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 substantial 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@fammed.wisc.edu).

Osteopathic Manipulative Treatment Is Efficacious for Management of Chronic Low Back Pain

Licciardone JC, Minotti DE, Gatchel RJ, Kearns CM, Singh KP. Osteopathic manual treatment and ultrasound therapy for chronic low back pain: a randomized controlled trial. *Ann Fam Med*. 2013;11(2):122-129.

Each year in the United States, low back pain (LBP) is associated with more than 20 million ambulatory health care visits[1] and $100 billion in related costs.[2] During a 4-year period, researchers at the Osteopathic Research Center on the campus of the University of North Texas Health Science Center in Fort Worth, with Executive Director John C. Licciardone, DO, MS, MBA, as principal investigator, performed a landmark study (the OSTEOPAThic Health outcomes In Chronic low back pain [OSTEOPATHIC] Trial) assessing the efficacy of osteopathic manual treatment, or *osteopathic manipulative treatment* (OMT) as it is more commonly known, and ultrasound therapy (UST) in patients with chronic LBP.

This randomized, double-blind, sham-controlled study enrolled 455 nonpregnant participants (171 men, 284 women; age range, 21-69 years) with LBP of at least 3 months' duration. Potential participants were excluded from the study if they met any of the following criteria: underlying spinal disease; low back surgery performed during the past year; receipt of workers' compensation benefits in the past 3 months; history of angina or congestive heart failure symptoms with minimal activity; history of stroke or transient ischemic attack; implanted biomedical devices; active bleeding or infection in the low back; corticosteroid use during the past month; use of manual therapy (OMT or manual therapy provided by chiropractors or physical therapists) or UST either in the past 3 months or more than 3 times in the past year. Potential participants who had signs of lumbar radiculopathy at physical examination were also excluded.

Participants were randomly assigned to 1 of 4 main effect groups: OMT (n=230), sham OMT (n=225), UST (n=233), or sham UST (n=222). Each participant received 6 treatments (performed at weeks 0, 1, 2, 4, 6, and 8) consisting of OMT or sham OMT for 15 minutes, followed by UST or sham UST for 10 minutes. After standard osteopathic structural examination, somatic dysfunction

in OMT group patients was managed in the lumbosacral, iliac, and pubic regions by using soft tissue; myofascial release; strain-counterstrain; muscle energy procedures; high-velocity, low-amplitude thrusts; and moderate-velocity, moderate-amplitude thrusts, followed by other osteopathic manipulative procedures administered as needed by the osteopathic physician providing the OMT. Sham OMT was described as "hand contact, active and passive range of motion, and techniques that simulated OMT but that used such maneuvers as light touch, improper patient positioning, purposely misdirected movements, and diminished physician force."

The same physician who applied the OMT or sham OMT intervention delivered UST or sham UST to 150 to 200 cm^2 of the low back region after the initial intervention was completed. A Sonicator 730 (Mettler Electronics Corp) with a 10 cm^2 applicator (intensity, 1.2 W/cm^2; frequency, 1 MHz) was used to deliver UST, and sham UST was delivered in the same way but at a subtherapeutic intensity (0.1 W/cm^2).

The primary outcome measure was short-term pain relief, which was recorded at week 12 using a 100-mm visual analog scale and was compared with the measurement obtained before treatment. Consensus statement recommendations from the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) regarding moderate (pain reduction of 30% or more) and substantial (pain reduction of 50% or more) improvement were used to evaluate the primary outcome. Secondary outcome measures included back-specific functioning, general health, work disability caused by LBP, prescription drug use, satisfaction with back care, safety outcomes, and treatment adherence. These outcome measures were recorded at baseline and at weeks 4, 8, and 12 by using the Roland-Morris Disability Questionnaire, the Medical Outcomes Study Short Form-36 Health Survey general health scale, the number of work days lost because of LBP during the past 4 weeks, and a 5-point Likert scale for recording patient satisfaction with back care.

