

The Somatic Connection

“The Somatic Connection” highlights and summarizes important contributions to the growing body of literature on the musculoskeletal system’s role in health and disease. This section of *The Journal of the American Osteopathic Association (JAOA)* strives to chronicle the significant increase in published research on manipulative methods and treatments in the United States and the renewed interest in manual medicine internationally, especially in Europe.

To submit scientific reports for possible inclusion in “The Somatic Connection,” readers are encouraged to contact *JAOA* Associate Editor Michael A. Seffinger, DO (mseffingerdo@osteopathic.org), or *JAOA* Editorial Advisory Board Member Hollis H. King, DO, PhD (hollis.king@famned.wisc.edu).

Manual Therapy Shown to Be Effective for Tension-Type Headache

Espí-López GV, Gómez-Conesa A, Gómez AA, Martínez JB, Pascual-Vaca AO, Blanco CR. Treatment of tension-type headache with articulatory and suboccipital soft tissue therapy: a double-blind, randomized, placebo-controlled clinical trial [published online January 27, 2014]. *J Bodyw Mov Ther*. 2014. doi:10.1016/j.jbmt.2014.01.001.

Tension-type headache is commonly encountered in primary health care settings. The application of osteopathic manipulative treatment (OMT) in the care of patients with head pain has been discussed^{1,2} but, to my knowledge, no randomized controlled trials have been conducted on the use of OMT for these patients. A recent study by Spanish physiotherapists Espí-López et al assessed the effectiveness of manual techniques in the treatment of patients with tension-type headache. This study was selected for review because it was well designed and used manual techniques similar to those taught and used by osteopathic physicians.

Eighty-four patients diagnosed with tension-type headache were randomly assigned to 1 of 4 groups: (1) suboccipital soft tissue inhibition (SI),

(2) occiput-atlas-axis (OAA), (3) combined SI and OAA, or (4) placebo. For the SI therapy, a physiotherapist placed his or her hands in contact with the patient’s suboccipital muscles in the area of the posterior arch of the atlas and applied steady pressure to release muscle spasm. For the OAA therapy, a physiotherapist administered global manipulation bilaterally, first performing cephalic decompression and then small circumductions on a vertical axis through the odontoid process of the axis. Patients in the placebo group received no treatment and rested in the supine position for 10 minutes. Patients in all groups participated in 4 weekly intervention sessions. Before each session, all patients underwent the vertebral artery challenge test.

The outcome measures were based on results of the Headache Impact Test-6; the Headache Disability Inventory; headache pain intensity, which was rated daily by patients on a 0- to 10-point visual analog scale; and craniocervical range of motion, which was measured with a standardized physiotherapy device. All outcome measures were collected at baseline, at the conclusion of the 4 weekly intervention sessions, and at an 8-week follow-up visit.

At the end of the 4 intervention sessions, statistically significant results were found for the SI, OAA,

and combined intervention groups compared with the placebo group on almost all of the outcome measures. Improvements were maintained at the 8-week follow-up evaluation. The authors hypothesized that the combined SI and OAA intervention would be more effective than each intervention separately. However, the OAA intervention was as effective as the combined intervention and more effective than SI alone.

In my opinion, this study needs to be replicated by osteopathic physicians. Such a study would contribute substantially to the evidence base of cervical spine OMT efficacy and safety. (doi:10.7556/jaoa.2014.080)

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OMT Improves Acute Hemodynamic Control in Pregnancy by Means of Improved Venous Return

Hensel KL, Pacchia CF, Smith ML. Acute improvement in hemodynamic control after osteopathic manipulative treatment in the third trimester of pregnancy [published online August 30, 2013]. *Complement Ther Med*. 2013;21(6):618-626. doi:10.1016/j.ctim.2013.08.008

For over a century, osteopathic physicians have been treating patients with pregnancy-related symptoms using osteopathic manipulative treatment (OMT).¹ In an effort to better understand the effectiveness of OMT in these patients, much research has been conducted in this field. More recently, King et al² reported that prenatal OMT has an impact on the

occurrence of meconium-stained amniotic fluid and preterm delivery, and Licciardone et al^{3,4} found that OMT helps to prevent progressive back-specific dysfunction that typically arises during the third trimester of pregnancy. Related to this research, a recent study by Hensel et al revealed that OMT has an influence on hemodynamic stability and the cardiovascular changes that occur during pregnancy.

