

The AAO

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TRADITION SHAPES THE FUTURE

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The mission of The AAO Journal is to facilitate a forum, with a sense of belonging, ensuring the opportunity for the present osteopathic community and its supporters to honor the past accomplishments, promote the osteopathic tenets, and advance osteopathic research and its influence within the medical field.

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View from the Pyramids: A Brave New World

AAOJ Editor-in-Chief Janice Upton Blumer, DO, FAAO

EDITORIAL

As I sit in my front yard garden 'remote office' during this time of Coronavirus social distancing, my thoughts go out to those on the frontlines of this pandemic. In the hardest hit areas, personal protective equipment is scarce, leading to reuse and potential for worsening the epidemic. So many of these frontline workers are facing a brave new world of medicine. In this brave new world, contact becomes the enemy instead of a source of comfort. In this brave new world, the more that can be done remotely the better. Robotics are rapidly evolving to help limit contact and spread by doing some of the more mundane tasks. For those of you using

“ **Maybe we need to rethink what it really means to be an osteopathic physician and how we can best assist our patients during this 'hands off' period of time.**

OMT on the frontlines, you remain rock stars in my book. It has been shown that OMT can help with reducing inflammatory cytokines, or the 'storm' that leads to ventilator use in some patients.¹

In the last month, the Academy has partnered with the American Osteopathic Association (AOA) to offer two new online learning CME activities focused on treating COVID-19 patients. The first offering reviews applicable OMM techniques for optimizing pulmonary function in COVID-19 or suspected COVID-19 patients. The second offering provides first-hand accounts from the frontlines on using OMT to treat COVID-19 patients. I encourage you to visit the Academy's website to enroll in these free courses.

In reflecting on this pandemic, we often compare it to the 1918 Flu Pandemic. It had similar impact and contagion, and osteopathic physicians of the time who used OMT had improved mortality rates overall.² At a time when antibiotics were not yet developed, OMT offered a positive impact.

But what about now, when 'non-essential' health care workers have been benched as mandates divert resources to the frontlines. Many

practices have gone to telehealth with varying results, and often low volume of patients. Some choose to wait out the storm rather than do telehealth visits. Other practices have shut their doors during this time to assist with the state orders for social distance. We as osteopathic physicians have a conundrum in that we know OMT can help, but we cannot get to the population that needs it most due to isolation, state orders, or worry for contracting the virus ourselves.



AAOJ Editor-in-Chief Janice Upton Blumer, DO, FAAO

I cannot help but think that osteopathic physicians in the 1918 epidemic had similar concerns, for themselves and for their families. How to safely deliver OMT to the highest risk populations while protecting themselves, their families and their loved ones? At the same time, they had to navigate containment of the contagion while providing care to the most affected. I don't know how they managed that dichotomy, but I do know many sent their families away to safer havens while still seeing patients.

Maybe the answer for this pandemic is different because it has to be. Most of us do not have the luxury of sending families to harbor safely elsewhere, especially in large cities. Maybe the answer for this pandemic during social isolation is to rethink how to deliver OMT, whether it is prudent, and what else we may do to assist during the pandemic. Maybe we need to rethink what it really means to be an osteopathic physician who practices OMT and how we can best assist our patients during this 'hands off' period of time.

In this brave new world, practices are having to reinvent how they will deliver health care, what is considered essential, and how they protect themselves and their staff. In this brave new world, we are going to have to go back to our roots and find the health of the patient in spite of the disease. Focusing on environmental health

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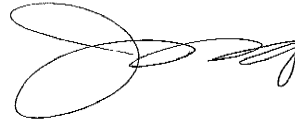
through good nutrition, regular exercise and reducing the burden of stress are just a few of the avenues we can choose.

While delivering osteopathic care in the time of social distancing is a challenge, it is not insurmountable. I am drawn to the new field of psychoneuroimmunology to help our patients at a time when we can't see them face to face. In short, 'psychoneuroimmunology' is the interface between a patient's *psychological processes* through coping and beliefs, their *nervous system* through pain and receptivity, and their *immune function*, or their ability to fend off disease.³ In other words, the *structure* of the immune system is dependent on the *function* of a healthy nervous system and psyche. What better time than during a pandemic to support our patient's immune systems through this interface? Perhaps we can support the health of the patient by partnering with them to work on the things that have been put on hold for so long in the ever-growing chaos of our day to day lives. I'm talking stress here.

In this brave new world, where we may not be able to interface with our hands to address pain, there is still another way we can improve structure and function by helping patients understand how their psyche and nervous system can impact their health and healing. Working with mindfulness-based stress reduction, optimism, and coping... all things that can be done remotely. Teaching self-care OMT for those who are motivated is another option. Adding cooking and nutrition classes, and coaching towards anti-inflammatory eating can also assist with immune function. There

is *so much* we can do, and have the knowledge to do in times of a pandemic to assist our patients, even if our hands are grounded so to speak. But the most important thing during this time is *to not give up*. You have so much to offer and patients are hungry for more. I'm interested in hearing what your practices are doing to continue to 'keep on digging'...

