Case Study

Resolution of Depression & Quality of Life Improvements in a Patient with Major Depressive Disorder after Hemisphere Specific Stimulation: A Case Study

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Abstract

Objective: To discuss the effects of chiropractic care utilizing a functional neurological approach for a patient with an eleven year history of Major Depressive Disorder (MDD).

Clinical Features: A 28-year-old male presented with an eleven-year history of depressive symptoms including: loss of interest or pleasure in nearly all activities, a lack of reactivity to usually pleasurable stimuli, and significant weight loss. The patient was diagnosed with MDD at the age of twenty and subsequently treated medically through the use of multiple anti-psychotic medications and multiple rounds of Electroconvulsive Therapy.

Intervention and Outcomes: The patient was treated over a period of one year and three months at a rate of 2-3 visits per week utilizing a combination of chiropractic techniques including Activator instrument as well as high velocity, low amplitude (HVLA) spinal adjustments, most consistent with Diversified Technique. Adjustments were constantly varied in relation to patient positioning (prone, supine, seated, and standing) to promote a variety of cortical stimulations. The patient was also adjusted utilizing hemisphere specific intervention designed to improve hemispheric coordination and sensory integration. Additional optokinetic home exercises were given as an adjunct to care. The patient reported a complete resolution of all depressive symptoms, termination of all related medications, and cessation of smoking while under chiropractic care.

Conclusions: We presented a case of a patient with MDD utilizing hemisphericity based chiropractic and rehabilitation which resulted in marked resolution of the patient’s depressive symptoms over the course of one year and three months.

Keywords: Major Depressive Disorder, chiropractic, spinal manipulation, chiropractic adjustment, hemisphericity, polypharmacy, dysaffectiveation

Introduction

Depression is one of the most prevalent mental disorders in the general population. The Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) defines Major Depressive Disorder (MDD) as one or more Major Depressive Episode(s). A Major Depressive Episode must include a period of at least 2 weeks during which there is either a loss of interest or pleasure in nearly all activities or a depressed mood. MDD affects anywhere from 10-25% of women and 5-12% of men within a community sample. For lifetime MDD, the total prevalence is approximately 16.2%,
which equates to 32.6 to 35.1 million adults in the United States. There are no prevalence rates for ethnicity, education, income, or marital status as related to MDD. According to the DSM-IV, MDD must be differentiated with a Mood Disorder Due to a General Medical Condition, Substance-Induced Mood Disorder, Dementia in the elderly, Manic Episodes with irritable mood, Attention Deficit Hyperactivity Disorder, and Adjustment Disorder with Depressed Mood.

The exact etiology of depression has remained elusive since 400 B.C. when Hippocrates used the term melancholia, meaning black bile in Greek, to describe it. Many genetic and environmental causes of depression have been explored with no definitive explanation. Epidemiologic studies have shown that the genetic risk for depression is as high as 40-50%; however, no specific genetic markers have been identified with certainty. Other risk factors include viral infections (e.g. West Nile Virus), stress and emotional trauma, and other anomalous processes during brain development.

According to Scheuerecker et al., the anatomical regions of the brain that have been implicated in patients with major depression due to volume reductions of grey matter in MRI studies, compared to healthy individuals, include the dorsolateral prefrontal cortex, orbitofrontal cortex, subgenual prefrontal cortex, anterior cingulate cortex, hippocampus, amygdala, and basal ganglia. However, the clinical implication of the relationship between structure and function has yet to be determined.

This retrospective case study will explore the chiropractic management of a 28-year-old male with an eleven year history of MDD.

**Case Report**

**History**

The patient was a 28-year-old male who sought out chiropractic care for the treatment of Major Depressive Disorder. At the time of presentation, his condition was such that he was unable to fill out his initial intake form without assistance from his mother due to the severely depressed nature of his disorder. The following history combined the information obtained from the patient’s mother during the initial intake process and the patient’s own retrospective history.

The first Major Depressive Episode began when the patient was 17-years-old. At the time of presentation, he could not recall any specific events or inciting factors that could have contributed to his condition. Later, after resolving all symptoms and with further retrospect he believed that he had an “emotional and spiritual experience.” He related this experience to the term “Kundalini.”