Results favored OMT over sham OMT for moderate ($P<.001$) and substantial ($P=.002$) pain relief at 12 weeks. Of the secondary outcomes, only patient satisfaction ($P<.001$) and decreased frequency of use of prescription medications ($P<.048$) favored OMT over sham OMT. All other outcomes did not differentiate between OMT and sham OMT. No statistically significant interaction between OMT and UST was noted, and neither UST intervention was considered efficacious for pain relief.

The results of this long-awaited and largest and most rigorously designed randomized clinical trial in osteopathic medical research history demonstrate that OMT is indeed efficacious in relieving chronic, nonspecific LBP related to somatic dysfunction. This study lends further support to the American Osteopathic Association's guidelines[3] that recommend the use of OMT for patients with LBP. (doi:10.7556/jaoa.2013.010)

Michael A. Seffinger, DO

Western University of Health Sciences College of Osteopathic Medicine of the Pacific, Pomona, California

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Further Demonstration of the Benefit of Osteopathic Manipulative Therapy in Pediatric Care

Cerritelli F, Pizzolorusso G, Ciardelli F, et al. Effect of osteopathic manipulative treatment on length of stay in a population of preterm infants: a randomized controlled trial. *BMC Pediatrics*. 2013;13:65. doi:10.1186/1471-2431-13-65.

In an exploratory study that I reviewed in the October 2011 issue of *The Journal of the American Osteopathic Association* (*JAOA*),[1] a group of researchers in Pescara, Italy, demonstrated a possible benefit of osteopathic manual therapy (OMTh) in a high-risk population (ie, preterm infants). Their results showed statistically significant reductions both in instances of gastrointestinal dysfunction and in length of stay (LOS) in the neonatal intensive care unit (NICU) among premature infants who received OMTh compared with infants who received routine care. Several of these researchers from Italy then joined other colleagues in conducting a more recent single-blind, randomized controlled trial to confirm the effectiveness of OMTh in reducing LOS in preterm infants.

To be eligible for inclusion in this study, male and female preterm infants had to have been born at Santo Spirito Hospital in Pescara, Italy, and admitted to the NICU between August 2008 and October 2009. They also had to be free of medical complications. Infants were excluded if their gestational age was younger than 29 weeks or older than 37 weeks; if OMTh was performed more than 14 days after birth; if they were transferred to or from another hospital; if their mothers were addicted to drugs or were seropositive for human immunodeficiency virus (or both); if they had genetic disorders, congenital abnormalities, cardiovascular abnormalities, neurologic disorders, proven or suspected abdominal obstruction, respiratory distress syndrome, or pneumoperitoneum or atelectasis (or both); and if they had a preoperative or postoperative status (or both).

After a power analysis was used to determine the number of participants required for this study, a total of 110 patients were randomly assigned to 1 of 2 groups: the experimental group (n=55), which received standard care plus osteopathic evaluation and OMTh, or the control group (n=55), which received standard care plus osteopathic evaluation only. Eight different osteopaths (4 who performed evaluations only and 4 who performed evaluations and OMTh) visited the infants in the NICU at different times. They were aware of and recorded the osteopathic evaluation and OMTh they provided to avoid the possibility of confounding and to provide blinding. Osteopathic evaluation and OMTh occurred twice per week and consisted of 10 minutes of evaluation and 10 minutes of OMTh involving myofascial release, balanced ligamentous tension, balanced membranous tension, indirect fluidic techniques, and v-spread. Osteopaths visiting the control group provided approximately 10 minutes of evaluation only and then stood in front of the incubators for the following 10 minutes.

The primary outcome measures were LOS and weight gain. Intent-to-treat analysis was used to evaluate study data because only 47 of the 55 patients in the experimental group and 54 of the 55 patients in the control group completed the study. The authors found no statistically significant difference between the experimental and the control groups with regard to gestational age ($P<.98$), sex ($P<.89$), or birth weight ($P<.24$). They did note a statistically significant difference, however, between the 2 groups with regard to LOS (mean [standard deviation (SD)] LOS for the experimental group, 26.1 [16.4] days; mean [SD] for the control group, 31.3 [20.2] days; difference in LOS, 5.9 days; $P<.03$). The association

between OMTh and weight gain was not statistically significant ($P<.06$).

