shall see—not only the physical stature of the individual entity but the MENTAL capacity also, and the spiritual attributes. 281-46

Pineal cord involvement in embryonic and fetal development has been discussed (section 3.2.2.1). Now the focus is on the pineal cord or thread *after birth*, mostly in adults. In most such cases the pineal cord or thread is mentioned in the context of pathology. Often, the pineal cord has been injured, or damage to adjacent structure on the spinal cord has put pressure on the *pineal system*.

. . . the imagination or vision of the mental plane becomes abnormal, when the reaction in the pineal gland gives the abnormal flow, and this produced by this structural condition existent in the upper cervical and in the lower end of the cerebrospinal system—for, as we find, this gland runs from the medulla oblongata to the lower end of the spine, in the coccyx. 4712-1

The disruption of the soul's contact with the physical body can result in the symptoms of major mental illness. For example, in a reading for a twenty-seven-year-old man suffering from mental illness, the problem was traced to pressure upon "that cord called the pineal." In the background section of the reading, the man's father reported: "He has had

several nervous breakdowns since he was about ten to eleven years old. The doctor who treated him last said it was acute mania. There is no sign of anything of that sort in either one of our families, on my side or my wife's side. These spells seem to come about every three to four years and last about two to three months." The cyclical nature of the episodes was also noted in the reading itself. The pineal gland proper is known to be involved in the regulation of biological cycles (section 3.1.1). The *pineal system* (and especially the *pineal centers* along the spine) are also cited in several readings of bipolar disorder. In case [1168] the disorder appears to have been bipolar disorder:

The indications through the blood supply show how that the body is constantly under a nerve strain, but that the reactions which come about that produce the incoordination in the reflexes between the muscular forces or the body-physical and the body-mental occur rather at those periods of CYCLE readjustment between the lower portions of that cord called the pineal with its coordination with the adrenal and the lacteal plexus, or larger portion of the assimilating system. For it is in the area here that the pressure has produced, does produce, a condition similar to a bundle of nerve tissue that has made and does make for its activity or pressure upon the pineal end AND the adrenal at periods when these changes, or cycles of change, occur. 1168-1

Note the connections of the pineal cord with the adrenal glands and lacteal plexus in the abdomen. These are *pineal centers* (to be discussed below) that are relevant to epilepsy. Also note the cyclical nature of the condition. The pineal gland is a regulator of physiological cycles (see The Pineal—Part 1, section 3.1.1).

In another case that likely involved major mental illness, a referral was made for treatment at the Still-Hildreth Osteopathic Sanatorium in Macon, Missouri (an institution dedicated to the treatment of mental illness using the osteopathic approach). Note the distinction between the "pineal gland in the base of the brain" and its "cord or thread, or connection" that runs throughout the body. In this case, the pathology was associated with pressure to the lower spine caused by an injury:

The body would then receive the better attention in an institution such as Still-Hildreth, for there the correction of the injury to the spine—in the lumbar and sacral—would be made, relieving the pressure on the pineal gland in the base of brain and its cord or thread, or connection, as traces itself through the body. 4862-1

A reading for a boy who was said to be experiencing “spasmodic reactions to the brain centers” also discussed the pineal cord, which was said to be engorged at the lumbar region of the lower spine (another important *pineal center*). There is no specific documentation to allow a medical diagnosis of epilepsy, although the pathophysiology (including abdominal adhesions) is very similar to other cases in the readings that do fall within the spectrum of seizure disorders:

Now, as we find, there are disturbing conditions that prevent the better physical functioning in this body, [769]. These conditions, as we find, are of incoordinations. There are hindrances in this direction. There was, with the conception of the body, that which hindered in the normal developments as from the active forces THROUGH the umbilical center. Hence we have in the area adhesions that at times prevent the proper coordination, with the passage of certain characters of foods and the developments of those portions of the organism that affect through same the glands in system; as related especially to the activity of the pineal center and gland. And there is an engorgement of the cord itself, the pineal cord, in the area of the lumbar region. This prevents the proper coordination between the sympathetic and cerebrospinal system, producing spasmodic reactions to the brain centers and to the circulatory system through same. 769-1

The pineal cord is probably also known as the *silver cord* spoken of in biblical scripture (Ecclesiastes 12:6) mentioned in this excerpt that describes a dramatic aspect of Cayce’s psychic process:

(Q) What caused the extraordinary physical reaction with Edgar Cayce at the close of the reading [254-67] this morning, at the beginning of the suggestion?

(A) As was seen, through the seeking of irrelevant questions there was antagonism manifested. This made for a contraction of those channels through which the activity of the psychic forces operates in the material body; as we have outlined, along the pineal, the lyden and the cord—or silver cord. The natural reactions are for sudden contraction when changing suddenly from the mental-spiritual to material. 254-68

If this association (pineal cord = silver cord) is accurate, then it is likely that the pineal cord allows the soul to manifest in the physical body. Destruction or serious deterioration of the pineal cord results in death or departure of the soul:

In the body we find that which connects the pineal, the pituitary, the lyden, may be truly called the silver cord, or the golden cup that may be filled with a closer walk with that which is the creative essence in physical, mental and spiritual life; for the destruction wholly of either will make for the disintegration of the soul from its house of clay. To be purely material minded, were an anatomical or pathological study made for a period of seven years (which is a cycle of change in all the body-elements) of one that is acted upon through the third eye alone, we will find one fed upon spiritual things becomes a light that may shine from and in the darkest corner. One fed upon the purely material will become a Frankenstein that is without a concept of any influence other than material or mental. 262-20

The silver cord and golden bowl noted in scripture (Ecclesiastes 12.6) and in several Cayce readings apparently rely on those minerals (gold and silver) to maintain health and sustenance. For example, in the following excerpt that prescribed vibratory gold and silver (via the wet cell battery), the role of gold and silver is specifically addressed:

Silver and Gold, then, as metals for the body, enliven the glands of the system that are lax in their physical functioning, supplying to the brain centers even themselves THAT impulse, that incentive, as to make for PROPER PHYSICAL COORDINATION in the body here . . .

(Q) How long should the electrical treatments be given each time?

(A) The Gold, charged in the low electrical vibration, would be for twenty to thirty minutes at a treatment. The Silver would be from ten to twenty minutes, when given. The change in time is as this: Remember, there is truth in, “When shall the silver cord be broken, or the golden horn be empty?” The golden activity upon the system is to supply that necessary element in the glands that secrete in the system for the supplying of the assimilated forces of a developing body, and pour their fluids as from the horn into the body. Hence more is necessary. While, as of those of the silver cord that makes for that transmutation of IMPULSE from the brain to the organs of the body, SUSTAINING—as it were—that spark of life itself in a material plane. 5500-1

Understanding the pineal cord (silver cord) and its relationship to the lyden and pineal glands (i.e., “seat of the soul”) is practical if one intends to apply the Cayce information on energy medicine with vibratory solutions such as gold and silver.

These conditions began with the period of presentation. For this was a breach or foot, breach and foot presentation. This brought about pressures in the coccyx and sacral areas that have prevented the normal reactions through the pineal. Not that portion having to do with growth but the exterior portions or to the left side, where there are connections in the lumbar axis, 9th dorsal, the brachial center and the upper cervical center. 5014-1

This reading suggests that the pineal (as it runs along the spine) has three aspects: an interior portion that has to do with growth, and two exterior bilateral portions (left and right) that connect with the lumbar axis, 9th dorsal, brachial center in the upper dorsal (thoracic), and upper cervical. These are important pineal coordinating centers between the sympathetic and cerebrospinal nervous systems. It seems likely that the two exterior portions are related directly to the sympathetic chain ganglia running along either side of the spine. The assumed interior portion that has to do with growth may be the pineal cord or thread that is active in embryonic/fetal development.

Here is another example from a reading discussing the association of the pineal with the central portion of the cerebrospinal cord.

As it [the pineal] then reaches from the umbilical cord to the brain, there is builded that as is centered about same by the physical attributes of that progenerated from those bringing such an action into being. When there has reached that stage when there is the separation of same, the [umbilical] cord then being broken, this forms then its own basis in the lower portion of the brain, or cerebellum, and through the medulla oblongata to the central portion of the cerebro-spinal cord itself is held intact . . .294-141

To paraphrase: During gestation the pineal cord extends from the brain to umbilicus where it is centered. At birth, when the umbilical cord is cut, the pineal becomes centered in the cerebellum and through the medulla oblongata is held intact in the central portion of the spinal cord. The focus will now shift to this portion of the pineal related to growth that is located in the central portion of the spinal cord.

Reissner's Fiber

An obscure and mysterious filament called Reissner's fiber (RF) is a potential candidate for the designation of pineal thread, at least as it pertains to the spinal cord. RF is the condensed secretion of glycoproteins produced by specialized ependymal cells of the subcommissural organ (SCO), a circumventricular organ, located in the roof of the third ventricle in close proximity to the pineal gland. As a threadlike structure, RF runs through the cerebral aqueduct and fourth ventricle down the central canal, essentially extending from the pineal gland to the end of the spinal cord (Monnerie et al., 1995; Cantaut-Belarif et al., 2018; Rodríguez & Caprile, 2001). Anatomist Ernst Reissner summarized his discovery of a delicate cord within the central canal of the lamprey spinal cord in 1860 as follows:

Within the central canal I frequently observed a cord, which in cross sectional profile is circular-appearing, measuring 0.10015" in diameter, very much resembles an axon, and at best displays a somewhat stronger light refractive capacity

. . . Since this cord, if I was lucky enough to find it, always displayed constant features and did not exhibit even those variations in form which are characteristic of axons in chromic acid preparations, I cannot assume that it is identical with the irregular masses which occasionally fill the central canal totally or partly and have been mentioned by several investigators to occur in the spinal cord in other animals or in man. (in Oksche et al., 1993, p. v)

Since Reissner's discovery a significant body of research literature has accumulated, almost entirely in animals (much as we have already seen with the Leydig gland). For example, Cantaut-Belarif et al. (2018) demonstrated that RF is critical for the morphogenesis of a straight posterior body axis in zebrafish in which the *sospondin* gene had been experimentally mutated. Due to the mutation the fish systematically failed to assemble the RF. Although ciliogenesis and cerebrospinal fluid flow were intact, the body axis morphogenesis was impaired. The authors concluded that cilia promote the formation of the RF and that the fiber is necessary for proper body axis morphogenesis. Interestingly, the essential role of RF in the morphogenesis of the body axis in this study appears similar to the activity of the pineal cord during gestation in humans as described in the Cayce readings discussed in section 3.2.2.1.

Although the presence of RF is well established through extensive animal research, including primates (Castenholz & Zoltzer, 1980), its presence in humans is controversial (Wile, 2016). Animal studies have confirmed that RF extends from the fourth cerebral ventricle to the end of the central canal of the spinal cord and is continuously renewed at its cephalic part by the addition of material released from the SCO (Ermisch 1973). Wile has written extensively on RF, contributing insights ranging from quantum physics to subtle energies—in many respects resembling the pineal thread in the Cayce readings:

During the past forty years I have been investigating a little-known, constantly growing, thread-like glycoprotein complex consisting of 2-5 nanometer fibrils called Reissner's fiber as a site of quantum behaviors. I was first led to

this enigmatic fiber through an exploration of the possibility that the parallels between esoteric traditions and modern physics are based on expanded states of consciousness produced by the activity of the “subtle body” described since the dawn of history. Yoga, kabbalah, and acupuncture as applied Taoism each describe a psycho/sexual/spiritual energy—kundalini, chi, and shekinah, respectively—which travels through a passageway through the center of the brain and spinal cord. This passageway corresponds to the central canal of the spinal cord and the third and fourth cerebral ventricles. The caudal end of the central canal is a triangular dilation called the terminal ventricle which is surrounded by hormone secreting and sensory cells. The cephalic end of the third ventricle is the pineal gland which has photosensory and hormone secreting properties. (Wile, 2012, p. 1007)

Although abundant animal studies document the existence of RF, the anatomical subtlety of this fiber is a technical challenge in the human body:

It is possible that Reissner’s fiber could have thus far evaded observation in human adults because of its rapid post-mortem degeneration and inaccessibility . . . Observation of the fiber in living subjects is also problematic. Current neuroimaging devices such as MRI and PET lack sufficient resolution to detect the fiber. (Wile, 2018, p. 67)

3.2.2.6 The Pineal Nerve

Twenty-six Cayce readings use the term “pineal nerve” with a few other readings making an indirect association, such as “the pineal gland and its nerve connection in the sensory system” (3816–1). From the standpoint of mainstream human anatomy, there are various possible nerve connections with the pineal that may be relevant to the pineal system. From the scientific literature the primary innervation of the mammalian pineal is related to melatonin production and circadian timing. The process involves (1) visual input (light) through

the retinohypothalamic tract to the suprachiasmatic nucleus (SCN) of the hypothalamus; (2) which generates a circadian signal transmitted by SCN projections to the parvocellular autonomic component of the paraventricular nucleus in the upper thoracic intermediolateral cell column; (3) that relays impulses through preganglionic sympathetic fibers to the superior cervical ganglion; (4) from which postganglionic sympathetic fibers innervate the pineal, mediating the secretion of melatonin (Moore, 1996). This complex pattern of innervation involves both subcortical and peripheral components, with sympathetic nerves providing the final connection with the pineal. Many of the Cayce readings that discuss the pineal nerve are equally (or more) complex and frequently emphasize connectivity with the sympathetic system. For example:

There has been in times back a repression to the functioning of the pineal nerve and gland. This then caused the enlarging of this gland in the body, especially in the base of the brain. In the centers then along the system, where the sympathetic and cerebrospinal connect, we find these are the property functioning of the sympathetic nerve system, the pineal gland and nerve being the seat of the forces as exercised in the sympathetic nerve system. Hence the organs that are under the repression of the nerve system in the sympathetic receive the reaction in their functioning. Hence we have at times a dull headache of seemingly no cause. Again it seems to be from eyes, or from repression in throat and bronchials. Again the effect is in the heart's action, affecting the breathing in lower portion of the lungs. Again we have the reaction to pneumogastric center and nothing seems to suit the appetite. Again the repression in the functioning and after eating the digestion seems to cause the distress. Again the repression in kidneys and an overtaxing, or a suppression, and the distresses come through these portions of body. This we find then a purely sympathetic condition through the action of the sympathetic nerve system, with a condition existing in the pineal gland causing the distress.

4581-1

Thus, the pineal gland and nerve are the "seat of the forces as exer-

cised in the sympathetic nerve system." Often in such cases, the pineal (gland and system) are said to influence the sympathetic system (rather than simply receiving innervation). Note the strong peripheral/systemic effects that one might expect from sympathetic dysfunction, caused by an enlarged pineal gland and the influence of the pineal nerve.

Although more obscure than the pineal/melatonin example cited above, the scientific literature does contain explicit reference to a "pineal nerve" (*nervus pinealis*) in animals (Møller et al., 1975) and humans (Møller, 1978). In a series of eighteen human fetuses Møller (1978) demonstrated, by light and electron microscopy, the presence of a pineal nerve located in the subarachnoidal space just caudal to the pineal organ, connecting this organ and the posterior commissure. Møller noted that the nerve is not present in postnatal life and therefore must disappear in the last part of intrauterine life.

