REVIEW ARTICLE

THE OSTEOPATHIC APPROACH TO TREATING DEPRESSION IN CHILDREN AND ADOLESCENTS

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ABSTRACT:

Evidence confirms that children and adolescents can experience the whole spectrum of mood disorders and suffer from the significant morbidity and mortality associated with them. Effective treatment often relies on physicians developing advanced communication skills with their patients. Enhanced communication will help decipher the etiology of the patient's depression and, in addition to serotonin-regulating medications, will optimize treatment. Osteopathic medicine offers an effective treatment model through osteopathic manipulative treatment (OMT) because of the inseparability of physical and mental health. Osteopathic medicine takes a holistic view in which somatic, visceral and psychological dysfunction are united. Thus, physicians who incorporate OMT into their practice will help treat psychopathologies, such as depression and its accompanying somatic dysfunctions. This paper discusses the epidemiology of depression, the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) depression criteria, screening algorithms, current treatment protocols, osteopathic considerations to treating depression, and lastly, OMT and its role in treatment.

INTRODUCTION

Depression is often thought of as an adult problem when many children and adolescents suffer from depression. The condition interferes with their ability to perform daily life tasks, create and maintain relationships, and perform in school. Additionally, in children and adolescents, depression is often accompanied by behavioral problems, substance abuse and/or other mental disorders. Complicating matters, in children and adolescents, depression can manifest differently than it does in adults, making the ability to recognize this problem and start interventions more difficult.[1] Forty years ago, many physicians doubted the existence of significant depressive disorders in children because they believed that children lacked the mature psychologic and cognitive structures necessary to experience these emotions.[2] However, evidence has confirmed that children and adolescents not only can experience the whole spectrum of mood disorders but also can suffer from the significant morbidity and mortality associated with them.[2]

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The 2005–2014 National Surveys on Drug Use and Health, which included 172,495 adolescents 12–17 years of age, found that the percentage of adolescents who experienced one or more major depressive episodes in the previous 12 months increased from 9% in 2005 to 11% in 2014.[3] In 2016, this percentage was approximately 13% (5% in 12-year-olds, 13% in 14-year-olds and 17% in 17-year-olds). Depression, in this paper, will be defined by using the DSM-5 criteria.[4] It should also be noted that children and adolescents may display symptoms and signs of depression that are different than that of adults and we will further elaborate on this.

DISCUSSION

Background

The exact cause of depression is unknown. However, twin studies suggest that genetics and environmental influences both play important roles in developing depression.[1] Biologically, neurotransmitters (i.e., serotonin, norepinephrine and dopamine) are thought to be involved in the onset of depression.[1] Normally, neurotransmitters allow neurons to communicate with each other and play an essential role in all brain functions, including movement, sensation, memory and emotions.[1] Moreover, an individual's behaviors and thoughts play a role in the development and course of depression.[1] However, many external risk factors have been studied in children and adolescents that put them at risk for depression. Typically, these risk factors are broken down into three domains:

Biological

Being overweight,[5] chronic illness (i.e., diabetes mellitus, asthma, cancer),[6] early puberty,[7] family history of depression,[8] female sex,[9] high-functioning autism,[10] LGBTQ status[11] and any genetic abnormalities in the serotonin, dopamine or monoamine oxidase genetic pathways.[12]

Psychological

Body dissatisfaction and early dieting,[13] dysfunction in emotion regulation,[14] video game addiction,[15] less attachment to parents,[16] problems with peers to peer interactions,[17] low self-esteem,[18] having an overall negative thought process,[19] previous depression,[20] substance use disorder (i.e., alcohol),[20] problematic use of and addiction to social media outlets (i.e., Facebook)[21] and extreme worry about school grades or standardized testing.[9]

Environmental

Academic difficulties,[9] being bullied or witnessing violence,[22] physical, sexual or emotional abuse,[23] loss of a loved one,[9] exposure to natural disasters,[24] few opportunities for physical activity,[25] greater than two hours per day of leisure-time screen use,[25] low socioeconomic status,[26] low parental involvement,[7] poor family functioning and caretaker depression.[7]