After surveying the available cost data for care provided to preterm infants in the region of Italy where the study was performed and then correlating these costs with LOS data, the authors determined that their osteopathic intervention would substantially reduce NICU costs for families of preterm infants and society in general. The cost savings would be approximately €3000 per patient per LOS. These savings do not include any savings resulting from reductions in either potential morbidities related to preterm delivery or special services that may be required for medical, mental, or psychological disabilities addressed long after preterm infants leave the NICU. The authors speculate as to why OMTh may be beneficial to preterm infants and people in general. They cite possible anti-inflammatory effects and benefits to the autonomic nervous system that improve visceral function, especially cardiac function, as possible mechanisms of action. Having worked for several years with Viola Frymann, DO, at the Osteopathic Center for Children and Families in San Diego, California, providing osteopathic manipulative treatment to preterm infants, I have observed that application of such treatment can enhance the vitality of preterm infants. The enhancement of vitality produced by osteopathic manipulative treatment reinforces the tenet of osteopathic medicine that the body is self-regulating and self-healing, thus providing benefit to the patient. (doi:10.7556/jaoa.2013.011)

Hollis H. King, DO, PhD

University of Wisconsin School of Medicine and Public Health, Madison

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Manual Therapy Is Beneficial for Cervical Radiculopathy

Nee RJ, Vicenzino B, Jull GA, Cleland JA, Coppieters MW. Neural tissue management provides immediate clinically relevant benefits without harmful effects for patients with nerve-related neck and arm pain: a randomised trial. *J Physiother*. 2012;58(1):23-31. doi:10.1016/S1836-9553(12)70069-3.

Cervical radiculopathy is a common problem that limits activities and work productivity. The use of osteopathic manipulation or other forms of manual therapy for relief of cervical radiculopathy has been a controversial topic among osteopathic physicians, as well as among chiropractors and physical therapists. Some clinicians believe that manual therapy can aggravate the patient's pain, whereas others maintain that it can help alleviate it. Researchers in Australia sought to determine the safety and efficacy of manual physical therapy for providing short-term relief of cervical radicular pain. Using a prediction model, they identified patients with this condition who would be most likely to benefit from manual therapy[1] and then developed a prospective, randomized clinical trial. Although they were unable to recruit the number of participants required to answer their research question as determined by a power analysis, manual therapy provided substantial benefits to patients compared with advice to remain active.

Sixty participants (38 women, 22 men; mean [standard deviation (SD)] age, 47 [9] years; age range, 18-60 years) with nontraumatic nerve-related

neck and unilateral arm pain spreading below the deltoid tuberosity were randomly assigned to an experimental group (n=40) or a control group (n=20). Pain had to have been present for at least 4 weeks and also had to have been preceded by a pain-free period of at least 4 weeks. The average intensity of any neck and arm pain occurring during the week prior to the study was assessed using separate 11-point numeric pain scales. The mean of these 2 pain scale scores had to be greater than or equal to 3 (with 0 indicating no pain and 10 indicating worst pain) for individuals to be included in the study. In addition, pain had to be reproduced during physical examination (namely, by use of the upper limb neurodynamic test for the median nerve, which assesses neural hypersensitivity) and changed by contralateral neck sidebending or releasing wrist extension.

Potential participants were excluded from the study if they had 2 or more abnormal neurologic findings (eg, decreased strength, reflex, or sensation) at the same nerve root level (C5 through T1), because they were then considered unlikely to respond to the manual therapy maneuvers used in the protocol. Additional exclusion criteria were symptoms or signs consistent with a diagnosis of bilateral radiculopathy or cervical myelopathy; physiotherapy intervention for neck and arm pain within the previous 6 weeks; previous surgery on the neck or upper limb; medical red flags suggesting serious pathologic conditions; and lack of proficiency in speaking and reading English.

Eight community physiotherapists who had postgraduate qualifications in musculoskeletal physiotherapy were assigned to provide neural tissue management to the experimental group. All physiotherapists attended a 2-hour training session before interventions occurred.