Both the function and fate of the mammalian fetal pineal nerve are crucial and unsolved questions. An investigation in our laboratory of newborn and adult rabbits and humans has failed to show the post-embryonic presence of this nerve. It is possible that the nerve is simply a vestigial homologue of the pineal nerve and of little more than phylogenetic significance. However, considering the fetal nature of the nerve, the possibility that it may play a functional role in development of the SCO-pineal complex must not be overlooked. A remaining possibility is that the nerve persists in the adult, having been incorporated into the pineal stalk and parenchyma. (Møller et al., 1975, p. 458)

Biochemical studies have demonstrated numerous receptors able to bind a wide variety of neurotransmitters in pineal nerve fibers. These findings indicate that the mammalian pineal gland can be influenced by a plethora of neurotransmitters (Møller & Baeres, 2002).

Interestingly, the anuran (frog) pineal complex proves to be one of the best documented cases of the presence of a nervous connection between the pineal and the region of the subcommissural organ (Møller et al., 1975). The subcommissural organ (SCO) secretes glycoproteins that form Reissner's fiber (as discussed in the pineal thread section above).

Nerve involvement with the pineal is mentioned in numerous Cayce readings, with connections to the both central and peripheral nerves. Furthermore the *pineal nerve* is said to extend throughout the body, affecting many important nerves plexuses and all “the organs through which it passes:”

IN THE NERVE SYSTEM, we find in the sacral plexus and from the coccyx end that abrasion and that pressure in the nerve system causing distress to the nerves that brings distress to the system through the reaction as this brings to the pineal nerve, and to the nerves that govern the refractory reaction in the mental that brings the abnormal development in the mental and in the body toward that development. In the pressure as created we find as here: In the coccyx end and to the ilium and sacral plexus, bringing pressure on the nerves of the false pelvis, which pressing on the pineal nerve brings then the whole reaction to those centers as brought in the system in the junction with the pineal nerve’s reaction in the organs through which it passes, and the center through which it becomes entwined, as we have in the solar plexus, brachial plexus and at the first dorsal and first cervical plexus, bringing these contractions, bringing these depressions, bringing these forces that find its manifestation in the action of the physical forces and the inability to control those voluntary centers as depressed through these. Not that the brain does not expand; not that the development does not come, but abnormal development through many of these reactions. 4521-1

A prominent connection of the *pineal nerve* is along the spine at the upper cervical region where it interacts with several important different nerves—“the first cervical center, or that connection between the pineal nerve, pneumogastric nerve, sympathetic nerve (both ends) and the cerebrospinal” (9-4).

The pineal nerve extends the length of the spine, “from the first cervical to the end of the cerebrospinal system, which it traverses, this pineal nerve, with the spinal cord” (41-1). It runs along the outside of the spine: “this central nerve, from the pineal gland, runs through with the cord, as it were, in the spinal system, running outside, though, the

spinal cord itself, though connected with same at the base of the brain and to the brain itself." (4678-1)

Connections with the Leydig/lyden gland in the reproductive tract are also mentioned in several readings that mention the pineal nerve. Here is an excerpt from a reading given in a case of psychotic depression with suicidal tendencies:

The nerve systems in the physical we find that depression first caused in the lyden [Leydig] gland that pressed, or indentations made on the perineurial and the pineal nerve center connected with the lyden [Leydig] gland. This then gives the hallucinations in the vibration to the brain center . . . In the impression as this receives, there comes those conditions of melancholia, of self-destructive forces, of aberrations, of depression as received and hallucinations to all the functioning of the sensory organism, through which these nerve connections find manifestations with the pineal nerve in its course through the system. 2197-1

Attempting to identify the precise anatomy and location of the pineal nerve (as discussed in the readings) is a challenge. The pineal nerve could be an unrecognized nerve fiber (alone or bundled with known, identified fibers). It could be a recognized nerve that the readings are calling *pineal nerve* due to its activity. For instance, a nerve from the pineal centers in the main branch of the pineal in the lower cerebellum could be called a *pineal nerve* if it was acting to coordinate and integrate systems of the body with the mental and spiritual—hallmarks of the *pineal system*. Keep in mind that just as glands are defined by activity (function/physiology) rather than by anatomy and location, the readings may be applying that same reasoning to nerves. Another variation on this explanation comes from neural network theory, where functional connectivity defines networks, even if there are no obvious direct structural connections (Yasuda et al., 2015). Thus the *pineal nerve* could simply be a nerve that functions as part of the pineal system network, and yet goes by another name in common usage. For example:

THE NERVE FORCES, we find many centers that are taxed, and the perineurial of almost all centers in the sacral, illium and

hypogastric plexuses show inflammation. These make pressure on those direct to the brain through the pineal nerve through the cerebrospinal and both branches of the sympathetic. 5700-1

Thus the peripheral pineal nerve (in the pelvic region) can affect the brain through the cerebrospinal and sympathetic systems. This has the quality of a neural network, typically described in the brain, but present in the periphery as well. Also worth considering is the role of the pineal (and likely the pineal nerve) in coordinating the cerebrospinal and sympathetic, as described in many readings. Thus case 5700-1 could be an example of peripheral nerve irritation producing incoordination between the sympathetic and cerebrospinal resulting in pathological affects in the brain (as discussed in many readings for neurological conditions such as epilepsy—see the case study section of this manuscript).

Another aspect of this discussion is the possibility that the pineal nerve and pineal thread are synonymous (or at least overlapping in terms of anatomy and physiology). For example:

. . . the physical condition existent in that of a pressure being produced on the pineal gland and its nerve supply as the thread through the system. Hence the enlarged condition existent in gland proper, and that produced by the presentation of the embryo at the time of birth, and the pressure produced in the 1st and 2nd cervical, producing then an unequalized condition to the metabolism of the body, and this producing this spasmodic condition in the system—the prenatal effect being that of the inductive forces as are shown in the pineal thread in this prenatal condition. 4625-1

3.2.2.7 Pineal Centers

Several readings describe various *pineal centers* as integral parts of the pineal system. We have already considered *pineal centers* in the cerebellum. *Pineal centers* are also associated with major nerve plexuses along the spine: “the centers as especially govern the central nerve system; also that of the pineal gland’s connection with the brain forces in the 1st and 2nd cervical, and in the 9th dorsal and the 4th lumbar” (5691-2). For example, in a case of epilepsy, the use of medication to suppress

the seizures had resulted in a lack of impulse that was affecting pineal centers along the spine:

In the BLOOD SUPPLY we find the lack of those elements necessary for a proper balancing for the functioning of organs in the relationships to the activity of glands in the body. These are as much lacking in the activity through those properties [medication] that it has been necessary to administer to the body from time to time, but these have GROWN in their activity from the lack of proper impulse in the lyden [Leydig] and the pineal centers; for the PINEAL center is engorged, especially at the 3rd and 4th LUMBAR and the 1st and 2nd cervical. 567-1

Here is another case presenting with depression and headaches where pineal centers were active in the brush end of the spinal cord, in the reproductive system, adrenal glands, and abdominal lacteal ducts—a pattern often present in epilepsy:

No form of narcotic, hypnotic or sedative should be taken that will be other than assimilated from the diet; only those stimulations that may be added to the system for the making of activity in the pineal centers, where they react from the brush end of the cerebrospinal system and through the activities of the glands in the reproductory forces and those in the adrenal and those connecting same with the ducts about the lacteals. For here we have, about the lacteals, a DRYING condition. Hence this heaviness that we have in the right side and down to the caecum and through the ileum reaction. These recur at times. 942-1

A case of probable bipolar disorder (“melancholia or the opposite reactions are apparent”) mentions “the pineal center that has remained or is engorged throughout its course along the cerebrospinal centers themselves, to and through the medulla oblongata to those upper or central portions of the brain” (3950-1). A reading for a woman with schizophrenia mentioned “the forces of the pineal centers, going to and through that of the medulla oblongata” (4472-1). In a case resembling epilepsy, the pineal center in the upper cervicals is cited:

Now as we find, these are disturbances from lesions that have been formed in the lacteal ducts in the right side, near to the activities of the gall duct and the entrance from the duodenum to the jejunum, where there are the first drainings, as it were, of oils and fats from foods digested that enter the tube [cisterna chyle and thoracic duct] to be emptied into the circulation in the right portion of the lungs. These congestions there have caused contraction affecting the pineal center, where it enters the medulla oblongata in the 1st and 2nd cervical areas. These are not epileptic reactions in the present, for they are not controlled by the activities from the lyden (Leydig) glands but from the injury to the lacteal duct center.

4072-1

In over 900 readings an electrical appliance called the *wet cell battery* was described, most often for neurological problems or glandular imbalance. The electrical circuit typically included medicinal substances to be transferred to the body. Most often the plates conducting the minute direct current were placed on certain important spinal centers that corresponded to pineal centers as described above. These same centers were said to be influential in the activity of the *kundalini* energy circulated along the spine to the brain. The *kundalini* was awakened by activity of the lyden gland, causing it to move along the pineal. The electrical energy of the wet cell battery was said to use the same circuit:

The small plate would be attached to three different centers alternately. The Appliance would be used for thirty minutes each day; one day attaching the small plate to the 3rd cervical, the next day to the 9th dorsal, and the next day to the 4th lumbar. Be sure to rotate the attachments in this order. These are the three centers through which there is activity of the kundalini forces that act as suggestions to the spiritual forces for distribution through the seven centers of the body.

3676-1

3.2.3 The Pineal Coordinating and Integrating System

The *pineal system* is the primary coordinating and integrating system of the body. It coordinates the nerve and glandular systems while in-

tegrating the spiritual and mental with the physical body, making it “the seat of the soul:”

. . . for this action in sympathetic and coordinating system, which occurs through the action of the lyden [leydig] gland with that of the pineal, in its recurrence to bring forces along those of the sympathetics coordinating with cerebrospinal centers. Now these, as seen then, a reflex—or an affectation from an existent condition. The basis, the seat of the soul, then, in that of the lyden [Leydig] gland, with the pineal reaction in the system, and this the activity that brings about psychological conditions. 3969-1

The concept of soul and its connection to the body is an ancient one:

. . . efforts to discern the nature and location of the soul have, throughout Western history, stimulated physiological exploration as well as theoretical understanding of human anatomy. The search for the soul has, in other words, led to a deepening of our scientific knowledge regarding the physiological and, in particular, cardiovascular and neurological nature of human beings. (Santoro et al., 2009, p. 633)

Next to the assertion that “I think therefore I am” the French philosopher Rene Descartes is probably best known for his identification of the pineal gland as the seat of the soul—or as he put it: “that part of the body where the soul operates most directly.”

Nevertheless, although the soul is joined with the entire body, there is one part of the body in which it exercises its functions more particularly than elsewhere. Some take this special part to be the brain, others the heart: the brain because of its connection with the organs of sense and the heart because it appears to be the place where our deepest feelings are centered. But it seems to me quite clear, after carefully examining the matter, that the part of the body where the soul operates most directly is not the heart, nor is it the entire brain, but only the innermost portion of the

brain—a tiny gland situated in the very middle of it, and suspended above the duct through which the animal spirits in the forward passages can communicate with those in the rear ones, so that the slightest movements which occur in it can greatly alter the course of those spirits, and conversely the smallest changes occurring in the animal spirits may greatly affect the movement of this gland. (Descartes, as quoted in Wheelwright, 1954, pp. 357-358)

Although Descartes' proclamation of the body-soul connection was not accepted by the scientific establishment, it did have a lasting impact on the way humans think about body and soul. Within the history of epilepsy research and theorizing, the centrencephalic concept of Penrose (as reviewed in section 1.3) inconveniently bumped into Descartes' theory. The *centrencephalic* model (as an evolving concept) posited a primary coordinating and integrating function to subcortical areas (thalamus and brainstem), uncomfortably close to the pineal gland. Consequently, Walshe unleashed a stinging criticism:

It seems scarcely credible that within this small and phylogenetically ancient part of the brain such numerous and complex functions could be carried out. How comes it that despite the great development of the cerebral cortex in man, the gamut of physiological and psychological activities characteristic of man, should still be carried on in these meagre collections of cells in the "old brain," as Penfield says? (Walshe, 1957, p. 537)

Naturally, Walshe's harsh attack elicited a defensive disclaimer from Penfield:

To suppose that centrencephalic integration is possible without utilization of the cortex would be to return to the thinking of Descartes and to enthrone again a spiritual homunculus in some area such as the nearby pineal gland. (Penfield, 1957 as cited in Jasper, 1969, pp. 202-203)

Essentially, Penfield's defense was to emphasize the integrative potential of his *centrencephalic* theory:

. . . the spirit of Penfield's theory when it is considered that the centrencephalic system was originally envisioned as coordinating and integrating the activities of that division of the brain (cerebral cortex) most intimately linked to higher mental functions. (Thompson et al., 1990, p. 171)

Nevertheless, the physical proximity (anatomically) of the pineal gland is worth noting in that the pineal is part of the epithalamus, immediately behind the thalamus together with the hypothalamus (in front of the thalamus). These three entities (epithalamus, thalamus, and hypothalamus) are all embedded in the third ventricle. So although Penfield's *centrencephalic* system moved the focus of attention to the nearby thalamus and the reticular system of the brainstem, his defensive reaction to Walshe's critique is understandable—there is an obvious resonance between his *centrencephalic* concept and Descartes's assertion of the pineal as the seat of soul. Curiously, this little misunderstanding between influential scientists did bring the pineal into the conversation about epileptic etiology and pathophysiology (epileptogenesis) in a 20th century context, albeit in a negative sense—which brings us to the information on epilepsy in the Cayce readings. Like Penfield's centrencephalic model, the concept of the pineal system is that of a coordinating and integrating influence. The pineal system coordinates by vibration:

In the nerves as give the vibration to the glands in the reproductive and in the vibratory rate set through the pineal gland, and the branches of same in each major ganglion along the spine . . .

464-4

One possibility is that impulses from the *pineal nerve* oscillate (i.e., neural oscillation) as a pacemaker that entrains other nerves and organs to the proper frequency for each tissue. To use a musical analogy, the body is like an orchestra and the pineal is the conductor. To use a mechanical analogy, the pineal is like the governor on an engine (section 3.2.4 below). It carries out its coordinating role by secretions—whether

hormonal or neurohormonal (neurotransmitters), or by other means (such as gap junctions or ephaptic effects). If the pineal system fails to maintain coordination and integration (as described in the numerous cases studies from the readings, section 2.2), brain networks may be thrown into patterns of abnormally excessive and synchronous neuronal activity that define epilepsy (sections 1.7.2.1 and 1.7.2.2).

3.2.4 A Mechanical Analogy of the Pineal System

Throughout the ages humans have sought to explain consciousness and the experience of being (including the concept of soul and its connection with the body) by analogy. Since the industrial revolution, the invention of ever more complex machines and the discovery of the physics of electricity to make them run have provided a practical analogy for the human body and its operation. The body is a machine and the nervous system an electrical circuit that controls it. Even with the invention of the modern computer and the layers of analogy that it provides, the mechanistic symbol still persists as a useful intellectual tool, even in the study of diseases such as epilepsy (e.g., Simonato, 2018; Godale & Danzer, 2018; Chen et al., 2017).

3.2.4.1 The Pineal Governor

At times, the Cayce readings use mechanical analogies to explain the anatomy and physiology of the body—and even the body-soul connection as exemplified in the pineal system:

... the pineal—which runs all the way through the system and is the GOVERNING body to the coordinating of the mental and physical. (567-1, a case of epilepsy) ... the pineal—the governing point of the brain impulses. 5498-1

Thus the pineal system encompasses the entire body, coordinating mental and physical activity while governing brain impulses. That has been the primary theme of this appendix. Take note of the term “governing” in this context. It is not used in the sense of political authority—rather in a mechanical sense as a device used to measure and regulate the speed of a machine, such as an engine.