Participants of the PROMOTE study (an unpublished clinical trial involving OMT and low back pain in pregnancy) were enrolled in the substudy of Hensel et al if they were between the ages of 18 and 34 years, in the 30th week of pregnancy, and did not satisfy any of the exclusion criteria, including history of syncopal episodes, abruptio placenta, placenta previa, pre-eclampsia, eclampsia, pregnancy-induced hypertension, vaginal bleeding, gestational diabetes, and current injury to the lower extremity. The participants were randomly assigned to 1 of 3 treatment groups: OMT, including standardized soft tissue, articular, myofascial release, and muscle energy techniques to the head, neck, abdominal diaphragm, back, pelvis, and pelvic diaphragm (n=25); placebo ultrasound (n=31); or time control (n=34). Baseline measurements were taken, including heart rate, mean arterial pressure, and heart rate variability, followed by a second set of measurements taken after a 5-minute period of head-up tilt or a 4-minute period of heel raises. After a 20-minute treatment period, the same measurements were taken again.

The study revealed no significant changes between groups during the 5-minute head-up tilt period when comparing pretreatment and posttreatment measurements of all 3 variables ($P>.36$). However, when comparing the OMT group to the placebo ultrasound and time control groups during the 4-minute heel raise periods before and after treatment, the authors found a significant increase in mean arterial pressure ($P=.02$) and a significant decrease in heart rate ($P<.01$), indicating enhanced hemodynamic stability. The authors concluded that this impact is not a representation of a direct action on the autonomic nervous system, but rather a manifestation of improved venous return caused

by OMT's removal of structural restrictions and somatic dysfunctions. Therefore, the OMT protocol used in this study may be beneficial in improving venous return in pregnant patients. (doi:10.7556/jaoa.2014.077)

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Several Manual Therapies Proven Beneficial for Patients With Chronic Neck Pain

Pérez HI, Perez JLA, Martínez AG, et al. Is one better than another? a randomized clinical trial of manual therapy for patients with chronic neck pain [published online January 11, 2014]. *Man Ther.* doi:10.1016/j.math.2013.12.002.

Chronic neck pain is a common problem found in patients of all ages at ambulatory primary care clinics. Osteopathic physicians employ a wide range of osteopathic manipulative treatment techniques to address somatic dysfunction associated with chronic neck pain. Often, multiple techniques are

used during 1 treatment session. It is rare to find a research investigation that compares the efficacy of 1 manual therapy procedure with that of another.

In a double-blind, randomized clinical trial, researchers in Madrid, Spain, assessed the effectiveness of 3 manual therapy techniques—high-velocity, low-amplitude; mobilization; and sustained natural apophyseal glide—on otherwise healthy patients with mechanically reproducible, nonradicular, chronic neck pain of greater than 12 weeks duration. Participants were randomly assigned to 1 of the 3 treatment groups. All treatments were performed by a physiotherapist with more than 10 years of clinical experience. For mobilization, the physiotherapist applied an oscillatory (2 Hz) posterior-anterior pressure on the patient's restricted hypomobile facet joint for 2 minutes and repeated the movement 3 times, with a 1-minute refractory period between applications. For sustained natural apophyseal glide, the physiotherapist facilitated active motion of the patient's cervical joint into the restrictive and painful barrier through contact on the dysfunctional vertebra's transverse process, resisting it when returning to neutral. This procedure was repeated 10 times in 3 sets. Each patient received a total of 4 treatment sessions over 2 weeks. Standard outcome measures compared the immediate and short-term effectiveness of the 3 maneuvers in terms of pain, disability, mobility, and the global rating of change scale at baseline. Measures were taken at the end of treatment and 1, 2, and 3 months after treatment.

Sixty-one patients from local primary care physicians' offices were enrolled in the study. Dropouts occurred in each group, but the 51 patients (35 women, 26 men; mean [standard deviation] age, 36.5 [9.4] years) that completed the study met the prestudy power analysis sample size requirements to detect significant differences in pain scores between groups (0.86-cm difference on a visual analog scale). Participants in all groups showed improvement in all measures, as well as in satisfaction. There were no adverse events reported with any intervention. Although there was more improvement in cervical extension in the high-velocity,

low-amplitude group, there was no long-term (ie, 3-month) difference between the groups for pain, disability, and other cervical ranges of motion. The authors concluded that all 3 manual techniques are effective for chronic neck pain management and recommended that further studies be conducted to investigate whether more sessions, longer follow-up, and combinations of different techniques have different effects. (doi:10.7556/jaoa.2014.078)

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How Much of Your Low Back Pain Is Really in Your Head?