DIAGNOSIS

With all these possible risk factors, the diagnosis of depression in children and adolescents can often be a challenge due to multifaceted social situations and comorbidities. The presenting signs of major depressive disorder (MDD) in children and adolescents include, but are not limited to, insomnia or hypersomnia, weight loss or gain, difficulty concentrating, loss of interest in school, sports or other previously enjoyable activities, increased irritability or a constant feeling of sadness or worthlessness.[4] To distinguish MDD from normal grief (such as after the loss of a loved one), it is helpful to determine whether the predominant symptom is a sense of loss (more typical of grief) versus a persistent depressed mood in which one cannot anticipate future enjoyment (more typical of depression). However, if a clinician suspects a child or adolescent having MDD, they may use a screening tool, such as the patient health questionnaire-adolescents (PHQ-A) and/or the Beck Depression Inventory, second edition (BDI-II). If the child or adolescent presents with symptoms indicating a possible depressive disorder, the primary care physician should assess whether the symptoms are truly the result of a major depressive episode and not better explained by another condition or substance that may mimic these symptoms. Criteria from the DSM-5 must be met to diagnose MDD.[4]

One important factor to consider is that children and adolescents may have more than one psychiatric diagnosis concurrently, such as co-occurring depression and anxiety (or behavioral problems).[27] In fact, about three in four children aged 3–17 years with depression also have anxiety (73.8%) and almost one in two have behavioral problems (47.2%).[27] Thus, it is understandable why the United States Preventive Services Task Force (USPSTF) dictates annual depression screening in adolescents because of the prevalence of comorbidities.[28] The importance placed on screening youth and being aware of potential depression symptoms is because of the significant negative consequences depression can have on this population. One of the significant negative consequences of missing or delaying the diagnosis of MDD would be the risk of suicide—the second leading cause of death for individuals 10-24-years old—after unintentional injury.[29] Depression is a major risk factor for suicide, yet at-risk youth can still be easily missed without specific suicide screening, as well as depression screening.[30] Nevertheless, early diagnosis and treatment can improve outcomes and possibly even resolve the issue.[28]

CURRENT TREATMENT OF DEPRESSION IN CHILDREN AND ADOLESCENTS

As many as 70% of youths with depression experience severe impairment from the condition, yet only about 40% received treatment.[3] Treatment rates have changed little since 2005, raising concern that adolescents are not receiving needed care for depression.[3] Thus, a thorough assessment of symptoms is warranted through a clinical interview that is aided by the physician, patient and parents' clinical relationship and through the use of assessments, such as the PHQ-A and BDI-II. If a child or adolescent has a positive screen on the PHQ-A and meets the diagnostic criteria for MDD, the next step for the patient should be to use the tools provided by the Guidelines for Adolescent Depression in Primary Care (GLAD-PC), as well as the following a suggested protocol from the International Classification of Diseases, 10th revision (ICD-10).[31]

Pharmacotherapy Monotherapy

Fluoxetine (Prozac®) and escitalopram (Lexapro®) are the only two medications approved by the U.S. Food and Drug Administration to treat MDD in children and adolescents. Three systematic reviews of randomized controlled trials, including children and adolescents with MDD, support fluoxetine as the first-line antidepressant medication.[33-34] Fluoxetine is approved for patients eight years and older, and escitalopram is approved for patients 12 years and older. Moreover, in trials of children and adolescents taking antidepressants, although there were no suicides, suicidal thoughts and behaviors were increased compared with placebo (4% vs. 2%).[32] Thus, children and adolescents who are taking these medications should be monitored for suicidality and a possible "flip" into a manic state, as there could be an underlying bipolar disorder not yet diagnosed. The frequency of monitoring should be based on the individual patient's risk.