For example, consider case 1001 from the readings where there was

a loss of consciousness during absence (petit mal) seizures. To explain the altered state, Cayce used a mechanical analogy to illustrate how the pineal governs or regulates the brain and organs of the system—in other words, the pineal as *governor*.

The changes or alterations are very individual, especially when meeting the conditions as exist from such a disorder as an improper pulsation through the nerve system, or in that state where there may be termed that the governor's belt of the nervous system slips off.
1001-8

Thus the *pineal system*, as the primary regulator of consciousness functions like a mechanical belt and pulley with the pineal as governor. When the impulse gets moving too fast, the belt is thrown off the pulley, resulting in unconsciousness.

3.2.4.2 The Genitive Motor and Leydig Switch

To extend this mechanical symbolism a bit further, the readings compared the reproductive (genitive or genital) system to a motor:

(Q) What other glands in the body, if any, besides the Leydigian, pineal, and glands of reproduction, are directly connected with psychic development?

(A) These three are the ducts, or glands. In some developments these have reached a stage where they do not function as ducts or glands, but are rather dormant; yet much passes through same, especially for the various stages of a psychical sojourn or development. These, as we find—the genitive organism is as the motor, and the Leydig as a sealed or open door, dependent upon the development or the use same has been put to by the entity in its mental, its spiritual, activity. The mental may have been misused, or used aright. The spiritual activity goes on just the same. It is as the electron that is Life itself; but raised in power and then misdirected may bring death itself, or—as in the activities of the glands as seen, or ducts . . . Hence these may literally be termed, that the pineal and the Leydig are the SEAT of the soul of an entity.

294-142

Although this reading excerpt is focused on psychic development and explains Edgar Cayce's [294] psychic process, it can shed some light on the altered states associated with epilepsy. Whereas Cayce's unconscious trance state was controlled and regulated for a constructive purpose, the process could be "misdirected," bringing illness or even death, as noted above.

Note the mechanical analogy used in this reading: "the genitive organism is as a motor." The reproductive system converts energy into movement or impulse with the Leydig gland as the switch to turn it on or off (like a closed or open door). Thus a complete mechanical system is laid out: A switch to turn it on or off; a motor to provide the power and motion; a belt and governor to direct and regulate the energy in a given direction (upward into the brain) for a definite purpose (to alter consciousness). But if the system becomes "misdirected" and the belt slips off, an epileptic episode may result.

3.2.4.3 Solar Plexus Brain

Another layer to this mechanistic analogy is an effect from the "genitive" (genital) forces to the solar plexus that "*pushes out consciousness*" like an overactive pump. Thus, in addition to the brain and pelvic reproductive system, there is an abdominal component to the *pineal system* that plays a role in the production of epileptic seizures.

(Q) From what part of the body do the [epileptic] attacks originate? and why does body lose consciousness during attack?

(A) From the solar plexus to that of the lyden [Leydig] gland, or through the pineal. The lyden [Leydig] is IN the pineal, see?

(Q) Why does body lose consciousness?

(A) That's just what we have been giving! It is the imaginative forces [sympathetics] and the cerebrospinal forces, or the nerve supply through the cerebrospinal system cuts off—through the lyden [Leydig] forces—which is sealed gland, see? they lie within those of the pineal themselves, see? When these become of such an activity, through conditions as excite in the system—as thrown out from those of the genitive forces, acting through those of the solar plexus, and the attempt to coordinate—they push in so much it pushes out consciousness.

1001-9

There are several key points to be emphasized in this excerpt. Note the role of the solar plexus, an important sympathetic ganglia in the abdomen. Apparently, the *abnormal excitation of the Leydig forces* causes a reflex from the solar plexus that cuts off the nerve supply through the cerebrospinal system. This causes nervous system incoordination (and the defining *abnormal excessive neuronal activity* of epilepsy—section 1.7.2.1) A seizure and loss of consciousness are the result.

Also note the reference to the lyden/Leydig as a “sealed gland” (like an electrical switch that is turned off by default). The lyden is in the pineal. This makes no sense without the recognition that a gland is defined by its activity (function/physiology) rather than anatomical location. In other words, the activity of the lyden (as a switch or sealed door) is present not only in the reproductive system but elsewhere in the pineal system, including “in the base of the brain so that the impulse received through the medulla oblongata is oftentimes choked” (2372-1). Without an understanding of the pineal as a system and the recognition that glands are defined by activity and function rather than anatomy, none of this will make sense.

Returning to the solar plexus as a key element in the *pineal system*, the readings refer to it as the “solar plexus brain” (2259-1), which is utilized in various electrotherapeutic prescriptions. For example, energy medicine appliances (McMillin & Richards, 1994) are said to transfer medicinal properties into the body via the abdomen:

In passing through this (force connected with the body) vibration as set up, each partakes of that of the chemical through which it passes, and is distributed to the body from that center of the body in solar plexus brain, or from those centers about the umbilicus, which are the electronic and atomic vibratory radiations of a human body. 1800-15

The solar plexus branch of the pineal system is explained in readings that discuss the flow of life force energy through the body during gestation and deep meditation.

(Q) Are the following statements true or false? Comment on each as I read it: The life force rises directly from the Leydig gland

through the Gonads, thence to Pineal, and then to the other centers.

(A) This is correct; though, to be sure, as it rises and is distributed through the other centers it returns to the solar plexus area for its impulse through the system . . .

Interpret that variation, then, as being indicated here. One life force is the body-growth, as just described. The other is the impulse that arises, from the life center, in meditation.

(Q) As the life force passes through the glands it illuminates them.

(A) In meditation, yes. In the life growth, yes and no; it illuminates them in their own activity in life growth . . .

(Q) The life force crosses the solar plexus each time it passes to another center.

(A) In growth, yes. In meditation, yes and no; if there remains the balance as of the attunement, yes . . .

You see, what takes place in the developing body, or in life growth (which we have used as a demonstration, or have illustrated), may be different from that which takes place as one attempts to meditate and to distribute the life force in order to aid another [e.g., spiritual healing or laying on of hands]—or to control the influence as in healing, or to attain to an attunement in self for a deeper or better understanding. 281-53

The life force operates at various levels of intensity. Normally the intensity is relatively low—the lyden gland is in default mode (switched off or sealed) and the door to higher consciousness is closed. During deep meditation and psychic experiences (such as Edgar Cayce's trance state) the intensity of the life force is raised (as an electrical vibration called *kundalini*—see The Pineal—Part 1). In certain pathological states (bipolar, manic phase; schizophrenia; epilepsy), the lyden center opens (switches on) and the energy level increases, as symbolized in the analogy of the belt slipping off the pulley, causing loss of consciousness during a seizure (as in case 1001 above).

The impulse to and from the solar plexus brain can become aberrant from various causes. The most frequent cause in the cases of epilepsy in the Cayce readings was lacteal duct pathology.

3.2.4.4 Lacteal Duct Short-Circuit

The final component in the mechanical analogy of the pineal system in epilepsy is a “short-circuiting” of the nervous system from lacteal duct dysfunction. Lacteal duct pathology (usually adhesions) were common in cases of epilepsy in the readings (see the appendix on Lacteal Duct Pathology). Pahnke (1983) considered lacteal duct pathology as a primary feature, usually in conjunction with spinal nerve reflexes mediated through the autonomic nervous system.

The pathophysiology of lacteal duct adhesions in epilepsy is unclear and could involve several options, such as aberrant afferent nerve impulses to the brain via the vagus. As noted, one reading describes the effect of the abdominal pathology as a “short-circuiting as it were between the nervous systems in the lacteal duct area” (571-5).

In the use of energy medicine appliances with attachments to the abdomen, the placement of the electrodes was typically described as the lacteal duct plexus or umbilical plexus, as in this reading for Edgar Cayce himself:

When using the Atomidine (commercial strength), attach the . . . nickel plate passing through the Solution to the umbilical plexus; that is, the umbilical and lacteal duct, or over the duct itself—about an inch and a half, or a little bit more, below the gall duct area, directly below. This is on the right side, about four fingers from the navel or umbilical center or plexus. 294-2-1

If the lacteal ducts become adhered in this area, a cold spot will result from the lack of circulation. This is the “cold spot” mentioned in numerous Cayce readings on epilepsy:

From EVERY condition that is of true epileptic nature there will be found a cold spot or area between the lacteal duct and the caecum. 567-4

Presumably this is where there is a “short-circuiting” of the nervous system in this important area of the nervous and pineal system activity that can be traced back to the formation of the fetus during gestation.

3.2.5 Imaginative and Impulsive System

The *pineal system* integrates and coordinates the spiritual and mental aspects of human experience with the physical body. Anatomically and physiologically this is primarily a neuroendocrine process resulting in psychological (mental, emotional, behavioral) and spiritual (soul) manifestations integrated with and manifested through a purely biological framework. In essence this is the body-soul connection with the “seat of the soul” focused in two glands—pineal and Leydig (the pineal/Leydig axis), as described above. The neurological connections are primarily through the sympathetic and sensory nervous systems—both primarily subcortical and peripheral, as is the entire *pineal system*.

I have chosen to use the term *pineal system* to encapsulate all of the above—it is not found in the readings. However, a term that is used in the readings that can be considered synonymous with the *pineal system* is the “imaginative and impulsive system” as described in the subsections that follow. Whereas the term *pineal system* easily envelopes both anatomy and physiology (and I have emphasized the functional physiology and activity of this system), the use of the expression *imaginative and impulsive system* in the readings is strongly functional, expressed in a variety of ways.

3.2.5.1 Psychopathology

For example, consider the following excerpt where proper digestion may be prevented because of a negative attitude and expectation—a psychosomatic effect:

Be careful that there is kept SUFFICIENT of the roughages in the diet, but DO NOT become cranky on the diet question and thus set IN the imaginative and impulsive system such expectancies as to produce a cogental reaction in the digestive forces of the body. Be precautions, but know that the body ADJUSTS itself readily—unless the imaginative or impulsive system prevents it from doing so. 340-41

Psychosomatic effects are often mediated through the sympathetic nervous system, which is involuntary and very amenable to suggestion: “... THROUGH the sympathetic system, which is as the basis of the IMAGINATIVE

forces; NOT that the body imagines as its illness, but that it may be accentuated by suggestion or RELIEVED much by suggestion . . . " (130–1) This is a practical aspect of the mental/imaginative forces, contributing to either pathology or healing, depending upon the application. Modern biofeedback makes effective use of the imaginative/sympathetic system connection which may even be useful in the treatment of epilepsy (Nagai & Trimble, 2014).

Here is a more extreme example of psychopathology in a case indexed as schizophrenia. Again, note the pathological nervous system incoordination in which the sympathetic nervous system is associated directly with the imaginative and impulsive system—and with associated dysfunction in the main branch of the pineal system in the lower cerebellum:

As we find, there are those incoordinations between the sympathetic (or the imaginative and impulsive system) and the physical or cerebrospinal system. These produce, in reactions at times, those variations and the variableness in the activities of the body as related to the physical and normal reactions; incoordination being produced by pressures that exist in the cerebro-spinal system, and those that make for lack of connections directly to those centers in the brain forces as to make impulse coordinate with the normal physical reactions. These are more severe or more disconcerting, and more pressure exists, at times than at others.

From the periods that have been passed in the development of the physical body, in its renewing of the physical attributes without the normal renewing of connections with the sympathetic and cerebrospinal, or between the impulse and the reactions from the imaginative to the normal physical or corporal body, necessarily these have left an enlargement of the pineal centers in the main branch or center of same in the lower portion of the cerebellum; forming, then, a definite place of contact with the physical attributes of the body.

4381-1

Many of the cases of epilepsy reviewed in section 2.2 describe similar pathophysiology (sympathetic and cerebrospinal incoordination with pineal system involvement). Case 885 is a likely example of the comor-

bidity between schizophrenia and epilepsy that is well documented in the medical literature (section 1.7.5.3). Whenever the term “psychopathic” is used in the readings, there is a very good possibility of *imaginative and impulsive system* involvement (case 2149).

Another aspect of imaginative and impulsive system relevance to epilepsy is the possibility of nonepileptic psychogenic seizures (Dickinson & Looper, 2012). Conceptually, this might be understood as a partial pineal system activity expressed psychologically without the full nervous system incoordination that results in abnormally excessive and synchronized neuronal activity that defines epilepsy (section 1.7.2.1).

3.2.5.2 Psychic Manifestations

There is an inherent association between psychic experiences and *imaginative and impulsive system* activity. The aerial activity of the pineal cord during gestation (when the mother and those close to the developing embryo and fetus are able to have a mental/telepathic influence) is a manifestation of the *imaginative and impulsive system*. This system is evident in readings given for Edgar Cayce himself in which an explanation of his psychic process was requested. The information provided in those readings applies not only to Cayce but to anyone experiencing psychic phenomena:

In the body as given, there are channels through which all forces do manifest. To some there are the voices heard. To others there is the vision seen. To others there is the impression, or feeling of the presence of those sources from which information may radiate; and then there are those channels that are submerged or awakened during such periods.

The lyden, [Leydig] or ‘closed gland’, is the keeper—as it were—of the door, that would loose and let either passion or the miracle be loosed to enable those seeking to find the Open Door, or the Way to find expression in the attributes of the imaginative forces in their manifestation in the sensory forces of a body; whether to fingertips that would write, to eyes that would see, to voice that would speak, to the whole of the system as would feel those impressions that are attuned with those the infinite by their development and association or with those inter-between, or those just passed over, or as to the unseen forces; for the world of unconsciousness is

not in a material change from the physical world save as to its attributes or of its relationships with. Whether the vision has been raised or lowered depends upon that height, depth, breadth or length, it has gone for its source of supply. 294-140

Thus the imaginative forces manifest via activation of the Leydig gland and thence through the pineal system through the sensory forces in what we might now call extra-sensory perception (ESP). Here is a more explicit explanation of *pineal system* activity during psychic manifestations:

For as we find this entity has more than once been among those who were gifted with what is sometimes called second sight, or the super-activity of the third eye. Whenever there is the opening, then, of the lyden (Leydig) center and the kundaline forces from along the pineal, we find that there are visions of things to come, of things that are happening. 4087-1

Interestingly, in one of the epilepsy cases (1683) the readings describe “supersensitiveness in the sensory forces, when the body-mind visions or has extra perception of sense reaction.” Case 567 describes imaginative system involvement resulting in excessive sensory system activity and psychic experiences during seizures.

Certain forms of epilepsy may present with “psychic” symptoms (Choi et al., 2006, p. 9). In this context, *psychic* simply refers to psychological or even psychiatric features, such as these:

- fear/panic/anxiety (intrusion of fear, panic, and anxiety not related to fear of an impending seizure),
- déjà vu (the sensation that the current experience has occurred before),
- jamais vu (the sensation of being unfamiliar with a person or situation that is actually very familiar),
- derealization/depersonalization (feeling of detachment from oneself, unreality, or dream-like state),
- forced thoughts (intrusion of thought).

