

Neurotherapeutic Treatment Of Fibromyalgia Using EEG-Based Stimulation

By Mary Lee Esty, Ph.D., L.C.S.W.-C & Emily Perlman, M.S., C.T.R.S.
Neurotherapy Center of Washington, Chevy Chase, MD

Introduction

I. Jon Russell, M.D., Ph.D., raises important questions about the difficulties of diagnosing fibromyalgia. He asks, “Would sub-grouping help to explain some of the difficulties in defining the pathogenesis of FMS?” “Could the recognition of a specific clinical sub-group help to define more specific, and thus more effective, management?”¹ These are important questions for clinicians because the better the understanding of causation the more specific treatment planning can be.

These issues voiced by Dr. Russell resonated with clinicians at the Neurotherapy Center of Washington (NCW) because our clients’ life histories strongly suggest that there are multiple causes of fibromyalgia, and that taking an exhaustive history of each individual is vital to good treatment planning. By doing so, different therapeutic approaches can be utilized to properly address each client’s unique problems.

To speak of fibromyalgia as if it were a rigidly defined and predictable entity within any one human body limits the likelihood of a single treatment paradigm leading to the fullest possible remission of symptoms. Labeling tends to constrict thinking and may be misleading. It can also add to the burden of the person with fibromyalgia because if the treatment is not appropriate to causative factors, then the clinician’s reaction may be to conclude that the cause is of emotional origin. Sadly, many of our patient’s have reported that when they had no positive response to a particular practitioner’s protocol, they were told that theirs must be an emotional problem.

In our experience, using central nervous system (CNS) functioning as a basic framework for evaluating symptoms of many medical problems is

a practical and useful clinical paradigm. In recent years there has been an explosion of CNS research contributing to a better understanding of pain mechanisms and behavioral problems. (See Table 1) Such findings, and many others too numerous to list here, all point to new treatments for difficult-to-treat problems and make it increasingly clear that we ignore the implications of recent CNS research findings to the detriment of our patients and to the detriment of improved future treatment of fibromyalgia and other conditions.²

A New Approach To Fibromyalgia Treatment

At the Neurotherapy Center of Washington, we are pioneering an exciting new way to treat fibromyalgia in sub-groups of clients who have suffered various forms of trauma. As will be explored later in this article, it has become increasingly clear that trauma adversely affects the functioning of the brain and central nervous system, sometimes producing the symptoms that we know as fibromyalgia. In our work, we have learned that if we can intervene non-invasively in the dysfunctional CNS state that occurs as a result of trauma and which creates and perpetuates the symptoms of fibromyalgia, we can significantly improve a client’s functioning. The purpose of this article is to describe our treatment approach that harnesses the brain’s ability to change (its “plasticity”) and places it within the context of current clinical practice, theory, and research.

Treatment at the Neurotherapy Center of Washington begins with an assessment of a client’s life and clinical history. Most clients find that we delve more deeply into particular aspects of their individual histories than they have experienced

Table 1: Recent Research Findings on the Relationship between the Central Nervous System and Pain/Behavioral Mechanisms

❖ The Donaldson series on neural plasticity and fibromyalgia demonstrates the link between CNS dysfunction and the ability of the brain to change (neural plasticity), and discusses what that means in terms of practical applications for successful treatment of fibromyalgia.³

❖ Mueller presents treatment outcomes showing the promise of currently available brain stimulation technology for some people with fibromyalgia.⁴

❖ Research that examines internal physiological functioning is also adding to the body of knowledge pointing to CNS dysfunction as a possible cause and perpetuating factor in fibromyalgia. In an article on central sensitivity syndromes, Yunus notes that: “Central nervous system sensitivity... results in amplified, widespread, and persistent pain. This central sensitivity seems to be the most important aberration among the neuroendocrine dysfunctions.”⁵

❖ Staud, Price et al., report that second pain ratings in response to a heat stimulus are greater in fibromyalgia subjects as compared to controls, providing evidence for central abnormal pain modulation controls.⁶

❖ Staud, Caril, et al., also write that, “FMS subjects required much lower mechanical pressures than controls to elicit wind-up, indicating abnormal pain mechanisms. These same mechanisms may also play an important role in FMS pain.”⁷

❖ Wittrup et al., looked at markers of CNS injury through measures of inflammatory markers in cerebrospinal fluid and serum. They found an immuno-inflammatory process in the CNS that supports “a model of immune-mediated brain injury leading to abnormal sensory processing and widespread allodynia in FMS”. They also suggest that their findings support subgrouping FMS patients by etiology.⁸