Psychotherapy Monotherapy

Cognitive behavioral therapy (CBT) is a form of talk therapy that focuses on changing behaviors by correcting faulty or potentially harmful thought patterns. Whereas CBT focuses on cognition and behaviors, interpersonal psychotherapy (IPT) concentrates on improving interpersonal relationships. Evidence is mixed for the use of CBT as monotherapy in children and adolescents with depression, with one study observing inconsistent effects on symptoms, response and functioning,[35] another observed shorter remission times,[36] and another observed a small positive effect on depressive symptoms in children and adolescents.[37]

With IPT, current evidence indicates it has superior efficacy and acceptability compared with controls in treating adolescents with depression.[38]

Combined Therapy

Evidence from a randomized trial suggests that adolescents are most likely to achieve remission with 12 weeks of combined fluoxetine and CBT therapy (37%; NNT = 4) compared with either therapy as a stand-alone (23% with fluoxetine; NNT = 11; 16% with CBT) or placebo (17%).[39] In addition, suicidality declined with the duration of treatment for all therapies, but the decline was less significant for fluoxetine alone (26.2% at baseline to 13.7% at week 36) vs. combination therapy (39.6% to 2.5%).[39] In another trial of adolescents who achieved at least a 50% decrease in depression scores following six weeks of fluoxetine mono treatment, those who were randomized to receive the addition of CBT to fluoxetine therapy for six months were less likely to relapse 1.5 years later when compared with continued fluoxetine monotherapy (36% vs. 62%).[40] Thus, children and adolescents with moderate, severe or persistent mild depression are usually treated with fluoxetine or escitalopram in conjunction with CBT or other talk therapy.[39] If combination therapy is not used, monotherapy with an antidepressant or psychotherapy is recommended, although the likelihood of benefit is lower.[37] In addition to the therapy, one trial found that constantly re-evaluating the treatment plan is one of the most important factors in how one's treatment course will work.[41]

THE OSTEOPATHIC APPROACH

Central to Andrew Taylor Still, MD, DO's philosophy of osteopathic medicine, the goal of OMT is to provide patients with the tools they need to restore and maintain their natural, self-healing state. Therefore, any alterations in any part of the system, including an individual's mental and spiritual health, will affect the body's function as a whole. Hence, we must treat a person's psychological state and accompanying somatic dysfunctions to optimize health.[42,43] Along with these tenets, there are five osteopathic care models that osteopathic physicians use to facilitate diagnosis and treatment by applying understanding of the various anatomical, psychological and physiological substrates of disease: biopsychosocial, respiratory-circulatory, neurologic, biomechanical and metabolic-nutritional.

Treating Depression in Children and Adolescents Through the Biopsychosocial Model

This model addresses the psychological and social components of a patient's health, as stress is a well-known contributor to illness. Treatment goals include optimizing psychological and social components of a patient's health. Irritability, tension, difficulty concentrating, diminished interest, feeling overwhelmed and sleep disturbances are all common in those suffering from mental dysfunction, including depression.[44,45] The application of the biopsychosocial model is knowledge and skill-based. Childhood depression should receive special attention, considering the serious and lasting consequences of the disease to child development,[46] ranging from physiological changes to the impairment of social and cognitive functions.[47] In the short term, depressive disorders might be a source of psychological suffering for these children; whereas, in the long term, they can compromise social, cognitive and emotional aspects of child development,[46] becoming an important predictor of the patient's psychopathologies in adulthood.[48]

More attention must be placed on health promotion and disease prevention, that is, providing more time to educate patients about their disease and to tell the patient and their parents about the symptomatology, the treatment plan and physician's assurance. This proactive approach leads to a healthier lifestyle for the patient but demands more time from the physician.[49,50] Also, an essential component of depression treatment is to reassure the patient that they have a disorder and that they are not at fault for these behaviors.[49] Moreover, because children or adolescents may not completely understand or articulate their feelings and the details of their economic, environment, and social status, it is important to have their parents/or guardian cooperate with the treatment plan. With this focus, the patient (and their caregiver) becomes part of the treatment team to promote a more comprehensive and unified treatment strategy.[49]

OMT: DEPRESSION AND ITS SOMATIC DYSFUNCTIONS

Although depression is considered a mental health issue, it may bring on somatic manifestations. Therefore, it is justified to use OMT as a potential tool in the treatment plan for depression. Here we will discuss functional anatomic disturbances possibly due to depression's effect on the mind, known as either a "viscero-somatic reflex" or, more specifically, a "psycho-somatic reflex."