Bialosky JE, George SZ, Horn ME, Price DD, Staud R, Robinson ME. Spinal manipulative therapy-specific changes in pain sensitivity in individuals with low back pain [published online October 27, 2013]. *J Pain*. 2014;15(2):136-148. doi:10.1016/j.jpain.2013.10.005.

Probably the most noted mind-body physician whose treatment for patients with low back pain is solely based on psychological interventions is John E. Sarno, MD.^{1,2} Sarno's treatment is a form of psychotherapy that requires the patient to confront any emotional issues associated with the pain. It is reported that patients who successfully complete his program become and remain pain free. The mind-body connection is also an important aspect of osteopathic medicine; the first tenet of osteopathic medical philosophy is, "The body is a unit; the person is a unity of body, mind, and spirit."³

A phenomenon closely related to the mind-body connection is the *placebo effect*. Researchers in the Department of Physical Therapy at the University of Florida have made strides toward understanding how the placebo effect may affect pain sensitivity.

A total of 110 participants were recruited by means of advertisement. Participants were included in the study if they were experiencing low back pain with worse pain in the previous 24 hours rated as

4 or greater on a 0- to 10-point scale. Participants were randomly assigned to receive standard spinal manipulative therapy (SMT), placebo SMT, enhanced placebo SMT, or no treatment. In the SMT group, participants received a low back manipulation similar to the osteopathic manipulative treatment technique *lumbar roll*, which was applied bilaterally while the patient was in the lateral recumbent position. The placebo SMT participants received a maneuver involving a "thrust," which was performed while the patient was supine in a neutral position. This maneuver was believed to have no beneficial effect. The participants in the standard SMT and placebo SMT groups were told that they would receive "either a studied SMT or a placebo intervention." In the enhanced SMT group, the participants received the same placebo maneuver as the placebo SMT participants, but they were told, "The manual therapy technique you will receive has been shown to significantly reduce low back pain in some people." The no-treatment control group sat silently for 5 minutes during the initial session. The standard SMT and placebo SMT interventions were repeated 6 times over a 2-week period.

Outcome measures included mechanical pain sensitivity determined using pressure algometry, a visual analog scale, the Oswestri Disability Index, and thermal pain sensitivity. Immediately after intervention, the standard SMT participants demonstrated a reduction in pain sensitivity on most measures, with statistically significant differences found for thermal pain sensitivity ($P \leq .05$). However, the outstanding finding and the focus of this research was an apparent central sensitization phenomenon, or preclinical effect: Compared with the other groups, the enhanced placebo SMT participants reported statistically significantly greater participant satisfaction.

This study showed that suggestion enhanced perceived benefit of similar procedures and patient satisfaction. In a like manner, greater empathy is associated with positive clinical outcomes and patient satisfaction, and osteopathic medical students have been shown to have more empathy than other medi-

cal students.⁴ I contend from my clinical experience that osteopathic physicians also have high levels of empathy, which manifests in generally better clinical outcomes and constitutes a major element of the osteopathic difference. (doi:10.7556/jaoa.2014.083)

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Mechanical Changes of the Brain During Sleep Clear Metabolites and Provide Key Mechanism for Sutherland's Cranial Respiratory Impulse

Xie L, Kang H, Xu Q, et al. Sleep drives metabolite clearance from the adult brain. *Science*. 2013;342(6156):373-377. doi:10.1126/science.1241224.

Sleep has long been a quandary for scientists, as it is required to sustain regular neurologic functioning yet its homeostatic mechanisms of action on the central nervous system have remained largely a mystery.^{1,2} Lacking a lymphatic system, the human brain was historically thought to secrete waste products via the choroid plexus, with waste products being absorbed by the arachnoid villi. This theory was proven incorrect, however, by the characterization of the glymphatic system.³ Using advanced imaging techniques (discussed previously in “The Somatic Connection”⁴), researchers have elucidated

a key mechanism that is responsible for metabolite clearance from the brain in adult mice. Mechanical changes of the glymphatic system, and more specifically changes to the interstitial space volume (ISV), have been observed during sleep.

Researchers from the Center for Translational Neuromedicine at the University of Rochester Medical Center in New York have furthered the understanding of metabolite clearance from the brain using quantitative in vivo 2-photon imaging and tetramethylammonium (TMA) diffusion changes via iontophoresis. Mice were studied using fluorescent and radiolabeled tracers, TMA, and β -amyloid ($A\beta$) infusion into the subarachnoid cerebral spinal fluid in the cortex during 3 states of wakefulness. Mice were awake, anesthetized, or sleeping; states of wakefulness were quantified by means of electrocorticography and electromyography recordings to monitor brain activity.