❖ Using SPECT scanning, Mountz et al., identified decreased blood flow in the thalamus and caudate nucleus. These are areas that generally modulate pain signals. In a 1995 article, the research group

wrote: “...specific parts of the brain’s limbic system, the thalamus and caudate nucleus, have decreased blood flow. These areas seem to modulate pain by inhibiting incoming pain signals. If they are not functioning normally, they will not be able to inhibit pain signals. Fibromyalgia seems to ‘turn off’ these areas, which allows pain signals to continue uninhibited through the brain.”⁹ We disagree with the suggestion that fibromyalgia has changed brain function. Rather, we assert that trauma of some type has changed the brain’s functioning, and *the change is the cause* of fibromyalgia. The thalamic area of the brain is especially vulnerable to physical damage from blunt and whiplash trauma.

❖ M. Donaldson et al., identified sub-groups in fibromyalgia based upon brainwave patterns. Research from many sources points to a significant CNS component in FMS and now, perhaps, to an EEG signature in people with fibromyalgia.¹⁰

❖ Schwartz and Begley provide a lively and well-documented history of research of the mechanisms and applications for treatments that take advantage of the brain’s ability to change (or neuroplasticity) and give hopeful news about the ability of the brain to change in response to stimulation.¹¹

❖ An increased understanding of the role of brain function on pain and on chronic illnesses is appearing more frequently in pain research literature. Researchers presenting at the American Pain Society and the American Academy of Pain Medicine reported “...clear evidence that chronic pain produces cardiovascular and immunologic complications. Even more compelling was a study by Sora and Associates from Northwestern University that compared brain mass in chronic pain patients with normal controls. The chronic pain patients’ gray matter had significantly less density... Although nervous system-type pain, per se, is in early stages of research, practitioners and patients need to be keenly aware that there is growing evidence that uncontrolled pain may produce pathologic, neurologic, immunologic, cardiovascular and endocrine changes.”¹²

before. We are especially interested in possible trauma to the central nervous system, whether it occurred as a result of blunt trauma to the head, whiplash, traumatic birth, hypoxia, surgery, chemotherapy, ongoing infections (parasitic or viral)—or as psychological trauma (acute and long-term), childhood abuse, congenital conditions, chronic medical problems, degenerative neurological conditions, coccyx injuries, or toxic exposure.

Mild traumatic brain injury (TBI) is far more prevalent than most realize and has lasting and far-reaching physiological and psychological effects that totally change a person's life.¹³ Multiple medical problems may arise from traumatic brain injury, and any trauma that affects the central nervous system can lower a person's threshold for developing fibromyalgia.

To determine if trauma has been responsible for changes in brain functioning in a client, we initially create a map of the brain using an electroencephalogram (EEG). An EEG is a recording of electrical activity in the neocortex of the brain that can be recorded at the scalp. Because the EEG is easily read at the scalp, it provides a pathway for connection and for intervention into the functioning of the central nervous system.

What does an EEG tell us? Electrical activity produced by the brain reflects a person's level of functioning. A condition known as "EEG slowing" is present in people who have suffered damage to the brain and central nervous system as a result of trauma and have developed such conditions as post-concussion syndrome from traumatic brain injury, post-traumatic stress disorder, and fibromyalgia, among other conditions. Memory and mood problems, fatigue, pain, and headache are reflected in brain dysfunction, and EEG recordings of people with these symptoms typically show an excess of energy in slow brainwaves. "An adult should not have theta or delta patterns in the waking record, and if they appear, they are called slow wave abnormalities. The slower the frequency and the more often it appears, the greater is the degree of abnormality. Abnormal slow waves appear when the brain cells are damaged regardless of the cause of the damage."¹⁴ In traumatic brain injury, "major

lesions tend to occur predominantly in the frontal and temporal poles, the brain stem, and the corpus callosum, that thick band of neural tissue that maintains the most efficient and the fastest connections between the brain hemispheres". "Diffuse damage to these areas causes attentional deficits, slow thought processing, and diminished bilateral integration."¹⁵

The good news is that we are able to treat EEG slowing in fibromyalgia and several other medical conditions. We learned from a NIH-funded study at the Neurotherapy Center of Washington that fibromyalgia symptoms could be treated using EEG-based stimulation treatment.¹⁶ We found that people who had functioned previously at a high level but went on to develop post-traumatic fibromyalgia responded rapidly to treatment with reduction in cognitive problems and pain.

EEG-based stimulation is a form of biofeedback. It is a non-invasive procedure that allows the monitoring and analysis of EEG signals through surface electrodes on the scalp and then uses the EEG itself to guide the feedback. The stimulation returned to the scalp as part of the treatment is of profoundly low power, but produces a reaction in the brain. The EEG signals influence the feedback, and the feedback, in turn, changes the EEG pattern.

