

## ABSTRACTS

# LBORC-NUFA Poster Abstracts 2023: Students

Every year at the American Academy of Osteopathy Convocation, the Louisa Burns Osteopathic Research Committee (LBORC) and the National Undergraduate Fellows Association (NUFA) together host a research poster presentation session for residents and medical students. The 2023 poster abstracts for students are presented here.

## CASE STUDY

*Courtney Baxter, OMS III; Julia Grote, OMS III; Jill Wallace-Ross, DO*

### **An Osteopathic Approach to Chronic Inflammatory Demyelinating Polyneuropathy**

**Introduction/Background:** Chronic inflammatory demyelinating polyneuropathy (CIDP) is an acquired autoimmune disorder wherein the body attacks the myelin sheath surrounding nerve roots and peripheral nerves. It can present as bilateral symptoms of upper and lower extremity weakness, decreased sensation, decreased reflexes, and fatigue. An atypical presentation of the disease is unilateral symptoms as discussed in this case. Can osteopathic manipulative treatment (OMT) be used to improve a CIDP patient's pain that is unresolved by medication?

**Case:** A 56-year-old female with a diagnosis of CIDP within the last year and being treated with carbamazepine presents to the osteopathic treatment center with worsening 7/10 stabbing chronic right-sided middle and lower back pain, right-sided lower extremity numbness, and the sensation that the bones in her right foot are flipped. Osteopathic examination revealed an inhaled 9th rib, hypertonic quadratus lumborum, hypertonic iliotibial bands, and inverted right talus. Passive treatments, such as counterstrain, articulatory, and soft tissue were most utilized throughout her body.

**Results:** Over eight visits the patient reported improvement in her pain for a few days after each treatment, especially in the mid-back, and temporary resolution of the sensation of her foot being rotated in between visits.

**Discussion:** This case-study discusses how OMT was used to improve pain unresponsive to medication in a patient with unilateral symptoms of CIDP. By treating the somatic dysfunctions resulting from the body's compensation for decreased sensation and weakness in the extremities, OMT was able to provide even temporary relief of her pain and therefore improve the patient's quality of life beyond medication. A limitation of this study was a change in the CIDP medication dosage making it difficult to isolate the changes in her symptoms to OMT.

*Caitlin Blaukovitch, OMS III; Mark Unger, DO; Nichole Thorsvik, DO, C-AOBNMM; Greg Heller, DO, C-AOBNMM*

### **Nervous System Under Attack**

**Introduction/Background:** Spinal stenosis is a disorder that causes increased fatigability with extension-based activities and impairment of activities of daily living. Axonal sensorimotor neuropathy is a subtype of Guillain-Barre Syndrome characterized by acute onset of distal weakness, loss of deep tendon reflexes and sensory symptoms. Long COVID includes a wide range of new, returning, or ongoing health problems experienced after COVID-19 infection. All three disorders can alter neurologic function via different pathophysiology.

**Case:** A 57-year-old male presented to the OMM clinic with complaints of chronic headache, chronic low back pain, chronic memory impairment, depression, and anxiety. History was notable for axonal sensorimotor neuropathy and acute respiratory failure due to COVID-19 infection four months prior. Hospitalization was followed by increased fatigue, cognitive impairment, depression, and anxiety. Osteopathic structural

examination was significant for decreased respiratory excursion and decreased amplitude of the cranial rhythmic impulse during early evaluation. Multiple osteopathic manipulative treatment (OMT) techniques were employed in treatment. Due to recent progressive weakness in the lower extremities, a lumbar MRI was ordered that revealed severe spinal stenosis at the L2-L3 level. Osteopathic evaluation and treatment is ongoing, and a neurosurgery consultation is pending.

**Results:** OMT successfully contributed to pain reduction, fatigue mitigation, improved cognition, and increased ability to perform activities of daily living for the patient compared to baseline subjective reports.

**Discussion:** Our case study suggests that OMT can play an integral role in the management of symptoms for patients with spinal stenosis, axonal sensorimotor neuropathy, Long COVID, or a combination of these diagnoses. Limitations of this study include not having objective baseline measurements of quality of life and of the ability to perform activities of daily living to confirm subjective findings.

*Samantha Cornwell, OMS III; Sheldon Yao, DO, FAAO; Reem Abu-Sbaih, DO*

### **The Effects of Osteopathic Manipulative Treatment (OMT) on an Infant with Failure to Thrive (FTT); A Case Study**

**Introduction/Background:** Failure to thrive (FTT) is defined as inability for a pediatric patient to properly maintain a steady increase in weight with resultant drop below the 5th percentile in both height and weight (1). The etiology of FTT is diverse and can include feeding difficulties, constipation, and overall insufficient nutrient intake. Osteopathic manipulative treatment (OMT) has been integrated in the management of various pediatric conditions, most notably torticollis and plagiocephaly (2), colic (3), and poor latch (4); however, there has been limited evidence for use in FTT (5).

**Case:** A 9-week-old male with difficulty feeding, weight loss, and constipation was referred to the OMT clinic for FTT by his pediatrician, a specialist in breastfeeding medicine. Structural exam was most notable for bilateral condylar, occipital, and OM suture compression, thoracic and lumbar paraspinal muscle spasms, bilateral psoas spasms, bilateral sacroiliac restrictions, and right-sided middle rib exhalation dysfunctions. The infant was

treated with balanced ligamentous tension, myofascial release, articular, cranial and visceral osteopathy.

**Results:** At first follow-up, the mother reported immediate improvement in the baby's ability to feed, increasing 8-10 ounces. Treatment was continued biweekly for six visits, with the pediatrician reporting improvement from the 2nd percentile in both height and weight to the 50th-60th percentile, respectively. The infant was then seen occasionally for other issues, with the mother reporting significant improvement in the ability to feed and eliminate stool, along with a decrease in irritability.

**Discussion:** This case study demonstrates utilization of OMT in a case of a patient with severe documented FTT, with resultant improvement of appetite, bowel function, and infant irritability. This encourages further exploration of utility of OMT in such cases of FTT.

*Samantha E. Danto, OMS III; Jay B. Danto, DO*

### **Tackling Structure and Function with an Osteopathic Approach: A Patient with a Herniated Lumbar Disc and a Small Hemipelvis**

**Introduction/Background:** A systemic review and meta-analysis in 2005 concluded that Osteopathic Manipulative Treatment (OMT) could significantly reduce low back pain. This case examines how an osteopathic approach is implemented when OMT initially fails to result in long-term improvement. This case also discusses the use of non-invasive Spinal Decompression Therapy (SDT) combined with OMT.

**Case:** A 54-year-old male presented to the clinic with complaints of lower back pain that started over 5-years ago. He described the pain as chronic and aching. Physical exam identified a right, small hemi-pelvis, as well as several other somatic dysfunctions. The pain had been mostly located in his lower back until it suddenly changed and started radiating into his right hip. OMT, which previously had been successful in relieving the pain, no longer provided relief. Due to the alteration in the pain pattern and the lack of response to OMT, imaging was attained. The imaging results included a paracentral fourth lumbar disc extrusion that had migrated caudally and was approximating the right fifth lumbar nerve root. A combination of OMT, non-invasive SDT, and the exercise prescription were utilized to treat the patient.

**Results:** The patient's hip pain resolved in the second

week of treatment and his back pain resolved in the fourth week. This outcome was attained by addressing biomechanical pathologic findings treatable by applying an osteopathic approach.

**Discussion:** This case demonstrates the treatment of lumbar radiculopathy from a lumbar disc herniation using a combination of OMT and non-invasive SDT. This study is limited by being a single case. Future research using a similar osteopathic approach that is placebo-controlled with an appropriate sample size would be beneficial.

*Bindiya Desai, OMS III; Courtney Baxter, OMS III; Nathan Widboom, DO*

### **Stop Chasing the Pain: An Osteopathic Approach to Treating Migrating Pain Caused by Lumbar Radiculopathy- the Importance of Treating the Cause not the Symptoms**

**Introduction/Background:** Radiculopathy initially presents as paresthesia/dysesthesia, motor dysfunctions, and hyporeflexia affecting a specific dermatome or myotome immediately following an inciting event. Radicular pain in patients older than fifty-five is concerning, with gabapentin sometimes used as conservative treatment.

**Case:** A 58-year-old male presented to the clinic with right anterior thigh pain that began 1 day prior as low back pain. Unsure of the inciting event, the patient had difficulty walking and weight-bearing on the right. Physical exam showed a negative Lasegues test with 5/5 muscle strength and 2+ reflexes bilaterally. Treatment focused on quadriceps, iliopsoas, sacroiliac, and lumbar somatic dysfunctions (SDs). Two days later, he returned with 9/10 right suprapatellar burning pain. Lasegues test was now positive, but patient denied any altered sensation. Knee SDs were subsequently added into treatment. Five days later, patient returned with lateral thigh soreness and 5/10 groin pain. At this visit, a diagnostic x-ray revealed grade 1 retrolisthesis of L2 on L3.