In Gratitude –



Janice Blumer, DO, FAAO

References

1. Licciardone JC, Kearns CM, Hodge LM, Bergamini MV. Associations of cytokine concentrations with key osteopathic lesions and clinical outcomes in patients with nonspecific chronic low back pain: results from the OSTEOPATHIC Trial [published correction appears in *J Am Osteopath Assoc*. 2017 Jun 1;117(6):350]. *J Am Osteopath Assoc*. 2012;112(9):596-605. doi:10.7556/jaoa.2012.112.9.596
2. Barry JM. *The Great Influenza: The Story of the Deadliest Pandemic in History*. New York, NY: Penguin Group Inc; 2004.
3. Fernandez-Sweeney Y, Baron D, Julius R, Willard F. Behavioral Science: Psychoneuroimmunology: Basic Mechanisms. In: Seffinger M ed. *Foundations of Osteopathic Medicine: Philosophy, Science, Clinical Applications, and Research*. 4th ed. Philadelphia, PA: Wolters Kluwer; 2019:402-407. ■

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tive Value Scale Update Committee (RUC) processes. Additionally, PRM has experience working with osteopathic physicians and has extensive knowledge of reporting osteopathic manipulative treatment (OMT).

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Osteopathic Self-Treatment to Promote Health and The Body's Ability to Fight COVID-19

Drew D. Lewis, DO, FAAO; Jose S. Figueroa, DO, FAOCPMR, FAAPMR;
Ryan D. McMunn, OMS IV; Adrian L. Woolley, DO

CASE REPORT

In the growing pandemic of COVID-19, the reality many face includes insufficient testing, limited personal protective equipment (PPE), and high risk of infection to those on the front lines providing essential care. With a lack of effective treatment and no vaccine in sight, a high rate of morbidity and mortality looms.

Osteopathic manipulative treatment (OMT) has been shown in numerous studies to support the body's own healing mechanisms, including beneficial effects on respiratory infections.

Based on well-established osteopathic principles, the osteopathic self-treatment (OST) aims to promote optimal respiration, circulation (venous, arterial, and lymphatic), immune function, balance of the autonomic nervous system, reduced stress, and improved homeostasis.

This OST provides exercises designed to remove obstacles to the body's own functions and therefore promote improved health. It is warranted for those at risk of infection or those already testing positive. There is particular utility in these approaches for patients that must self-isolate and socially distance such as during the 2020 COVID-19 pandemic.

Introduction

Optimal respiration and circulation is vital to health. In states of health, normal physiologic function of the respiratory and circulatory systems drives oxygenation of body tissues and the delivery of nutrients and hormones as well as the removal of waste throughout the body. Additionally, the pressure gradients created by proper respiratory and circulatory mechanisms contribute to optimal flow within the lymphatic system to support immune function.^{1,2,3} In the setting of disease, including acute infection, the importance of these physiologic functions becomes paramount for the body to mount an adequate immune response and allow the body to reclaim a state of health.

From the Des Moines University College of Osteopathic Medicine.

Disclosures: none reported.

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The incorporation of osteopathic manipulative treatment (OMT) into the treatment of respiratory infections in both ambulatory and inpatient settings has been shown to improve patient outcomes in a variety of measures when compared to conventional care alone. Benefits of OMT include decreased length of hospitalization, decreased in-hospital mortality rates for elderly patients, lower ventilator-dependent respiratory failure rates, and shorter duration of intravenous antibiotic treatment for bacterial pneumonia.^{4,5} This evidence, coupled with historical data on the efficacy of OMT as part of treatment during the 1918 influenza pandemic, provides a compelling argument for the continued application of OMT into patient care in similar settings.^{6,7}

The rapid spread of the highly infectious and lethal severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has proved dangerous for both healthcare providers and the patients they are treating. Challenges for preventing the spread of the illness include: a lack of sufficient testing (to know who is at greatest risk of spreading the virus), the risk of asymptomatic transmission of the virus, and a lack of adequate personal protective equipment (PPE) for

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health care workers, those with known coronavirus disease 2019 (COVID-19), and the essential community workers at greatest risk of becoming infected and/or infecting others. These challenges, coupled with the use of social distancing to slow the spread of disease, have led to the halt of non-emergent, non-essential outpatient medical care like OMT in many regions of the country and worldwide.

In the absence of effective antiviral medications, a viable vaccine, and adequate PPE necessary for physicians to provide more hands-on care in clinical settings, we suggest the incorporation of osteopathic principle-based self-treatment (OST) as an alternative to physician-delivered OMT.

The support of optimal circulation, immune system function and homeostasis that the application of osteopathic principles lends to the body is more important now than ever in both maximizing the innate immune system function in those at risk for, or currently fighting, COVID-19 infection, as well as helping to maintain health in those not yet affected.

