

This study shed light on injury trends, locations and incidences of injuries at the highest level of MMA competition. This information should give ringside physicians or medical personal information when managing the competitors acutely.

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## Osteopathic Considerations in the Management of Migraine in Pregnancy

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## KEYWORDS:

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Many women frequently suffer from migraines and require pharmacotherapy to alleviate and control their symptoms. Unfortunately, many of these therapies are contraindicated when a woman becomes pregnant leaving her to find alternative treatments to manage her symptoms. Osteopathic medicine provides a unique perspective for treating migraines without the use of medication. Osteopathic manipulative treatment (OMT) can provide hands-on treatment to help alleviate migraine symptoms and improve the quality of life as a woman's body changes throughout her pregnancy.

## INTRODUCTION

Headaches are the most frequent neurological disorder seen by family physicians. Approximately 90% of individuals will experience headaches in their lifetime, with the most common type being tension headaches. Migraines are the second most common type of headache, specifically migraine without aura, and tend to be more chronic and debilitating than tension headaches<sup>1</sup>. Migraines are caused by irritation of the trigeminal nucleus (see Figure 1). Irritation of the trigeminal nerve and its associated ganglion affects the release of vasoactive substances which in turn cause vasodilation of the large vessels underneath the dura mater causing pain<sup>2</sup>. The International Headache

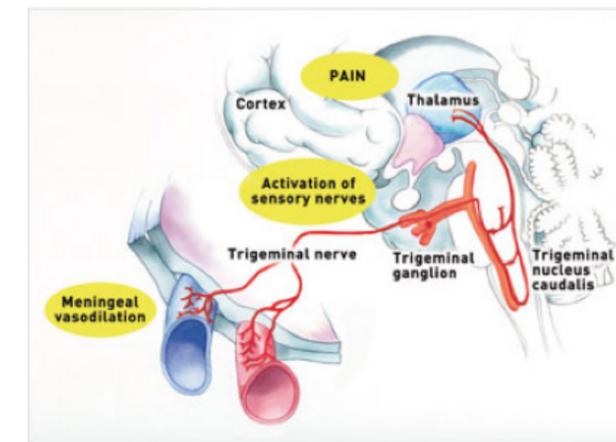


Figure 1 – Migraine pathway  
Source: "Site of Migraine Generation: The Trigeminovascular System." Photo. The Role of CGRP and its Antagonists in Migraine. 10/2/2013. <<http://flipper.diff.org/app./items/5242>>

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Society reports the average lifetime prevalence of migraines is 18%, with 1 in 5 women, and only 1 in 13 men, experiencing them in their reproductive years<sup>1</sup>. Prior literature on migraines has linked the high prevalence of migraines in females of childbearing age to hormonal influences<sup>1,3,4</sup>. Many females report their first migraine to coincide with the same year of menarche<sup>1</sup>. Additionally, migraines are commonly triggered by transitions in hormone balance of the menstrual cycle<sup>1,3-6</sup>. One theory is that migraines may be precipitated secondary to a rapid drop in estrogen levels. This idea is further supported by the lower prevalence of migraines in pre-pubescent or post-menopausal females as well as those females whose migraines improve during pregnancy and rebound in the post-partum period<sup>1,3-5</sup>.

Headaches are a common ailment seen in pregnancy, with migraines without aura responsible for 64% of headaches in pregnancy, and migraine with aura for another 10%<sup>7,8</sup>. Studies indicate that women who suffer from pre-conception migraines tend to show improvement in migraine frequency and intensity over the course of their pregnancy<sup>3,4,9,10</sup>. However, many women continue to experience migraines in the early months of their pregnancy, and some do not obtain adequate pain relief during the second and third trimesters. There are a few reports of women even having worsening of migraines<sup>11</sup>. Also, de novo migraines can develop during pregnancy, often presenting as migraines with aura<sup>12</sup>. The incidence of gestational migraines is notable for correlations with hypertensive disease, preeclampsia, vascular complications and low birth weight infants<sup>6,13,14</sup>. One could theorize that by treating gestational migraines, these other potential high-risk associations may be modulated. Treatment of gestational migraines poses a challenge because the majority of pharmacologic therapies used to