He believed that various features of the practices and philosophy associated with Kundalini could have contributed to his initial and subsequent episodes. He described his early symptoms of depression as constant with no factors relieving or worsening his condition.

His depression manifested with melancholic features including a loss of interest in pleasure in almost all activities, a lack of reactivity to usually pleasurable stimuli, and significant weight loss.

He was diagnosed in 2001 with MDD by a medical doctor, four years after the initial episode, and put on a variety of medications. The records detailing the exact timeline of introduction of each of the medications could not be procured.

The patient reported that medications were added sequentially, until he found himself on all four of the following medications: Seroquel, Invega, Vistaril, and Lamictal. In addition, the patient was also concurrently prescribed Atenolol for elevated blood pressure, Lyrica for neuropathy, Nexium for gastroesophageal reflux, and Tricor for hypercholesterolemia.

Each was prescribed to treat a particular side effect of each one of the MDD medications he had been previously prescribed. In 2005, the patient further reported that he had been prescribed a double dose of Invega by his medical doctor, which he believed resulted in a minor stroke he suffered at that time. No specific information or MRI report could be obtained from his medical doctor relating to the extent or areas of damage. The patient reported no residuals from the incident.

He reported a history of Electroconvulsive Therapy (ECT) for his diagnosis of intractable MDD performed in 2004 and 2007. These treatments were performed three years and six years respectively after his diagnosis. Each round consisted of 36 treatments. He reported no change in symptoms after the first round. After the second round of treatments he reported a temporary decrease in his symptoms.

The patient’s past medical history revealed no traumas or motor vehicle accidents. His only hospitalization was for surgery to remove his gallbladder (he could not recall the date). He reported no history of recreational drug use, occasional alcohol use in social settings, and a smoking history of two packs per day for the past 10 years.

During his depressed period, his diet was very poor due to the fact that he would get nauseous every time he attempted to eat. He would have one small meal per day at 7:00pm. His current diet has reportedly improved as he eats mostly fruits and vegetables with no animal products. No information could be obtained concerning his family history due to the fact that he was adopted at a young age and has had no contact with his biological parents.

**Examination**

The patient sought chiropractic care for the treatment of Major Depressive Disorder eleven years after his initial episode. Initial physical observation revealed an anorexic male who was neither alert nor oriented to time and place. He was severely unresponsive and lacked facial expression.

Due to the patient’s inability to comply with a full exam procedure, an abbreviated physical exam was performed that included a postural exam, eye movement analysis, pupillary reflexes, manual muscle testing with horizontal eye
movement, manual muscle testing of extensor muscles, static palpation, and motion palpation.

Postural exam revealed global flexor posturing. Eye movement analysis demonstrated a decreased ability to pursuit in all directions, hypometric saccades upon horizontal eye movements bilaterally, and hypometric upward saccades upon vertical eye movements. Pupillary exam revealed corectasia on the right. Manual muscle testing (MMT) was used in conjunction with horizontal eye movements to determine the side of decreased cortical function.

During manual muscle testing the patient was asked to resist using the target muscle while the doctor applied a force isolating the target muscle. The anterior deltoid muscle was tested while the patient was instructed to shift the eyes horizontally to the left and then horizontally to the right. Weakness of the anterior deltoid muscle was subjectively determined by the investigator when the patient shifted his eyes to the right, suggesting decreased right cortical activity.

Manual muscle testing was also used to subjectively test select extensor muscle groups to determine a functional pyramidal distribution of weakness (this functional type of weakness typically occurs on the same side of cortical weakness). Select extensor muscles were tested, using the same procedure described above, including extensor digitorum communis, extensor hallicus longus, vastus medialis, and latissimus dorsi. The exam revealed weakness during manual muscle testing of all extensor groups tested on the right side compared to the left side suggesting a functional pyramidal distribution of weakness on the right.

Static palpation revealed moderate point tenderness over the spinous process of T3, T10, and L5 with taut musculature palpated bilaterally in the upper thoracic and lower lumbar regions. Taut fibers and trigger points were also palpated bilaterally in the upper trapezius muscle.

Motion palpation was used to determine a reduction of motion for each segmental vertebra in three anatomic planes: sagittal, transverse, and frontal. Anterior and posterior restrictions occur in the sagittal plane, right and left rotation restrictions occur in the transverse plane and right and left lateral flexion occur in the frontal plane.