Typically such symptoms are associated with focal seizures of the temporal lobes and can include the experience of precognition or prescience:

A number of subjective phenomena compose the psychic auras of temporal lobe-originating seizures. A patient was encountered whose seizures begin with a profound sense of being able to predict imminent events in her environment. This experience fulfills the definitions of precognition (“antecedent cognition or knowledge; foreknowledge”) or pre-science (“knowledge of events before they happen”). These experiences can be distinguished from the more common psychic phenomenon of *déjà vu* (“an illusory feeling of having previously experienced a present situation”). (Sadler & Rahey, 2004, p. 982)

The sections that follow will be exploring some of these *psychic* symptoms of epilepsy.

3.2.5.3 Mystical Aspects

Mystical experiences are one of the prominent manifestations of the *imaginative and impulsive system*. The preferable means for this type of activity recommended in the Cayce readings is deep meditation.

As has been given, there are DEFINITE conditions that arise from within the inner man when an individual enters into true or deep meditation. A physical condition happens, a physical activity takes place! Acting through what? Through that man has chosen to call the imaginative or the impulsive, and the sources of impulse are aroused by the shutting out of thought pertaining to activities or attributes of the carnal forces of man. 281-13

The ultimate purpose of such activity is mystical union with the divine—the experience of oneness with God (by whatever name or designation). In certain instances, epileptic seizures may take on distinctly mystical qualities, including out of body experiences (Greyson et al, 2014) and feelings of well-being, intense serenity, and bliss that could be described as mystical:

If religious beliefs are merely the combined result of wishful thinking and a longing for immortality, how do you explain the

flights of intense religious ecstasy experienced by patients with temporal lobe seizures or their claim that God speaks directly to them? Many a patient has told me of a “divine light that illuminates all things,” or of an “ultimate truth that lies completely beyond the reach of ordinary minds who are too immersed in the hustle and bustle of daily life to notice the beauty and grandeur of it all.” Of course, they might simply be suffering from hallucinations and delusions of the kind that a schizophrenic might experience, but if that’s the case, why do such hallucinations occur mainly when the temporal lobes are involved? (Ramachandran & Blakeslee, 1998, p. 124)

Persinger (1983) has hypothesized that mystical and religious experiences may be evoked by transient, electrical microseizures within deep structures of the temporal lobe. Thus, spontaneous paranormal experiences and the psychological components of *focal* impaired awareness seizures with automatisms (formerly called *complex partial psychomotor seizures*) may exist along the same continuum of temporal lobe sensitivity (Persinger 1984).

However, the association of mysticism with epilepsy has been challenged. Greyson et al. (2015) administered a modified mysticism scale to ninety-eight epilepsy patients with varied seizure types. Although there were some features typical of mystical experience among the participants, no single participant reported enough of these features to meet the criterion for having had a mystical experience. The authors concluded:

Mystical experience does not appear to be associated commonly with seizures, although features of introvertive mysticism are more common than extrovertive; nor does mystical experience appear to be associated with any one particular region of the brain. (p. 194)

A thorough review by Kelly & Grosso (2007) also questioned an association of mysticism and epilepsy (particularly of the temporal lobes), although the possibility of a broader connection remains an open question:

It may still be true that epilepsy sometimes produces neurobiological conditions conducive to mystical experiences, but as yet we have no clear picture as to what, precisely, those conditions are. (Kelly & Grosso, 2007, p. 534)

If there is a connection between epilepsy and mystical experience, perhaps it is associated with the pineal system as expressed through imaginative and impulsive forces.

3.2.5.4 Sleep and Dreams

The purpose of sleep is a great mystery to science. If considered only from a strictly physical or material perspective, sleep is a period for rest and rejuvenation and memory consolidation in the brain (Eugene & Masiak, 2015). The readings affirm both of these aspects of sleep. But there is also a deeper, metaphysical dimension to sleep. It is a period of soul activity, internal and external: "Each and every soul leaves the body as it rests in sleep." (853–8) The pineal system is particularly active as the conscious mind recedes and gives way to the subconscious mind and imaginative forces:

First, we would say, sleep is a shadow of, that intermission in earth's experiences of, that state called death; for the physical consciousness becomes unaware of existent conditions, save as are determined by the attributes of the physical that partake of the attributes of the imaginative or the subconscious and unconscious forces of that same body; that is, in a normal sleep (physical standpoint we are reasoning now) the SENSES are on guard, as it were, so that the auditory forces are those that are the more sensitive.

5754-1

Coordination of the nervous systems are required for healthy sleep, not only for rest and rejuvenation, but also for the psychic activity of the soul operating through the sympathetic system in its imaginative role:

(Q) Why does the body not sleep well?

(A) Produced by the nerve pressures, that tend to make for impro-

er coordination between sympathetic and cerebrospinal system; for the cerebrospinal is to the whole of the physical body as of that of IMPULSE to carry out conditions of the living physical organism, while the sympathetic system is rather that of the imaginative, or akin to the psychic and to the operative forces of the brain centers and impulses. Without coordination, these bring restlessness and insomnia. 5601-1

Sleep is interrelated with epilepsy (section 1.7.2.2) and a common factor in the cases of epilepsy in the readings (e.g., 693, 885, 1784, 1836, 2149, 2153). The altered consciousness of dreaming is also associated with epileptic seizures, in a different and highly unusual way—a “dreamy state.” Within the historical epilepsy literature, the work of John Hughlings Jackson stands out as illustrative of the “psychic” manifestations associated with temporal lobe seizures. Some of Jackson’s most fascinating contributions to the field of epileptology relate to what he regarded as the “dreamy state” of what is now recognized as *focal* impaired awareness *seizures* with automatisms:

The variety of epilepsy alluded to is one in which (1) the so-called “intellectual aura” (I call it “dreamy state”) is a striking symptom. This is a very elaborate or “voluminous” mental state. One kind of it is “Reminiscence”; a feeling many people have had when apparently in good health . . . Along with this voluminous mental state, there is frequently a “crude sensation” (“warning”) of (a) smell or (b) taste, (or, when there is no taste, there may be movements, chewing, tasting, spitting . . .) (Hughlings-Jackson, 1888, p. 179)

This aura is now most often referred to as a feeling of familiarity, or *deja vu*. However, Hughlings-Jackson’s broader definition of a heightened intellectual state, or “over-consciousness,” is perhaps a better description. With the symptom of the “dreamy state,” he further listed associated symptoms of “crude sensations” and at least some degree of alteration of consciousness. Hughlings-Jackson also called the symptom of the “dreamy state” a “double con-

sciousness.” In this state, patients were vaguely aware of ongoing events (one consciousness), but were preoccupied with the intrusion of an “all knowing” or “familiar” feeling (a second consciousness). He stated, “This double mental state helps the diagnosis of slight seizures greatly”. (Hogan & Kaiboriboon, 2003, p. 1740)

Interestingly, Jackson’s use of the term “dreamy state” was derived from one of his patients, a highly educated man (physician) who experienced a so-called “intellectual aura” as a symptom of his epilepsy. For this individual the experience of “dreamy state” was essentially a “double consciousness.” For example, in one particular instance, he was attending a young patient—and then the next thing he recalled was speaking to another patient. Apparently, during the altered consciousness of the seizure he had while attending to the first patient, he was able to make a physical examination, write a diagnosis, and advise that the young man take to bed at once. Later, he re-examined him with some curiosity and found that his conscious diagnosis was the same as the unconscious one during the seizure. He was rather surprised, but not necessarily unpleasantly so, as one might expect (Hogan & Kaiboriboon, 2003).

Thus, at least in this instance, the disorder seemed much less pathological (derealization or depersonalization) than is ordinarily considered in cases of epilepsy—it almost seemed adaptive or a higher level of functioning. Many Cayce readings describe altered states in which different aspects of the larger self (that the readings call the ENTITY) are able to carry on in the absence of a normal waking consciousness. In fact, each Cayce reading was a demonstration of double *consciousness* where a portion of the self (the readings used various terms: subconscious self, inner self, subliminal self) is able to function in an altered state similar to (or identical) with Jackson’s *dreamy state*. With regard to the concept of the *imaginative and impulsive system*, the readings spoke of “the imaginative body, or the trained body” (294-141) in much the same way that Jackson described the *dreamy state* and *double consciousness*.

3.2.5.5 Reincarnation and Karma

The mental, emotional, and behavioral patterns expressed through the *imaginative and impulsive system* are often hereditary and karmic,

manifesting as innate impulsive urges and mental tendencies expressed through the sympathetic and sensory nervous systems. In other words:

. . . the appearances [past lives] in the earth that make for the impulse from the imaginative or the impulsive or the sense expressions in the earth, we find these are those that influence the entity in the present; for, as indicated, oft have been the activities of the entity in the earth's environs . . . 820-1

One of the clearest examples of this is case 1001 whose epilepsy was linked to a past life as King Louis 15th in France—a life of sexual excess and debauchery. As a young man in the early twentieth century America, this individual continued the same patterns, only in this life the outcome was epileptic seizures. The lack of control of the imaginative forces was said to be a major factor in the loss of consciousness during seizures:

(Q) Why does body lose consciousness?

(A) That's just what we have been giving! It is the imaginative forces and the cerebro-spinal forces, or the nerve supply through the cerebro-spinal system cuts off—through the lyden [Leydig?] forces—which is sealed gland, see? they lie within those of the pineal themselves, see? When these become of such an activity, through conditions as excite in the system—as thrown out from those of the genitive forces, acting through those of the solar plexus, and the attempt to coordinate—they push in so much it pushes out consciousness. 1001-9

In contrast to other aspects of *imaginative and impulsive system* involvement in epilepsy (e.g., psychological symptoms and quasi-mystical experiences), reincarnation and karma (as etiological and pathophysiological factors) have no obvious correlation in the medical literature. Thus the manifestations of the *imaginative and impulsive system* activity are diverse and relevant to epilepsy, particularly the aspects of epilepsy with psychological manifestations.

3.2.6 Summary

The purpose of this appendix is to lay out the parameters of the *pineal system* in terms of anatomy, physiology, and pathology. This may be relevant to understanding medical conditions such as epilepsy, in addition to higher states of consciousness and paranormal experiences. Although the pineal is typically regarded as a small endocrine gland in the middle of the head, in the Cayce readings the word *pineal* often refers to a system that extends throughout the entire body, playing an essential role in the formation of the body and maintenance of health (mental and physical). This is achieved by the coordinating and integrating influence of the *pineal system*.

The pineal and lyden/Leydig gland are called the “*seat of the soul*” and form the core of the *pineal system* along with pineal centers in the main branch of the pineal in the lower cerebellum, along the spine, and in the abdomen. The *pineal system* includes a cord or thread and nerve.

The *pineal system* is involved in many medical conditions, and notably, with regard to this review, epilepsy. Lyden/Leydig gland activity affects the reproductive system. Its linkage to brain activity via the pineal (as described in the readings) suggests a close relationship. This may be reflected in the epilepsy literature as the influence of sex hormones on the epileptic brain (as reviewed in section 1.6.2)

Because the *pineal system* extends through the body, it is vulnerable to damage or dysfunction that may require treatments directed to the periphery. The Cayce approach is holistic, recognizing the reality of spiritual, mental, and physical dimensions of the human condition. The *pineal system* coordinates and integrates the spiritual and mental with the physical body through definite anatomy and physiology that can be studied and influenced by various means. The *pineal system* is the basis for the connection of spirit and mind with the body. This is the basis for psychological experience. In epilepsy the *pineal system* plays a role in seizure production, but probably also in nonepileptic manifestations related to psychogenic or pseudoseizures. In such cases, perhaps nervous system incoordination is present, but not the higher vibration of lyden/Leydig activation. Thus, only a portion of the *pineal system* is involved.

3.3 Appendix C: Sympathetic and Cerebrospinal Incoordination

The scientific study of the nervous system is a constantly changing, evolving process that relies on “man-made concepts, i.e., verbal maps, intended to describe and account for certain empirically observable aspects of the structure and function of the nervous system.” (Meyers, 1953, p. 630) As such, the nomenclature of neurological anatomy, physiology, and pathology reflects the transitional values and biases of any given time period. It has always been a moving target, but the pace of concept building and verbal mapmaking seems to be accelerating with the explosion of information and technology in modern neuroscience.

Incoordination between the sympathetic and cerebrospinal nervous systems is cited as a core pathophysiological feature in the Cayce readings on epilepsy. To fully appreciate the meaning of that *incoordination*, it is essential to understand the historical context of anatomy and physiology during the early decades of the 20th century when Edgar Cayce began giving readings—and then to translate that perspective into modern neurological *concepts* and *verbal maps*. To be sure, compared to the current lexicon, there are significant differences, not only in terminology, but conceptually, as well. For example, consider these definitions and descriptions provided in Gray’s Anatomy (1901):

The nervous tissues of the body are comprised in two great systems—the cerebro-spinal and the sympathetic; and each of these systems consist of a central organ, or series of central organs, and of nerves.

The cerebro-spinal system comprises the brain (including the medulla oblongata), the spinal cord, the cranial nerves, the spinal nerves, and the ganglia connected with both these classes of nerves. The sympathetic system consists of a double chain of ganglia, with the nerves which go to and come from them. It is not directly connected with the brain or spinal cord, though it is so indirectly by means of its numerous communications with the cranial and spinal nerves.

All these nervous tissues are composed chiefly of two dif-

ferent structures—the gray or cineritious and the white or fibrous. It is the former, as is generally supposed, that nervous impressions and impulses originate, and by the latter that they are conducted . . . (p. 1113)

The simplistic approach to translating these terms into modern anatomy and physiology is to equate *sympathetic* with the *autonomic nervous system* (ANS) and *cerebrospinal* with the *central nervous system* (CNS). And certainly, there is some basis for such an interpretation (as will be discussed below). But this can lead to confusion with regard to the meaning of *incoordination* between the systems as described in the Cayce readings on epilepsy.

First, note that the historic definition of the *sympathetic system* is essentially the same as the modern sympathetic system (the chain ganglia along the spine and associated nerves in the viscera). But the historic description of the sympathetic nervous system DOES NOT include the parasympathetic division of what is now called the ANS. Furthermore, the historic definition of the cerebrospinal system DOES include the cranial and sacral outflow of what is now called the parasympathetic. Thus when the readings discuss *incoordination between the sympathetic and cerebrospinal nervous systems*, one of the possible forms of that incoordination could be described in modern terminology as an incoordination WITHIN the ANS (i.e., BETWEEN *sympathetic* and *parasympathetic*). In the modern epilepsy literature it is more often called an “imbalance” or “dysregulation” between the sympathetic and parasympathetic divisions of the ANS. As the review of ANS involvement in epilepsy (in the historical section of this manuscript) documents, that form of incoordination is pervasive and noteworthy (see section 1.5).

And yet, there are other possible ways of interpreting the sympathetic/cerebrospinal incoordination as portrayed in the readings. To grasp these other possibilities, it is necessary to fully appreciate the sympathetic nervous system (SNS) as viewed historically.

3.3.1 The Great Sympathetic System

Given our modern infatuation with the brain and all things cortical, it is easy to appreciate the designation of “great” that Gray’s Anatomy applies to the cerebrospinal system—particularly if one simply trans-

lates it as the modern CNS. The nervous system of the brain and spinal cord is certainly *great* by any standard one wishes to apply. And yet, Gray's *Anatomy* was inclusive: "two great systems—the cerebro-spinal and the sympathetic." Simply considering the sympathetic as a *great system* on a par with the cerebrospinal might be a conceptual stumbling block for some who are not aware of the historical perspectives on the subject. As a beginning, the name of Jacques Winslow (1669–1760), one of the most brilliant anatomists of the 18th century, is "undissociable from the history of the sympathetic nervous system" (Olry, 1996, p. 190). Winslow's insights into the cervical sympathetics, exemplified by his modification of existing terminology by replacing the term "intercostal nerve" with that of the "great sympathetic nerve," established an aura of greatness surrounding the entire sympathetic system that endured for over 150 years.