Background

Key definitions from the *Glossary of Osteopathic Terminology*⁸:

- *Osteopathic Manipulative Treatment*: The therapeutic application of manually guided forces by an osteopathic physician to improve physiologic function and/or support homeostasis that has been altered by somatic dysfunction.
- *Somatic Dysfunction*: Impaired or altered function of related components of the body framework system: skeletal, arthroal and myofascial structures, and their related vascular, lymphatic and neural elements.
- *Homeostasis*: The level of well-being of an individual maintained by internal physiologic harmony that is the result of a relatively stable state or equilibrium among the interdependent body functions.
- *Respiratory-Circulatory model*: One of the five models of osteopathic care that articulates how an osteopathic practitioner seeks to influence a patient's physiologic processes. The goal of the respiratory-circulatory model is to improve all of the diaphragm restrictions in the body. Diaphragms are considered to be 'transverse restrictors' of motion, venous and lymphatic drainage and cerebrospinal fluid.
- *Thoracic inlet*: The anatomic thoracic inlet consists of T1 vertebra, the first ribs, and their costal cartilages and the superior end of the manubrium.
- *Transitional region*: Areas of the axial skeleton where structure changes (can) significantly lead to functional changes;

transitional areas commonly include the following: occipitocervical region (OA); typically the OA-AA-C2 region is described. Cervicothoracic region (CT); typically C7-T1. Thoracolumbar region (TL); typically T10-L1. Lumbosacral region (LS); typically L5-S1.

Respiratory-Circulatory Model

The respiratory-circulatory model (RCM) utilizes a treatment approach with the goal to optimize the venous, lymphatic, and arterial flow to improve health. A prominent contributor, Gordon Zink, DO, presented an efficient and effective osteopathic approach to maximize health utilizing this approach. Key restrictions, or somatic dysfunctions (SDs), were identified throughout the body, with some of the most important found at the transition zones of the body. The transition zones of the lumbopelvic, thoracolumbar, cervicothoracic, and occipitotantal regions are areas subject to higher stress and potential for dysfunction and are also closely associated with the transverse diaphragms of the body (urogenital and pelvic diaphragms, thoracoabdominal diaphragm, Sibson's fascia and the tentorium cerebelli respectively). Dysfunction in these transition zones impairs the body's respiratory and circulatory functions.

Key Concepts and Body Regions to be Addressed

The Thoracic Inlet

The thoracic inlet, the most superior aspect of the bony rib cage, is formed by the ring structure of the bilateral first ribs and their articulations with the first thoracic vertebra and the manubrium. This region is clinically important, as the major vascular and lymphatic structures that supply and provide drainage routes for blood and lymphatic from the head and neck, to the trunk and appendages, traverse or are closely located in the thoracic inlet.⁹ The thoracic inlet is a key anatomic site in Zink's approach to the RCM, and, regarding the lymphatic system, it has often been termed the site of "terminal drainage".^{3, 9(p87), 10-12}

The Thoracoabdominal Diaphragm

The thoracoabdominal diaphragm, often referred to as the abdominal diaphragm, is widely attached across the xyphoid process of the sternum, the lower six ribs, T12, L1-2 or L3.^{9(p9)} The myofascial connections of the thoracoabdominal diaphragm are widespread, from the mediastinum to the pelvis and lower extremity, through the lower extremity and psoas muscles. The pump-like function of the thoracoabdominal diaphragm creates negative intrathoracic pressure to pull oxygenated air into the lungs and assist in venous and lymphatic return to central circulation.¹³ Somatic dysfunction in this region can lead to disruption of the pressure gradients

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within the thorax needed for adequate respiratory-circulatory function to prevent venous and lymphatic stasis in the trunk and extremities.^{3,14}

The Autonomic Nervous System

The autonomic nervous system, often described as the involuntary manager, affects almost all tissues, controls the moment by moment activity of viscera, and functions to maintain homeostasis. While optimally there is a balance in the body between the sympathetic (fight or flight) and parasympathetic (feed and breed) systems, dysfunctions can occur where a body may seem to be inappropriately in a state of increased 'tone' of one system or another. Sustained hyperactivity of sympathetic or parasympathetic tone has been shown to have negative effects on target tissues, and can result in conditions affecting every organ system secondary to their inter-related nature.^{15 (p64)}

A primary goal of OMT is to facilitate the normal compensatory mechanisms of the individual's body. To promote inner health and optimally balance the sympathetic nervous system, we look for and address somatic dysfunctions in the thoracolumbar region (T1-L2). To balance the parasympathetic nervous system, we look for dysfunctions in the cranio-sacral regions, specifically SD that might affect cranial nerves III, VII, IX, X, and sacral roots 2-4.

Importance of Breath

The alternating intrathoracic pressures created with inhalation and exhalation and the piston-like movement of the thoracoabdominal diaphragm constitute important mechanisms for promoting venous and lymphatic return.^{15(p259)} This is especially important for those patients spending a significant amount of time lying supine, where the pumping benefit of the lower limb musculature is correspondingly reduced. Removing restrictions at the top (cervicothoracic junction, i.e. the thoracic inlet) and bottom (thoracolumbar junction) as well as any major restrictions throughout the thorax allows optimal motion. Improving the inhalation/exhalation motion of the thoracic cage maximizes the negative intrathoracic pressure to help pull the fluids from the periphery (on a macro-level think head/neck, limbs) back into central circulation.^{3,13}

In addition to the mechanical benefits of unimpeded diaphragmatic breathing, review of the current literature suggests that exercises such as mindfulness and slow deep breathing may improve health in a variety of areas, including reducing markers of inflammation and improving immune responses to vaccination,¹⁶ decreasing markers of physiologic stress,¹⁷ and modulation of the autonomic nervous system.¹⁸ A proposed mechanism for the influence on these and other measures of health by deep breathing is respiratory vagal nerve stimulation.¹⁹