**Results:** Prior to treatment, the patient scored 58% on the Oswestry Low Back Pain Disability scale, marking severe disability. After 2.5 months of osteopathic manipulation, including 1 month of physical therapy and gabapentin, he scored 2%, marking minimal disability, and his pain was a 2/10 intermittent twinge.

**Discussion:** At first, the migrating pain was treated as it presented, but as one symptom would resolve, a new one would arise. The confounding pain persisted until

we discovered its origin, highlighting the importance of treating the etiology to produce lasting relief. Future research into the effectiveness of osteopathic manipulation combined with gabapentin to treat radiculopathy would be appropriate. A limitation of this study includes the involvement of physical therapy in treatment.

*Zachary Dickey, OMS II; Jacob Turnbull, DO; Navneet Sharma, MD; Stephanie Aldret, DO*

### **Drug Induced Tibial Nerve Neuropathy in Former Collegiate Baseball Player**

**Introduction/Background:** Peripheral neuropathy is commonly seen as an adverse reaction in a varying number of prescribed medications. Some drugs, however, are more well known to produce neuropathic symptoms than others. Often, a drug induced neuropathy (DIN) affects individuals more at risk, for example, those with preexisting neuropathy or diabetes. DIN also tends to produce a systemic reaction across the nervous system and less so a focal nerve lesion.

**Case:** A 23-year-old male retired collegiate baseball player presents with paresthesia of his left lower extremity that occurred six days after being treated with low dose olanzapine for refractory panic and generalized anxiety disorder. Paresthesias began across multiple limbs during treatment but persisted in the left lower leg six months after olanzapine was discontinued. Physical exam was unremarkable except for neurological abnormalities in the tibial nerve distribution. Medication and OMT had minimal improvements. EMG/NCS revealed increased latency within the tibial nerve. MSK US revealed enlargement of the tibial nerve within the tarsal tunnel.

**Results:** OMT was directed at correcting structural somatic dysfunctions as well as myofascial binds around the neuropathic lower extremity. Treatment has been aimed at restoring proper balance and removing obstruction to allow for proper nerve regeneration.

**Discussion:** Tibial nerve neuropathy is most often seen in patients with tarsal tunnel syndrome (TTS). TTS commonly presents with paresthesia of the sole of the foot and/or weakness of the plantar flexors. In this case, a thorough Osteopathic examination allowed for potential etiologies as well as their role in the prognosis of the neuropathy to be investigated. This case highlights the interconnectedness between the structural, neurologic, and behavioral models of osteopathic medicine and the



importance in addressing them.

*Caitlin Drakeley, OMS III; Ravi Shah, OMS III; Holly Waters, DO, MS; Rohit Mehra, DO, MPH, MS; Nitya Kumaran, OMS III; Timothy Johnson, OMS III*

### **Cranial Osteopathic Manipulative Treatment for Post-COVID Syndrome**

**Introduction/Background:** COVID-19 infection may lead to long-term effects with a multitude of symptoms. Common neurological complaints include difficulties concentrating, headache, paresthesia, and fatigue. Treatments to address specific symptoms have yet to be identified.

**Case:** A 61-year-old female presented to the osteopathic clinic complaining of headaches. The patient described her head as feeling heavy and indicated this began after her COVID-19 diagnosis in July of 2022. Additionally, she experienced complications including brain fog, memory loss, “electrical shooting” pain along her upper and lower extremities, fatigue, and acid reflux. She reported that Aleve provided no symptomatic relief. Physical exam revealed generalized allodynia and epigastric tenderness upon palpation. Osteopathic manipulative treatment (OMT) was directed towards the following somatic dysfunctions: cranial strain patterns, cervical and suboccipital muscle hypertonicity, and celiac ganglion restriction. Numerous treatment modalities were utilized including OA decompression, osteopathy in the cranial field (venous sinus drainage technique, frontal lift, parietal lift, balance membranous technique, temporal decompression, CV4), and cervical soft tissue techniques.

**Results:** After two OMT visits, the patient experienced significant improvement in concentration, memory, heavy-headedness, and decreased paresthesia. There was notable progress in her acid reflux and fatigue. Her headaches improved from 7/10 to 3/10 in intensity. She continues to receive OMT for overall maintenance.

**Discussion:** This case report suggests OMT may be beneficial in treating neurological manifestations of post-COVID syndrome, thus improving patient quality of life. Limitations include that this is a single case report and symptoms are difficult to quantify. Further research in the use of cranial osteopathy as a modality in treating individuals experiencing cognitive setbacks following COVID-19 infection is indicated

*Elizabeth Geyer-Roberts, OMS III; Philip Helderlein, OMS III; Jill Wallace-Ross, DO, MS*

### **An Osteopathic Approach to Shoulder Injury Following Post-Hemorrhage Hemiparesis**

**Introduction/Background:** An arteriovenous malformation (AVM) rupture is rare, occurring in less than 1% of the population according to Mayo Clinic. The resulting brain hemorrhage can lead to unilateral muscle weakness called hemiparesis. This weakness leads to increased risk of musculoskeletal injuries, specifically of the shoulder joint due to its inherent instability.

**Case:** A 20-year-old female presented to the Osteopathic Manipulative Treatment (OMT) clinic 18-months following AVM rupture. Shoulder weakness from left sided hemiparesis caused supraspinatus tendinosis and subdeltoid bursitis diagnosed via MRI 16-months following hemorrhage. Bicep tendonitis was also suspected due to positive Yergasons and Speeds tests on osteopathic structural exam. The patient exhibited decreased range of motion (ROM) in left shoulder abduction and flexion, and complained of numbness and tingling into her fingertips. She also noted sharp shoulder pain radiating to her elbow at rest and with motion. The OMT protocol included decreasing hypertonicity of the upper extremity muscles through counterstrain, increasing ROM with Spencer’s articulatory technique, and treating the thoracic spine with muscle energy and soft tissue to prevent future compensation through the shoulder.

**Results:** The patient had a total of 13, 60-minute treatments spanning 1 year. After 3 treatments spanning 2 months, she had a negative Yergasons test, and after 11 treatments spanning 7 months, she had a negative Speeds test. After 12 treatments she denied any shoulder pain at rest and decreased pain with abduction and flexion. She also denied numbness and tingling.

**Discussion:** Hemiparesis increases risk of musculoskeletal injury, specifically that of the shoulder. OMT was shown to increase ROM, and reduce shoulder pain, numbness and tingling. Study limitations include basing outcome on one patient, however promising results should generate additional studies.

*Julia Grote, OMS III; Julian Perez, OMS III; Jill Wallace-Ross, DO, MS*

### **An Osteopathic Approach to Dizziness Secondary to Meniere’s Disease**

**Introduction/Background:** Meniere's Disease is a chronic inner ear disorder characterized by spontaneous and recurrent vertigo, hearing loss, and aural fullness and/or tinnitus. Current treatment is aimed at symptom management through pharmacologic and surgical interventions. The National Institute of Deafness and Other Communication Disorders estimates that 615,000 people are currently living Meniere's Disease. Meniere's disease often affects patient's physical, emotional, and social functioning.

**Case:** A 58-year-old male with history of Meniere's disease presented to the osteopathic treatment center with a complaint of constant, severe, 9/10 dizziness for 3 years. Daily dizzy attacks lasted 12 hours, not improved by diuretics or steroids. He reported dizziness prevented him from exercising and participating in social activities. Osteopathic treatment was focused to somatic dysfunctions of head and neck and osteopathic cranial manipulative medicine (OCMM), using indirect and direct techniques coupled with cranial lifts and venous sinus drainage.

**Results:** At 3 monthly treatments, the same somatic dysfunctions were found and treated in the occipito-atlantal joint, cervical spine, frontal and temporal bones, and dural venous sinuses. After treatment course, the patient reported decreased frequency of severe dizzy days and duration of dizzy attacks lasting 4-6 hours. He reported maximum effects of treatment occurred 2-3 days after treatment and lasted 2 weeks. The patient stated he began participating in exercise and social activities, due to symptom relief.

**Discussion:** Osteopathic manipulative treatment (OMT) is a non-invasive technique that may be used to effectively decrease symptomatology of Meniere's disease that is not adequately controlled by traditional interventions. Treating somatic dysfunctions of the head and neck improved the primary symptom of dizziness and quality of life of the patient. A limitation of this study included lack of objective dizziness scale.