For example, referring to the vegetative aspect of sympathetic nerve function, Cruveilhier (1844, p. 765) called the "great sympathetic system" the "apparatus of nutritive life." Howard (1885, p. 591) spoke of the trophic and vasomotor functions of the "great sympathetic system." Atkinson (1910, p. 11) acknowledged "the Great Sympathetic System which controls the involuntary movement and processes, such as the processes and functions of nutrition, secretion, reproduction, excretion, the vasomotor, etc." The Cayce readings were very attuned to the philosophy and practice of the early osteopathic physicians who, beginning with Still (1899, p. 252), wrote of the "great sympathetic system of the nerves of life."

The point is simply that the modern concept of the sympathetic nervous system does not do justice to its historical predecessor, the *great sympathetic system*. This can be a major hindrance for anyone seeking to understand the Cayce health readings, and particularly the meaning of sympathetic/cerebrospinal incoordination. Specifically, with regard to the readings on epilepsy, the primary concern is that the sympathetic/cerebrospinal incoordination cited so often in the readings is *not necessarily* BETWEEN the ANS and CNS (as might be easily assumed). Rather it *may* very well be an incoordination WITHIN what is now called the ANS—that is, between the sympathetic and the parasympathetic (which historically fell within the domain of the cerebrospinal).

As the nomenclature (and underlying conceptualization of nervous

system relationships changed) and the designation of “autonomic” became accepted (with subdivisions of sympathetic, parasympathetic, and enteric), the sense of a distinct, *great sympathetic nerve system* was lost. This was formalized by Langley (1921), which eventually led to the idea that the ANS consisted of two equal divisions that were antagonistic—*sympathetic* (flight or flight) and *parasympathetic* (rest and digest). Until recently the *enteric* branch of the ANS (which had previously been part of the *great sympathetic system*) has largely been ignored (or at least underappreciated). Thus the sympathetic division of the ANS (in modern terms) hardly even deserves recognition as a system—quite a fall from grace. Osteopathic researcher Irvin Korr lamented the loss of status of the sympathetic as a system:

Among the most persistent myths is that the two divisions of the ANS, the sympathetic and parasympathetic, are equal and opposite moieties, one being inhibitory where the other is excitatory, one positive, the other negative, one yin, the other yang. The implication usually conveyed is that normal life is a nicely balanced tug-of-war between these two divisions, and that it is the physician’s function to redress “autonomic imbalance,” usually with appropriately -lytic or -mimetic medications.

Although this view is widely held by physicians (and others), it will be shown that the two divisions are vastly different systems. Indeed, only one of them, the sympathetic, can truly be called a system. They differ in their basic design, central origins, peripheral distributions (overlapping though it is), and the sensory stimuli to which they respond. (Korr, 1979, p. 214)

The current nomenclature with its verbal maps is unlikely to change any time soon. Unfortunately, in losing a sense of the sympathetic as a great system, its role in the cause and treatment of epilepsy can be missed—but more on that later. For now, with the understanding that the epilepsy readings *may* be referring to ANS incoordination as a primary factor in epilepsy (as amply documented in the literature as cited in section 1.5), the focus will be on exactly how that might happen

within the brain (and save the peripheral implications for later).

3.3.2 The ANS Incoordination Model

The ANS incoordination model relates directly to the modern epilepsy literature where dysfunction is WITHIN the ANS (i.e., BETWEEN the sympathetic and parasympathetic). Terms such as ANS *imbalance* and *dysregulation* are used to describe the *incoordination*. Keep in mind that the modern parasympathetic division of the ANS was regarded (in the readings and historical sources) as part of the cerebrospinal.

Anatomically, the Cayce readings on epilepsy typically portray the sympathetic/cerebrospinal incoordination as manifesting subcortically in the medulla oblongata. If one accepts the premise of peripheral irritation being transferred to the brain, the medulla oblongata is the logical target for said incoordination. In modern terms, that is where the sympathetic and parasympathetic nerve centers coordinate for vital cardiovascular and respiratory functions, both of which are well documented in epilepsy (see sections 1.5.4 and 1.5.5).

Autonomic symptoms associated with epileptic seizures can be divided into cardiovascular changes, respiratory manifestations, gastrointestinal symptoms, cutaneous manifestations, pupillary symptoms, genital and sexual manifestations, as well as urinary symptoms (Baumgartner et al., 2001). In each instance, to some extent, the normal homeostatic balance between sympathetic and parasympathetic is disrupted as represented by incoordination within the ANS and symptomatic manifestations. Much of this was covered in the section on ANS Involvement in Epilepsy. Because cardiovascular and respiratory ANS incoordination has received a great deal of attention due to possible linkage to SUDEP, a significant literature has been generated, which will now be briefly reviewed within the context of the Cayce readings on epilepsy.

3.3.2.1 ANS Cardiovascular Incoordination in Epilepsy

Normal cardiovascular function is a complex interaction of peripheral and central nervous system processes that relies on coordinated activity of sympathetic and parasympathetic centers within the medulla oblongata. This physiology is commonly represented as equal competing opposites: sympathetic tone (fight or flight) increases cardiovascular

activity vs. parasympathetic tone (rest and digest) having the opposite effect. And yet, it is important to keep in mind that the sympathetic and parasympathetic are not necessarily equal and opposite factors in ANS coordination:

With regard to autonomic control of the cardiovascular system, it is important to dispel a common fallacy . . . that parasympathetic and sympathetic neurons exert equal but opposing effects on all target tissues. Parasympathetic neurons innervate the heart and a small number of blood vessels, limiting their influence largely to the control of cardiac function. In contrast, sympathetic neurons innervate the heart, blood vessels, adrenal glands, and kidneys, providing for widespread direct and indirect control of cardiac and vascular function. Thus, neural control of the cardiovascular system is governed mainly by the activity of the sympathetic nerves, with a limited but important cardiac effect of the parasympathetic nerves. (Thomas, 2011, p. 29)

Thus in cardiovascular function we catch a glimpse of the *great sympathetic system*—even within the modern concept of the ANS. With this reservation in mind, note that medullary cardiovascular control centers receive neural input (afferent and efferent) from both peripheral and central autonomic network (CAN) sources. In particular, the nucleus tractus solitarius (NTS) in the dorso-medial region of the medulla is the primary parasympathetic center in the medulla that can influence cardiac function directly (via vagal outflow to the heart mediated by NTS neurons that synapse on preganglionic parasympathetic neurons in the dorsal motor nucleus of the vagus and the nucleus ambiguus)—and indirectly via inhibition of a major sympathetic center in the rostral ventrolateral medulla (RVLM) responsible for cardiac output and vascular resistance (Dampney, 1994). The sympathetic activity in the RVLM is tonic—that is, continuous—and is regulated by an intrinsic pacemaker (as reviewed by Accorsi-Mendonça et al., 2016). Thus, the pre-sympathetic neurons of the RVLM provide tonic activity in contrast to those in the parasympathetic nucleus ambiguus, which show reflex activity dependent on sensory inputs (Delamonta & Walker, 2011).

Without inhibition by the parasympathetic projections from the NTS, sympathetic RVLM output to the cardiovascular system is sympathetic dominant. Thus, with regard to cardiovascular function, maintaining the appropriate balance of tonic excitation (sympathetic) and situational inhibition (parasympathetic) involves *coordination* between sympathetic and parasympathetic centers within the medulla oblongata.

With regard to epilepsy, cardiac manifestations of excessive sympathetic activation are common during most seizures, causing tachycardia and hypertension. On the other hand, parasympathetic activation (or excessive sympathetic inhibition) can result in bradycardia and hypotension. Combinations of sympathetic and parasympathetic activation and inhibition may occur simultaneously or sequentially during seizures (Kothare & Singh, 2014).

In addition to clinical indications of abnormal cardiovascular function in epilepsy, analysis of heart rate variability (HRV) in epilepsy patients can reveal ANS incoordination. The rhythm of a normal heart is characterized by significant beat-to-beat variability that depends on the balance between parasympathetic and sympathetic innervation of the heart that can be disrupted in epilepsy (Goit et al., 2016):

In conclusion, HRV showed that patients with epilepsy were accompanied by a significant increase in sympathetic control and a significant decrease in parasympathetic control. Hence, our study suggests that cardiac autonomic dysfunction is present in untreated patients with epilepsy. (Goit et al., 2016, p. 4)

Another ANS cardiovascular abnormality in epilepsy is an increase in cerebral blood flow velocities associated with elevated sympathetic activity, even during the interictal period (i.e., between seizures). Sympathetic influence on systemic blood flow produces characteristic M waves (5–9 cycles per minute). “Enhanced M waves in epileptic patients may reflect increased sympathetic activity even in the absence of seizures.” (Diehl et al., 1997, p. 2457) Thus, with regard to cardiovascular dysfunction in epilepsy, an *incoordination between sympathetic and cerebrospinal* (i.e., within the ANS) is very plausible and well represented in the modern literature.

3.3.2.2 Respiration Abnormalities in Epilepsy

Respiration is produced by medullary respiratory rhythm generators and is modulated from various sites in the lower brainstem, which are then output as motor activities through premotor efferent networks in the brainstem and spinal cord (Ikeda et al., 2017). Neurons that help trigger inspiration are in the dorsal medulla, near the NTS, and in the ventral medulla, near the nucleus ambiguus. Neurons that help trigger expiration are near the nucleus ambiguus, between zones that appear to govern inspiration. The pre-Botzinger complex in the rostral ventrolateral medulla has been proposed as a primary site of respiratory rhythm generation (Blum, 2009; O'Regan & Brown, 2005). Although sympathetic oscillations in the ventral medullary neurons coupled to the respiratory activity have been suggested as an important homeostatic mechanism optimizing tissue perfusion and blood gas uptake/delivery, parasympathetic NTS neurons also play an essential role in coordinating respiratory and sympathetic adjustments in response to activation of peripheral cardiovascular and pulmonary afferent inputs (Zoccal et al., 2014).

Neurons in the rostral medulla that are modulated by serotonin and norepinephrine have been linked to respiratory dysfunction and sudden unexplained death in epilepsy (Moseley et al., 2012). Inhibition of brainstem respiratory control circuits likely subserves epileptic ictal respiratory changes (Blum, 2009). Thus, ANS incoordination at the level of the medulla oblongata is one possible form of *incoordination between sympathetic and cerebrospinal* that may play a role in epilepsy and possibly even SUDEP.

3.3.3 Voluntary and Involuntary Motor Activity

Abnormal motor activity is common in various types of epileptic seizures ranging from relatively mild focal movements to violent tonic-clonic convulsions. The mainstream *cortico-centric* approach is content to assign causation to the seizure itself affecting the motor cortex, resulting in aberrant motor activity.

From the Cayce perspective, *incoordination between the sympathetic and cerebrospinal* nervous symptoms can cause or contribute to motor activity during seizures. The readings discuss this aspect of incoordination in terms of *voluntary* and *involuntary* nerve activity. For example, in case 1625:

Now as we find, there are definite [lacteal duct] adhesions which prevent the normal reaction between impulse and the activity of the cerebrospinal system—or the voluntary and involuntary nerve center, or the ungoverning by the adhesion and its effect upon the cerebrospinal and nervous system and the sympathetic of that governor of the impulse through the medulla oblongata. 1625-1

The pathophysiology of this case involves lacteal duct adhesions affecting the pineal system with reflexes to the “governor of impulse through the medulla oblongata” (section 3.2.4.1). That is the location of a major pineal center that regulates nerve impulses, especially of the sympathetic in its coordination with the cerebrospinal. Also note that the incoordination prevents “the normal reaction between impulse and activity of the cerebrospinal system.” Impulse and activity are associated with white and gray matter in the brain, respectively (section 2.1.6). Thus, normal neurotransmission of impulses within the brain is prevented, resulting in impaired consciousness and abnormal motor activity. Normal voluntary movement becomes abnormally involuntary (out of conscious control). A similar pattern of incoordination is present in case 1001:

We find the physical forces are still on the improve; that is, there is more near the normal balance of the physical forces. This balance must, necessarily, become such as that all of the impulses, whether of the voluntary or involuntary nature, become coordinant with the cerebro-spinal reflexes, both to the brain and to functioning organs or impulses towards functioning of voluntary or involuntary nature. 1001-6

Normal voluntary movements involve striated muscles controlled by the corticospinal tracts operating through the pyramidal system. They are consciously controlled via the motor cortex. Walking, shaking hands, standing, and sitting, etc. are typical normal voluntary movements. Normal involuntary muscle activity is typically associated with smooth muscle (no visible striations) found primarily in the walls of hollow organs (such as digestive tract, blood vessels, urinary bladder) and other tissues (such as the iris). Normal involuntary muscle activity

is controlled by the ANS (mostly sympathetic), hormones, and intrinsic factors in the organ (Carroll, 2007). For example, the motor activity of the smooth muscle of the heart is regulated in the medulla oblongata without conscious volition—it is involuntary.

During epileptic seizures normal voluntary muscle activity becomes pathologically involuntary, manifesting in symptoms such as generalized convulsions or focal motor events. From a corticocentric perspective, this is explained as an effect of the seizure on the motor cortex and its pyramidal tracts that control peripheral striated muscles. However, voluntary and involuntary motor activity (and particularly the abnormal involuntary motor activity associated with seizures) may be a little more complex than the simple corticocentric model suggests.

For example, a set of experiments performed by Johann Prus in 1898 called into question the dominant role of the cerebral motor cortex and associated pyramidal tracts in epileptic motor events. Prus unilaterally transected the pyramidal tract in dogs and observed that bilateral epileptic seizures occurred on stimulation of the cerebral cortex, on the same as well as the side opposite the electrical stimulation (Louis, 1993). These experiments led Prus to the recognition of “extrapyramidal tracts”:

As a physiologist, Prus was interested in asserting that the pyramidal tracts were the pathways through which epileptic activity experimentally evoked from the cerebral cortex was transmitted to the spinal cord. To test his hypothesis he cut the pyramidal tracts in the internal capsule, peduncle, pons, pyramid, and spinal cord, first on one, then on both sides. Contrary to his expectation the pyramidal sections did not prevent the occurrence of seizures at all. Prus then postulated that the epileptic activity reached the spinal cord through alternative motor pathways that necessarily lay outside the pyramidal tracts, for which he coined the term “extrapyramidal tracts”. (de Oliveira-Souza, 2012, p. 844)

Although the conceptual evolution of the extrapyramidal system in the 20th century was “an amalgam of disparate and often conflicting ideas with a tortuous history,” the excellent review by de Oliveira-Souza & Tovar-Moll (2012) concludes that “the extrapyramidal concept is a

valid and robust anatomic concept as long as it strictly refers to the collection of descending fibers originating in a few discrete brainstem tegmental motor nuclei that project to the spinal cord.” (p. 280) Specifically, the extrapyramidal system in humans is composed of a collection of six tracts that originate in brainstem motor cell groups—medial and lateral reticulospinal, medial and lateral vestibulospinal, medial tectospinal, and lateral rubrospinal (de Oliveira-Souza, 2012).