During an EEG-based stimulation treatment session at the NCW, a mild abrasive gel and alcohol are used to clean the skin. Small sensors held on the scalp with a conductive paste measure the EEG. During the initial mapping process only measurement occurs. Later, in a treatment session a minuscule signal is transmitted to the brain, influencing it in beneficial ways. This tiny discharge seems to gently stimulate the brain into starting a reorganization of its own activity. The strength of the signal is a fraction of the power of the normal brainwave. (The emissions have been measured at Lawrence Livermore Laboratory.) The speed of the feedback is controlled by signals picked up at the scalp. During very short sessions the only instructions to the client are to close the eyes and sit quietly. The brain and the signals are the active players. Treatment sessions are usually scheduled twice a week, with two days between sessions to allow comfortable integration of the treatment

response. For most people with fibromyalgia, this permits integration of the treatment effect and thereby avoids overloading the system.

EEG-based stimulation is important because it begins to change the way the brain handles a previously dysfunctional state in the central nervous system that has acted as an amplifier of pain. We have also found that EEG-based stimulation makes positive changes in the body. Physical therapists report that after EEG-based stimulation the texture of the muscles is softer and that they can work more deeply without causing discomfort and that trigger points have reduced in sensitivity and texture.

Surface Electromyography: Muscle Retraining Therapy

Once EEG-based stimulation is well underway, it is important to go a step further and assess any dysfunctional relationships which occur in the muscles and soft tissues of the body, either as a result of previous injury, poor posture, or other causes. Muscle retraining is essential for improved central nervous system functioning because ongoing pain from muscle spasms and misuse perpetuates the overloading of the already burdened brain, hindering recovery.

We have had good results using a form of medical technology known as surface electromyography (sEMG) in which sensors are placed over various pairs of muscles in the body to measure their electrical activity. Such measurement helps to identify and correct physical sources of pain such as muscle imbalances or hypertonicity. Muscle activity is measured with the muscles at rest and again with movement. Dedicated software displays the results numerically and graphically on a computer screen, and the relative level of activity measured in microvolts is computed automatically. Calculations are then made regarding how well the muscles return to a resting state. Muscle imbalance, by definition, is a difference of at least 20% in electrical activity between the left and right muscles of a pair. Such imbalances are a direct source of pain. Also problematic are co-contractions of muscles which are often painfully present in fibromyalgia. A co-contraction is defined as occurring when "...a

muscle that is normally quiet and has no biomechanical involvement with the movement demonstrates increased electrical activity during the movement in a manner that is directly time linked to that movement."¹⁷ In other words, a co-contraction occurs when a given muscle is activated for a particular movement and a second muscle is inappropriately and unnecessarily activated as well.

Surface electromyography can also be used to guide treatment. Muscle imbalances are addressed systematically by prescribing individualized exercises that the client can do at home to retrain various muscle groups. Imbalances are rechecked, usually weekly, after the exercises are done. The exercises, if done faithfully and correctly, produce some correction so that other sets of muscle imbalances can then be addressed. If muscles have retained some healthy function through exercise and use, then response to treatment is faster, and there is a better outcome. Usually, relatively few sEMG sessions are required as imbalances are sequentially treated. Pain signals are altered so that those therapies that have provided short-term relief in the past (PT, massage, relaxation biofeedback, stress management, meditation, and acupuncture, for example) now have longer lasting effects. Our clients develop an increased awareness of their body mechanics as treatment progresses, applying the lessons of sEMG treatment to daily life. This is the beginning of true life-style changes that help prevent relapse.

When combined with EEG-based stimulation, treatment using surface electromyography is able to help resolve dysfunctional relationships between muscles and surrounding soft tissues with lasting results. The use of sEMG provides the patient with information that is not available in any other way. The following example illustrates the value of identifying details of muscle function in fibromyalgia.

A physician referred a young woman to NCW for treatment of weakness, fatigue, disequilibrium, headaches, and cognitive problems. She had been very athletic and worked in an extremely physically demanding job. The sEMG evaluation revealed that muscles at the back of the legs were not firing enough to allow her to walk with a sense of balance, and it was impossible for her to walk up even a

slight incline. Within two treatment sessions the firing of her leg muscle had tripled, and pain was greatly reduced. She was given leg exercises specific to the problem. Treatment was complete after 23 EEG-based simulation sessions, and only 11 sessions of surface electromyography. She went back to work full-time and was aerobically exercising again.