*Philip Helderlein, OMS III; Elizabeth Geyer-Roberts, OMS III; Nathan Widboom, DO*

### **Cranial for Chronic pain: The efficacy of osteopathic manipulative treatment (OMT) in the management of chronic post-traumatic headache (CPHA)**

**Introduction/Background:** Chronic post-traumatic headache (CPHA) is the most common complaint

following a traumatic brain injury (TBI) with anomic aphasia being the most frequent aphasia appreciated. Anomic aphasia results from damage to the frontotemporal region of the brain characterized by difficulty finding words. OMT is commonly used to treat CPTAs, however little information is known about its utility in the treatment of aphasias. Common treatments for aphasias include speech/language therapy and pharmacologic interventions. This case-study poses the question: Is OMT a viable alternative for patients suffering from post-traumatic anomic aphasia?

**Case:** 63-year-old female presented to the osteopathic treatment center with a one-year history of daily CPTAs rated 10/10 pain and moderate difficulty with word-finding following head trauma suffered from an elevator accident in 2020. A 3-story elevator drop resulted in a right orbital fracture, semicircular canal dehiscence, and TBI with loss of consciousness. MRI in 4/2022 revealed no acute intracranial abnormality. Osteopathic cranial manipulative medicine (CV-4, frontal/parietal lifts, and temporal decompression) was utilized to alleviate her headaches and improve her speech fluency.

**Results:** The patient received two 60-minute sessions of OMT. Following her first treatment, her headaches improved to 5/10 pain with a decrease in frequency to <5 days/week and nominal improvement in word-finding. After her second visit, her headaches were rated 4/10 with <3 days/week and her anomic aphasia resolved completely.

**Discussion:** This study demonstrates the effectiveness of OMT for the treatment of CPTAs and anomic aphasia. The resolution of the patient's anomic aphasia in two visits suggests OMT as a potential alternative to standard-of-care treatment. A limitation is the patient's medical history was taken based on her own accounts without prior imaging seen by the OMM staff.

*Keiko Inouye, OMS III; Mary Ann Magoun, DO*

### **Treatment of A Pediatric Patient with Right Eye Esotropia using Osteopathic Manipulative Treatment**

**Introduction/Background:** Strabismus is insufficiency of the EOMs by mechanical or neurological causes, resulting in misalignment of the visual axes. It is thought that strain patterns affecting the bony orbit and compromising these muscles' attachments and insertion points can be targeted using osteopathic manipulative treatment

(OMT). Here we discuss a patient who presented with esotropia and was successfully treated using prism lenses and OMT.

**Case:** A 14-year-old presented to clinic with new complaints of headache and visual disturbance. Physical exam revealed esotropia of the right eye, left unilateral sacral flexion, left lateral strain with spheno-basilar-synchondrosis (SBS) restriction favoring flexion phase, occipitomastoid suture restriction bilaterally, and temporal bone dysfunction. Head was normocephalic and atraumatic. The patient was treated in clinic using cranial technique, myofascial release, balanced ligamentous tension, muscle energy, and Still technique. Significant improvement in somatic dysfunction and esotropia was noted by physician and the patient immediately posttreatment, and the patient was advised to follow up with optometrist.

**Results:** At their follow up visit, the patient noted resolution of the headache and visual disturbance. On cranial examination, there was an absence of the original left lateral strain pattern, SBS restriction, and occipitomastoid suture restriction. No optometric exam was preformed other than Snellen eye chart and gross visual examination. The patient was able to obtain prism lenses through their optometrist, which were used only as needed with regular OMT.

**Discussion:** It is theorized that the left lateral strain and downward pull of the reciprocal tension membrane contributed to the visual disturbances and, to a degree, the patient's esotropia. Based on this theory, it is possible that regular OMT can help alleviate the long-term need for prism lenses in patients with strabismus.

*Timothy A. Johnson, OMS III; Holly Waters, DO*

### **The Effects of Osteopathic Manipulative Treatment (OMT) on Rare Diseases- Gordon Syndrome**

**Introduction/Background:** Gordon Syndrome, or Distal Arthrogryposis Type 3, is a rare congenital disorder inherited in an autosomal dominant pattern. A mutation in the PIEZO2 gene, responsible for a mechanosensitive ion channel, produces this disease which presents with a wide variety of musculoskeletal (MSK) pathologies.

**Case:** A 40-year-old female presented to the OMT Center with widespread, severe, polyarticular MSK pain with a mix of flexion and extension contractures due to Gordon Syndrome. The patient had a history of cleft palate; bilateral foot amputation at age 9 due to congenital club

feet; and recurrently surgically removed right eardrum skin tags. History also includes esophageal strictures, hemorrhoids, polyps, diverticulosis, gastroesophageal reflux disease, and recurrent sinus pain and infections since childhood. OMT was directed at her areas of most discomfort and disability: legs, spine, and neck. Multiple modalities were performed, including success with both indirect techniques and direct during her second appointment. Substantial improvements were noted with muscle energy and stills technique.

**Results:** After her first treatment, the patient reported significantly less stiffness while being able to constantly hold her head up; achieving her main requested treatment goal. First follow-up appointment she reported: a decrease in back and neck pain (after post-treatment myalgias); an increase in range of motion; and a considerable increase to functionality in her neck. Cervical manipulation during follow-up allowed for full correction of C2-C5 via cervical articulation and stills technique.

**Discussion:** Despite being limited by only 2 treatments, this study suggests that OMT can significantly decrease pain and increase functionality of Gordon Syndrome patients. There is a need for more case reports, or if possible, a clinical trial comparing various modalities and body regions of Gordon Syndrome treatment.

*Nitya Kumaran, OMS III; Caitlin Drakeley, OMS III, Holly Waters, DO, MS; Rohit Mehra, DO, MPH, MS*

### **Osteopathic Manipulative Treatment for Enhanced Functional Recovery in Stroke Survivors**

**Introduction/Background:** About 1 in 4 people have a stroke<sup>1</sup>, 75% of which occur in people 65+<sup>2</sup>, and up to 30% lead to permanent disability<sup>3</sup>. Impairments are usually treated with physical therapy<sup>4</sup>.

**Case:** A 57 year-old male with a past medical history of 5 strokes presented with right shoulder pain and upper back pain. He had 6/10 pain when lifting his right arm above his shoulder, significantly restricting his ability to drive or even drink water. Despite multiple rounds of physical therapy after each stroke, he was frustrated by little improvement in his ability to perform ADLs. Physical exam showed restricted flexion in right hand and fingers, which was addressed with myofascial release, effleurage and petrissage of the forearm, MET for the radial head, and HVLA of the humeroulnar joint.



OMT was also used to address somatic dysfunctions in: the cranium, ribs, posterior scalenes, paraspinal muscles. Modalities used included: muscle energy, counterstrain, balanced ligamentous technique, HVLA, myofascial release and osteopathy in the cranial field.

**Results:** Over 3 visits spanning a year, the patient was amazed to finally drink water without spilling, and to have pain reduction in his upper back and shoulders from 6/10 to 0/10. Abduction ROM in his right arm improved by 70%, allowing him to drive. He discontinued physical therapy and continues to receive OMT.

**Discussion:** This report suggests OMT enhances recovery of gross motor movements for stroke survivors when the current standard of care is lacking. Limitations include confounding variables like physical therapy and medications. The patient's outcome suggests that OMT should be included in the current standard of care to improve gross motor movements in post-stroke patients.

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### Use of Micronized Lipoaspirate with Platelet-rich Plasma Injection and 3D Tenotomy for Treatment of a Longitudinal Peroneal Brevis Tear

**Introduction/Background:** Lateral ankle instability is associated with posterolateral ankle pain and ligamentous laxity. Longitudinal tears of peroneus brevis can

occur with repeated sheering due to the sharp, posterior boarder of the fibula. Standard surgical treatment may involve lateral ankle complex reconstruction. Micro-fragmented adipose tissue (MFAT) with platelet-rich plasma (PRP) is a novel regenerative treatment for tendinopathy.

**Case:** A patient with left>right chronic knee pain was referred to our integrated osteopathic neuromusculoskeletal (NMM) and sports medicine clinic from an out-of-state NMM physician. History included numerous traumas, moderate-severe bilateral genu valgus with instability, and multi-joint degenerative joint disease (DJD). A non-surgical approach was taken to address mobility and pain, including Osteopathic Manipulative Treatment (OMT), physical therapy (PT) and regenerative medicine. The patient then presented with right ankle pain and instability, and a right peroneus brevis tendon longitudinal split tear was found on diagnostic ultrasound. Primary treatment included 3D tenotomy with PRP of peroneal brevis tendon, multiple ankle ligaments, and ankle/subtalar joints, combined with PRP/MFAT injection into tendon tear. Post-procedural care has included bimonthly OMT and weekly physical therapy.