treat migraines are not proven to be safe in pregnancy. For example, Sumatriptan is classified as a category C medication (potential benefits may warrant use despite risks), while the ergot medications are category X (contraindicated in pregnancy)<sup>3,6,14</sup>. The American Academy of Neurology practice guidelines do not recommend pharmacologic prophylaxis for pregnant patients with migraines<sup>15,16</sup>. Many patients and physicians therefore turn to acetaminophen (category B), or NSAIDs (category C), for analgesia. A recent study found that children of women who used acetaminophen (paracetamol) during pregnancy appear to be at higher risk for attention-deficit/hyperactivity disorder (ADHD)-like behavioral problems and hyperkinetic disorders<sup>17</sup>. Different forms of alternative and complementary medicine practices may help to treat gestational migraines. Some modalities being used in practice are behavior modification, biofeedback, acupuncture, chiropractic manipulation, and osteopathic manipulation<sup>3,6,15,18</sup>. This article presents a patient case exemplifying how the osteopathic approach may be used to help manage patients experiencing migraines during pregnancy. Our approach encompasses the five osteopathic models and correlates OMT with recent research findings. Although some of the studies were not conducted on this specific population of pregnant women, their outcomes show support for the field and provide a foundation for further research.

### CASE STUDY

A 31-year-old female, G1P0 at 20 2/7 weeks gestation, presented to the office with a chief complaint of migraine headaches with blurry vision. She reported a history of migraine headaches since age 12. Her migraines were localized to the right frontal region, rated a 7/10 in severity, and associated with nausea, vomiting, and more recently blurry vision in her right eye. She reported being migraine free in her first trimester but that in her fourth month, they became progressive and “worse than ever”. Her right eye visual disturbances began approximately 18 months prior to the office visit. She had neuro-ophthalmologist evaluations and several negative MRIs of the head prior to pregnancy. Upon further history taking, she admitted that her visual disturbances started after sustaining a sit-down fall onto her sacrum in a skiing accident with subsequent sacro-iliac pain which although much better, still flared up on either side and was currently bothering her. Since the injury, she has had right lower back pain and sacroiliac joint pain with radiation of the pain to her right groin. She states that the back pain is occasionally sharp and associated with movement. Prior to pregnancy, Rizatriptan and Sumatriptan helped to relieve her headaches. During her first trimester she had decreased frequency and intensity of her migraine headaches but after month four they had



become more frequent and progressively worse than her antepartum migraines. She missed work for a few days before her appointment because she “couldn’t see out of her right eye”. Her obstetrician recommended Acetaminophen and small amounts of caffeine for her headaches, yet she experienced little relief. Her obstetrician also suggested osteopathic manipulative treatment for her symptoms. Her medications included prenatal vitamins, calcium citrate, magnesium citrate 300mL once daily, and Acetaminophen as needed. Review of systems was positive for fatigue, weight gain, and sleep disturbances attributed to her pregnancy. Her headaches were associated with nausea and vomiting, unsteady gait, feeling off-balanced, and blurry vision.

Osteopathic Structural Exam	
Cranial	Right Sidebend-Rotation with SBS compression
Cervical	C2 FRS <sub>s</sub> , C3 FRS <sub>s</sub>
Thoracic	T9 FRS <sub>s</sub> , T10 FRS <sub>s</sub> , T11 FRS <sub>s</sub> , T12 FRS <sub>s</sub>
Ribs	Bilateral First Rib Inhalation Dysfunction
Lumbar	L1-L5 NS <sub>R</sub> , Bilateral Paravertebral Muscle Hypertonicity
Sacrum	Forward Sacral Torsion
Pelvis	Bilateral SI Joint Restriction, Pelvic Diaphragm Restriction
Extremities	Bilateral Psoas Restriction, Lymphatic Congestion

Table 1 – Osteopathic Structural Exam Findings

On physical examination, fundal height was at the level of the umbilicus and she had a positive systolic ejection murmur of pregnancy. No focal neurologic deficits were found in the cranial nerves or the extremities. Findings on osteopathic structural exam are found in Table 1. Treatment included OMT in the cranial field with frontal lifts and venous sinus drainage techniques to relieve her sphenobasilar synchondrosis (SBS) compression and right sidebending rotation strain pattern.