Participants in both study groups were advised to continue their usual activities and medication after completing baseline assessments. Participants in the control group received no other intervention or education. In addition to receiving neural tissue management, the experimental group received an educational component, manual therapy techniques, and a home program of nerve-gliding exercises during 4 treatments over 2 weeks. Contralateral cervical lateral glide and a shoulder girdle oscillation combined with active craniocervical flexion were the manual therapy techniques used. A sliding and a tensioning technique for the median nerve and cervical nerve roots were part of the home program. To preload the neural tissues during manual therapy techniques and nerve-gliding exercises, shoulder abduction angles up to 90° were used. Neural tissue management techniques were prescribed to avoid provoking the participants' symptoms. A 2011 article by the same researchers[1] details the protocols for applying neural tissue management techniques.

Outcomes were evaluated at follow-up, which occurred 4 weeks after the baseline assessment. The primary outcome was participant-reported improvement or worsening after manual therapy according to responses on the Global Rating of Change scale. Secondary outcomes included neck pain, arm pain, patient-reported limitations of activities (as measured by the Neck Disability Index and the Patient-Specific Functional Scale), and adverse events related to treatment (ie, intensification of existing symptoms or an increase in other unpleasant sensations after manual therapy).

Two participants from each group were lost to follow-up. Numbers-needed-to-treat analysis favored the manual therapy intervention for participant-reported improvement (2.7; 95% confidence interval [CI], 1.7-6.5), neck pain (3.6; 95% CI, 2.1-10.0), arm pain (3.6; 95% CI, 2.1-10.0), Neck Disability Index (4.3; 95% CI, 2.4-18.2), and Patient-

Specific Functional Scale (3.0; 95% CI, 1.9-6.7). The prevalence of worsening in the experimental (13%) and control (20%) groups was not different (risk difference, –7%; 95% CI, –28 to 13). Adverse events such as aggravation of pain or headache had minimal impact on daily activities, were brief and nondisabling, and did not reduce the chance of improving with the experimental intervention at 4 weeks (relative risk, 1.03; 95% CI, 0.58-1.84).

Because there were no sham control groups in this study, it is not possible to determine whether there were unintended benefits from the physiotherapy provided—that is, personal interaction with the clinician, the clinical environment, or simply being touched. It is important to note that the duration and extent of symptoms, as well as medication usage, were greater for participants in the experimental group than for participants in the control group. In addition, the long-term benefits and cost-effectiveness of physiotherapy were not assessed. Despite such limitations, these researchers made a solid effort toward addressing and supporting the controversial topic of whether manual therapy is beneficial for patients with cervical radiculopathy who fit the inclusion criteria of this study. (doi:10.7556/jaoa.2013.012)

Michael A. Seffinger, DO
Western University of Health Sciences College of Osteopathic Medicine of the Pacific, Pomona, California

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Multimodal Chest Physiotherapy Is Beneficial for Patients Receiving Ventilation

Pattanshetty RB, Gaude GS. Effect of multimodality chest physiotherapy on the rate of recovery and prevention of complications in patients with mechanical ventilation: a prospective study in medical and surgical intensive care units. *Indian J Med Sci*. 2011;65(5):175-185. doi:10.4103/0019-5359.106608.

A recent Cochrane review[1] did not find sufficient evidence to recommend chest physiotherapy for hospitalized patients with pneumonia, even though pneumonia is one of the causes of respiratory failure and the subsequent need for mechanical ventilation.[2] The findings from several osteopathic clinical trials, including the Multicenter Osteopathic Pneumonia Study in the Elderly (MOPSE),[2] which was not included in the review, support the use of osteopathic manipulative treatment (OMT) in addition to standard therapy to prevent the need for ventilation for elderly hospitalized patients with pneumonia. However, a paucity of osteopathic medical literature exists on the application of OMT for patients already receiving mechanical ventilation for respiratory failure in hospital intensive care units. It is well known that, of all hospitalized patients, those receiving mechanical ventilation have an increased risk of morbidity (including pneumonia, atelectasis, and sputum retention), which makes it difficult to wean patients from the ventilator and increases the risk of death. This study, performed by critical care clinical researchers at a tertiary care referral hospital in India, demonstrates the positive effects of multimodality chest physiotherapy for the prevention of complications in adults receiving ventilation and their rates of recovery.