This formulation of the extrapyramidal system (particularly with its implications for epileptic seizure motor symptoms) is reminiscent of the animal research done to investigate the centrencephalic theory as reviewed in section 1.7.2.4). In that body of data, brainstem and spinal nerve physiology was shown to be sufficient to explain convulsive motor activity in experimental seizures.

Even at the subcortical and peripheral level there is an aspect of striated muscle control that involves the sympathetic system—not in the sense of the rather diluted sympathetic branch of the ANS that is often presented as simply the counterpart of the parasympathetic. Rather this aspect of sympathetic functioning is more reflective of the *great sympathetic system* of historical import.

The first and most obvious sympathetic involvement in striated muscle is vasomotor control regulated primarily via the sympathetic RLVM center in the medulla oblongata. Sympathetic vasomotor control of blood vessel diameter regulating circulation to skeletal muscle is an indirect influence that has been known and accepted for many years. Recent experimental research also indicates a direct sympathetic involvement in muscle junctions (Straka et al., 2018).

Although many effects of the sympathetic system on skeletal muscle physiology and disease are known, direct sympathetic innervation targets in skeletal muscle have been scarcely studied. We investigated this aspect and found that neuromuscular junctions, the contact points between motor neurons and muscle fibers, are innervated by sympathetic neurons, which is of crucial importance for the integrity and function of nerve-muscle contact. (Khan et al., 2016, p. 746)

As with most aspects of sympathetic activity, influence of striated skeletal muscle is essentially unconscious and involuntary (with possible exceptions for biofeedback and advanced yogic techniques). The larger question of whether such sympathetic activity plays a role in epileptic seizures is unknown.

Simplistically, voluntary and involuntary aspects of seizure motor events can be regarded as a manifestation of consciousness. From the perspective of the Cayce readings, full waking consciousness requires coordination between the sympathetic and cerebrospinal systems. The incoordination associated with seizures temporarily suspends conscious (voluntary) control of motor activity that is compromised and becomes involuntary. The precise nature of any sympathetic system involvement (i.e., the historical concept of the “great sympathetic system” adopted in the Cayce readings) is unclear as to whether it may involve extrapyramidal or direct and indirect sympathetic influence on striated skeletal muscles. In either case, subcortical involvement of nerve centers in the lower brainstem (and particularly the medulla oblongata) is likely. Thus, voluntary motor activity becomes involuntary during epileptic convulsive seizures as a direct result of *incoordination between the sympathetic and cerebrospinal systems* in that region.

3.3.4 The Pineal System and Nervous System Incoordination

As discussed in Appendix B, the *pineal system* is the *coordinating and integrating* system of the body. At the highest level, the *pineal system* coordinates and integrates spiritual and mental activity with the physical body. It is the body-soul connection. The pineal/Leydig gland axis is its core, which the Cayce readings called the “seat of the soul.”

With regard to the theme of sympathetic/cerebrospinal nervous system incoordination (and the various ways in which it may manifest), it is essential to understand what the readings meant by the phrase “. . . the sympathetic system or the brain manifestation of soul forces in the body . . .” (4566-1) That the sympathetic nervous system could be regarded as the brain of the soul is one of the most challenging aspects of grasping the expansive concept of the *great sympathetic system*. Pathologically in epilepsy (and certain other conditions such as schizophrenia, McMillin, 1991a) this infers that the spiritual and mental aspects of the soul are unable to fully coordinate with the physical body. Thus,

psychological and/or psychiatric symptoms are apparent (section 3.2.5.1). This is the form of sympathetic/cerebrospinal incoordination to be explored in this subsection.

In my study of the Cayce readings, I came to realize that the *great sympathetic system* has three faces: the *imaginative system*, the *vasomotor system*, and the *vegetative system*. I found the work of Byron Robinson (1907), a medical doctor who wrote a major treatise on the sympathetic system (*The Abdominal and Pelvic Brain*, 670 pages and 207 detailed anatomical drawings), to be particularly helpful. So much so, that I compiled a book containing selections from Robinson's text with my own commentary as a comparative study with the Cayce readings (McMillin, 1997). Here is a selection from Chapter Seven titled "The Imaginative System":

Edgar Cayce called the sympathetic system the nervous system of the unconscious mind (which is the mind of the soul). He contrasted it with the cerebrospinal nervous which is more closely associated with the conscious mind and a primary focus on the material world. Cayce's expression for this aspect of sympathetic functioning was the "imaginative system." He maintained that unconscious psychological processes affected the "vegetative" and "vasomotor" aspects of sympathetic functioning by imagination, resulting in psychosomatic illness and psychosomatic healing. In other words, the sympathetic system is a key component of the "mind-body" connection in health and healing. (McMillin, 1997, p. 87)

With this bit of background on how the *imaginative* face of the *great sympathetic system* functions as a key component in the body-soul connection, we can now explore how all of this relates to nervous system incoordination in epilepsy with regard to *pineal system* involvement. I have chosen to use the term *pineal system* to portray specific anatomical structures and physiological activities in the body that coordinate and integrate the spiritual and mental with the physical body. However, the term *pineal system* is not found in the readings. A term that is used in the readings that can be considered synonymous with the *pineal system* is the "imaginative and impulsive system." Whereas *pineal system* easily

accommodates both anatomy and physiology, the use of the expression *imaginative and impulsive system* in the readings is more functional, expressed in a variety of ways such as “ . . . incoordinations between the sympathetic (or the imaginative and impulsive system) and the physical or cerebro-spinal system.” (4381-1) In a reading for a woman having problems sleeping, the cause was said to be as follows:

Produced by the nerve pressures, that tend to make for improper coordination between sympathetic and cerebrospinal system; for the cerebrospinal is to the whole of the physical body as of that of IMPULSE to carry out conditions of the living physical organism, while the sympathetic system is rather that of the imaginative, or akin to the psychic and to the operative forces of the brain centers and impulses. Without coordination, these bring restlessness and insomnia. 5601-1

This is an example of specific aspects of the *great sympathetic system*—aspects pertaining to the incarnation of the soul in a physical body through the *imaginative and impulsive* forces of the pineal system (which are particularly active during sleep). Sleep and epilepsy are closely interrelated, which is evident in case 1784 where a young man with epilepsy was experiencing disturbed sleep with possible nocturnal seizures:

In the coccyx area [tailbone] there is the lesion in the present. This has prevented and does prevent the coordination between the impulses and the activities. And with the drain this has produced upon the glandular system, we find the abilities for the activities in directing the influences and impulses become disturbing to the body, as well as the recurrent disturbances especially in sleep and when there is the closeness of the higher spiritual forces to the border conditions. These all as we find work together upon the imaginative forces of the body-physical at times, and thus causing those periods when there is greater incoordination. 1784-1

In this case, pressures on nerves at the base of the spine resulted in “ . . . disturbances that have been indicated through the medulla ob-

longata in the activity of the pineals . . . ” Note the involvement of the imaginative forces and aberrant nerve impulses causing the periods of “greater incoordination.”

In another case (1001) where imaginative and sympathetic forces of the pineal system were directly addressed, notice how the imaginative forces of the sympathetic was one of several etiological factors involved in the nervous system incoordination:

(Q) When may body expect a cessation of attacks?

(A) When those pressures in the upper cervical and in the 11th and 12th dorsal are entirely eliminated. There is seen at times, that those contractions in the dorsal and cervical region, apparently at times come from stomach; at others from genitive system; at others from purely imaginative forces. These all of the coordination between sympathetic and cerebro-spinal . . . 1001-5

In this case there was a karmic (past life) source for the unhealthy mental attitudes and behaviors—the soul dimension of the imaginative influence. Other readings for this young man focused on the “impulsive” aspect of sympathetic/cerebrospinal incoordination. Note the reference to voluntary/involuntary *impulses* as well as *impulses* along the pineal cord:

We find the physical forces are still on the improve; that is, there is more near the normal balance of the physical forces. This balance must, necessarily, become such as that all of the impulses, whether of the voluntary or involuntary nature, become coordinant with the cerebro-spinal reflexes, both to the brain and to functioning organs or impulses towards functioning of voluntary or involuntary nature.

(Q) Have the pressures in the upper cervical and 11th and 12th dorsal been reduced?

(A) Been reduced, but not wholly the pressure taken off; so that there ARE concurrent effects from impulses along that of the cord as runs THROUGH the system to that of the gland in the base of the brain. This is still existent, when this SHOULD have been—in the 13th or 14th year—almost WHOLLY a center in the lower portion of brain. 1001-6

With regard to the *impulsive* aspect of this incoordination, consider the role of the Leydig gland and solar plexus (the “abdominal brain” described by Byron Robinson, 1907) in the production of *impulse* to the system.

(Q) What is it that brings on or incites said attacks?

(A) The attempt of the physical body—through the forces in the imaginative body—to coordinate through that condition existent in the lyden [Leydig] gland, or in the base of the brain itself. Hence the contraction, and the lack of coordination in such conditions.

(Q) From what part of the body do the attacks originate? and why does body lose consciousness during attack?

(A) From the solar plexus to that of the lyden [Leydigian] gland, or through the pineal. The lyden [Leydig] is IN the pineal, see?

(Q) Why does body lose consciousness?

(A) That’s just what we have been giving! It is the imaginative forces and the cerebro-spinal forces, or the nerve supply through the cerebro-spinal system cuts off—through the lyden [Leydig] forces—which is sealed gland, see? they lie within those of the pineal themselves, see? When these become of such an activity, through conditions as excite in the system—as thrown out from those of the genitive forces, acting through those of the solar plexus, and the attempt to coordinate—they push in so much it pushes out consciousness.

1001-9

The flow of impulse described above is part of a pattern that creates the fetus during gestation and may also be activated during deep meditation (section 3.2.2.1). The life force energy is raised in vibration and its most extreme form is called *kundalini*. In this instance the unhealthy imaginative influences produced nervous system incoordination. The past life karma was intensely sexual in nature, and the young man was unable to control his mind and behavior. As noted in the reports for this case:

The boy himself never seemed to grasp the spiritual significance of his affliction. At times he would go away for days at a time, on drinking sprees and riotous night life excursions.

His mother would finally locate him in some hotel, foot the bills, and bring him home.

Whereas in this case the impulsive system effect was of a sexual nature, for other individuals the imaginative and impulsive system expressed other past life karmic soul patterns:

Then, as to the appearances in the earth [past lives] that make for the impulse from the imaginative or the impulsive or the sense expressions in the earth, we find these are those that influence the entity in the present . . . 820-1

Whereas mainstream neuroscience focuses on nerve impulses associated with brain activity (and particularly cortical neurotransmission) the soul influence through the sympathetically mediated impulsive system provides a channel for past life and other soul experiences to manifest. This is the meaning of the expression “the sympathetic system or the brain manifestation of soul forces” and why the sympathetic system is the *greater impulsive* influence in the body:

The cerebro-spinal, the nerve cord itself, acts for the physical attributes of the body through the IMPULSES.

The sympathetic is the greater IMPULSIVE system. 4125-5

Thus the *incoordination between sympathetic and cerebrospinal* nervous systems in epilepsy can have various meanings. With regard to the pineal system and imaginative/impulsive forces associated with the sympathetic system, this could involve past life experiences manifesting as imaginative or impulsive mental/psychological symptoms (section 3.2.5.5), or even more severe biological illness (karma) as described in numerous case studies in section 2.2.

3.3.5 Summary

To understand the meaning of *incoordination between the sympathetic and cerebrospinal* nervous systems in the Cayce readings (and particularly those involving epilepsy), one must understand the historical context in which those terms were used—especially the concept of the “great

sympathetic system.” With that in mind, the incoordination described in the readings can take various forms, including these:

- incoordination WITHIN the autonomic nervous system (i.e., BETWEEN sympathetic/parasympathetic) as amply documented in the epilepsy literature (e.g., cardiovascular and/or respiratory imbalance);
- voluntary/involuntary motor symptoms during seizures;
- psychological manifestations related to pineal system involvement (imaginative/impulsive) that reflect soul patterns (i.e., karma).

3.4 Appendix D: Lacteal Duct Pathology

3.4.1 Background

Many of the Edgar Cayce readings for persons with epilepsy describe lacteal duct pathology as a core element in the production of seizures. This appendix will provide some general information on the anatomy, physiology, and pathology of the lacteal ducts as described in the readings.

Lacteals are specialized lymphatic vessels in the villi of the intestine. Nearly all dietary lipid is assimilated and transported via the lacteals and their vessels (Dixon, 2010).

Anatomically, a *duct* is a tube, canal, or vessel conveying a body fluid (Dictionary.com). Bile ducts and tear ducts are common examples. In the lymphatic system, the most prominent duct is the thoracic duct. Thus, lacteal ducts are tubes or vessels that carry absorbed lipids (chyle) from the lacteals to the thoracic duct of the general lymphatics. Chyle is a milky fluid consisting of fat droplets and lymph.

3.4.2 Anatomy and Physiology of the Lacteals and Lacteal Ducts

In general, one can regard lymphatic transport of chyle as a two-stage process: 1) entry into the lacteals and movement through the initial vessels (ducts) via the intrinsic motion of intestinal peristalsis, and 2) the subsequent movement of this lipid through the rest of the lymphatic system by the contractile activity of the larger collecting lymphatics (Dixon, 2010). Historically, the anatomical structures involved in the absorption and transport of lipids from the intestines are collectively referred to as the “lacteal system” (Knox, 1824; Bryan, 1845; Trall, 1854; Gulliver, 1863), and the term is still in use (Rudrappa & Paul, 2018).

The designation of *lacteal system* is actually quite practical in understanding how lipid absorption and transport relates to the broader anatomy

and physiology of the entire lymphatic system, which has three aspects:

1) *lacteal* function, as just described, will be explored in more detail on page 435;

2) *immune* function as part of the larger immune system. In the intestinal tract the Peyer's patches are most notable in this regard.

3) general purpose *cleansing* and maintenance of tissue fluid balance. This aspect of lymphatic function has been historically regarded as the "sewer of the vasculature, passively draining fluid and proteins from the interstitial spaces" (Dixon, 2010, p. 480).

The primary focus of this mini-review will be on lacteal system function, and particularly intestinal lipid transport from the gut to the thoracic duct. In that regard, the small intestine has two distinct lymphatic networks: one comprised of the lacteals and submucosal lymphatic network (i.e., lacteal ducts) and one comprised of the lymphatic network of the muscle layer (that cleanses and maintains fluid balance), as just described. Although tracers move freely within each of these networks (suggesting that they contain few if any valves) tracers are not exchanged between the networks, indicating that they are isolated from each other. However, both networks do eventually combine to drain into common *collecting lymphatics* near the mesenteric border of the intestine. The collecting lymphatics contain valves and have spontaneous contractions to transport the lymph away from the intestinal segment toward the cisterni chyle before emptying into the thoracic duct (Millera & Newberry, 2010).

In terms of the Cayce readings' discussion of the lacteal ducts and associated pathology with regard to epilepsy, the focus is on adhesions without explicitly stipulating the location (whether within the small intestine proper, mesenteric lymphatic vessels, or between the mesentery and thoracic duct). In the medical literature, specific use of the term "lacteal duct" is limited. However, numerous sources use the terms "lacteal vessels" and "lacteal system":

When the mucous coat of the small intestines is examined several hours after a meal, the lacteal vessels are seen turgid with chyle, and covering its entire surface . . . [including]

- 1 Smaller branches of the lacteals.