Balanced ligamentous tension (BLT) and articular technique were applied to the spine and sacroiliac joints. Sacroiliac joint release and sacral rock techniques were applied to further increase excursion of the sacrum to remove any potential strain on the reciprocal tension membrane (dural attachments from S2 to the cranium). Techniques were also performed on the lymphatic system to facilitate more efficient respiratory motion and decongestion of the extremities. These techniques included diaphragm doming, thoracic outlet release, popliteal spread, and thoracic lymphatic pump. Two weeks later the patient returned with a mild, 1/10, headache. The patient stated that she had not had any migraines or visual disturbances since her last visit. On osteopathic structural exam, the patient had occipito-atlantal compression, less evident SBS compression strain pattern and decreased iliosacral restrictions. The patient was again treated with OMT in the cranial field and gentle techniques (BLT, myofascial, etc.). A month later the patient returned to the clinic for her third appointment, and admitted to being migraine-free. She remained essentially migraine and visual disturbance-free from 20 weeks gestation through the remainder of her pregnancy and up to last correspondence at eight months post-partum. She reported she only one “minor” migraine at four months post-partum which she attributed to dehydration and stress.

### BIOMECHANICAL PERSPECTIVE

Throughout pregnancy, weight gain and growth of the fetus causes a shift in the body’s center of gravity, placing more stress on the muscles and ligaments of the back and stretching of the abdominal musculature. During this shift, women often experience changes of the curvature of their spine such as increases in the natural cervical and/or lumbar lordoses. These physiologic changes and added weight gain can affect a pregnant woman’s gait as sacral nutation and ligamentous laxity increase. Pregnancy also places stress on the surrounding organs and body systems as they too accommodate the growth of the fetus as shown in Figure 2.

As part of the physiologic changes of pregnancy, strains are placed on just about every bodily structure including the dural membranes surrounding the central nervous system (CNS). The dura mater is one of the three meningeal layers protecting the CNS. The dura splits into two layers in the cranium, the periosteal layer which lines the cranium is continuous with the fibrous tissue at each cranial suture; and the meningeal layer surrounds the CNS itself and is continuous through the foramen magnum with the spinal dura. The meningeal dura folds on itself to form the falx cerebri, falx cerebelli, and tentorium cerebelli, which attach to multiple cranial bones including the ethmoid, frontal, parietals, temporals, sphenoid and occiput. The dura also has bony attachments at C2, C3, and S2, with light attachments at the lumbar spine.

All of the areas above may be susceptible to somatic dysfunction, as seen with our patient. In osteopathic literature, the dura is referred to as the “reciprocal tension membrane” or the “core link” due to the described anatomical connections and relationships. Strains that affect one part of this tension membrane have been clinically observed to affect other parts of the entire unit. More specifically, since the dura is a pain sensitive structure, a strain involving any of its attachments may lead to cephalgia. Additionally, there are dural attachments at the level of C2 and C3, an area that can relay afferent pain stimuli to the spinal nucleus itself (19). Increased A-P curvature of the spine and sacral nutation is noted throughout pregnancy and predisposes the reciprocal tension membrane to added stress and strain at its dural attachments. Not only do these changes exacerbate low back pain throughout pregnancy, but they can directly hinder proper motion of the cranio-sacral mechanism and affect the previously described trigeminal influenced migraine pathway.

Various other studies using OMT have focused on biomechanical changes of pregnancy. Guthrie and Martin performed a study which focused on treating the lumbar spine with manipulation to decrease the amount of pain during pregnancy<sup>20</sup>. A randomized controlled trial by Licciardone et al found that women who underwent OMT along with their obstetric care were statistically proven to have less deterioration of back function compared to placebo<sup>21</sup>. Family physicians can use gentle techniques such as myofascial release and articular techniques to provide pain alleviation and improve cervical and lumbar mobility to attempt to address not only spinal dysfunctions but also cranial ones that are related through these dural attachments. Sacral rock may also be used to enhance sacral motion and allow a woman’s body to better adapt to the changes of pregnancy. Basic manipulation techniques in the cranial field such as V-spread at the occipito-mastoid suture, (dural) venous sinus drainage, naso-frontal spread, and frontal and parietal lifts can all target dural strain within the cranium. In this case, the patient’s previous unresolved ski trauma was likely a factor in her migraine with blurry vision of “unknown” etiology. Recognition of the body as a unit paves the way for addressing structural abnormalities involved maintaining the patient’s dysfunctional state. These techniques were successfully utilized in our patient, addressing the structural changes of her body to pregnancy and previous trauma.