A total of 200 adult patients who were receiving ventilation were enrolled in the study and randomly assigned to either an experimental group or

a control group. Underlying disease was not taken into consideration. Patients were excluded if they had hemodynamic instability, had just undergone coronary artery bypass grafting, were receiving bedside dialysis, had untreated pneumothorax, or had either a condition that contraindicated raising the head of the bed or any condition for which chest physiotherapy was considered to be contraindicated. After 13 patients in the study group and 14 patients in the control group withdrew from the study, data on 173 participants were available for final analysis. The 86 patients in the control group (67 men, 19 women; mean [standard deviation (SD)] age, 49.7 [16.21] years) received manual hyperinflation (MH) and suctioning, whereas the 87 patients in the study group (64 men, 23 women; mean [SD] age, 49.4 [16.13] years) were treated with multimodality chest physiotherapy. Both groups received their interventions twice daily until extubation was performed.

Chest physiotherapy consisted of suctioning of secretions before and after chest vibrations and MH followed by positioning (head of the bed was elevated 30° to 45°). The control group was treated with MH and suctioning only. Systematic reviews of the literature have not recommended the use of MH alone as being beneficial for patients receiving ventilation.[3] Pattanshetty and Gaude[4(p71)] provided details on the protocol for this intervention, as follows:

> A 2.0-L reusable manual resuscitator (Hudson RCI-nondisposable and autoclavable (silicone) was used to deliver the MH breaths. It was connected to a flow of 100% oxygen at 15 L/min. The resuscitator was slowly compressed with both hands, and an inspiratory breath was maintained for 3-5 s at the end of half of the resuscitator and then it was kept completely pressed. The resuscitator expiration was maintained at passive mode and unobstructed to facilitate expiratory flow with no positive end expiratory pressure applied. Sufficient time was allowed for the resuscitator to fill completely prior to the next breath. The MH procedure was carried out daily at the rate of 8-13 breaths/min for a period of 20 min at each session twice a day (9.30 a.m. and 3.30 p.m.).

The chest vibration protocol used in this study was also described in the same article,[4(p71-72)] as follows:

> Chest vibration defined as the manual application of a fine oscillatory movement combined with compression to the patient's chest wall which helps to loosen and mobilize the secretions was given prior to suctioning. The patient was positioned in supine, and then randomly positioned either to right or left side lying in the bed. The principal investigator placed her hands anteriorly and laterally on the patient's chest with fingers placed in the inter-rib space, and then applied vibrations in the expiratory phase of breathing. This technique was repeated thrice in each of the three zones, i.e., upper zone, middle zone, and lower zone of the chest.

In a study published in 2012,[5] chest vibrations were determined to be beneficial in children receiving ventilation. These maneuvers appear to be similar to the OMT technique known as thoracic lymphatic pump and may be similar to rib raising, procedures that were both used in the MOPSE trial. The purposes of these manual procedures are slightly different in that chest vibrations are used to loosen secretions, whereas the lymphatic pump is designed to enhance lymphatic drainage and rib raising allegedly increases chest wall compliance and is intended to alter sympathetic activity.

The outcomes that were measured included successful weaning from ventilation, recovery and discharge from the hospital, death, total length of stay while receiving ventilation, discharge from the hospital against medical advice, and any complications that occurred during mechanical ventilation.

The rate of recovery was higher in the study group (58 patients [66.7%]) compared with the control group (28 patients [32.6%]) (P=.000; χ^2=22.577). Complication rates were higher in the control group (53 patients [61.6%]) compared with the study group (23 patients [26.4%]) (P=.000). Although the 2010 publication by these researchers[4] supported the conclusion that multimodal chest physiotherapy prevented ventilator-associated pneumonia, this study did not. In addition, the mean (standard deviation) length of stay in the hospital was longer for participants in the study group (16 [9.40] days) than for participants in the control group (12.8 [6.12] days) (P=.000). Twenty-four patients (27.6%) in the study group died compared with 39 patients (45.3%) in the control group. Five participants (5.7%) in the study group left the hospital against medical advice, whereas more than 3 times that number (17 patients [19.8%]) in the control group left against medical advice.