A decreased cranial motion has been reported in patients with depression and other psychological disturbances.[51] Along with this, we will discuss the ramifications of depression on the central nervous system (CNS). The CNS has a valveless venous plexus and any passive congestion can compromise the CNS circulation and accumulate waste products in the CNS.[52] In fact, studies have shown the complex interplay of psychological state and neuroendocrine-immune function. This includes alterations in rates of healing, immune function and autonomic tone during psychological disturbances.[53]

Other somatic manifestations in depression are related to postural changes.[54] The depressed patient tends to adopt a slouched forward posture, which leads to the development of exhalation dysfunctions in the ribcage (and shallow breathing) and shortening of the psoas muscles, lower back pain, with partial un-doming of the abdominal diaphragm.[54] Additionally, there is hyperflexion of the cervical spine as well as increased kyphosis in the thoracic spine and a dropped sternum allowing for less full breaths.[54] Patients suffering from depression and other psychological disturbances often have shallow and rapid breathing, causing a dysfunction of the respiratory-circulatory system to effectively return lymph to the central circulation and venous blood to the heart.[52] This change in posture can also lead to chronic pain along with the affected, slouched regions. Hence, an OMT focus on these systems would aid in treatment.

The above considerations provide a rationale for the efficacy of OMT in the treatment of depression. Using OMT to improve respiratory-circulatory efficiency and decrease sympathetic hyperactivity can be used as an adjunct to counseling, pharmacotherapy, and engaging the patient in a therapeutic process where the depression is being treated.[51] Additionally, OMT can effectively give short term relief of somatic issues that accompany depression such as muscle aches, headaches, musculoskeletal pain, abdominal pain and excessive sweating.[51]

OMT TECHNIQUES TO TREAT PATIENTS WITH DEPRESSION

The contraindications for each technique are all the same: do not use any of the following techniques if there is no somatic dysfunction and if there is regional pathology or the somatic dysfunction suggests an underlying pathology that should be further evaluated before rendering OMT.

Treating the Sympathetic Nervous System at T1-T6

These regions are the major points of viscero-somatic reflexes of the head and neck, as well as heart and lungs.[56]

- Rib raising bilaterally to normalize the sympathetic inputs to this region.
- Direct balanced ligamentous tension (BLT) to directly work on any thoracic, lumbar or rib dysfunctions.
- Counterstrain, facilitated positional release (FPR) and other soft tissue techniques that most primary care providers typically feel comfortable doing and most patients feel comfortably receiving. Additionally, thoracic high-velocity, low amplitude (HVLA) could be used if deemed necessary.

Rib raising, a technique that is very commonly used in practice and will be suggested several times throughout this article, has studies that back up its efficacy in regulating the sympathetic nervous system. One study suggests that sympathetic nervous system activity may decrease immediately after rib raising, which was confirmed through the usage of salivary alpha-amylase as a biomarker.[56]

Treating the Exaggerated Thoracic Kyphosis, Dropped Neck Posture and Lower Back Pain

Treatment of rib dysfunctions resulting from the kyphosis improves the circulatory and oxygenation status and often has the effect of patients having more energy. Many of these techniques will be like those mentioned in the first point, with a few additions:[54]

- Rib raising
- Direct BLT
- Muscle energy technique (MET) of the cervical, rib, thoracic and lumbar regions.
- Counterstrain, FPR and other soft tissue techniques.
- Thoracic, cervical and/or lumbar HVLA could be used if deemed necessary.

Studies show muscle energy and counter strain techniques can play a significant role in treating lower back pain injuries.[57] They can lead to a reduction in pain and disability and even an increase in lumbar flexion range of motion (ROM) immediately upon one treatment session.[57] Moreover, these techniques can lead to a reduction of pain and disability.[57] Patients with depression often experience these somatic pains, and relief of them would be an integral part of their treatment plans to possibly encourage performing activities.

Treating the Lymphatic System

Depression may lead to shallow and rapid breathing, which can cause a dysfunction of the respiratory-circulatory system to effectively return lymph to the central circulation and venous blood to the heart. Treating the thoracic inlet and performing other lymphatic techniques will assist lymph flow.[55]

- First rib MET bilaterally to free up restrictions in the thoracic inlet, as well as sympathetic influences.
- Clavicle MET bilaterally to free up restrictions in the thoracic inlet, as well as sympathetic influences.
- Thoracic outlet release to open the thoracic inlet and allow for better lymphatic drainage.
- Upper and lower extremity wobble techniques to allow for proper lymphatic flow through the extremities.
- Hepatic and splenic pumps to support organ function and support fluid circulation.
- Counterstrain, FPR and other soft tissue techniques.
- Additionally, thoracic and/or lumbar HVLA could be used if deemed necessary.