### NEUROLOGIC PERSPECTIVE

The structural changes that happen to a woman’s body over the course of pregnancy also influence nearby tissues and organs. As changes occur within the spine, different strains can be placed on the surrounding nerve roots which may also directly influence the autonomic nervous system. The spinal nucleus of the trigeminal nerve travels into the cervical spine (see Figure 1). As stated previously, this area is involved in the

major pathway thought to be responsible for the production of pain during a migraine. Irritation at cervical and thoracic nerve roots potentially plays a role in the exacerbation of a woman's migraines during pregnancy.

The upper thoracic region provides sympathetic innervation to the head and neck. Hypersympathetic tone can cause vasoconstriction within the cranium. This may precipitate a hypoxic state within the tissues inducing specific cytokines to be released and leading to vasodilation. This quick reaction of vasodilatation of vessels may exacerbate migraines. The female body undergoes musculoskeletal changes in pregnancy which in turn influences surrounding nerve fibers that can lower the migraine threshold in a patient who has a known history of cephalgia.

At this time, research regarding migraine development has focused on non-pregnant patients with cephalgia, and has shown promising results. Unfortunately, studies are needed using pregnant patients as a subject population. Jull et al, found that cervical manipulation was shown to both reduce the degree and frequency of cervicogenic headaches<sup>22</sup>. OMT has also been compared to medicinal therapy for migraines. A study was completed looking at the effects of amitriptyline vs. OMT<sup>23</sup>. This randomized, controlled trial proved that OMT was as effective in migraine pain control as Amitriptyline in the study population. This is a key finding and could be extremely beneficial to the pregnant population since pharmacologic therapy for migraine prophylaxis and treatment is not recommended. Both the cervical and thoracic regions remain important areas of focus to the osteopathic family physician. As seen in this patient, simple techniques such as myofascial cervical techniques, suboccipital release and thoracic outlet release may all be applied to pregnancy patients' cervical and thoracic somatic dysfunctions in hopes of decreasing neuronal irritation at these areas. OMT is a key distinguishing factor for family physicians who offer this to support their patients' inherent tendency toward health by removing restrictions in order to enhance homeostasis.

### RESPIRATORY/CIRCULATORY PERSPECTIVE

As a woman's body continues to change throughout pregnancy, the vascular system adapts by increasing systemic blood and lymph volume. The increased blood volume and cardiac output can place physiologic stress on the mother and her ability to maintain hemodynamic stability. Increased stress can ensue in an overall hypersympathetic state, which, when combined with other factors may be present in other disorders such as pregnancy induced hypertension and pre-eclampsia. It is interesting to note that the same segments that supply sympathetic innervation to the head and neck (T1-4 sympathetic chain from first through fourth thoracic

segments) also supplies sympathetic innervation to the terminal thoracic duct as well as to the heart. Homeostasis of her circulatory system, including lymphatic drainage, is crucial for prevention of venous congestion or lymphatic stasis, as well as maintaining optimal perfusion to both the patient and her baby. During pregnancy, women are more prone to a state of congestion due to various factors. As the fetus enlarges, surrounding vessels and therefore proper circulation is affected. The fetus can compress the vena cava causing decreased venous return. Also, the enlarging fetus displaces the diaphragm and affects one of its key roles as a primary mover of lymph. Venous pooling has been postulated to cause nausea, headache, and light-headedness due to a decrease in oxygenation and poor blood circulation<sup>24</sup>. Diaphragm restriction, nausea and lower limb edema were evident in our patient and also were reduced with OMT.