Myofascial Treatment

Myofascial treatment (which includes cranio-sacral therapy) is the third arm of our recovery program and is coordinated with EEG-based stimulation and sEMG treatment so that the three therapies are mutually supportive. Myofascial treatment focuses on the connective tissue of the body. The fascia superficialis is situated under the skin of the entire body forming a continuous sheet of strong tissue. A deeper structure, the fascia profundus, is like a rubber stocking or bandage surrounding the muscle groups, glands, and sheathes for the great vessels and nerves. In fibromyalgia, these fascia become hardened because of prolonged muscle spasms. The result is severe constriction of the fascial tissue covering muscles with reduced range of motion, stiffness, and reduced blood flow to the affected muscles. These fascial constrictions must be released with careful manual stretching of the fascia in myofascial release sessions.

When the brain responds to stimulation treatment, the threshold for pain seems to be increased. As higher tolerance for pain develops from the stimulation treatment, the benefits of myofascial or craniosacral therapies begin to last longer. Along with the benefits of EEG-based stimulation treatment, the recovering brain receives support from sEMG and myofascial treatment that improves the flow of blood and cerebral spinal fluid. Improved flow removes toxins and increases the body's supply of nutrients.

We encourage exercise, good nutrition, and life-style changes as appropriate for each client. Most of our clients learn over the course of treatment to adopt new postural habits and the importance of a self-care plan that supports recovery and actually leads to new levels of

functioning with family, social acquaintances, and co-workers.

NCW Treatment Overview

A treatment protocol that uses EEG technology to guide stimulation to the brain has been shown to have positive effects on central nervous system function and on a multitude of symptoms. These effects along with the added benefits derived from treatment using surface electromyography have been documented in several studies that suggest that direct intervention accomplished through stimulation of the brain seems to be essential to recovery from traumatic brain injury and thus from fibromyalgia.¹⁸

Using EEG-based stimulation as part of a multi-faceted treatment regimen is important because "...relapse is likely unless the sEMG treatment is combined with EEG biofeedback . . . Unlike myofascial pain that appears to involve the peripheral nervous system, FMS appears to involve the central nervous system as well."¹⁹ Clinical treatment observations at the NCW support these findings. It is usually true that for most fibromyalgia patients EEG-based stimulation treatment *alone* is not sufficient for recovery. Although EEG-based stimulation often reduces pain, improves cognition, relaxes muscle spasms, and reduces the irritability of myofascial trigger points, the most complete recovery—one that allows a person to be resilient to life's ongoing stresses—must combine EEG-based stimulation with sEMG and myofascial treatment.

Not all of the three modalities described here are utilized simultaneously. At times, we have stopped one or more of our treatments in consultation with a prescribing physician while medications are changed and stabilized or some other treatment is explored. Coordinating surface electromyography treatments with physical therapy or other bodywork may also be necessary. We seek close working relationships with others on a client's health care team to organize a treatment plan. We have also coordinated our treatment of people referred by mental health therapists. These therapies have included insight-oriented and cognitive psychotherapy and Eye Movement Desensitization

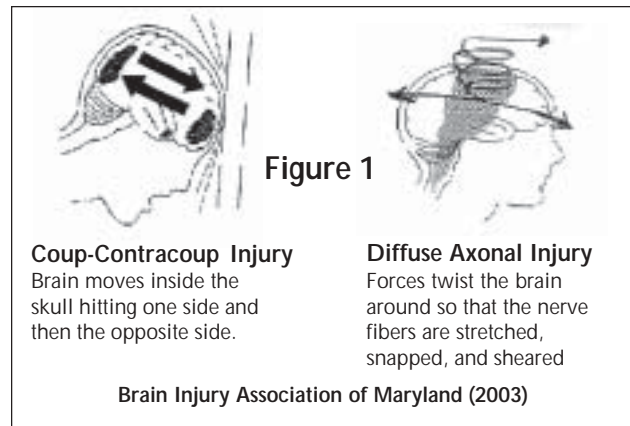
and Reprocessing (EMDR). In other words, the components of fibromyalgia treatment at the NCW are tailored to each client and constitute an integrated resource for complementary work in conjunction with other health care providers.

Some Etiologies of Post-Traumatic Fibromyalgia

Traumatic Brain Injury. In our opinion, the most significant risk factor for developing fibromyalgia is a history of mild traumatic brain injury. There are more incidents of TBI each year in the US than cases of breast cancer, HIV/AIDS, spinal cord injuries, and multiple sclerosis combined. Conservative reports of brain injuries estimate 1.5 million new cases per year, but many never reach a hospital and so are not officially recorded.²⁰ Concussion is a cause of brain injury and there are two levels of concussion before loss of consciousness occurs.