**Results:** The patient's multiple conditions have continued to improve over a 6-month period resulting in significant functional improvement. Patient telehealth follow-up showed adequate recovery with progression in right ankle weight-bearing, mobility, stability, and pain reduction.

**Discussion:** This case demonstrates the use of regular OMT and PRP/MFAT injectate as a promising treatment paradigm for the management of chronic severe tendinopathy, tendon split tear and DJD. Patient satisfaction and self-reported improvement of ankle stability support its efficacy. Limitations include pending follow-up physical exam and repeat ultrasound for tendon imaging. Future research should include prospective assessment of PRP/MFAT injectate combinations with and without OMT simultaneously.

Emily Lin, OMS III; Emily Montalvo, OMS III; Diana Garcia Garcia, OMS III; Natalie Adams, OMS II; Clarence Sparks, OMS IV; John Gibson, MD; Ryan Seals, DO

### Case Study on the Effect of Osteopathic Manipulation on Gallbladder Ejection Fraction

**Introduction/Background:** There is minimal research

regarding the effects of osteopathic manipulative treatment (OMT) upon biliary emptying. Despite the limited research, OMT has been used to treat gallbladder dysfunctions in clinical practice.

**Case:** The purpose of this case study was to examine the effects of OMT on gallbladder ejection fraction (EF) as measured by ultrasound and to determine if there was sufficient evidence of OMT-influenced biliary emptying to base a larger study. OMT was performed by a neuromusculoskeletal medicine board certified osteopathic physician on a medical student, who was acalculous and asymptomatic of any biliary disorder. Interventions included OMT targeting sympathetic and parasympathetic innervation levels, Chapman points, visceral myofascial release, and Sphincter of Oddi release.

**Results:** Results included gallbladder EF as measured by ultrasound. Blinded analysis demonstrated a 8.88% increase in average gallbladder EF following OMT, with a statistically significant difference in mean ejection fraction between OMT ( $M=46.95$ ,  $SD=19.83$ ) and no OMT ( $M=38.07$ ,  $SD=19.13$ ) conditions (paired  $t(4)=2.828$ ,  $p=0.047$ ).

**Discussion:** A limitation in the design of this study is that the comparison EF was measured 15 days after the OMT intervention. In future studies, we would first measure the EF and then perform OMT and measure the EF at least 4 weeks later. The results of this case study provide an enhanced understanding of OMT's effect on gallbladder EF. Future studies should apply the biliary OMT protocol to a diverse clinical population with and without functional gallbladder disorder to determine if OMT could be used as an alternative treatment.

*Grace Macmillan OMS III; Rachel Radigan OMS II; Alexa Finkelstein OMS II; Sheldon C. Yao, DO, FAAO*

### **Effect of Muscle Energy Technique (MET) on muscle parameters and lower extremity functionality in a Parkinson's Disease (PD) patient: A case report**

**Introduction/Background:** Musculoskeletal complaints like muscle rigidity are common in PD patients, causing pain and impaired activities of daily living (ADLs) [1,2]. Past research validates the lower extremity functional scale's (LEFS) reliability in assessing patient's functional impairment [3]. Prior studies show that MET significantly decreases calf muscle stiffness, but not specifically

in PD. The MyotonPRO device has been used previously as an objective and reliable tool to measure muscle stiffness [4].

**Case:** FG is a 67-year-old male with a 22-year history of PD, Hoehn and Yahr Scale 3, who presented with leg stiffness and pain. The LEFS survey was administered to assess functionality. The MyotonPRO measured stiffness of the anterior tibialis and medial and lateral gastrocnemius muscles before and after Osteopathic Manipulative Treatment (OMT). MET was used to treat somatic dysfunctions of the hip, knee, and ankle joints of the lower extremities bilaterally.

**Results:** The patient reported increased range of motion, decreased stiffness and decreased pain immediately post-treatment. MyotonPro measurements of the medial and lateral gastrocnemius showed a significant decrease in stiffness from pre-treatment ( $M=337$ ,  $SD=61$ ) to post-treatment ( $M=261$ ,  $SD=26$ ),  $t(3)=2.95$ ,  $p=0.030$  and relaxation levels increased from pre-treatment ( $M=17$ ,  $SD=3$ ) to post-treatment ( $M=23$ ,  $SD=2$ ),  $t(3)=9.44$ ,  $p=0.001$ . At one week follow up his LEFS score improved from 62 pre-treatment to 70.

**Discussion:** This case demonstrates quantitative improvement in lower extremity muscle stiffness and LEFS scores after MET in a PD patient. The findings set a precedent for potential benefits of MET in improving pain and functionality in PD. Further research exploring the effects of OMT on muscle properties and lower extremity functionality in PD patients are warranted.

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*Ryan McIntire, BS, OMS III; Rachel Terry, BS, OMS III; Garren Gebhardt, DO*

### **Osteopathic Manipulative Treatment for Chemotherapy-Induced Abdominal Pain and Anorexia in Glioblastoma Multiforme**

**Introduction/Background:** We present the case of a 53-year-old male diagnosed with glioblastoma multiforme (GBM) and his eventual decision for only osteopathic manipulative treatment (OMT). Glioblastoma multiforme (GBM) is a fast-growing tumor of astrocyte cells in the central nervous system.<sup>1</sup>

**Case:** Initial presentation to the emergency department on 08/21/21 was suspicious for seizure or stroke, with magnetic resonance imaging of the head performed 8/28/21 supporting a diagnosis of GBM. Chemoradiation with Temozolomide was implemented 10/06/21 - 11/24/21, followed by adjuvant treatment using Temozolomide from 12/15/21 - 04/19/22. The patient lost appetite for food during this treatment, and reduced eating led to a decrease in weight from 210 pounds on 08/21/21 to 156 lbs during the first OMT on 04/19/22.

**Results:** Despite therapy, imaging on 04/11/22 demonstrated tumor enlargement. Given the disease progression, the patient elected to discontinue radiation and pharmaceutical therapies. Therefore, the patient's only medical treatment from 4/19/22 to 8/19/22 was OMT consisting of visceral manipulation, myofascial release, soft tissue, and lymphatic techniques directed to the celiac, superior mesenteric, and inferior mesenteric ganglia. Appointment weights were 152 pounds, 147 pounds, 154 pounds, and 166 pounds at respective, chronological one-month follow-ups. This weight re-gain demonstrates the effect of OMT in promoting appetite and feelings of wellness.

**Discussion:** The patient endorses increased appetite, alleviation of stomach cramping, and weight gain following OMT sessions. This case supports the use of OMT techniques to promote appetite and improve patient-reported wellness in a patient with GBM.

1. Glioblastoma (GBM). American Brain Tumor

Association. [https://www.abta.org/tumor\\_types/glioblastoma-gbm/](https://www.abta.org/tumor_types/glioblastoma-gbm/). Published October 4, 2022. Accessed January 2, 2023/

*Julian Perez, OMS III; Philip Helderlein, OMS III; Nathan Widboom, DO*

### **Free to Fly: A Case of A Dancer's Flexor Hallucis Longus Tendonitis**

**Introduction/Background:** Flexor hallucis longus (FHL) tendonitis, known as dancer's tendonitis, results from repetitive plantarflexion. The FHL is vulnerable to tension in various areas, one being the intersection between the flexor digitorum longus (FDL) and FHL, known as "knot of Henry". Standard conservative care with home exercises, physical therapy and anti-inflammatory medications has a 64% success rate. Limited OMT research discusses treating local somatic dysfunctions, but none highlight addressing the fascial meridians.

**Case:** A 22-year-old female ballet dancer, presented with non-radiating neck pain rated as 8/10 with a secondary complaint of daily foot pain 7/10. Patient suffered MVA in 2019 causing neck pain. A bad landing practicing ballet en-pointe techniques April 2022 initiated the foot pain with daily spasms. Examination revealed tenderness on cervical & upper back paraspinals. Patient had L foot hypertonic knot of Henry, compressed by an IR navicular. Tenderness on 1st metatarsal, and taut plantar fascia were also present. OMM treatment plan focused on treating superficial back line (SBL) meridian with myofascial release and improving tarsal bone movement. A Lower extremity functional scale (LEFS) was obtained retroactively at the 5th session.

**Results:** Over 5 months of treatment, foot spasm frequency decreased from daily to monthly, and neck pain to 0/10. The LEFS showed a 17.5% clinically important difference. As a result, patient's dance endurance improved. This is due to relieving tension upstream, and downstream of SBL meridian for improvement of whole-body functionality.