Although not all outcome measures favored multimodality chest physiotherapy, this therapy seems to be a safe protocol that can improve clinical outcomes in patients receiving ventilation. Whether these physiotherapy maneuvers have the same, better, or worse impact on clinical outcomes than the OMT procedures that were used in the MOPSE study[2] is yet to be determined. Further clinical trials assessing comparative effectiveness are warranted. (doi:10.7556/jaoa.2013.013)

Michael A. Seffinger, DO

Western University of Health Sciences College of Osteopathic Medicine of the Pacific, Pomona, California

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Visceral Manipulation Is Shown to Reduce Postoperative Ileus in an Animal Model

Chapelle SL, Bove GM. Visceral massage reduces postoperative ileus in a rat model. *J Bodyw Mov Ther.* 2013;17(1):83-88.

The development of postoperative ileus after abdominal surgery often extends patient hospitalization and results in increased hospitalization costs. In the tradition of osteopathic research using animal models that showed that the lymphatic pump technique increases both lymphatic flow[1] and immune system function,[2] researchers Chapelle and Bove investigated whether visceral manipulation could reduce postoperative ileus in Long-Evans rats. To identify potential associations with visceral manipulation, the authors also sought to assess intraperitoneal inflammation, which is considered to prolong postoperative ileus.[3-6]

In this tightly designed study, 40 adult, female Long-Evans rats weighing 225 g each were randomly assigned to 1 of 4 experimental groups in a 2 × 2 factorial design. The 4 groups were surgery and treatment (ST), surgery and no treatment (SNT),

no surgery and treatment (NST), and no surgery and no treatment (NSNT).

Before undergoing operations, the 20 rats assigned to the ST and SNT groups were appropriately anesthetized with isoflurane in pure oxygen and underwent sterile procedures for preoperative preparation. Each operation began with a midline incision. The small intestine was carefully "exteriorized," and its entire length was gently rolled between gloved thumb and forefingers in a process taking 5 minutes. Saline-soaked gauze was then draped over the small intestine, where it was left in place for 10 minutes. After this time, the small intestine was returned to the abdominal cavity and the incision closed. The start of the experiment was defined as the moment when the rats received a subcutaneous injection of morphine sulphate, 0.3 mg/kg of body weight. (Rats that did not undergo surgical procedures also received morphine injections, to control for the effects of morphine.) The rats were then wrapped in a soft pad for the recovery period. All rats were housed in separate enclosures, to facilitate the counting of fecal pellets and to provide the animals with easy access to food and water. The end of the experiment was defined as the point in time 24 hours after administration of the morphine injection.

A massage therapist (S.L.C.) whose practice has emphasized postoperative care provided manual therapy to the ST and NST groups, thereby ensuring that therapy was standardized. Visceral manipulation involved 1 minute of gentle mobilization. For the first 15 seconds, a side-to-side motion was applied with the thumb and index fingers placed lateral to the descending and ascending colon, respectively. For the next 45 seconds, the index finger was moved in small, clockwise circular motions over the ascending, transverse, and descending colon, starting from the lower right quadrant of the abdomen and moving to the lower left quadrant. The first 4 therapy sessions were applied every 15 minutes for the first hour, and the next 4 sessions were administered every 30 minutes over the next 2 hours. Four additional therapy sessions were given every 2 hours until 12 hours after the operation. To control for possible nonspecific effects of visceral manipulation, the rats in the SNT and NSNT groups were picked up and handled for approximately 1 minute, according to the same schedule used for the ST and NST rats.