While there are currently no studies discussing the direct effects of OMT on depression-induced lymphatic stasis, what is known is that many conditions that lead to lymphatic stasis commonly present with depression as a comorbidity. Lymphatic filariasis[58] and post-surgical lymphedema[59] following a mastectomy are conditions in which the lymphatic system performs sub-optimally and many of these patients present with depression. A study that looked at the comorbidity between post-mastectomy lymphedema and depression found that lymphatic massage and relaxation techniques reduced anxiety and depression levels.[59] Looking into the relationship between using OMT as a supplemental treatment to encourage lymphatic drainage in those with depression is a possible future study of relevance.

Secondary Respiration Through Diaphragm Release

Treating the abdominal diaphragm helps to normalize lymphatic flow, which, as discussed, should have an overall positive effect.[55] Due to the diaphragm's connection to the sternum, if the diaphragm is flat, it prevents sternal elevation, further inhalation is prevented, which leads to less oxygenation.[54]

- Re-doming of the diaphragm
- Pelvic diaphragm release

- Rib raising
- Direct BLT
- MET of the cervical, thoracic and lumbar regions.
- Counterstrain, FPR and other soft tissue techniques.
- Thoracic, cervical and/or lumbar HVLA could be used if deemed necessary.

Shortness of breath is a significant predictor of depressive symptoms. Given that shortness of breath is responsive to therapeutic intervention, active intervention to relieve the symptom could reduce the incidence of depressive symptoms.[60] In addition, one study found there is potential for diaphragmatic breathing practice to improve cognitive performance and reduce negative subjective and physiological consequences of stress in healthy adults.[61]

While no studies have been done on OMT regarding assisting respiratory changes in depression specifically, studies show OMT effectively assisting respiration in other pathologies such as pneumonia. These protocols all take advantage of the importance of the diaphragm and include it in the treatment. Thus, in treating a patient with depression who displays suboptimal breathing, we can help to increase this respiratory excursion through doming of the diaphragm to help alleviate downstream symptoms of poor respiration.[62]

Sacroiliac (SI) Joint Treatment

Treating the SI joint will treat the "core" link between the sacrum, spinal column and dura mater. By releasing this tension, you decrease restrictions along the CNS, which may have passive congestion at this time due to depression.[63]

- SI joint exaggeration
- Sacral rock
- Sacral MET

There are no OMT studies that discuss the effects of sacral OMT treatments concerning depression. However, sacral techniques are used in many other protocols to normalize parasympathetic influences and CNS-based congestion.

Treating Cortical Tissue

The goal is to assess tension, restriction laxity and seek balance to affect the tissues themselves directly.[55] It is important to remember that these techniques are contraindicated if the patient had a recent vascular event. The techniques include:

- Suboccipital release
- Cranial vault hold
- CV4 technique
- Myofascial release to the C1-C2 region
- Balanced membranous tension

Many studies have shown the effectiveness of sub-occipital release on the autonomic nervous system due to its effect on the vagus nerve. Studies show that suboccipital release has the capacity to modulate autonomic control and regulation,[64] as well as affect heart rate variability acutely.[65] This would be extremely beneficial as we discussed how depression could affect the CNS and its effects. One study observed an association between patients who received cranial field osteopathy and lower depression rates, higher satisfaction with life and higher meaningfulness of daily activities.[66] This would have clinical relevance for managing patients, particularly those who are depressed, not satisfied with life or do not perform meaningful daily activities.[66]

OMT overall can have positive effects on a patient's condition overall and improvement of clinical signs and symptoms. This, in turn, may translate to increased compliance with medications and psychotherapy as well and, thus, more positive outcomes.

OMT RESULTS ON DEPRESSION

Current literature regarding OMT in depression treatment is limited and even more so in the pediatric and adolescent population. However, preliminary data regarding OMT and depression overall is encouraging.