The impact of every trauma on brain functioning is cumulative. Motor vehicle accidents are the most common cause of traumatic brain injury. Falls are the second leading cause. Brain injury can result from a blow to the skull—a blunt trauma that causes many changes in the brain with focal trauma being localized. It can also result from more general damage such as diffuse axonal injury that is common in acceleration/deceleration injuries such as whiplash. (See Figure 1) The forces involved in diffuse damage cause the brain to move in two or more directions at once resulting in a stretching and tearing at the cellular level. Damage at that level does not show up on either an MRI or CT scan but is very evident in its effect on daily functioning. The injury is diffuse and not localized to a specific area of the brain. Therefore, the cause of traumatic brain injury is not limited to blunt trauma because of the resulting acceleration and deceleration forces. Traumatic brain injury is a hidden epidemic and is often overlooked as a contributing cause of fibromyalgia.

Why do some people suffer following an injury while others appear unaffected? Unlike man-made materials, “people are not made according to specification. Accordingly, it is important to realize



that different people have differing thresholds for injury. This can be a function of age, size, and sex. . . . Even for otherwise similar people, without medically determined signs of significant degeneration (which can only lower the possible thresholds for injury), observations indicate a possible three-to-one range in tolerance levels for injury.”²¹ History of prior seemingly insignificant traumas is often overlooked but increases vulnerability to new traumas.

Whiplash. The effects of whiplash extend far beyond the muscle damage that causes headache and the neck/back spasms that can lead to chronic pain. Damage to the central nervous system results from physical forces on the brain inside the skull. Acceleration and deceleration forces wreak remarkably exquisite damage on the internal structures leading to cognitive dysfunctions of memory and attention as well as the inability of the brain to properly handle noxious stimuli. Overload is the final result that diminishes quality of life in the multiple ways known all too well by those who struggle with fibromyalgia symptoms.

Symptoms typically associated with whiplash as outlined by Maitz et al., include headaches, dizziness, nausea, auditory problems, tinnitus, blurred vision, diplopia (double vision), hypersensitivity to light and noise, impaired taste and smell, and disturbed sleep.²² Headaches can be seen in up to 80% of patients. Other somatic problems involving pain, along with cognitive or thinking problems that manifest in impaired attention, concentration, memory (fibrofog), and affective or psychological problems such as anxiety,

depression, emotional lability, and social withdrawal, are part of this symptom complex. (There is a virtually complete overlap of this symptom list with that of fibromyalgia and mild/moderate traumatic brain injury.) “Wherever there is momentum, there is a potential for tissue injury. Whenever a whiplash injury occurs, there is a risk for chronic painful complications such as fibromyalgia.”²³ Injury to the neck from whiplash is only one piece of the damage incurred.

Brown presents data on G Forces to the brain directly resulting from rear-end collisions.²⁴ In the first 100 milliseconds after collision, the car moves from under the body, and the torso rises. The forces involved are compression, torsion, and shear. It is the compression and shear that cause big problems. In 200 milliseconds the head starts back and rises. Between 200-300 milliseconds later, the body starts forward—even faster than it went backward—but the head always lags behind, then whips forward. One hundred milliseconds after a 20 mph impact, the G force inside the skull reaches 18Gs. At 250 milliseconds, the force is 2.3 Gs; at 350 milliseconds the force is 1.7 Gs; and at 400 milliseconds it is down to 0.8 Gs.

Watts reviews impact data from low-speed accident research using human subjects and precise measurements of resulting forces on the head involving a variety of cars and impact speeds. Data from one study of an impact at 11.3 kph produced an acceleration force of 17.9 Gs and a deceleration of 17.1 Gs.²⁵ Pellegrino states that in his practice the majority of his fibromyalgia patients report the onset of their symptoms following a traumatic event, the most common of which is an automobile accident.²⁶ Air bags must now be considered as paradoxically contributing to the problem, even as they prevent some damage. Getting hit in the head at high speed by an exploding air bag is a traumatic event.