Methods

The Thoracic Inlet

The thoracic inlet is influential in key anatomic structures due to its position at the cervicothoracic junction. In addition to the major circulatory vessels present here, the anatomic thoracic inlet is the location of terminal lymphatic drainage for the entire body. Superior to these structures resides Sibson's fascia, the suprapleural membrane, an extension of the endothoracic fascia that extends above the apices of the lungs. This structure functions as the cervicothoracic diaphragm. Finally, many muscles span the region of, or attach to the bony structures of the anatomic thoracic inlet, including the anterior and middle scalenes, sternocleidomastoid, levator scapulae, upper trapezius, intercostal muscles, the subclavius muscles, and the first digitation of the serratus anterior muscle.

Tissue tension, muscular imbalance, or bony displacement of any of the above structures results in restriction of the vascular and lymphatic structures coursing through the inlet, compromising both respiratory and circulatory function. The application of osteopathic self-treatment to the thoracic inlet allows for the removal of impediments to circulation and terminal lymphatic drainage to maximize the respiratory-circulatory function of the body.

Self-Treatment of the Thoracic Inlet

The simplest and most feasible self-treatment techniques for patients utilize simple range of motion and stretching techniques to achieve improvement of motion in key anatomic regions without requiring the patient to self-monitor for indications of tissue change that require more precise palpatory skill. The thoracic inlet can be treated by addressing two segments: the first rib portion and the first thoracic vertebra (T1). Self-treatment of the first rib focuses on range of motion exercises that mobilize the first rib to remove bony restriction on circulatory structures. (*Figures 1 and 2*).

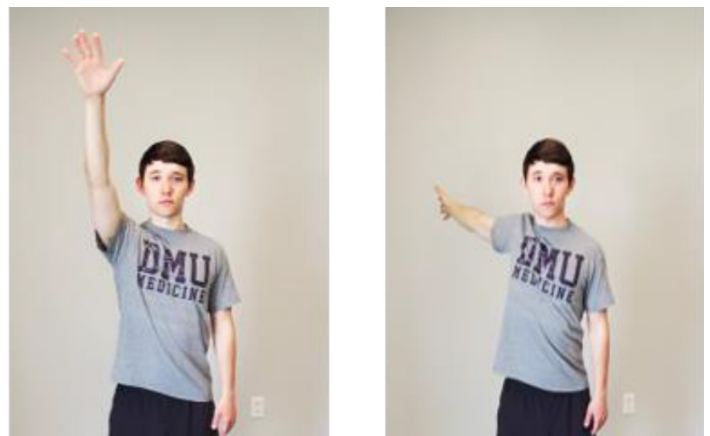


Figure 1. 1st Rib and Collarbone-Base of the Neck (Thoracic Inlet): Arm circles

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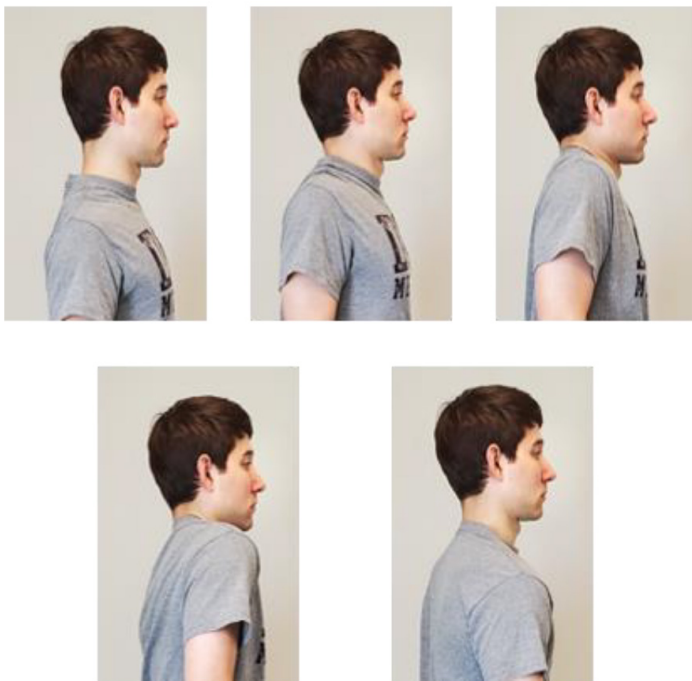


Figure 2. 1st Rib and Collarbone-Base of the Neck (Thoracic Inlet): Shoulder blade

The T1 component of the inlet can be treated with self-stretching to address cervical spine range of motion restrictions caused by unbalanced tissue tension in the cervical and upper thoracic musculature (Figure 3).

Additionally, self-stretching of the anterior/lateral (sternocleidomastoid) and posterior neck muscles, as well as postural retraining of the neck, can help to reduce musculotendinous tension and postural contributions to dysfunction of the thoracic inlet (See Figures 4-7).