**Discussion:** Case study suggests a novel way to incorporate OMT into the standard care of treating FHL tendonitis. It demonstrates the impact that a "dropped" navicular bone can have in foot functionality. Case study limitation includes having the patient complete LEFS retroactively after treatment.

*Ravi Shah, OMS III; Caitlin Drakeley, OMS III;*

*Rohit Mehra, DO*

### **Refractory Temporomandibular Joint Pain Resolved with Intraoral Osteopathic Manipulative Treatment**

**Introduction/Background:** The temporomandibular joints (TMJ) are intricate joints comprised of the temporal bone and mandible. These joints, along with the temporalis, masseter, medial and lateral pterygoid muscles play a vital role in smooth mandibular motion. Disorders of these jaw muscles, TMJ, and facial nerves leads to temporomandibular disorders (TMD). Complications include jaw discomfort, headaches, and jaw locking.

**Case:** A 36-year-old female presented with neck pain and left-sided migraine headaches for 15+ years secondary to two major MVAs. The neck pain was constant, aching, with 7/10 intensity. The headaches were persistent, sharp, with 8/10 intensity. Subsequently, she reported suffering from bilateral TMD with pain and jaw-locking worse on the left side. Prior to receiving OMT in April of 2021, the patient visited chiropractors and dentists with minimal relief noted. OMT was directed towards somatic dysfunctions involving the head, TMJ, and cervical spine. Several modalities were utilized, the most effective being intraoral, direct myofascial release, maxillary decompression, counterstrain, OA decompression and cranial osteopathy. An at-home muscle energy technique was demonstrated to strengthen her TMJ.

**Results:** Through 5 OMT visits, the patient reports significant improvement regarding her TMD. Tenderness is minimal on palpation, and she experiences negligible jaw-locking. Upon observation, there is no longer asymmetrical TMJ motion with left-sided deviation. She notices decreased TMJ stiffness and increased ease during chewing. This patient continues to receive OMT for her other complaints, which have markedly improved overall.

**Discussion:** The findings of this case promote the use of intraoral OMT to benefit patients with refractory TMD. Limitations include that this is an invasive technique unable to be tolerated by all individuals. This report suggests further support for the clinical application of cranial and TMJ OMT.

*Kaitlin Unser, OMS III; Sheldon Yao, DO, FAAO*

### **Effects of Osteopathic Manipulative Treatment (OMT) on Functional Impairment in Limb Girdle Muscular Dystrophy Patient: A Case Report (271)**

**Introduction/Background:** Limb Girdle Muscular Dystrophy (LGMD) is a group of disorders characterized by progressive weakness of the proximal limb girdle muscles (1). Clinical features of disease include tiptoe walking, difficulty running and climbing stairs, and joint contractures (1). Treatment of LGMD remains supportive (2). Physiotherapy has been recommended to delay joint deformities and promote walking (2). OMT can be effective in addressing structural and musculoskeletal dysfunctions of Duchenne Muscular Dystrophy (3); this case demonstrates the positive effects of OMT in a case of LGMD.

**Case:** An 8-year-old female with LGMD presents with tiptoe walking, bilateral lower extremity (LE) hypertonicity, and bilateral LE pain. Patient has attempted passive stretching and antiinflammatory diet with minimal relief. On physical examination, 4/5 strength is present bilaterally in hip flexion/extension, knee flexion/extension, ankle plantarflexion and dorsiflexion. Decreased range of motion (ROM) in dorsiflexion and hip flexion bilaterally was noted. Myofascial release (MFR), muscle energy technique (MET), and facilitated positional release (FPR) was utilized to treat somatic dysfunctions (SD) of the lumbar spine, pelvis, sacrum, and lower extremities.

**Results:** Immediately post-treatment, pain levels decreased from a 7/10 pre-treatment to a 3/10 post-treatment when walking. MET significantly improved dorsiflexion and hip flexion ROM. Over a one-month course of receiving OMT weekly, patient reported the ability to climb 1 additional flight of stairs and walk 2-3 additional blocks without fatigue. Patient also reported decreased reliance on crawl method to climb stairs.

**Discussion:** This case demonstrated improvement in functional impairment in a LGMD patient after OMT. Limitations of this study include subjective measurements of improvement in pain and daily function. In all, further research is required to understand the effect of OMT on LGMD.

*Erik VanFossen, OMS IV; Manasa Kanithi; Savannah Jelneck; Derrica Ferguson; Jarvis Tran; Nina Bui; Dalia Hassan; Travis Gordon, DO, MPH*

### **Osteopathic Manipulative Medicine as an Adjuvant Treatment for Hemicrania Continua: A Case Study**

**Introduction/Background:** Hemicrania continua (HC) is a continuous, unilateral, and highly debilitating

headache responding exclusively to Indomethacin. Dose-dependent adverse effects of Indomethacin are common and increase the burden of disease. Our case study explores the use of osteopathic manipulative medicine (OMM) to improve HC symptoms and reduce pharmacologic dependence.

**Case:** A 35-year-old Canadian woman presents with a nine-year history of HC. She reports a history of a broadside motor vehicle accident at age 16 initiating migraine-like headaches, then progressing to constant, unilateral headaches after a near-drowning incident at age 26. Indomethacin was trialed and provided relief, confirming diagnosis of HC.

The patient received a total of 12 OMM treatments over 3 months. Her most significant key lesions included: right parietal bone internally rotated, left occipitomas-toid suture restriction, bilateral temporal and parietal lobe restrictions, bilateral 12th ribs exhalation dysfunction, left epigastric trauma point, left on right posterior torsion, and left ovarian restriction. The patient experienced multiple, significant emotional releases during this process.

**Results:** The patient began to show marked improvement after the third treatment, including improved pain, less fatigue, elimination of pain triggers, and improved quality of life. Furthermore, she was able to decrease her Indomethacin intake. By the end of the last treatment, she claimed that this was the best she had felt in the last 10 years of her life and rediscovered a “will to live”.

**Discussion:** The patient’s HC improved significantly with OMM, reducing burden of disease, need for pharmacologic assistance and potential for adverse effects. Most importantly, in the final treatment, the patient confessed to having considered physician-assisted suicide, given her many years of minimal quality of life. OMM helped give this patient’s life back to her.

## EDUCATION AND PUBLIC HEALTH

*Lauren Hartwell, OMS IV; Laura Rudberg-Post, OMS IV; Olivia Matz, OMS IV, MSA; Hannah Gustafson, OMS IV, MSA, MSBS; Ariel Gubatina Jr., MS; Jose Figueroa, DO, FAOCPRM, FAAPMR*

### **Iliolumbar Ligament Dissection with Motion Testing Emphasizing Osteopathic Relevance**

**Introduction/Background:** The iliolumbar ligament

contacts the lumbar, iliac, and sacral regions. This ligament stabilizes and restricts movement of the lumbo-sacral junction, as well as protects the L4 and L5 discs from degeneration. When experiencing postural stress, this ligament is one of the first to become tender. Pain referral patterns are to the anterior groin, lateral hip, and low back. During common procedures such as sacroiliac (SI) fusions or laminectomies, the iliolumbar ligament is intentionally ligated potentially leading to sacral instability, disc degeneration, and pain. Through an osteopathic lens, we hypothesize that the structural and functional implications of ligating the iliolumbar ligament can be demonstrated using a cadaveric dissection.

**Methods:** With the cadaver prone, we isolated and removed the musculature surrounding the sacrum to isolate the iliolumbar ligament. Anterior pressure was applied to the sacrum while the ligaments remained intact. One of the ligaments was fully ligated in order to emulate surgical ligation. The same anterior pressure was applied a second time and palpated. To complete the dissection, the second ligament was ligated, and motion palpated. All motion testing was filmed for comparison.

**Results:** After the initial iliolumbar ligament was ligated, increased sacral motion was appreciated via palpation. Following the second ligation, further laxity was manually appreciated.

**Discussion/Conclusion:** The finding of increased sacral motion suggests that sacral instability is a potential consequence of damage to the iliolumbar ligament. Increased awareness of the repercussions of surgical ligation or postural strain will be beneficial to surgeons and providers during patient care. Limitations to this study include lack of variability in human anatomy due to dissection of one cadaver, tissue stiffness resulting from the preservation technique, and use of a single dissection technique.

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### **Assessing Differences in Palpation Pressure between Osteopathic Medical Students and Osteopathic Physicians**

**Introduction/Background:** Osteopathic medical students are trained extensively in palpatory skills. There are



limited studies on the difference in palpation pressure between Osteopathic Medical Students (OMS) and Osteopathic Physicians (OP) during the diagnosis of somatic dysfunctions.