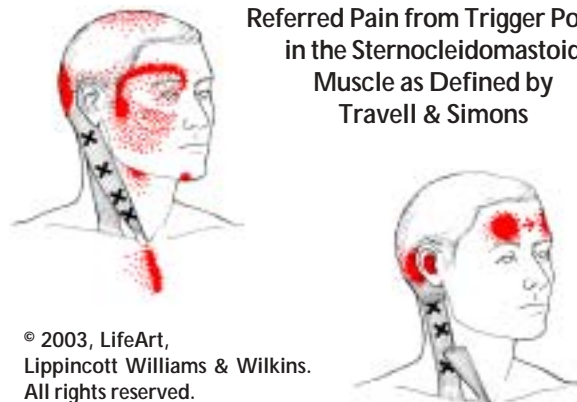
It should also be noted that there is a lack of a relationship between the amount of vehicle damage and tissue injury. Brown discusses the disparity between damage to the occupant of a vehicle and to the vehicle itself as a function of speed in rear-end collisions.²⁷ In a low-speed collision, more force is transferred to the occupant than to the vehicle whereas

in a high-speed collision the vehicle absorbs more force as it responds to the impact.

As noted above, headache is one of several expected symptoms of TBI. Simons and Travell (1983) documented that whiplash injuries can activate certain trigger points.²⁸ Shown in Figure 2 is a typical headache pattern resulting from trigger points in the sternocleidomastoid muscle.

Figure 2

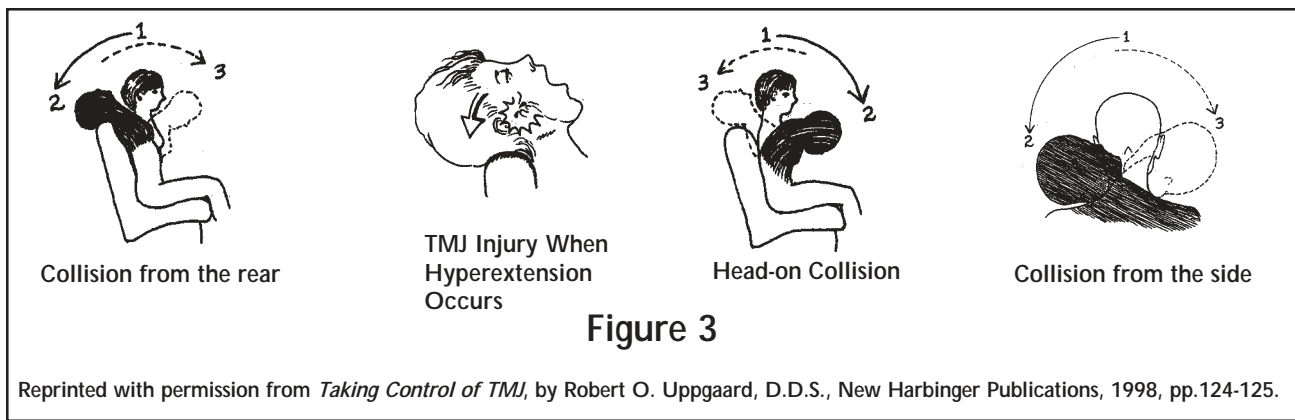
Referred Pain from Trigger Points in the Sternocleidomastoid Muscle as Defined by Travell & Simons



Trigger points (noted by the Xs) often refer pain to other parts of the body and can develop as a result of physical and/or emotional stress. Muscle strength can then be affected, causing unexpected weakness as well as other symptoms. According to Travell and Simons, these trigger points in the neck muscle can be responsible for symptoms such as dizziness, loss of balance, scalp pain, ringing in the ears, eye pain, and headache. Other symptoms can include neck, shoulder, and arm pain.

As seen above, the biomechanics of whiplash can also cause muscle dysfunction leading to headache and dysfunction of the temporomandibular joint or TMJ (i.e., jaw joint). The connection between whiplash and TMJ shown here stems from the head and neck being thrown in one direction and then in another. (See Figure 3) Damage is typically to ligaments, tendons, muscles, with effects on vertebral alignment. Vestibular problems are also likely to result from inner ear damage.

Buskila & Neumann found that 21.6% of 102 adults developed fibromyalgia within one year of suffering neck injuries.²⁹ When that group was compared with 59 adults who had suffered only



lower extremity fractures, only one in the latter group had developed fibromyalgia. They noted: “Almost all FMS-related symptoms were more common and more severe in the neck injury group. Fibromyalgia syndrome was noted at a mean of 3.2 months after the trauma. Neck injury subjects with FMS had more tenderness, had more severe and more prevalent FMS-related symptoms, and reported lower quality of life and more impaired physical functioning than did those without FMS whereas even major trauma to the legs, such as fracture, has no similar impact.”³⁰

The authors suggest that some areas of the body are more vulnerable to trauma, especially the neck. However, we suggest that the brain/head is connected to the neck and that the perpetuation of quality-of-life problems, as well as neck pain, is the result of the biomechanical forces of whiplash causing traumatic brain injury and its inevitable central nervous system dysfunction. The mechanics of these forces are well documented. There is nothing trivial about whiplash even at low speed.