Thoracolumbar Region: Thoraco-Abdominal Diaphragm

The thoracoabdominal diaphragm, or simply the diaphragm, is the large sheet-like muscle separating the thoracic and abdominal cavities. The diaphragm's attachments are extensive, composed of three regions: sternal (xyphoid process), costal (lower six ribs) and thoracolumbar (T11-L2/3). Restriction of motion at the thoracolumbar junction can create dysfunction in the abdominal diaphragm. The potential for the resulting tourniquet-like effect on the inferior vena cava and descending aorta where they traverse the diaphragm, can compromise circulatory efficiency in the entire body. In response to decreased circulatory efficiency, the body is forced to compensate by increasing the work done by the heart to drive circulation and the recruitment of accessory muscle used for costal motion in respiration. It is crucial from a respiratory-circulatory standpoint that the diaphragm be free of dysfunction.

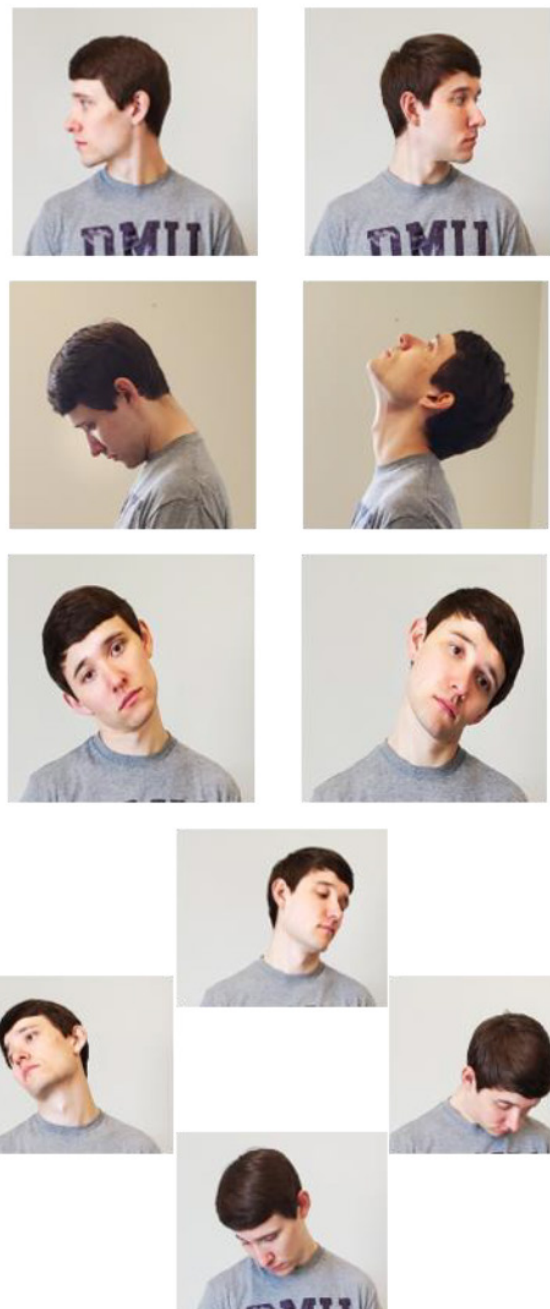


Figure 3. First Thoracic Vertebra-Base of the Neck (Thoracic Inlet): Neck range of motion

Self-Treatment of the Thoracolumbar Junction

The thoracolumbar junction can be addressed with self-treatment in two ways. First, the patient can mobilize this transitional zone by performing rotational stretches, stretching the latissimus dorsi, and utilizing the prone-press up (see Figures 8-10). The combination of these maneuvers has been theorized to decrease regional restriction and again encourage efficient respiratory-circulatory function.

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Figure 4. Front of Neck (SCM) Muscle Stretch

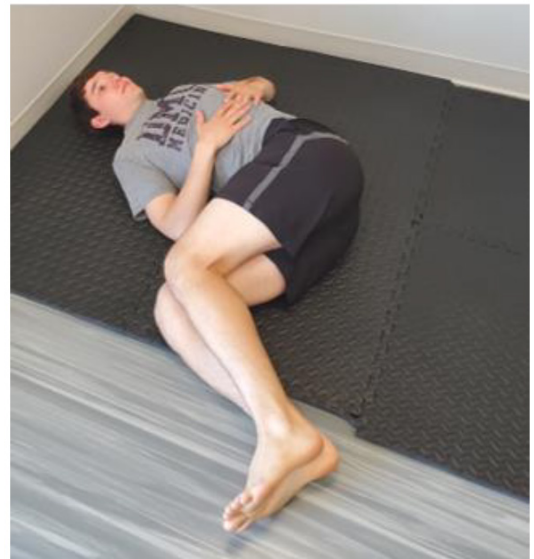


Figure 8. Bottom of Rib Cage (Thoracolumbar Junction) Stretch



Figure 5. Upper Back (Levator Scapula) Stretch



Figure 6. Upper Shoulder (Upper Trapezius) Stretch



Figure 9. Under Arm/Back (Latissimus Dorsi) Muscle (or “Prayer Position”) Stretch