**Objective:** Quantify the amount of pressure exerted when diagnosing thoracic somatic dysfunctions and elucidate any difference in pressure between OMS and OP.

**Methods:** OMS and OP were randomly recruited to diagnose a thoracic somatic dysfunction in the same standardized patient in a seated position. Tekscan FlexiForce Sensors were attached to cotton gloves with the sensing area on the tip of the finger. Participants first palpated the spine without the glove to elicit a diagnosis and then repeated the diagnosis while wearing the gloves to measure the force utilized. Participants first diagnosed the rotational component, then the side-bending component, and finally the flexion/ extension component.

**Results:** Twelve OMS (six first-year students and six second-year students) and eight OP participated. There was no statistically significant difference between the palpation force used by medical students versus physicians. The mean pressure used when diagnosing the rotation portion (6.15 PSI L; 5.84 PSI R) was greater than side-bending pressure (3.36 PSI L; 3.54 PSI R) and flexion/ extension (4.46 PSI L; 4.16 PSI R) pressure for all participants. ANOVA test showed a statistical difference between the three groups for both hands (Left-hand P-value = 0.0013) (Right-hand P-value = 0.0089).

**Discussion/Conclusion:** It was observed that when diagnosing the thoracic spine, there was no identifiable difference in pressure used by physicians and medical students; however, there was a significant difference when diagnosing the rotation portion compared to side-bending and flexion/ extension. Limitations of this study include a small sample size.

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**International Overview of Osteopathic Manipulative Treatment in Infants with Nonsynostotic Plagiocephaly: A Scoping Review to Aid in the Inclusion of OMT into the Current**

## Evidence-Based Treatment Guidelines

**Introduction/Background:** Nonsynostotic Plagiocephaly (NSP) affects 20-50% of infants by six months old. Pathogenesis varies but current evidence-based treatment guidelines from the American Association of Neurological Surgeons (AANS), published in 2016, recommend conservative treatment and observation for mild to moderate NSP. There are currently no evidence-based guidelines recommending osteopathic manipulative treatment (OMT) for NSP.

**Objective:** Focused literature review of OMT in NSP examining the inclusion of OMT into the treatment guidelines for mild to moderate NSP.

**Methods:** MeSH headings/keywords relevant to the objective of this review were queried using PubMed, ScienceDirect, Google Scholar, and EBSCOhost. The risk of bias was assessed using the Downs and Black Scale and Cochrane Collaboration tool. Abstracts were reviewed, and studies meeting the inclusion criteria were selected for evaluation.

**Results:** A total of 1242 records were identified, duplicates were removed, and abstracts were screened. Seventy-two articles were assessed for eligibility. Fourteen articles met the inclusion criteria, including four prospective randomized controlled trials (RCTs), one prospective multicenter observational study, six prospective comparative studies, two retrospective observational case-control studies, and one outcome research study. In these studies OMT improved cranial asymmetries diagnosed in the early stages, with no reported adverse reactions.

**Discussion:** Two recent RCTs directly compared OMT with other treatment modalities for NSP; however, earlier studies were more subjective toward OMT. Other limitations include the varying description of OMT, resulting in synonymous terms excluded from the search.

**Conclusion:** Recent publications provide substantial clinical evidence supporting the addition of OMT to treat mild to moderate NSP in infants <8 months old. Additional prospective clinical trials with larger sample sizes are warranted to examine the inclusion of OMT as a treatment option for NSP.

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*Reindel, DO; Holly Waters, DO, MMEL; Rohit Mehra, DO, MPH, MS*

### **Utilization of Osteopathic Structural Examinations by Osteopathic Physicians During A Routine Adult Physical Examination: A Systematic Review**

**Introduction/Background:** Osteopathic Structural Examinations (OSE) should be an integral part of a full body assessment during a routine physical examination. Spinal Alignment, Mobility, Posture and Localizing Effects (SAMPLE) such as tenderness, asymmetry, restriction of motion, tissue texture (TART) changes, Viscero-Somatic Reflexes (VSR), or Chapman's Points (CP) are some constituents of the OSE. To our knowledge, a SAMPLE-OSE has not been previously utilized as part of a holistic approach during routine physical examination.

**Objective:** The primary objective of this study is to evaluate the utilization of OSE in routine physical examination by osteopathic physicians and determine the techniques used, areas examined, and specific SAMPLE-OSE constituents assessed.

**Methods:** A systematic review was conducted utilizing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) format.

**Results:** 466 articles met the screening criteria, and 27 articles were included in the final analysis. Utilization of OSE appears to be driven more by specific conditions or complaints instead of the traditional, holistic, "patient-as-a-unit" approach. Additionally, assessments appear to be directed to a specific area of concern or complaint, with CP(s) and TART changes assessed more frequently compared to spinal alignment, mobility, posture, and localizing effects such as VSR.

**Conclusion:** There is paucity of literature on the utility of OSE during routine physical examinations. The utilization of OSE in the assessment of somatic dysfunction appears to be more segmental and localized than holistic in approach. There is an apparent need to develop a SAMPLE-OSE incorporating the various tenets of osteopathy. Our study has limitations akin to the systematic reviews. Future studies should develop and incorporate a novel SAMPLE-OSE and test for its feasibility and outcomes.

*Heather Paul, OMS II; Paige Bonner, OMS II; Rohit Mehra, DO, MPH, MS*

### **An Osteopathic Approach to Dysmenorrhea**

**Introduction/Background:** 45-93% of menstruating women experience dysmenorrhea, including abdominal cramping, back pain, and diarrhea. Etiology is attributed to an increase in prostaglandins during menses. Initial treatment, nonsteroidal anti-inflammatory drugs (NSAIDs), is ineffective in 18% of patients. Osteopathic manipulative treatment (OMT) is a non-pharmacological treatment with minimal side effects that improves joint function and muscle tension with treatment of viscerosomatic reflexes in T10-L2 caused by dysmenorrhea.

**Objective:** Evaluate the effects of OMT in dysmenorrhea patients.

**Methods:** Conducted a search in CINAHL, MEDLINE, Biomedical reference, and Nursing & Allied Health from inception to June 2022. Three independent reviewers assessed randomized controlled trials (RCTs), Controlled Before/After, and case studies. Editorial/opinion articles were excluded. P values were reported.

**Results:** 10 studies (n = 299) demonstrated a decrease in back and menstrual pain intensity and duration. The control groups of four RCTs were sham manipulation, rest, or NSAIDs. All four RCTs reported statistically significant decreases in pain intensity in the treatment group with p values of  $p < 0.5$ ,  $p < 0.005$ ,  $p = 0.004$ ,  $p = 0.024$ . Only 12 articles resulted from the initial search, demonstrating a lack of research.

**Discussion/Conclusion:** Numerous positive effects were found, including a reduction in pain duration, pain intensity, and analgesic use. However, the low number of studies supports the need for further investigations. Dysmenorrhea patients could benefit from an RCT targeting spinal facilitation and viscerosomatic reflexes. Non-MSK focused OMT has mostly anecdotal evidence for treating conditions such as migraine, GERD, and anxiety. OMT helps when traditional standards of care have failed. Non-MSK focused OMT research represents a relatively untouched field that can have a profound and positive global impact, particularly in areas with poor income/healthcare access.

*Laura Rudberg-Post, OMS IV; Olivia Matz, OMS IV, MSA; Hannah Gustafson, OMS IV, MSA, MSBS; Donald Matz, PhD*

### **Superficial Approach to the Sphenopalatine (Pterygopalatine) Ganglion**

**Introduction/Background:** The sphenopalatine (pterygopalatine) ganglion is the most superficial ganglia to manipulate from the oral cavity. It has parasympathetic and sensory fibers directly affecting the paranasal sinuses and can be manipulated by providers using manual osteopathic techniques to relieve congestion associated with sinusitis, allergies, and upper respiratory infections. In the documented ganglia release technique, the physician inserts their fifth digit into the oral cavity to locate the ganglia, which is not able to be directly visualized due to its location. Using anatomic dissection, the provider can further appreciate the orientation and depth of this ganglion. The most efficient dissection of this ganglion is bisecting the head and pursuing a deep to superficial approach, which challenges the understanding of its osteopathic relevance. Our hypothesis is that this superficial dissection approach can help providers better appreciate the osteopathic relevance of this ganglion's location.

**Methods:** To accomplish this dissection, we first identified each terminal branch of the trigeminal cranial nerve

(CN V), then specifically targeted the maxillary branch (CN V2) as it travels deep into the face. To follow this nerve, we then removed the eyeball, portions of the inferior orbit, and zygomatic arch while keeping the nerve intact.