2. Larger branches, formed by the union of the smaller.

These vessels [lacteal ducts], which are so numerous, and of such magnitude as to sometimes almost conceal the ramifications of the blood-vessels, anastomose freely with each other, forming a network, from the meshes of which proceed branches, which, successively uniting, form larger and still larger trunks; and these, perforating the mucous coat, pass for some distance between the mucous and muscular coats, finally perforating both coats, and passing to the outside of the intestine, and, with it, are included between the layers of the mesentery . . . (Trall, 1854, p. 140)

This description by Trall is perhaps one of the more generous historical examples in defining the extent of the “lacteal vessels”—essentially from the lacteal villi lining of the intestinal mucous to the termination of the thoracic duct (as illustrated in Figure 97).

The Cayce readings do contain several explicit descriptions of the lacteals ducts that transport chyle:

Digestive system shows the real condition, or HOW the [pathological] condition affects the body in the lacteals—the lacteal ducts, and especially in the lacteal tubes—so that no fats of ANY nature are assimilated by the system . . . 536-1

To be sure, there may be many questions as to the exact area of the ducts, even according to some anatomists for they have changed their ideas of people, and yet people haven't changed a very great deal! There are, to be sure, lacteal ducts. There are the strings or ducts all through the upper portion of the alimentary canal, or jejunum; but the larger patch or area is that lying just below the lower end of the duodenum, and where same EMPTIES into the jejunum, see? THIS patch is not only an INTERNAL activity but an EXTERNAL, that makes for the production of assimilation. 2153-4

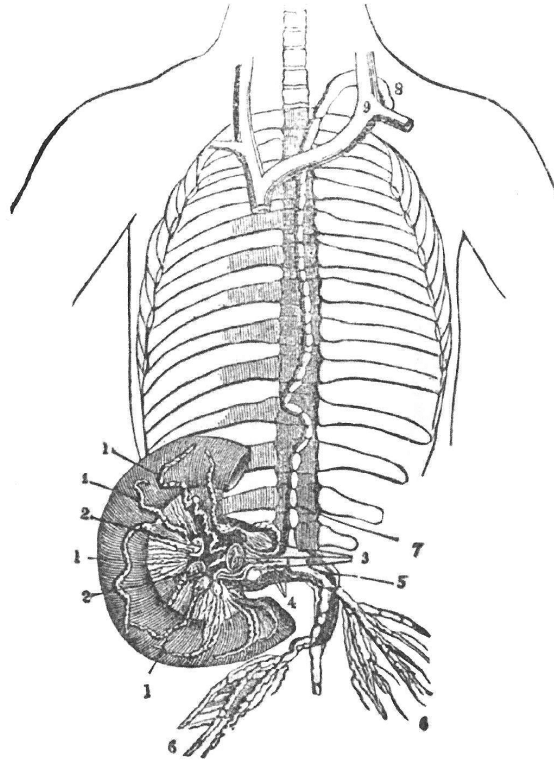


Fig. 97 is a view of the entire lacteal system

1. Lacteal vessels emerging from the mucous surface of the intestines.
2. First order of mesenteric glands.
3. Second order of mesenteric glands.
4. The great trunks of the lacteals emerging from the mesenteric glands and pouring their contents into—
5. The receptacle of the chyle.
6. The great trunks of the lymphatic, or general absorbent system, terminating in the receptacle of the chyle.
7. Thoracic duct.
8. Termination of the thoracic duct
9. The angle formed by the union of the internal jugular vein with the left subclavian vein.

(from Trall, 1854, p. 142 - public domain).

3.4.3 Causes of Lacteal Duct Adhesions

The readings described various ways in which adhesions can form in (or around) the lacteal ducts:

- Fever after-effects (2153-4; 693-1; 161-4; 1625-1; 561-1);
- Direct injury (from blow, fall, lick, pressure, etc.) (1025-2; 2276-1);
- Vasomotor constriction—spinal reflex (1980-1; 5333-1);
- Developmental problem (663-1; 1527-1);

- Nutritional deficiency (2019-1).

Regardless of the cause of lacteal duct adhesions, the slowed circulation in that area tends to produce a cold spot on the right side of the abdomen.

3.4.4 The Abdominal Cold Spot

Ten readings explicitly discuss an abdominal cold spot associated with lacteal duct pathology in epilepsy. Here are some key points that summarize this concept:

- *True Epilepsy*—Reading 567-4 states that “From every condition that is of true epileptic nature there will be found a cold spot or area between the lacteal duct and the caecum.” Naturally, the question arises as to the meaning of the term “true epileptic nature.” Considering the historical meaning of the term (section 1.2.4), this likely translates most closely into what has been called “idiopathic epilepsy.”

This interpretation is reinforced by the use of the phrase “This is NOT true epilepsy” in reading 2276-1. Cayce was apparently familiar with the diagnostic meaning of *true epilepsy* in this instance. In readings for other conditions where a differential diagnosis was required, Cayce also used this type of designation (e.g., *true migraine* and *true multiple sclerosis* in readings 3051-1 and 2983-1, respectively). The concept of *true epilepsy* is covered in detail in the general literature review (section 1.2.4).

In reading 2276-1 an abdominal cold spot on the right side of the abdomen linked to seizure activity is described, yet the case is regarded as “NOT true epilepsy.” Interestingly, the treatment regimen in this case relied heavily on abdominal castor oil packs to break up adhesions. In fact, all the details of this case seem to fit the pattern typical for epilepsy in the readings. Apparently, lacteal duct pathology with associated abdominal cold spot was a necessary but not sufficient requirement for a diagnosis of *true epilepsy* (as mentioned in reading 4072-1, stipulating the need for Leydig gland involvement).

- *Causes of Cold Spot*—Several etiological factors were noted as causing the abdominal cold spot in epilepsy:
 - Injury to the spine with nerve reflex to the abdomen (251-1, 567-4, 1980-1, 5333-1)
 - Fever (561-1, 2153-4)
 - Nutritional deficiency (2019-1, 2276-1)

◦ Injury to abdomen (2276-1, 3082-1)

- *Circulation*—In numerous readings, adhesions or lesions in abdominal lacteals were explicitly linked to poor circulation in the area which produced the “cold spot or area” (e.g., 251-1, 561-1, 1980-1, 2276-1).

- *Location of Cold Spot*—Most of the readings that mention an abdominal cold spot also describe its location. Invariably the cold spot is associated with adhesions or lesion in the lacteals along the intestinal tract on the right side of the abdomen. When a precise location was not provided, the placement of the hot castor oil pack along the right side of the abdomen to break up the adhesions and lesion provided a general location. The general location covers an area from the lower portion of the liver (point of last rib) to the hip bone. This area is consistent with the remark that “From EVERY condition that is of true epileptic nature there will be found a cold spot or area between the lacteal duct and the caecum.”

However, when a precise location for the cold spot was given, it varied slightly from person to person, although always within the general area on the right side of the abdomen. With this variability in the location of the cold spot, any research effort to measure it must take into consideration the entire general area. Here are some links to excerpts describing the location of the cold spot:

- 251-1—“over the caecum area”
- 561-1—“caecum and the area about the lacteal ducts”
- 567-4—“lower lobe of the liver to the hip bone, or pelvis bone, coming into the caecum area” (castor oil pack placement)
- 2019-1—“right portion of the upper abdomen,—as has been indicated,—about the umbilical and lacteal duct center”
- 2153-4—“hand’s breadth below the point of the rib, or over that area of the ducts”
- 2276-1—“lower portion of the duodenum and jejunum”
- 3082-1—“hand’s breadth from the navel center to the right, and two fingers up on the body from that point”
- 5333-1—“just below the gall duct center”

- *Timing of Cold Spot*—Apparently the cold spot was not always present but was linked to changes in patterns of circulation associated with seizure episodes. The most explicit description of the pattern is contained in reading 3082-1: “First a tremor is caused through the body.

At the time a very cold spot may be found at the lacteal duct." Reading 561-1 also discusses changes in circulation that occur "right after or just before" a seizure. In that reading a tautness along the right side was present "at times." Reading 561-1 also recommends placing a hand on the right side of the abdomen during a seizure ("spasm to the head") to feel the cold spot. These two readings clearly suggest that the cold spot might only be present in conjunction with seizure activity, a view espoused by Pahnke (1983, p. 137): "This sign [cold spot] was usually only present at the time of the seizure."

- *Determination of the Cold Spot*—As noted in reading 561-1, Cayce sometimes encouraged individuals to locate the cold spot to verify its presence. Reading 251-1 insisted that the cold spot "may be found by holding the hand (when warm, of course) over the caecum area, and SEE the difference in the temperature of that particular area from the lack of circulation." The qualification that the hand must be warm suggests that the temperature variation may be subtle but should be detected with proper thermographic equipment and protocol. Reading 2019-1 states that the cold spot should be detectable "upon examination" (presumably manual palpation) but does not provide explicit instructions for the procedure.

3.4.5 Summary

Lacteals are specialized lymphatic vessels in the villi of the small intestine that absorb dietary lipids. The lipids are transported to the thoracic duct via a complex system of vessels (lacteal ducts). Historically, this constitutes the *lacteal system* as described in numerous Cayce readings that cite various causes for adhesions or similar pathology linked to epileptic seizures. The adhesions and related nerve reflexes are associated with decreased circulation and lower temperature described as a cold spot on the right side of the abdomen during epileptic seizures of an idiopathic type (i.e., *true epilepsy*).

3.5 Appendix E: Possession

This appendix was created as a supplemental resource for an earlier work (*The Treatment of Schizophrenia*, McMillin, 1991a). Because possession is prominent in the history of epilepsy and a few of the Cayce readings mention it (almost as an aside), it is included here as

an example of Cayce's expansive holistic perspective.

Possession is a difficult subject to discuss in relation to mental illness due to the atrocities which have been inflicted upon the insane over the centuries in the name of religion. Nevertheless, the Cayce readings explicitly acknowledge the reality of possession in certain cases of insanity. Therefore, it is important to understand the precise meaning of possession in the readings.

The readings affirm the continuity of consciousness and state that souls do not proceed immediately after death to some eternal resting place (be it heaven, hell, or whatever). Instead, the process of evolution toward unity with the Creator continues on various "planes" or dimensions of reality other than the earth. Unfortunately, some individuals have such strong attachments to the earth experience that they are unable to detach from this dimension at death. Instead, they may exist in a realm which Cayce describes as the "borderland." Such discarnate souls seeking expression in a physical manner, may find it through persons whose spiritual centers are open to cosmic influences. This opening may result from cases of insanity (i.e., dementia praecox, now called schizophrenia), alcoholism, epilepsy, and various other organic disorders or from misdirected attempts at spiritual evolvment (e.g., certain occult practices, obtaining "higher knowledge" without applying it, etc.).

Keep in mind that the readings referred to "definite points" within the body which serve as connections between body, mind, and spirit (i.e., the pineal system, Appendices A & B). These interfaces could be adversely affected by somatic dysfunction, biochemical imbalances, and so forth. Severe weakening of these centers could thus leave the body open to outside influences seeking expression in the earth plane.

In certain cases cited in Chapter Three, possession was indicated because the individuals had lost control themselves and had little, if any, ego strength or sense of personal identity due to the degenerative effects of dementia praecox. In cases where dementia praecox was not indicated, the experience was more of obsession (e.g., [5221]) due to the opening of the spiritual centers of the body to outside influences.

It is also important to note that Cayce's use of the word *possession* in the readings does not suggest demonic possession. The intrusive entities were always earthbound spirits seeking expression in the earth plane.

The readings' portrayal of life after death can be best described as a "continuity of consciousness." In other words, patterns of thought and action are carried over into the discarnate state. Interpersonal patterns of "possession" developed during one's earthly life would thus be maintained by earthbound discarnates (e.g., a marriage partner who dominates a spouse, a parent who lives vicariously through an offspring, an employer who controls employees, etc.). With this in mind, one can appreciate the readings' frequent use of the term *influence* (e.g., "discarnate influence" or "outside influence," etc.) to describe the manifestation of possession.

Possession is not necessarily always a negative experience. Throughout history people of all cultures have sought possession by benevolent spirits and have engaged in rituals and ceremonies for that purpose (e.g., the Holy Spirit in Christianity).

Mediumship is a form of trance possession whereby individuals willingly allow discarnate entities to use their bodies for communication. In this form, possession does not necessarily interfere with an individual's course of life or produce pathological dissociation, and is time limited so that the individual can resume normal conscious daily living. The prime consideration in this type of possession is the conscious voluntary involvement of the person being possessed. The popularity of spiritualism in the nineteenth century and the current interest in channeling are examples of trance possession.

Electrotherapy and hypnotherapy were two of the most common forms of therapy for the treatment of possession in the Cayce readings. Specifically, Cayce stated that electricity would drive out the discarnate influences. Wickland (1924) was an early twentieth-century M.D. who used electrotherapy in conjunction with other techniques (including hypnosis) to encourage the earthbound entities to detach from their hosts and proceed forward in the evolutionary process of soul growth.

The Unquiet Dead (Fiore, 1987) is an informative and readable introduction to this subject. Fiore is a clinical psychologist who uses hypnosis to perform "depossession therapy." Her view of possession in relation to schizophrenia is similar to that presented in the Cayce readings: "I do not feel that all schizophrenics are psychotic because of the possibility of possession. I do feel that—in addition to their mental illness—they are undoubtedly possessed. The possession is an extra burden for them" (p. 163).

Numerous clinicians are currently involved in various applications of depossession therapy. Baldwin's (1989) work with "spirit releasement therapy" echoes many of the themes developed by Fiore and attempts to provide a research format for exploring this subject. His work is scholarly and highly recommended to readers seeking further information.

Naegeli-Osjord (1989) is a Swiss medical doctor who provides assessment criteria for the distinguishing possession from schizophrenia. The range of criteria includes interpersonal contact, presence of phobias, auditory phenomenon, sudden changes in personality, and mediality (mediumistic). His discussion of auditory hallucinations will serve as an introduction to his diagnostic procedure.

In the theory of established psychiatry, hallucinations—voices—are, for the most part, considered to be primary symptoms of schizophrenia. In my opinion, this is wrong. We have to consider that "voices" which another person cannot hear are real sensations, but only heard by the individual in the subtle interaction of the anatomic auditory center of the brain. This may be caused by either a very intense personal feeling, or by a being of the ethereal dimensions, a "suffering soul" or a demon. But the existence of an ethereal body is not considered. In my opinion, it is an absolute proof of possession or harassment when these "voices" constantly repeat the same words, for example, "kill yourself" or "you are a fool," for a long time, without stopping. (pp. 471-472)

There is abundant literature in this area, and it is not necessary to wade through it because possession is not the primary focus of this book. Rather, this Appendix is intended to provide a context from which to consider Cayce's occasional reference to it in cases of dementia praecox (schizophrenia).

Because Cayce's use of the term *possession* in the readings was not satanic but more a matter of influence and obsession, the manifestation of this state was closely allied to the symptoms of the mental disorder. In other words, one would not expect a person receiving a psychic reading from Cayce, which indicated possession, to be exhibiting symptoms and behaviors that are graphically portrayed in innumerable movies

about satanic possession (i.e., no rotating heads and vomit). Rather, one might observe a lack of control, periods of unconsciousness, obsessive thought patterns, etc.

The written correspondence associated with the readings where possession was involved provides vivid and personal accounts of the experience of possession in this context. There are three Circulating Files and a research bulletin on possession, which are available through the A.R.E. James Windsor has written a brief paper entitled *Commentary on Possession*, which provides an excellent overview of possession as noted in the readings. A concise quotation from this work will be provided, and interested readers are encouraged to review this insightful paper in its entirety.