Motion palpation of the upper cervical spine revealed an occiput restricted in the anterior and superior directions, T3 and T10 spinous processes restricted in the posterior direction, L5 spinous process restricted in the posterior and right rotational directions, the costotransverse articulations of the right and left 1st ribs restricted in a posterior direction, and the sacral base restricted on the left.

Subjective analysis was performed each visit by the patient ranking the severity of his condition on a linear scale of 0-10, with zero representing no symptoms of depression and ten representing the worst possible manifestations of this patient’s depression including suicidal tendencies. At the initial visit the patient ranked his severity as a 7/10 (Figure 1).

**Intervention**

After the initial exam, the patient was seen regularly 2-3 times per week over the course of one year and three months. The patient was seen for a total 146 visits until the patient reached maximum chiropractic improvement as measured by consistent score of zero on the linear scale indicating that all symptoms of depression were resolved.

The chiropractic treatment for this patient consisted of hemispheric specific adjusting and rehabilitation in order to stimulate function of the affected right cortex, activating plastic changes in the subcortical and frontal cortical areas. This patient was adjusted using a combination of HVLA adjustments (most consistent with Diversified Technique) as well as mechanical force, manually assisted adjustments delivered by a mechanical, hand-held device (Activator IV instrument). It must be noted that the analysis traditionally utilized with Activator Methods International was not used.

For all adjustments delivered, only static and motion palpation, as described above, were used to determine the level of vertebral and extremity fixation. HVLA thrusts were delivered in the vector of correction on the left side of the body to stimulate right cortical function. Due to the presentation of severely depressed cortical activity in the patient, the HVLA adjustments were constantly varied in relation to patient positioning (prone, supine, seated, and standing) during the adjustments to promote a variety of cortical stimulations.

A mechanical, hand-held device (Activator IV instrument) was utilized to introduce variability into the adjusting procedure due to the fact that it has the capabilities to produce four discrete forces based on the setting of the instrument. The four settings act by limiting the displacement of the spring, which generates the force in the instrument. After the setting was determined, the blunt stylus of the instrument was placed in contact with the skin and positioned in the vector of correction and the force was generated by engaging the instrument. This technique was also used with the patient in varying positions (prone, supine, seated, and standing) and to adjust both vertebral and extremity misalignments.

In addition to spinal and extremity adjustments, a variety of therapy techniques were used and varied each visit including: Neuromuscular Therapy (NMT), Nexerciser, warm-up exercises on the Pettibon wobble chair, and Optokinetic exercises. NMT is a treatment that utilizes specific massage therapy and flexibility stretching to eliminate neuromuscular pain patterns. It has been shown to have favorable short-term benefits. NMT was used in this patient to address trigger points in the upper trapezius muscle, bilaterally.

Nexerciser is a piece of equipment used to facilitate isometric and isotonic neck muscle testing and exercise. Exercises are to be used to facilitate motion of the cervical spine in all vectors. There is no peer-reviewed literature available on the validity or reliability of this equipment or the associated exercises. However, this equipment was used to promote extension exercises of the cervical spine in this patient.
The Pettibon Wobble Chair® is a piece of equipment used to isolate the lumbar spine to facilitate training of the core musculature. According to Morningstar et al., “The Wobble Chair® exercises are performed by holding the head and shoulders still, moving only the pelvic girdle. The exercises consist of a front-to-back motion, a side-to-side motion, and clockwise/counterclockwise circles.” This therapy was used to engage the patient’s core musculature and improve posture.

Optokinetic exercises were used to stimulate eye movement patterns. The patient utilized a computer program to stimulate vertical and horizontal eye movement patterns. The program consisted of a thin bar that was oriented horizontally across the computer screen. The patient was instructed to follow the bar as it moved inferiorly on the screen, initiating vertical pursuit. As soon as the bar reached the bottom of the screen it would quickly jump back to the top.

The patient was instructed to follow the bar with his eyes, initiating vertical saccades. The computer program also contained a separate exercise for horizontal pursuit and saccades that consisted of a vertically oriented bar that would move laterally from one side of the screen to the other, initiating horizontal pursuit. It too would jump back to the opposite side, initiating horizontal saccades. The patient would do these exercises prior to each adjustment and one time per day at home for as long as he could stand without getting fatigued.