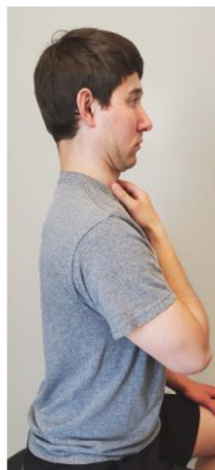
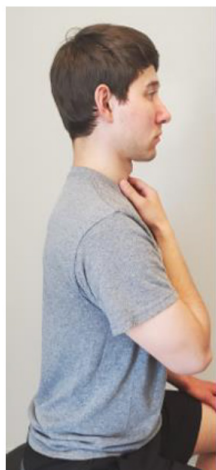


Figure 7. Head-Neck Posture Training (by Strengthening the Deep Neck Flexor Muscles)



Figure 10. Face Down (Prone) Press-up

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Lumbopelvic Region: Pelvic and Urogenital Diaphragm

The lumbopelvic diaphragm, composed of the pelvic and urogenital diaphragms, contains the musculature of the pelvic floor, the superficial membranous pelvic fascia, and endopelvic fascia between the viscera of the pelvis. Fascial, muscular, and articular restriction of the lumbo-pelvic transition area limits the ability of the sacrum to move between its contacts with the ilia during respiration. Restriction of the sacrum results in elevated tissue tension in the pelvis that can cause restriction in the lumbopelvic diaphragm and limit motion farther up the spinal column via the attachments of the sacrum to the posterior longitudinal ligament and the dura.

Muscular tightness in major muscles in the lumbopelvic region can lead to significant restriction of the sacroiliac joints and tension in the pelvic diaphragms. Key muscles implicated in these patterns include the abdominal muscles, psoas, piriformis, gluteus maximus, and the latissimus dorsi.^{20(p340)} Rotation of the innominates of the pelvis leads to further restriction of the lumbopelvic region.

Self-Treatment of the Lumbopelvic Region

This region can be addressed by performing rotational stretches for the transition zone, utilizing self-stretches to the above muscles specifically, and by performing more general regional mobilization maneuvers to self-correct innominate rotations (see Figures 11-15).

The Cranial Diaphragm Composed of the Tentorium Cerebelli

The dura of the cranium is made up of the tentorium cerebelli (considered a diaphragm within the skull), the falx cerebri, and falx cerebelli, all of which attach to the bones of the skull. They provide important functions for supporting the brain and house the venous sinuses. Because of the intimate connections between the dura and the cranial bones, displacement of the cranial bones as a result of tissue tension in the cervical paraspinal musculature and muscles attaching to the cranial bones, primarily the occiput and temporal bones, results in increased tension to the dura which in turn can limit the ability of the venous sinuses to drain as part of the global respiratory-circulatory function.

Self-Treatment of the Cranial, Cervical, and Upper Shoulder/Thoracic Regions

Treatment of the head directly is outside the scope of this OST protocol. Reduction in tissue tension in the muscles of the cervical and upper shoulder/thoracic regions may reduce tension in the head and neck as a whole to encourage increased circulatory efficiency

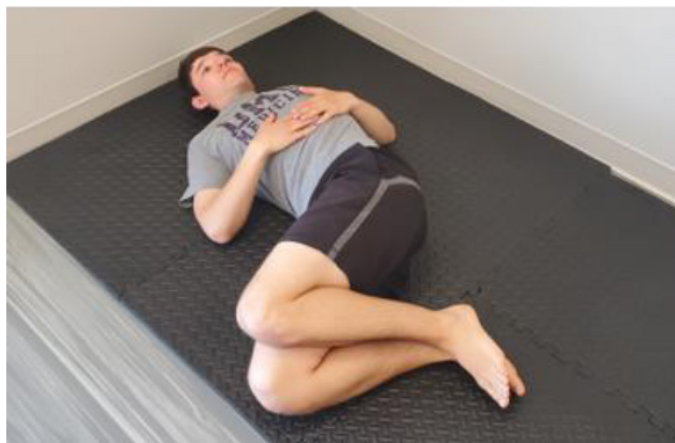


Figure 11. Bottom of the Spine (Lumbosacral Junction)



Figure 12. Ribs to Pelvis (Quadratus Lumborum) Muscle Stretch

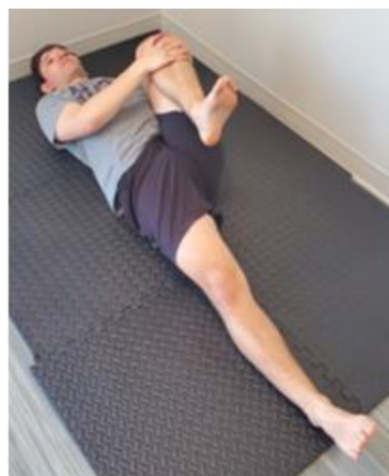


Figure 13. Knee to chest

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Figure 14. Front of Hip (Psoas) Muscle Stretch



Figure 15. Spine to Hip (Piriformis) Muscle Stretch

to and from the head and neck. This is achieved in the OST by stretching the sternocleidomastoid, levator scapula, upper trapezius, and posture retraining for the deep neck flexors (see Figures 4-7). Additionally, tension in the cervical paraspinal musculature may be reduced by mobilization of the occipito-atlantal and atlanto-axial joints of the cervical spine (see Figures 16 and 17).