**Results:** By following CN V2 deep into the face, we were able to identify the sphenopalatine ganglion superficially to deep as it branched inferiorly.

**Discussion/Conclusion:** This dissection approach allowed for a more thorough understanding of the sphenopalatine ganglion's location in a manner highlighting its osteopathic relevance. Limitations include a lack of variability in human anatomy due to dissection of one cadaver and using a single dissection technique.

## **ORIGINAL RESEARCH**

*Nicole Companion, OMS III; Anoushka Guha, OMS I; Abeer Naeem, OMS II; Reem Abu-Sbaih, DO; Jordan Keys, DO; Sheldon Yao, DO, FAAO*

### **Comparison of Tone and Stiffness Changes to Lumbar Paraspinal Muscle with Varying Osteopathic Treatment Modalities (254)**

**Introduction/Background:** Osteopathic manipulative treatment (OMT) has been proven effective to treat chronic lower back pain (CLBP) and significantly reduce pain.<sup>1</sup> High-velocity low amplitude (HVLA) technique has been shown to be effective in CLBP reduction<sup>2</sup>; however, there are limited studies comparing efficacy of other OMT techniques.

**Objective:** To investigate the effects of different OMT techniques on lumbar muscle stiffness and tone.

**Methods:** Subjects were treated with 6 OMT sessions over 3 weeks. Three NMM/OMM board-certified osteopathic physicians diagnosed and treated lumbar somatic dysfunctions with OMT techniques of their choice. Tone and stiffness were measured bilaterally at L1 and L3 levels of paraspinal muscle via the MyotonPro, pre and post-OMT.

**Results:** MyotonPRO data was analyzed from 7 healthy female subjects, 168 unique measurements, using paired t-tests with SPSS statistical software. Group 1 was treated with HVLA only (n=52), group 2 was treated with articulatory only (n=80), and group 3 was treated with mixed treatments (i.e. soft tissue, muscle energy) excluding HVLA (n=36). The average tone ( $13.43 \pm 1.57$  Hz)



significantly decreased after HVLA ( $12.83 \pm 1.05$  Hz)  $p < 0.001$ . The average stiffness significantly decreased after HVLA was performed ( $220.96 \pm 64.8$  N/m) to ( $194.88 \pm 54.96$  N/m),  $p < 0.001$ . Tone and stiffness for groups 2 and 3 decreased, but none were statistically significant.

**Conclusion:** HVLA proved most effective in objectively reducing lumbar paraspinal tone and stiffness compared to articulatory and mixed methods of OMT. Limitations include small sample size and varying physician treatment styles. Further research is needed to determine the efficacy of various OMT techniques addressing muscle hypertonicity and CLBP.

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### **Osteopathic Manipulative Treatment Reduces Pain and Improves Range of Motion in Patients with Chronic Neck Pain**

**Introduction/Background:** Chronic neck pain is characterized by hyperalgesia of the skin, ligaments, and muscles; making it difficult to treat. Counterstrain techniques minimize the pain experienced during treatment, however, studies demonstrating counterstrain efficacy in this population are limited.

**Hypothesis:** Counterstrain will reduce neck pain intensity, tenderpoint burden, and improve cervical range of motion (ROM) acutely and after three OMT sessions.

**Methods:** IRB approval was obtained (MWU#22010) and four subjects with chronic neck pain completed the single subject design study. Cervical ROM and tenderpoint burden were assessed. Subjects received OMT using counterstrain 1x/wk for 3 weeks with measures

obtained on 2 baseline sessions, after the first treatment, and 2 days and 1 week after the last treatment. Neck Disability Index and neck pain were measured at baseline and the last day. Data analysis was a mixed effects model for each dependent variable (pain, tenderpoint burden, ROM).

**Results:** Tenderpoint burden was reduced acutely from  $94.0 \pm 16.8$  total tenderpoint summation to  $31.5 \pm 10.8$  ( $p = 0.125$ ); and 2 days after the last OMT session  $51.5 \pm 18.8$  ( $p = 0.125$ ). Reductions remained durable 1 week after treatment  $49.3 \pm 19.6$  ( $p = 0.125$ ). ROM was improved at all time points following OMT across all motion directions ( $p = 0.039$ ). Subjective disability improved by an average of 6 points; neck pain was reduced by an average of 1 point which did not exceed the minimally clinically important difference.

**Conclusion:** OMT counterstrain was effective in improving tenderpoint burden, cervical ROM, and perceived disability in individuals with chronic neck pain. A limitation was low sample size. Future studies could incorporate ultrasound measures to provide additional quantitative assessments for OMT efficacy and mechanisms of response.

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### **Effect of Objective Training Programs on Symmetry and Accuracy of Passive Motion Force Application**

**Introduction/Background:** Applying force along the spine (passive testing) is commonly used to evaluate segmental vertebral motion. When performing this testing, it is rational that both hands apply equal or very similar forces to accurately perceive motion/displacement for determining somatic dysfunction.

**Objective:** The purpose of this study was to evaluate two training programs on participants' ability to learn to apply symmetric forces when testing segmental motion.

**Methods:** The local IRB approved this study. Twenty participants, divided into 2 training groups, practiced passive motion testing using Novel Loadpad force sensors and an IOS application.

Training modules asked participants to apply symmetric vertical forces with their thumbs at specific target forces. The app displayed real-time force measurements with

visual/auditory feedback when forces were within 10% of the target. Group A practiced 1 hr/week for 8 weeks. Group B practiced 1 hr/day for 10 days. Each group performed baseline and final assessments of sustained single hand forces and alternating forces between hands at 10, 20, and 30N. Symmetry was calculated as percent difference between hands (DH%) and accuracy as percent difference from target (DT%).

**Results:** DH% decreased for Group A (-7.2%,  $p=0.29$ ) and Group B (-9.4%,  $p=0.002$ ) to 14.7% and 15.4% respectively. DT% decreased from baseline to final for both Group A (-20.860%,  $p=0.003$ ) and Group B (-27.6%,  $p<0.001$ ). No interaction was found between group training programs and improvement over time ( $p=0.617$ ).

**Conclusions:** Objective feedback training increased symmetry and accuracy of force application for segmental motion testing, however, there was no difference between training programs. This study was limited by small sample size.

*Bethany Harting, OMS III; Sarah Fox, OMS III; Thomas Motyka, DO; Amy Hinkelman, PhD*

### **Investigating the mechanism of dextrose prolotherapy in vitro: fibroblast proliferation and production of growth factors**

**Introduction/Background:** Dextrose prolotherapy injections represent a promising treatment option for patients with osteoarthritis. However, the mechanism and optimal concentration of dextrose prolotherapy is not well understood.

**Objective:** Therefore, we investigated how the response of dextrose-exposed fibroblasts impacts other cells that were not exposed to dextrose, and what factors they secreted. We hypothesize that hypertonic solutions of 10-25% dextrose will incite an initial inflammatory response followed by the production of growth factors and enhanced fibroblast proliferation.

**Methods:** We exposed MRC-5 fibroblasts to dextrose concentrations (5-25%) and a media control for 15 minutes-2 hours, removed the supernatant fluid, and then added fresh media (without dextrose) for 8 hours to collect any secreted factors in response to treatment. After 8 hours, the media from the dextrose-treated fibroblasts was transferred to nascent MRC-5 fibroblasts (not exposed to dextrose) for 48 hours. Then cell viability was

quantified using an XTT assay and analyzed using ANOVA. Additionally, we used the supernatant fluid collected 8 hours post-treatment to run ELISAs for BMP-12/GDF-7 and CXCL12/SDF-1.

**Results:** Supernatant fluid from fibroblasts treated with 5-20% dextrose concentrations have a positive impact on cell viability of nascent fibroblasts (not directly exposed to dextrose). Production of BMP-12 and CXCL-12 increases with higher concentrations of dextrose (<1 hour of exposure) but decreases with longer exposure (>1 hour).

**Discussion/Conclusion:** These preliminary results support the hypothesis that dextrose prolotherapy initially stimulates the production of growth factors and cellular proliferation. As this is an in vitro study using fibroblasts, further research using other cell and animal models are needed to better understand the mechanism by which prolotherapy may improve function and reduce pain in osteoarthritis.

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### **Investigating Fryette Mechanics in CT Scans**

**Introduction/Background:** Fryette mechanics is an integral part of osteopathic practice, adopted in many guiding branches of study as an accepted scientific principle of coupled spinal movement. Its validity has long been contested in practice, highlighting the need for continued experimentation. This research combines innovative advances in technology with the concept of Fryette mechanics, to test its efficacy in predicting spinal movements.