Melamed and Larsen demonstrated that regional cerebral blood flow (rCBF) increased in certain regions in the cerebral cortex during contralateral and ipsilateral saccades in both horizontal and vertical eye movements. It was assumed that these focal flow increases corresponded with an elevated metabolic rate in the neurons in the associated cortical regions.

### Outcomes

After one year and three months of care, the patient reported a marked resolution of all depressive symptoms on the subjective depression scale (Figure 1). He regained the ability to interact and communicate, which he was unable to do effectively when he first began care. He reported termination of all related medications as well as termination of all adjunct medications for associated conditions including elevated blood pressure, neuropathy, gastroesophageal reflux, and hypercholesterolemia

While he was under care, he also reported complete cessation of smoking after a ten year history of smoking two packs per day, improvement in his diet and exercise regimen, and an overall sense of well-being. The patient reported that “chiropractic care has been really incredible” and that it was a way for him to “gently relieve [his] pain and bring it to the surface.”

The following improvements were also noted: decrease in flexor posturing, improvement in patient’s ability to pursue in all directions, normal saccades upon horizontal eye movements bilaterally, normal upward saccades upon vertical eye movements, and resolution of corectasia of the right pupil.

### Discussion

#### Conventional Medical Treatment

The conventional medical treatment of MDD is surprisingly widespread despite the limited understanding of the etiology of the disease. It predominantly includes the use of psychotropic agents, electroconvulsive therapy, and cognitive and behavioral psychotherapies. Only psychotropic agents and ECT will be discussed here due to their relevance to the case.

Drug therapy for the treatment of depression was revolutionized in the early 1950’s with the discovery of two classes of effective antidepressants including tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs). The innovation behind these agents was unintentional with tricyclic antidepressants being discovered in the course of antihistamine research and monoamine oxidase inhibitors being discovered while working on antitubercular drug therapy.

The mechanism of action for tricyclic antidepressants includes inhibition of serotonin or norepinephrine reuptake transporters in the brain whereas monoamine oxidase, a major catabolic enzyme for monoamine neurotransmitters, is inhibited by the monoamine oxidase inhibitors. The second generation of antidepressant drugs, including serotonin-selective reuptake inhibitors (SSRIs), have afforded the same efficacy with fewer side effects. Their success is demonstrated by the fact that they are part of a $10 billion a year, world-wide sales market.

However, despite many advancements in antidepressant drug therapy, many issues still remain including: persistence of symptoms, polypharmacy, and drug side effects.

The pathophysiology of depression remains controversial with minimal convincing evidence regarding the proposed therapeutic mechanisms of serotonin or norepinephrine reuptake inhibition. A recent meta-analysis suggests that antidepressant drugs are largely ineffective in mild or moderate depression. Complete remission in patients utilizing the newer generation of SSRI drug therapy is around 50%, with up to 80% showing partial response.

Due to the minimal side effects, these are typically the first line of defense for a majority of patients. A study sample demonstrated by Glezer et al. demonstrated that 98% of patients with a diagnosis of either unipolar depression or MDD had undergone a trial of SSRI/SNRI (selective norepinephrine reuptake inhibitor) as a first-line of treatment. However, due to the inconsistent effectiveness of SSRIs/SNRIs and the increase in the number of available psychotropic medications, the prevalence of polypharmacy has also increased.

Polypharmacy constitutes the use of multiple medications (or multiple forms of medications) by a patient as well as when more drugs are prescribed than is clinically warranted. Faye et al. reported an increase in the percentage of patients with a diagnosed mood disorder discharged from an NIMH hospital who were prescribed and taking three or more medications from 3.3% in 1974-1979, to 9.3% in 1980-1984, then significantly increasing to 34.9% in 1985-1989, and finally...
escalating to 43.8% in 1990-1994. Despite the increasing prevalence of polypharmacy, the effectiveness has not been proven. In fact, a worse treatment outcome has been implicated with the use of increased number of psychotropics and antidepressants.\textsuperscript{15} In addition to poor outcomes, the use of multiple medications can lead to decreased compliance, increased costs, and an increased risk of side-effects.