Figure 16. Self-correction of occiput – atlas joint (OA)



Figure 17. Self-correction of atlas – axis (AA) Joint

Thoracic Spine and Rib Cage

As discussed above, optimal motion of the rib cage is imperative for both the maximal movement of air, as well as the negative intra-thoracic pressure gradients that assist in the return of venous and lymphatic circulation. Additionally, there exists a close anatomic relationship between the sympathetic chain ganglia and the rib heads' articulations with the thoracic spine. Addressing

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dysfunctions of these anatomic structures can assist with balancing the autonomic nervous system.

Self-Treatment of the Thoracic and Rib Cage Region

Spinal mobilizing techniques (Figure 18) can improve motion of the spine, maximize respiratory motion, and even provide a ‘stimulating effect’ for the sympathetic nervous system, similar to some of the rib-raising approaches.

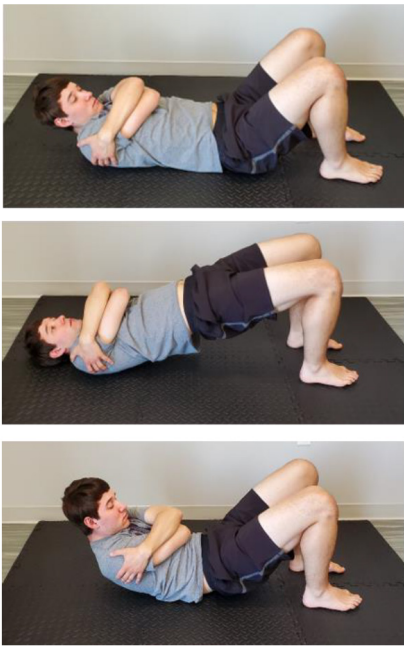


Figure 18. Spinal Stimulation – Thoracic and Rib Areas

Lymphatics

The lymphatic system is a network of endothelial vessels distributed throughout the body in close proximity to circulatory vasculature. It functions in maintaining tissue fluid homeostasis, the dissemination of immune cells, and the reabsorption of lipids.²¹ The flow of lymph through the tissues of the body toward terminal drainage at the thoracic inlet is driven by pressure differentials created by interstitial pressure and intrinsic pumps of the body, including arterial pulse pumps, skeletal muscle contractions during movement, intestinal motion, and the generation of negative pressure in the thorax by the transverse motion of the diaphragms of the body.

Lymph pump techniques directed at increasing the movement of lymph toward terminal drainage are an established part of the osteopathic approach to patient care.^{15(p203), 22(p175), 23(p72)} In the setting of acute illness, where the immune function of the lymphatic system is of elevated importance and where patients may be less active than in during states of health, addressing the lymphatics with OMT becomes important. These physician-performed techniques can be modified for incorporation into OST.

Self-Treatment of the Lymphatics

To encourage lymphatic flow and drainage in the head and neck, patients may perform gentle effleurage and kneading techniques to the anterior and lateral neck (Figure 19). To augment the flow of lymph driven by skeletal muscle pumps, the pedal (Dalrymple) lymphatic pump can be modified for patients to perform on their own (Figure 20).

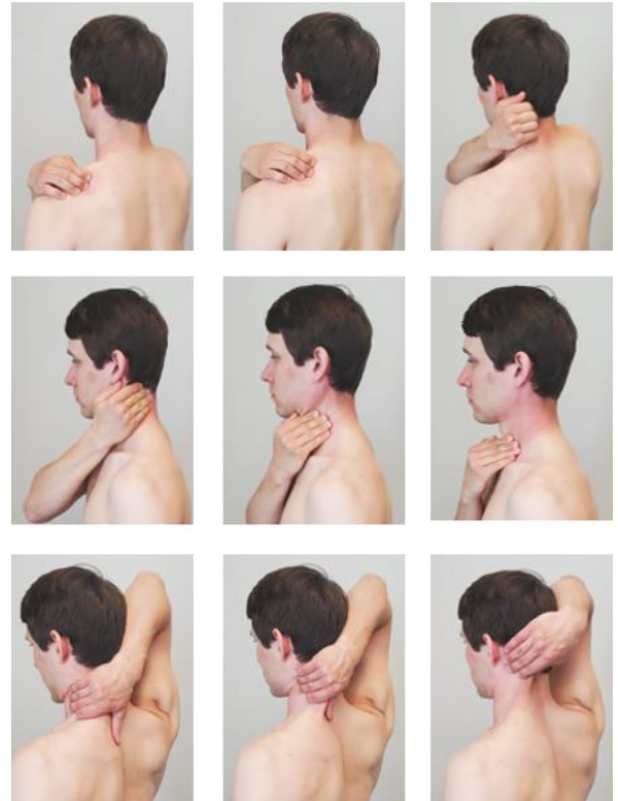


Figure 19. Gentle Self-Massage of the Neck and Upper Shoulder



Figure 20. Self-Pedal Pumps

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Breathing Exercises

In addition to the mechanical benefits with full inhalation and exhalation, deep breathing exercises have been shown to help with reducing stress and improving cardiovascular parameters.²⁴ This can be an important means of reducing anxiety associated with the COVID-19 pandemic and mitigating the negative effects of stress on the body (Figure 21).