OMT may be used by physicians to treat the respiratory diaphragm restrictions to augment lymphatic drainage. Techniques for the thoracic cage and the diaphragmatic attachments such as diaphragm doming and BLT to the 12th rib or any of the costo-vertebral segments can improve thoracic motion and enhance lymphatic flow. Lymphatic augmentation techniques such as lymphatic pumps may be used to help prevent fluid congestion. A study was done looking at the influence of OMT on cardiovascular return in pregnant women at 30 weeks gestation. This study found that the effects of abnormal cardiovascular adaptation to pregnancy including decreased venous capacitance and a decreased cardiac output may be blunted by OMT during pregnancy<sup>25</sup>. This can benefit women who experience migraines in pregnancy by optimizing cerebral vascular thereby decreasing the likelihood of a hypoxic state in those with a history of migraines.

### METABOLIC PERSPECTIVE

Fatigue is a common complaint of women throughout their pregnancy<sup>26</sup>. The strains that are placed on a woman's body as the pregnancy progresses can affect her energy levels. Within the first trimester, energy is being used to develop the embryo and placenta as well as to prepare her entire physiology for the months ahead. By the third trimester, the baby is growing to a size that places mechanical as well as physiologic stress on the mother and may cause fatigue. It is important to incorporate OMT as a mechanism to optimize the body's homeostasis in order to decrease its work of gestational physiology as the female body changes. The goal is to restore balance to the body so a woman can optimize her energy to support both her and her child. Again, soft tissue severity in migraine sufferers, but it also was able to improve the subjects' quality of life and decrease their days of disability<sup>28</sup>. techniques may be helpful to relax strained musculature and enhance structural mobility throughout the pregnancy. Spinal articular techniques

may be used to enhance spinal mobility to allow for adaptive changes within the spinal curvature. Also, treatment of the psoas muscles can alleviate some strain as the woman's abdomen grows with each trimester. By optimizing structural motion and decreasing allostatic load, the mother's energy consumption should decrease allowing allocation of energy for supportive fetal development. .

### BEHAVIORAL PERSPECTIVE

It is beneficial for a woman to remain comfortable throughout her pregnancy. By maintaining a level of comfort, she is more apt to thrive despite physical and psychological stressors that commonly surface throughout the course of pregnancy. Physical and psychological ease during pregnancy likely ensures more positive outcomes. Alleviating discomfort can lead to a better course with fewer complications throughout the pregnancy and at the time of delivery. King et al, focused on the effects of prenatal OMT on delivery<sup>27</sup>. This case control study statistically showed that women who received prenatal OMT experienced less preterm labor and less meconium stained fluid during delivery in comparison to women who did not receive any osteopathic treatments. Additionally, migraines can be extremely debilitating when experienced on a daily basis. Couple this with missed work time, inability to complete household chores or childcare duties and it is no wonder pregnancy is looked upon as a time of drudgery for many women. Having this burden, in addition to the normal changes of pregnancy, may be very difficult for a woman to cope with. Prenatal patients do not have as many options for pharmacotherapy because the most common therapies are teratogenic. Previous research has been conducted on non-gravid headache sufferers to see if OMT could improve their headaches and if it had any effect on their daily lifestyles. Not only was OMT proven to decrease the pain severity in migraine sufferers, but it also was able to improve the subjects' quality of life and decrease their days of disability<sup>28</sup>.

### CONCLUSION

Migraines during pregnancy can be very difficult for women to cope with due to what is for many already a stressful period. Due to potential side effects, many pain-relieving medications are not recommended for use during pregnancy, and leave family physicians few options to help their suffering patients. OMT provides family physicians a safe and effective alternative treatment for their pregnant patients who suffer from migraines. OMT is helpful in reducing the pain and frequency of migraines by addressing structural causes rather than merely battling symptoms. Additionally, OMT can aid in helping a woman's body adapt to the changes of pregnancy and decreasing structural stressors which lead to a wide range of other complaints. The successful results illustrated

by this case demonstrate how family physicians may support their pregnant patients by taking a hands-on approach to optimizing the physical and psychological well-being of their patients throughout their pregnancy and beyond.

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