It is with some envy and appreciation that I report these researchers' application of their manual therapy protocol to a rat population. Chapelle and Bove reported that the Long-Evans rats did not bite and that they did not require anesthetization for visceral manipulation. From my experience working with Lisa M. Hodge, PhD, as she strives to develop a manual therapy protocol in her studies of rats,[7] I can report that the Sprague Dawley rats used by Dr Hodge did indeed bite and that they also required anesthesia before they received manual therapy.

Primary outcome measures included the time to production of the first fecal pellet, the number of fecal pellets counted at 6, 12, and 24 hours, gastrointestinal transit duration, total protein concentration in the intraperitoneal fluid, and intraperitoneal inflammatory cell counts. After the fecal pellet count was completed at 24 hours, the rats received gavage of approximately 1 mL of a slurry of 10% charcoal and 1% arabic acid in water. The rats were then humanely killed 30 minutes later. The length of the small intestine from the pylorus to the ileocecal valve was removed, stretched, and measured using a tape measure. The distance that the slurry had traveled from the pylorus was measured to determine gastrointestinal transit over 30 minutes, which was expressed as a percentage of the total length of the small intestine. Lavage fluid was collected and used to determine inflammatory cell (leukocyte) counts.

All the rats that underwent surgical procedures had statistically significant reductions in both gastrointestinal transit time ($P<.001$) and fecal pellet count ($P<.05$), thereby supporting the contention of the authors that surgical procedures produce ileus. A statistically significant reduction in time to first fecal pellet discharge was noted in the ST group compared with the SNT group ($P<.01$), and although not statistically significant at 12 hours after the surgical procedures, by 24 hours the total fecal pellet count for rats in the ST group was statistically significantly greater than that in the SNT group ($P<.005$). The authors concluded that visceral manipulation substantially increased gastrointestinal function and reduced postoperative ileus in the rat population studied.

The authors also believed that ileus was due to inflammation and that visceral manipulation could reduce ileus by suppressing inflammation. To support this belief, they cited data indicating that rats in the ST group had statistically significantly fewer intraperitoneal cells than rats in the SNT group ($P<.05$).

Overall, the findings of Chapelle and Bove regarding the nature of postoperative ileus in the animal model studied are worthy of consideration and extrapolation to future research on postoperative ileus in humans. For now, the relatively well-accepted notion that osteopathic manipulative treatment reduces postoperative ileus has received some additional support from this study. Although I taught the application of osteopathic manipulative treatment for postoperative ileus when I was on the faculties of the University of North Texas Health Science Center Texas College of Osteopathic Medicine in Fort Worth and the A.T. Still University-School of Osteopathic Medicine Arizona (Mesa), I will do so with greater confidence in the future, given the results of this study. (doi:10.7556/jaoa.2013.014)

Hollis H. King, DO, PhD
University of Wisconsin School of Medicine
and Public Health, Madison

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Editor's Note: The article by Tozzi et al was also reviewed in the January 2013 installment of "The Somatic Connection" (2013;113[1]:102). The section editors believed there were more insightful points to be made about the article, however, so an additional review from Dr King's perspective is offered here. Readers are encouraged to comment on this and other articles reviewed in "The Somatic Connection" in letters to the editor.

Osteopathic Manipulative Therapy Affects the Position of Internal Organs in Humans

Tozzi P, Bongiorno D, Vitturini C. Low back pain and kidney mobility: local osteopathic fascial manipulation decreases pain perception and improves renal mobility. *J Bodyw Mov Ther*. 2012;16(3):381-391.

Low back pain (LBP) is of interest globally because of its association with disability and its effect on health care costs.[1] The osteopathic medical profes-

sion has been intrigued by associations between the fascia and nonspecialized connective tissues of the back and the pathophysiologic profile of LBP,[2,3] as well as by fascial connections between the kidneys and the dorso-lumbo-pelvic structures. Building on their earlier research, which I reviewed in the October 2012 installment of "The Somatic Connection,"[4] clinical researchers in Italy assessed the impact of osteopathic fascial manipulation (OFM) on right kidney mobility through the use of Dynamic Ultrasound Topographic Anatomy Evaluation and measurements of perceived LBP.