The side effects associated with conventional antidepressants include, but are not limited to, glucose intolerance, dyslipidemia, hypertension, abdominal obesity, and weight changes and appetite.\textsuperscript{18} The side-effects listed above are consistent with the metabolic syndrome, which is a set of established risk factors for cardiovascular disease and type 2 diabetes mellitus. Up to 48% of patients with MDD have reported prevalence of metabolic syndrome.\textsuperscript{18}

The mechanisms that have been implicated in both conditions, that provide additional evidence for co-occurrence, are proinflammatory features, oxidative stress, and counter-regulatory hormone imbalance mechanisms.\textsuperscript{18} For example, according to McIntyre et al\textsuperscript{19} “increased serum and/or plasma levels of interleukin-6 and C-reactive protein identified in individuals with depression and metabolic syndrome reflect disturbances in inflammatory homeostasis.” Along with an increased risk of side effects, it must also be noted that as the number of medications are increased so is the risk for drug-drug interactions.

Electroconvulsive Therapy (ECT) has been used since 1938 in the treatment of psychiatric conditions. Since its inception, the treatment protocol has changed to include hypnotics and muscle relaxants to eliminate complications such as muscle tears or bone fractures.\textsuperscript{19}

Efficacy has been shown to have a rate of anywhere from 55\% to 75\% remission after a mean number of 8 treatments.\textsuperscript{19} Patients aged 65 and older and those more severely ill tend to respond more favorably and faster. The most common side effects of ECT include headache, nausea, general disorientation immediately post-treatment, anterograde memory impairment for up to one month post-treatment, and retrograde memory impairment for up to 6 months post-treatment.\textsuperscript{19}

Chiropractic Care

Conservative management for depression is not widely utilized. A telephone survey of 3,921 women aged 18 and older living in the United States reported 54\% use of complimentary and alternative medicine (CAM) to treat depression, with 26\% reporting use of manual therapy.\textsuperscript{1}

They reported in this survey that CAM was sought out for depression because 45\% of respondents had unpleasant side effects and 43\% had not had success with conventional medicine.\textsuperscript{1} Isolated cases of chiropractic care have shown effectiveness within the realm of affective disorders and quality of life improvements including the treatment of nervousness and depression,\textsuperscript{20,21} general anxiety disorder,\textsuperscript{22} and MDD.\textsuperscript{23}

Cortical function is dependent on afferent input from the body because each area in the primary somatosensory region receives afferents from specific receptors.\textsuperscript{24} If afferent input was eliminated, the cerebrum would cease to function in a conscious manner. Due to the rich supply of corpuscular mechanoreceptors, muscle spindles, and Golgi tendon organs (GTOs) surrounding or controlling joints, altered or decreased motion of joints could lead to altered afferent input, or dysafferentation.

Dysafferentation, according to Seaman et al,\textsuperscript{24} refers to “an imbalance in afferent input such that there is an increase in nociceptor input and a reduction in mechanoreceptor input.” Dysafferentation is also outlined as a model of vertebral subluxation by Kent,\textsuperscript{25} who demonstrated that spinal joint neuroanatomy is such that alterations in afferent input could quantitatively and qualitatively affect efferent response. Thus removal of vertebral subluxations is necessary for the body to be able to accurately perceive itself and its environment.

Limitations

The limitations of this case study include the fact that there was a single participant with no variables controlled for and therefore the results are not widely applicable and no conclusions can be drawn from the study. The case history of this patient was lacking some important information that could have affected the presentation and treatment of the case. Also, due to the variable nature of the care received, these results would be very difficult to replicate.

Conclusion

Depression is a complex disease process that is not well understood. The many physiological and emotional components render treatment for it quite difficult. This case of a 28-year-old male with MDD was a good example of a case that did not respond well to traditional medical care; however, positive results were achieved with hemisphere specific manipulations and rehabilitation procedures. The patient also experienced an improved quality of life as demonstrated by resolution of all depression symptoms, cessation of smoking, improvement in his diet and exercise regimen, and an overall sense of well-being.

References


Figure 1. Linear graph demonstrating the decrease in patient’s subjective depression analysis over the course of 146 visits in one year and three months. The patient rated his depression every visit as score of 0-10, with zero representing no symptoms of depression and ten representing the worst possible manifestations of this patient’s depression, including suicidal tendencies.