**Objective:** To investigate the presence of coupled spinal movements as described in Fryette mechanics by extracting three-dimensional symmetry planes from diagnostic computed tomography scans of thoracic and lumbar vertebrae.

**Methods:** 953 thoracic and lumbar vertebrae were extracted from three-dimensional models, obtained from 82 computed tomography scans within the VERSE'20 open-source dataset. A stepwise algorithm was used for each vertebra to generate three planes of unique symmetry, which provided three-dimensional angular orientation with respect to the vertebral level below. Data was analyzed to determine quantitative coupled motion,

comparing observed spinal movements against expected coupled spinal movements in line with Fryette mechanics.

**Results:** 531 of 953 extracted vertebrae were analyzed; the remaining were omitted secondary to pathology or incongruent symmetry plane analysis. 302 vertebral levels demonstrated coupled physiologic spinal motion consistent with both Type I (166) and Type II (136) Fryette Mechanics.

**Discussion/Conclusion:** The presence of Type I and Type II Fryette mechanics was appreciated in 56.9% of vertebral levels. Although technological advancements allowed the novel application of open-sourced diagnostic imaging to be applied to historically evolving guiding osteopathic principles, they demonstrated the complexity of physiologic spinal motion as influenced by pathology, imaging metrics, and statistical significance. This research highlights the need to further explore osteopathic practice and the philosophy of science, reflecting the union of modern imaging advances with osteopathic theories.

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### **Effects of OMT on Running Performance and Recovery**

**Introduction/Background:** Studies have shown that coaches notice improvement in their athletes' performance following Osteopathic Manipulative Treatment (OMT). However, objective evaluation of individual performance following OMT is not well documented. Our hypothesis is that following OMT, runners will appreciate significant improvement in their running performance and perceived recovery. The OMT used in this study follows the respiratory-circulatory model, which focuses on maximizing blood flow to and from targeted tissues to optimize function.

**Methods:** Following consent and neurologic exam, eleven adult runners from a 10K training program participated in the study for six consecutive weeks. Each week, pre-run full body treatments based on the respiratory circulatory model were performed. Participants completed a baseline timed one mile run and validated RESTQ survey. After the initial visit, participants received OMT weekly for five weeks before their run, with a final appointment to repeat a timed mile, RESTQ survey, and

subjective survey. A paired t-test was used to validate the results with a p value of 0.05.

**Results:** Out of the eleven participants, 91% felt an improvement in their running performance and 54.5% of participants felt a decreased recovery time. Faster one mile run time was noted with an average decrease from 10.25 minutes to 9.73 minutes ( $p=4.0e-6$ ) and there was an overall decrease in sports stress ( $p=.004$ ) using the RESTQ survey with emphasis on decreased muscle aches and decreased stiffness during performance.

**Discussion/Conclusion:** This study finds that utilizing OMT through the respiratory circulatory model should be considered in athletes to objectively aid performance and subjectively improve recovery. Some limitations of this study include a small sample size and variability in number of treatments received (36% received less than 4 treatments).

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### **The Effect of OMT on Insulin Sensitivity and Glucose Control in Rodent Models: A Pilot Study**

**Introduction/Background:** Previous reports suggest primary areas for blood glucose homeostasis include the autonomic nervous system, thoracolumbar diaphragm, abdominal lymphatic system, pancreas, liver, and adrenal glands.

**Objective:** This proof-of-concept study demonstrates the feasibility of performing osteopathic manipulative treatment (OMT) on adult rats.

**Methods:** Two groups of male rats were used. One group was fed a normal chow diet, whereas the other was fed a high-fat diet to induce obesity and insulin resistance. The high-fat diet rats were weighed every two weeks and blood glucose measurements began one month after starting the high-fat diet. In the pilot, rats fed with chow diet were anesthetized daily with isoflurane followed by OMT (rib raising and thoracolumbar diaphragm, celiac ganglia, suboccipital, and thoracic outlet release). Glucose was measured using a glucometer on blood from the tail immediately pre-OMT, 5 minutes post-OMT, and 15 minutes post-OMT. Sham control rats were anesthetized in parallel and received light touch.

**Results:** The rats were able to be anesthetized and OMT, sequential blood glucose drawings, and weighing could



be performed. The practitioner palpated somatic dysfunctions, indicating OMT will be possible in these animals. OMT does not acutely alter blood glucose levels in male rats fed with normal chow diet; however, blood glucose was altered, possibly from the isoflurane gas, which will be considered in the next phase.

**Conclusions and Discussion:** This study demonstrates great promise in being able to study the efficacy of OMT in rats. The team will continue to assess both acute and long-term effects of OMT on insulin sensitivity and glucose homeostasis in normal and obese rats. Study limitations included rodent sex. Future studies will use both males and females to account for size and temperament differences accompanying sex.

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### **Effect of Occipito-Atlantal Decompression, Transcutaneous Auricular Vagus Nerve Stimulation, and the Splenic Pump on Circulatory Immune Cell Numbers**

**Introduction/Background:** Occipito-atlantal decompression (OA-D) and transcutaneous auricular vagus nerve stimulation (taVNS) may activate the cholinergic anti-inflammatory pathway through parasympathetic activation. The splenic pump may augment this effect on immune function.

**Objective:** The objective is to evaluate the effects of OA-D or taVNS combined with the splenic pump on circulatory immune cell numbers.

**Methods:** Subjects (n=34), healthy adults of both genders, met inclusion criteria. OA-D or taVNS was performed on three consecutive days followed by either the splenic pump or a sham intervention. Blood was drawn on the third day. OA-D (fingers placed at the level of the OA, applying 5 N for 10 minutes), taVNS (current of 2 mA, 10 Hz, 300  $\mu$ s pulse width applied via a bipolar clip electrode attached the ear for 10 minutes), splenic pump technique (rhythmic pumping of the left upper abdomen at 2-4 mmHg and 30 compressions/minute for 10 minutes) were performed.

Leukocytes were detected using fluorescence-labeled

antibodies, analyzed using multiple linear regression analysis with the R Statistical Platform. Dependent variables: relative percentage of total immune cells. Independent variables: body mass index (BMI) and whether OA-D, taVNS, or the splenic pump had been performed. Independent parameters: significant at  $P < 0.05$ , trends at  $P < 0.15$ .

**Results:** B-cells were reduced by the splenic pump (-0.21,  $P < 0.15$ ). Splenic pump increased monocytes (+0.51,  $P < 0.15$ ), OA-D decreased monocytes (-0.74,  $P < 0.15$ ). Splenic pump decreased NK cells (-0.71,  $P < 0.05$ ).

**Discussion/Conclusion:** OA-D decreased monocytes which was offset by the splenic pump. The splenic pump markedly reduced NK cells and mobilized monocytes from the spleen. This suggests translocation into the systemic circulation, with an exchange of immune cells between the spleen and the blood. Study limit: we cannot determine where cells are being translocated.

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### **Releasing the Restriction: A Study of Myofascial Release to Improve Pain and Range of Motion in Post-Cesarean Section Patients in the Peruvian Amazon**

**Introduction/Background:** The rate of delivery by cesarean section (CS) is globally on the rise at roughly 20%. Peru follows this upward trend at 27%, far from the WHO-recommended 10-15%. As health professionals traveling to and serving in this country, it is important to understand the potential sequelae of CS and how to treat them.

**Objective:** This quasi experimental design, before-after study seeks to determine the effectiveness of myofascial release to improve low back pain (LBP), incision site pain, scar mobility and lumbar range of motion (ROM) in Peruvian women with a history of CS. We hypothesize that myofascial release will, indeed, improve these 4 parameters.

**Methods:** Study participants included 33 Peruvian women from the city of Iquitos, Peru who were seen by MSUCOM during their annual medical outreach trip. Participants were required to be 18 years or older, have a history of one or more CS, and have LBP beginning after CS. After initial measurements, patients underwent 5 minutes of myofascial release to SC incision site. Pain

changes in low back and incision site were assessed with 1-10 pain scale. Lumbar ROM changes were assessed by iPhone goniometer application. Scar mobility changes were assessed by use of adherometer.

**Results:** This study showed a statistically significant improvement in LBP, incision site pain, scar mobility, and in lumbar flexion ROM ( $<.001$ ). Only lumbar extension at T12 and S1 improved non-significantly (.245 and

.283, respectively). No adverse events were observed.

**Discussion/Conclusion:** This study provides statistically significant data supporting the use of myofascial release as a means of treating post-CS LBP and related sequelae. This is likely related to anatomic relationships between the abdomen and lumbar spine. More research is needed to further elucidate these results. ■