Even a severe history of fibromyalgia in someone with an involved psychological history can respond quickly to EEG-based stimulation, as the following case history illustrates. A physician referred for treatment a late-middle-aged woman who suffered severe pain, fatigue, and constant headache and was virtually unable to use her hands because of arm pain. She had been very highly functioning prior to several traumatic brain injuries despite some serious emotional issues. In the preceding four years, there had been three serious motor vehicle accidents, one a severe whiplash.

Her course of treatment at the Neurotherapy

Center of Washington provided good recovery of function following only EEG-based stimulation and sEMG treatments. During the three weeks in which she received the first three treatments, she reported a return of energy, no more headaches, and a significant reduction in tightness in her shoulders and neck. During this period she also needed less pain medication. One psychiatric medication was also eliminated during the treatment. She received a total of 10 EEG-based stimulation treatments. The sEMG evaluation showed 13 imbalances out of 15 muscles tested, and there were four surface electromyographic sessions for retraining. At her last session, she reported feeling calm and that depression and anxiety were no longer major problems but were rather appropriate responses to life events. This is a fairly typical response of people who have been highly functioning and then develop fibromyalgia after a trauma. It appears that those functions that were lost are often readily regained with appropriate CNS treatment.

Abuse: Teicher documents imaging studies that illustrate the effect of abuse in childhood on brain function. Comparing two groups of 15 study subjects—a control group and a second group composed of people with a history of physical and/or sexual abuse—Teicher found that, overall, the people who were abused had less well developed left cerebral cortices compared to right ones.³¹

A further test looked at the pathways for processing information between hemispheres, located in the corpus callosum. The data showed that parts of the corpus callosum were significantly smaller in those in the abused group. Of significance

for women, who comprise the greatest percentage of fibromyalgia patients, is the finding that sexual abuse was a powerful factor, showing a major reduction in the size of the corpus callosum. EEG mapping also may show evidence of abuse and its resulting hypervigilance that contributes to hyperarousal.

Yudenfreunc-Sujka found that 90% of the Orlando VA Healthcare Center's female patients with chronic headaches and fibromyalgia have a sexual assault/abuse history.³² Patients presented with several diagnoses overlapping with the symptoms of fibromyalgia and post-traumatic stress disorder. "It is the author's opinion that the sexual assault/abuse that the patients had been subjected to resulted in psychological problems that contributed to the development of headaches and muscle aches and pains which were then labeled fibromyalgia." He concludes that "...rape and any type of sexual assault can be a precipitating cause of post-traumatic stress disorder."³³

Highly charged emotional events create a chemical cascade in the central nervous system that leaves its imprint on functioning. What is not mentioned in most of this research is the effect of physical trauma from blunt forces on the central nervous system or internal forces generated by acceleration/deceleration trauma. Many sexual abuse incidents involve head trauma as a result of accompanying physical assault. Highly charged emotional events create a chemical cascade in the CNS that leaves its imprint on functioning in addition to whatever physical trauma may have occurred during the abuse.

Infection: Several people who have come to the NCW for treatment have had significant gastrointestinal infections prior to the onset of fibromyalgia. Most had been previously treated for parasitic infection and were negative for infection on retest. However, their symptoms had not abated, and they were then diagnosed with irritable bowel syndrome. The pattern in the EEG maps of these people seemed to have some common elements. Later testing for parasites of various kinds and for mycoplasmas were positive for most of those with this EEG pattern. Once re-

treated for the infection, many of their symptoms decreased or disappeared completely.

Among the problems we have found in patients at the Neurotherapy Center of Washington are typhoid fever, amoebas, Lyme disease, and various types of mycoplasmal infection. Testing is done by an infectious disease specialist and at the laboratory of Dr. Garth Nicolson. It is important to know, however, that treatment for these organisms can be difficult and should not be undertaken lightly or without identification of the infectious agent.³⁴

Symptoms Common To Fibromyalgia & TBI

People with fibromyalgia and those who have been diagnosed with Post-Concussion Syndrome (traumatic brain injury) have much in common, as has been noted above. They may be accused of malingering because they appear normal. Unfortunately, the observer cannot actually see pain or slow cognitive processing. Those who struggle with these problems become skilled at covering up the fact that they have been unable to follow conversations or remember something just read, to name only a few examples. This makes them subject to being labeled malingerers.

However, studies on this point do not support that conclusion. Moldofsky et al., studied eight patients who had resolved litigation related to developing fibromyalgia with 16 who had ongoing litigation. There were no significant differences in symptoms between the two groups "The successful resolution of litigation...did not lead to an improvement in their symptomatology, their psychophysiologic dysfunction, or their overall economic well being."³⁵ Similar studies in the literature on traumatic brain injury reached the same conclusion.