The investigators recruited 101 asymptomatic individuals (30 women; 71 men; mean [standard deviation (SD)] age, 38.9 [8] years) who met the following inclusion criteria: no history of LBP, absence of other chronic pain that limited activities of daily living or work, and a current pain index that was less than 1 on a 10-point visual analog scale. They also recruited 140 individuals with LBP (66 women, 74 men; mean [SD] age, 39.3 [8] years) who met the following inclusion criteria: age 18 to 60 years, complaint of nonspecific pain in the lumbar area lasting at least 3 weeks and not more than 3 months, and magnetic resonance imaging or ultrasonography findings confirming the absence of inherited or acquired pathologic conditions of the spine or kidneys. Individuals in the group with nonspecific LBP were then randomly assigned to an experimental group (n=109) or a control group (n=31).

Exclusion criteria, which were the same for asymptomatic individuals and individuals with LBP, included previous severe injury to, operation performed on, or pathologic findings for the back, kidneys, or lower extremity; major structural derangement, such as scoliosis, kyphosis, or stenosis; ankylosing spondylitis or rheumatoid arthritis; spinal fracture, tumor, or infection; bleeding; neurologic or major psychiatric disorder; pregnancy; kidney ptosis; acute systemic infection; receipt of concomitant physical or manual therapy; use of an analgesic or anti-inflammatory medication (or both) in the previous 72 hours; and litigation for LBP.

Perceived pain in individuals with LBP was assessed using the Short-Form McGill Pain Assessment Questionnaire. The total pain score (scale, 0-45), which was the outcome of this study, was determined by adding affective pain and sensory rating scores.

An experienced osteopath performed both the osteopathic assessment and the OFM. The osteopathic assessment involved identifying somatic dysfunction through "fascial listening posts," as described by DiGiovanna et al,[5] and induction of motion to assess restricted planes of motion, as performed by Greenman.[6] Deep tissue palpation of the abdomen was not performed.

The duration of OFM was 3.5 minutes and comprised 2 minutes of Still technique[7] and 1.5 minutes of fascial unwinding.[8] The illustrations in this study provide good representations of these osteopathic techniques, which seem to have been performed in a manner typical of US-trained osteopathic physicians and foreign-trained osteopaths. For the control group, the authors used a novel sham treatment in which an untrained layperson simply rested his hands on the lumbar region of the patient for the same length of time and in the same positions used during application of OFM in the experimental group.

The outcome measure, the kidney mobility score (KMS) (ie, the difference in kidney height on maximal inspiration and maximal expiration), was assessed in a standard manner with the participant supine. The mean (SD) KMS for the asymptomatic group was 1.92 (1.14) mm, whereas that for the group with nonspecific LBP was 1.52 (0.79) mm,

which was statistically significant ($P<.05$). Comparison of the pre- and posttreatment KMS showed a statistically significant increase in kidney motion in the experimental group compared with that in the control group ($P<.001$). A statistically significant decrease in pain, as measured by the Short-Form McGill Pain Assessment Questionnaire, was also noted for the experimental group compared with that in the control group ($P<.001$).

The authors note several possible limitations of their study. For example, abdominal breathers have been shown to have greater kidney displacement, whereas thoracic breathers have displacement that is below average.[9] This varied displacement was not controlled for in the present study. Only the right kidney motion was assessed, apparently because of time constraints and the perceived ease of measuring movement of the right kidney compared with that of the left kidney. Displacement will need to be controlled for in any future research on this topic.

This study demonstrates the effects of common manual techniques on the viscera. In my opinion, manual therapy does more than just affect kidney position. Osteopathic interventions aid the self-regulatory and self-healing capacity of the body, thereby exemplifying a main tenet of osteopathic medicine, and they also support the structure-function relationship. Additional research regarding the structure-function relationship is necessary; however, on the basis of the presumption that improved kidney mobility is a good thing, this study shows how osteopathic interventions could benefit kidney function. (doi:10.7556/jaoa.2013.015)

Hollis H. King, DO, PhD

University of Wisconsin School of Medicine
and Public Health, Madison

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