The methodologic details and results are too numerous and complex to describe in the present review, but the salient clinical points were (1) a 60% increase in the ISV was measured during sleep states (either induced by anesthesia or naturally occurring), (2) the sleep-wake cycle itself is responsible for ISV changes, and (3) adrenergic signaling largely contributes to the alterations of neuronal activity in the sleep-wake cycle and the interstitial fluid.⁴

Cranial osteopathic manipulative medicine has previously demonstrated alteration of the Baroarterial pulse waves (Traube-Hering-Mayer waves), which are responsible for the influx of cerebrospinal fluid inward along periarterial spaces.⁴⁻⁶ The study by Xie et al demonstrates that different states of wakefulness alter ISV and therefore fluid mechanics within the cranial vault. The phenomena encompassing cranial osteopathic manipulative medicine, as described by William Garner Sutherland, DO, are (1) the inherent motility of the central nervous system, (2) the articular mobility of the cranial bones, (3) the involuntary movement of the sacrum between the ilia, (4) the function of the reciprocal tension membrane, and (5) the fluctuation of the

cerebral spinal fluid. These phenomena may be rooted in the neurologic, anatomic, and physiologic principles of ISV fluctuation, as sleep-wake (adrenergic) cycle fluctuations are typically noted during cranial osteopathic manipulative medicine.^{4,7,8} (doi:10.7556/jaoa.2014.084)

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G.I. Joe: Could Visceral Osteopathy Help Fight the War against IBS?

Attali TV, Bouchoucha M, Benamouzig R. Treatment of refractory irritable bowel syndrome with visceral osteopathy: short-term and long-term results of a randomized trial. *J Dig Dis*. 2013;14(12):654-661. doi:10.1111/1751-2980.12098.

Visceral sensitivity is found in 60% of irritable bowel syndrome (IBS) patients and is theorized to contribute to abdominal pain and intestinal motor abnormalities.¹⁻³ Direct palpation, evaluation, diagnosis, and management of the viscera have been used to treat patients since the time of Andrew Taylor Still, MD, DO.⁴ In 2012, a study by Florence et al⁵ revealed a greater reduction in IBS severity score and improvement of quality of life with visceral manipulation compared with massage therapy. In 2013, a randomized crossover trial by Attali et al on the same topic used the additional objective measures of rectal sensitivity and colonic transport time.

Thirty-one voluntary refractory IBS patients participated in Attali et al's study (8 men, 23 women; mean [SD] age and body mass index of 50 [2] years and 25.1 [4.0], respectively). The patients were randomly assigned to group A or group B. Participants in group A received 3 sessions of massage therapy and then 3 sessions of visceral manipulation at 2-week intervals. Participants in group B received the same interventions in reverse order. All techniques were performed by a single osteopath who trained in France and who has a clinical practice in Paris (personal communication, March 2014). The osteopath applied "global" and "local vibratory" techniques to the tender visceral areas as determined by abdominal palpation. The massage therapy used similar hand placements but did not involve visceral manipulation, only abdominal wall massage.

After massage therapy, participants in group A reported decreased abdominal distention ($P=.026$) and abdominal pain ($P=.001$). After visceral manipulation, participants in this group reported further decreased diarrhea ($P=.036$), abdominal distention ($P=.002$), and abdominal pain ($P=.003$). Patients in group B reported improvement in the following symptoms after visceral manipulation: constipation ($P=.022$), diarrhea ($P=.016$), abdominal distention ($P=.001$), and abdominal pain ($P=.005$). For the same group, no significant differences in symptom severity were reported after massage therapy. Cross-over analysis revealed a decrease in self-reported diarrhea ($P=.016$), abdominal distention ($P=.043$), and abdominal pain ($P=.013$) after visceral manipulation. At 1-year follow-up, participants reported persistent amelioration of diarrhea ($P=.029$), abdominal distention ($P=.001$), and abdominal pain ($P<.001$). Visceral manipulation improved rectal sensitivity ($P<.05$), whereas massage therapy alone did not have a significant effect. Neither treatment had a statistically significant impact on colonic transit time.

The study of Attali et al supports previous research that has shown visceral osteopathy to be beneficial in patients with IBS. As a well-designed feasibility study, it will enable power analysis to determine appropriate sample size for future clinical

trials. Further investigations with objective measures are warranted. (doi:10.7556/jaoa.2014.079)

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