Dysautonomia is a common symptom of fibromyalgia and traumatic brain injury, and most people are aware of it because they usually feel colder than other people. An informal definition is that dysautonomia is basic autonomic failure. The autonomic nervous system (ANS) is the system that is in charge of many body systems, and the hypothalamus is the central player in ANS function. "The hypothalamus is a tiny, pea-sized brain organ

that serves as a sort of United Nations for important meetings between various body systems. The body systems that rely on the hypothalamus to orchestrate communication speak via chemical molecular messengers. They include the immune system, the endocrine system which is made up of all hormone producing glands, and the autonomic nervous system which is responsible for monitoring cardiac and other smooth muscle functions.”³⁶

The ANS controls systems that determine physiological and emotional arousal states. “Body temperature is regulated by a hierarchical neuronal network of thermo-regulatory pathways extending from the hypothalamus and limbic system to the lower brain stem, reticular formation, spinal cord, and sympathetic pathways. The POAH region (pre-optic area/anterior hypothalamus and septum) is the predominant site for integration of central and peripheral information for control of thermo-regulatory effector responses through the autonomic nervous system.”³⁷ This information is of special import for fibromyalgia because areas of the brain most likely to be disturbed by mild traumatic brain injury or whiplash are the hypothalamus, thalamic, and pituitary areas.

Conclusion

Recovery from fibromyalgia requires an individualized yet comprehensive approach for each person. In addition, there is strong evidence that fibromyalgia has multiple causations. When central nervous system function is disturbed in any way, ability to function well in daily life is also disturbed. As life progresses with its inevitable stresses, strains, illnesses, and accidents, our systems become increasingly burdened. When the physiology of various organ systems in our bodies can no longer return to a functional state after an illness or trauma, symptoms begin to appear. *It is the system that is least able to return to a resting state that will show dysfunction first, and the ensuing dysfunction will begin to impact the central nervous system.* Therefore, it seems reasonable to conclude that the plethora of symptoms that can be present in persons with fibromyalgia involves the central nervous system. Further, the unique complex of symptoms present in any one person is determined by events in a person’s history that impact physiological resilience. When

chance events such as mild head trauma are superimposed upon an individual’s physiological pattern, some very complex symptoms pictures can appear. In our opinion, it is for this reason—the organizing role of the central nervous system—that the treatment of fibromyalgia must include a direct intervention into the brain’s functioning to be maximally effective.

Physicians whose patients have been in treatment at the Neurotherapy Center of Washington now appreciate the importance of the impact of traumatic brain injury as a possible cause of fibromyalgia and the importance of including EEG-based stimulation as one part of the treatment program. Medications can help with symptoms because of their temporary effect on CNS function. However, many people cannot, or will not, tolerate the side effects even if medication happens to be helpful to them.

This is the rationale for EEG-based stimulation treatment being the critical element of NCW treatment protocols. When surface electromyography and myofascial treatment accompany it, significant change is probable. However, not all people with fibromyalgia can expect results. There are some people we cannot help. In those situations where there has been severe structural damage or neurological damage from Lyme disease or some other chronic infection, we have often been able to help improve cognitive function, comfort, and energy, but not achieve a more complete recovery. Complicated chronic conditions are likely to require longer treatment with a less certain outcome. However, as described above, the innate capacity of the human body to strive for wellness must never be underestimated. We try to be as realistic as possible about the data gathered in the evaluation. At the same time we are respectfully optimistic about the body and brain’s resilience. It is our belief that as research and clinical experience continue to add to better understanding of the events leading to onset of fibromyalgia, we are moving closer to even better treatment planning for FMS patients. This in turn will make timely recovery a reasonable expectation for those diagnosed with fibromyalgia.

About the Authors: Mary Lee Esty is President of the Neurotherapy Center of Washington in Chevy Chase, MD. Emily Perlman is a therapist at the NCW who provides sEMG and EEG-based stimulation treatments.

Dr. Esty is a co-author of a NIH-funded study performed at the NCW on the effects of EEG-based stimulation on the problems following mild/moderate traumatic brain injury. The study was published in 2001. A large research project on the effects of EEG-based stimulation treatment alone on the symptoms of fibromyalgia was done jointly by the Neurotherapy Center of Washington and Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL. That data is now being processed. NCW is a provider in the Kaiser Permanente network. For more information, visit the NCW website at: www.neurotherapycenters.com. Phone: 301/652-7175.

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