Possession was not a major theme of the Cayce readings. It was mentioned several times, almost as an aside, in cases where the primary concern was either physical or mental health. Possession was presented as a consequence of other problems such as insanity, epilepsy, and alcoholism, rather than a cause. The disease, and resulting weakness, opened the person to the possibility of possession. (Windsor, 1989, p. 2)

Clinicians (e.g., Fiore, Baldwin, Naegeli-Osjord, etc.) have provided assessment criteria for differential diagnosis for those interested in pursuing the relationship between possession and mental illness in a clinical setting. Oesterreich's (1966) *Possession: Demonical and Other Among Primitive Races, in Antiquity, the Middle Ages, and Modern Times* is a comprehensive treatment of the subject from an historical perspective while Rogo's (1987) *The Infinite Boundary* focuses on twentieth-century clinicians who have investigated the relationship between mental illness and possession. Admittedly, this Appendix is an abridgment of this controversial subject and will only serve as an introduction. Although William James was perhaps a little hard on the medical profession, his view of this subject is still timely:

I am not as positive as you are in the belief that the obsessing agency is really demonic individuals. I am perfectly willing

to adopt that theory if the facts lend themselves best to it: for who can trace limits to the hierarchies of personal existence in the world? But the lower stages of mere automatism shade off so continuously into the highest supernormal manifestations, through the intermediary ones of imitative hysteria and “suggestibility,” that I feel as if no general theory as yet would cover all the facts. So that the most I shall plead for before the neurologists is the recognition of demon possession as a regular “morbid-entity” whose commonest homologue today is the “spirit-control” observed in test mediumship, and which tends to become the more benignant and less alarmingly, the less pessimistically it is regarded . . . I am convinced that we stand with all these things at the threshold of a long inquiry, of which the end appears as yet to no one, least of all to myself . . . The first thing is to start the medical profession out of its idiotically conceited ignorance of all such matters—matters which have everywhere and at all times played a vital part in human history. (in Murphy & Ballou, 1960, p. 261)

Excerpts from the Cayce Readings

(Q) What has caused the severe attacks during the past week?

(A) The return of those influences and forces seeking a home.

(Q) Why should those entities return to this body after our prayer?

(A) They are as material as individuals, why doesn't an entity return home? They are seeking a home, the same as individuals, personalities! 281-6

(Q) In certain types of insanity, is there an etheric body involved? If so, how?

(A) Possession. Let's for the moment use examples that may show what has oft been expressed from here:

There is the physical body, there is the mental body, there is the soul body. They are One, as the Trinity; yet these may find a manner of expression that is individual unto themselves. The body itself finds its own level in its own development. The mind, through anger, may make the body do that which is contrary to the

better influences of same; it may make for a change in its environ, its surrounding, contrary to the laws of environment or hereditary forces that are a portion of the *élan vital* of each manifested body, with the spirit or the soul of the individual.

Then, through pressure upon some portion of the anatomical structure that would make for the disengaging of the natural flow of the mental body through the physical in its relationships to the soul influence, one may be dispossessed of the mind; thus ye say rightly he is “out of his mind.”

Or, where there are certain types or characters of disease found in various portions of the body, there is the lack of the necessary vital for the resuscitating of the energies that carry on through brain structural forces of a given body. Thus disintegration is produced, and ye call it *dementia praecox*—by the very smoothing of the indentations necessary for the rotary influence or vital force of the spirit within same to find expression. Thus derangements come.

Such, then, become possessed as of hearing voices, because of their closeness to the borderland. Many of these are termed deranged when they may have more of a closeness to the universal than one who may be standing nearby and commenting; yet they are awry when it comes to being normally balanced or healthy for their activity in a material world. 281-24

(Q) Are there entities, because of a psychic opening, feeding on or sucking my vitality?

(A) Entities that would seek to find expression through that left open . . . yet the harmony even of the spheres may be the experience of the entity with the aid in self builded to such an extent as to gain from the meditation healing influences from the higher sources, and give out to those who would as vultures feed upon the body—that they may find for themselves that guiding influence in their present environ and sphere of experience. 436-3

Mr. Cayce: Yes, we have the body here, [638]. [In undertone, after long pause: “We have possession here.”] Now, as we find, from the physical or material standpoint we have conditions that

disturb the better physical functioning of this body. These have to do with the coordinations between the sympathetic and cerebrospinal responses to the activities in the physical forces of the body . . . we have . . . corresponding cold spots on various portions of the body . . .

(Q) What causes the illusions?

(A) Incoordination between the sympathetic and cerebrospinal nerve system, from those areas or ganglia as indicated. We must create for the physical forces of the body that which will make coordinations in these areas. 638-1

For the subconscious, as given, is the storehouse of every act, thought, or deed . . . Hence the condition as is seen about such entity having passed into the spirit plane; it seeks the gratification of such through the low-minded individuals in an earth plane. 900-20

(Q) What causes him to lose control of himself?

(A) Possession!

(Q) Is there any way I can help him?

(A) Kindness, gentleness and prayer. These offer the channels through which the greater help may come at this time . . .

(Q) Regarding my husband, what is meant by “possession”?

(A) Means possession!

(Q) Does that mean by other entities, while under the influence of liquor?

(A) By others while under the influence that causes those reactions and makes for the antagonism, and the very change of the activities.

For this body [the husband], if there could be a sufficient period of refraining from the use of alcoholic stimulants and the diathermy electrical treatments used these would drive these conditions out! But do not use same with the effects of alcohol in the system—it would be detrimental!

But such information for the physical condition of the body had best be approached from the individual, to be sure.

(Q) Is he crazy, or mentally deranged?

(A) If possession isn't crazy, what is it? 1183-3

(Q) Is it possible that this body is possessed by an unclean or evil spirit which causes peculiar crying and expression of rage at times?

(A) As has been indicated, there is the inclination for the inner self to GATHER the influences of same. Not a case of complete possession, but ENTERTAINING of such influences at times. Hence the electrical forces will aid, with the [hypnotic] suggestions, in eliminating these IMPRESSIONS —or POSSESSIONS of the mental attitudes. (1553-6, see 1553-17 below)

This can only be met through the [hypnotic] suggestions—for, as has been indicated, these periods come and go; and, as has been outlined heretofore, it is a lack of the coordinating between the cerebrospinal and sympathetic impulses or reflexes.

(Q) Is there POSSESSION in this body?

(A) No—not in the present. As has been indicated, there have been periods; but these have passed. 1553-17

Hence pressures are indicated in the lumbar and the lower dorsal area . . . As has been given, this is the incoordination between the cerebrospinal and the sympathetic nervous system. And as the glandular system is affected as related to the genitive system, and especially affecting directly the center above the puba, there is produced—with the toxic forces in the system—this burning, and the EFFECT of POSSESSION! 1572-1

The beauty of this soul, its abilities as a creative influence in the lives of those who may bring it back as it were from the very borderland, is worth all the effort, all the love, all the kindness one may give. Such is so near possession that there needs to be great care taken. 1789-1

In the present environs (this is not meant to be as a disputation), it is not thoroughly understood. For here we have a condition that is as much POSSESSION as a weakening of the nerve forces in the system; and the general nerve breakdown will NOT be elim-

inated by the administering of drugs nor by the mere activity of suppression. 1969-1

(Q) When my vitality is low and I get discouraged, is it still possible for undesirable discarnate beings to obsess me and make a statement unbeknown to me, as I believe they did in 1938 in [1387]'s office?

(A) May obsess anyone that opens self to listen to same! 2067-3

There has been a lesion in the lacteal duct and that as coordinating with the organs of the pelvis. Hence at times such a state is produced as to almost become obsession, but possession in same. The reaction to the pineal becomes so severe as to short circuit the nerve impulse; carrying or producing a fluttering or an engorgement in static waves to the base of the brain. Thus periods are caused when there is lack of self-control. 2465-1

Now we find, there are disturbing conditions. These are the result of external injuries to the body. [thrown up in air in an automobile accident]

And the pressures that exist especially in the coccyx area of the spine cause a deflection of nerve energies and impulses; producing hallucinations to the mental reaction.

But from external injuries the nerves in the coccyx end of the spine have been jammed, as well as the reaction upon the nerves in the lumbar axis and the brachial and cervical.

In the reaction to the nerves, as the pressures upon the coccyx end and the brush end of the cerebrospinal, congested areas have formed there.

Periods come when there is self-condemnation, self-realization of the reaction; and at times the feeling or expression of POSSESSION. 2544-1

These are the result of chemical and glandular reactions in the body; producing a deteriorating reaction in nerve impulses. Thus the mental aberrations that appear, the hallucination as to lack

of desire for associations and activities, faultfinding in self and in environs, as well as those about the body. If these are allowed to progress they may bring a very detrimental condition—either that of possession or such a deteriorating as to become dementia praecox in its nature. 2614-1

When the adjustments or manipulations are given, now about once a week, follow same with the ultraviolet light—this to be the Mercury Light, and project the green glass between it and the body; this to be applied mainly to the spinal system.

(Q) What material conditions are upsetting to the body, and what adjustments need to be made to prevent this?

(A) These have just been outlined. As the centers are opened, that is why we are giving the electrical treatments in the two forms—one external to act upon the structural portion, the other to the centers that will prevent any form of possession or impression from the psychic forces outside the body. 2863-2

As we find, there are physical or pathological, as well as mental-psychological, disturbances. These, while they do not work together, are caused or produced by retentions in the mind—or that which is partially, or at times possession.

The body-mind lost control of itself through overtaxing of the body-mind, combined with a type of fever that was part of the experience when the body so taxed itself; reducing the body-forces to such an extent that in many centers along the spinal column there came to be less and less ability for the centers to coordinate between sympathetic and cerebrospinal nervous systems.

First there was caused absentmindedness, the tendencies towards a little temperature, the driving of self too much, and then the hallucinations, and then debilitation in the impulses to be carried back and forth through the ganglia. 2865-1

As we find, the conditions that disturb this body are as much of a psychological nature as of a pathological nature.

Pathologically, these would have to do with conditions which existed during the period of gestation.

Psychologically, these have to do with the karma of this body, and those responsible for the physical body.

Hence we have here conditions that at times approach near to that of possession of the mind by external influences, or that very close to the spiritual possession by disincarnate forces.

To be sure, these interpretations would not be accepted by some as an explanation. And yet there will come those days when many will understand and interpret properly . . .

Owing to those conditions which existed in the manner in which coordination is established in the physical reactions between impressions received through sensory system and the reactions upon the reflexes of brain, we find these at times become very much disassociated . . .

At such times possession near takes place.

With the capsule of the inner brain itself, these cause the distortions, the associations with not the normal reflexes but with the impressions received in the suggestive forces. 3075-1

The conditions here, as we find, have been so aggravated by animosities, and by hates, that we have a deterioration in the nerve force along the spinal system; so that this dementia—and now possession, such that this may appear near to hopeless in this experience.

Ready for questions.

(Q) What was the original cause, or what brought about this condition?

(A) Changes in the glandular system, and then aggravated by animosities and hate. 3315-1

As we find, there are disturbing conditions. Part of these are pathological, part are psychopathic. There has been the opening of the lyden [Leydig] gland and thus a disturbance through glandular system. Possession at times is the result. 3410-1

. . . there has been the opening of the lyden [Leydig] gland, so that the kundaline forces move along the spine to the various centers that open . . . with these activities of the reaction is much like that

as may be illustrated in one gaining much knowledge without making practical application of it . . . Now we combine these two and we have that indicated here as possession of the body; gnawing, as it were, on all the seven centers of the body, causing the inability for rest or even a concerted activity—unless the body finds, as this occurs, the disturbance is retarded or fades—in the abilities of the body to exercise itself in [giving] help for others.

3421-1

. . . the body is a supersensitive individual entity who has allowed itself through study, through opening the [gland] centers of the body, to become possessed with reflexes and activities outside of itself . . .

(Q) How did I happen to pick this up?

(A) . . . the body in its study opened the [gland] centers and allowed self to become sensitive to outside influences.

(Q) What is it exactly that assails me?

(A) Outside influences. Discarnate entities.

5221-1

3.6 Appendix F: References

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EDGAR CAYCE'S A.R.E.

Who Was Edgar Cayce?

Twentieth Century Psychic and Medical Clairvoyant

Edgar Cayce (pronounced Kay-Cee, 1877-1945) has been called the “sleeping prophet,” the “father of holistic medicine,” and the most-documented psychic of the 20th century. For more than 40 years of his adult life, Cayce gave psychic “readings” to thousands of seekers while in an unconscious state, diagnosing illnesses and revealing lives lived in the past and prophecies yet to come. But who, exactly, was Edgar Cayce?

Cayce was born on a farm in Hopkinsville, Kentucky, in 1877, and his psychic abilities began to appear as early as his childhood. He was able to see and talk to his late grandfather's spirit, and often played with “imaginary friends” whom he said were spirits on the other side. He also displayed an uncanny ability to memorize the pages of a book simply by sleeping on it. These gifts labeled the young Cayce as strange, but all Cayce really wanted was to help others, especially children.

Later in life, Cayce would find that he had the ability to put himself into a sleep-like state by lying down on a couch, closing his eyes, and folding his hands over his stomach. In this state of relaxation and meditation, he was able to place his mind in contact with all time and space—the universal consciousness, also known as the super-conscious mind. From there, he could respond to questions as broad as, “What are the secrets of the universe?” and “What is my purpose in life?” to as specific as, “What can I do to help my arthritis?” and “How were the pyramids of Egypt built?” His responses to these questions came to be called “readings,” and their insights offer practical help and advice to individuals even today.

The majority of Edgar Cayce's readings deal with holistic health and the treatment of illness. Yet, although best known for this material, the sleeping Cayce did not seem to be limited to concerns about the physical body. In fact, in their entirety, the readings discuss an astonishing 10,000 different topics. This vast array of subject matter can be narrowed down into a smaller group of topics that, when compiled together, deal with the following five categories: (1) Health-Related Information; (2) Philosophy and Reincarnation; (3) Dreams and Dream Interpretation; (4) ESP and Psychic Phenomena; and (5) Spiritual Growth, Meditation, and Prayer.

Learn more at EdgarCayce.org.

What Is A.R.E.?

Edgar Cayce founded the non-profit Association for Research and Enlightenment, Inc. (A.R.E.®) in 1931, to explore spirituality, holistic health, intuition, dream interpretation, psychic development, reincarnation, and ancient mysteries—all subjects that frequently came up in the more than 14,000 documented psychic readings given by Cayce.

The Mission of the A.R.E. is to help people transform their lives for the better, through research, education, and application of core concepts found in the Edgar Cayce readings and kindred materials that seek to manifest the love of God and all people and promote the purposefulness of life, the oneness of God, the spiritual nature of humankind, and the connection of body, mind, and spirit.

With an international headquarters in Virginia Beach, Va., regional representatives throughout the U.S., Edgar Cayce Centers in more than thirty countries, and individual members in more than seventy countries, the A.R.E. community is a global network of individuals.

A.R.E. conferences, international tours, camps for children and adults, regional activities, and study groups allow like-minded people to gather for educational and fellowship opportunities worldwide.

A.R.E. offers membership benefits and services that include a quarterly body-mind-spirit member magazine, *Venture Inward*, a member newsletter covering the major topics of the readings, and access to the entire set of readings in an exclusive online database.

Learn more at EdgarCayce.org.

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