A study in 2001 by Plotkin *et al*., which has yet to be re-done, assessed the impact of OMT as an adjunct to standard psychiatric treatment of premenopausal women with depression and found that OMT may be a useful adjunctive treatment for alleviating depression in this population.[53] Another study found that OMT produced a statistically significant decrease in self-perceived fatigue in first-year osteopathic medical students. Thus, OMT represents a potential modality to reduce self-perceived distress in medical students.[67] However, a thorough literature review does not display any results for how OMT treatment would compare to the mainstay treatment of depression. Thus, we have included a possible sample study design to view OMT's effect on depression against standard treatment.

OMT STUDY DESIGN

A possible cohort study looking at the effects of OMT on children and adolescents with MDD may be conducted by dividing participants into three groups. One group is treated with selective serotonin reuptake inhibitors (SSRIs) and therapy (mainstay treatment), another with SSRI, therapy and OMT and the last group with SSRI, therapy and a sham OMT (performed by a Ph. non-health care professional or student). The BDI-II, as discussed previously, would be used to measure the patient's MDD at three different time points: pre-treatment, three months into treatment and six months into treatment. A repeated-measures analysis of variance (ANOVA) could be used to analyze statistical differences between the time points. The comparison of these results would give an interesting perspective regarding the treatment of MDD patients with osteopathic manipulative medicine (OMM). In addition, a qualitative component to our study design could be interjected by monitoring the participants for irritability, tension, anxiety, difficulty concentrating, diminished interest, feeling overwhelmed and sleep disturbances that they felt throughout the treatment course at those same three-time points.

CONCLUSION

Children and adolescents are affected by depression, often accompanied by behavioral problems, substance abuse and/or other mental disorders. Many risk factors have been studied in children and adolescents that put them at risk for depression, usually broken down into biological, psychological, and environmental domains. Complicating matters, in children and adolescents, depression can manifest differently than it does in adults, making the ability to recognize this problem and start interventions more difficult. Early recognition, while challenging, is essential in the treatment of these individuals. Regular screening plays an important role.

Moreover, the better the connection that a physician, parent and patient has, the more likely the patient and their parents will come in earlier with their concerns. The most effective treatment for children or adolescents with depression is a combination therapy of psychotherapy, IPT or CBT and pharmacotherapy. OMT should be considered as a supplemental treatment for depression. Ultimately, if treatment is done with all these considerations accounted for, the patient will more likely have positive results. It is important to note that OMT affects the somato-visceral and somato-psychological pathways and somatic dysfunctions caused by depression and should be considered in the treatment of depression. The biopsychosocial model is significant with an understanding that enhanced communication is vital. OMT plays a role in its varied applications, which can positively impact the somatic, visceral systems affected by this condition and thus is a viable treatment modality. Studies are warranted and greatly encouraged to expand on OMT's role in depression.

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CALENDAR OF EVENTS

MAY 21–22, 2021
IOA '21 Virtual Live Annual Spring Update
Indiana Osteopathic Association
Virtual
inosteo.org

JUNE 12–13, 2021
MOA 110th Annual Convention
Maine Osteopathic Association
Virtual
mainedo.org

JUNE 19, 2021
2021 Virtual Summer Family Medicine Update
Missouri Society of the ACOFP
Virtual
msacofp.org

JUNE 25–27, 2021
2021 Annual CME Conference and Golf Tournament
Kentucky Osteopathic Medical Association
Lexington, Kentucky
koma.org

JULY 16–18, 2021
Direct Primary Care Summit
ACOFP
Virtual
dpcsummit.org

JULY 23–25, 2021
2021 Intensive Osteopathic Update
ACOFP
Virtual
acofp.org

JULY 30–31, 2021
FSACOFP Family Medicine Update and Convention 2021
Florida Society of the American College of Osteopathic Family Physicians
Virtual
fsacofp.org

AUGUST 6–8, 2021
POFPS Virtual Annual CME Symposium
Pennsylvania Osteopathic Medical Association
Hershey, PA
poma.org

AUGUST 13–15, 2021
NCS-ACOFP 2021 CME Conference
North Carolina Society of the American College of Osteopathic Family Physicians
Pinehurst, NC
nc-acofp.org

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