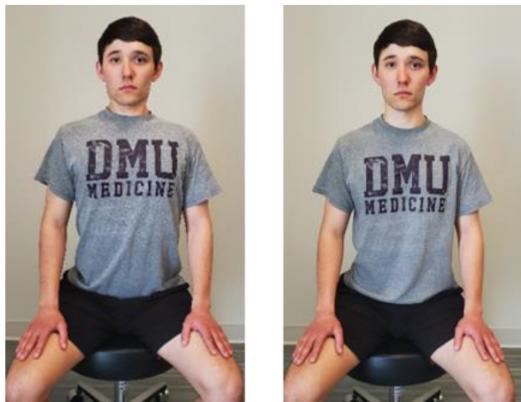


Figure 21. Box Breathing

Discussion

With a goal of promoting improved respiration, circulation, immune function, homeostasis, and overall inner health, we propose the above OST to promote the body's ability to fight-off COVID-19 infection.

There are numerous manuscripts detailing OMT for respiratory and infectious disease processes, notably describing some of the impressive benefits OMT provided to patients surviving the 1918 influenza pandemic. To our knowledge, this is the first paper focused on OST for COVID-19, a unique pandemic posing significant infection risk to patients, caregivers, and the community. Self-treatment for those at greatest risk, and those who are COVID-19 positive (but not hospitalized on a ventilator), should help promote their body's innate ability to mount a response to the disease.

Owing to the current medical pandemic, we did not feel it was appropriate to wait for a prospective designed research project, which would significantly delay our ability to provide this information to the public.

The OST protocol recommended above is safe for non-disabled individuals, and can be modified in innumerable ways for those who have difficulty achieving one or more of the exercises. The OST should be performed pain-free. There should be no pain with any of the exercises or stretches, and any pain experienced should result in reducing the particular activity or position until it can be performed pain-free. If unable to modify the particular exercise to allow for pain-free achievement, it may be necessary to discontinue that exercise. For patients with hypermobility concerns, it is important to avoid damaging your tissues with over-stretching. With these conditions, the focus should be on identifying restrictions and attempting to restore symmetry.

Conclusion

We are facing the growing pandemic of COVID-19 for which the medical and national disaster systems are grossly unprepared and ill-equipped to handle. For those at risk of infection, or those already testing positive and self-quarantining, current standard and public health recommendations include increased hydration, frequent hand washing, social distancing, and/or sheltering in place.

In addition to these recommendations, we propose an osteopathic self-treatment (OST) protocol designed to optimize overall health and recovery. Based on well-established osteopathic principles, the osteopathic self-treatment (OST) aims to promote optimal respiration, circulation (venous, arterial, and lymphatic), immune function, balance of the autonomic nervous system, reduced stress, and improved homeostasis.

OMT has been shown in numerous studies to support the body's own healing mechanisms, including beneficial effects on respiratory conditions and infections. Further testing to evaluate the effect of OST on these conditions and overall health promotion is warranted.

Visual Aids for Osteopathic Self-Treatment

The authors have created an osteopathic self-treatment (OST) handout and video that have been made available for physicians to share with their patients and directly for the public on the Des Moines University website. These resources are written for the public, with layperson descriptions demonstrating how to perform the OST. Pictures from the handout are utilized as figures throughout the manuscript, however detailed descriptions of the exercises/stretches are left in the handout. These resources can be found online at www.dmu.edu/covid-19/exercises.

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References

1. Breslin JW. Mechanical forces and lymphatic transport. *Microvasc Res*. 2014;96:46–54. doi:10.1016/j.mvr.2014.07.013.
2. Liao S, von der Weid PY. Lymphatic system: an active pathway for immune protection. *Semin Cell Dev Biol*. 2015;38:83–89. doi:10.1016/j.semcdb.2014.11.012.
3. Zink JG, Lawson WB. Pressure gradients in the osteopathic manipulative management of the obstetric patient. *Osteopathic Annals*. 1979;7(5):208-214.
4. Noll R, Degenhardt B, Johnson J. Multicenter osteopathic pneumonia study in the elderly: subgroup analysis on hospital length of stay, ventilator-dependent respiratory failure rate, and in-hospital mortality rate. *J Am Osteopath Assoc*. 2016;116:574-587. doi:10.7556/jaoa.2016.117.
5. Noll R, Shores J, Gamber R, Herron K, Swift J. Benefits of osteopathic manipulative treatment for hospitalized elderly patients with pneumonia. *J Am Osteopath Assoc*. 2000; 100(12):776-782.
6. Smith R. One hundred thousand cases of influenza with a death rate of one-fortieth of that officially reported under conventional medical treatment. *J Am Osteopath Assoc*. 2000; 100:320-323.
7. Riley, G. Osteopathic success in the treatment of influenza and pneumonia, 1919. *J Am Osteopath Assoc*. 2000; 100:315-319.
8. Educational Council on Osteopathic Principles. *Glossary of Osteopathic Terminology*. Rev ed. Chevy Chase, MD: American Association of Colleges of Osteopathic Medicine; 2017.
9. DeStefano L, ed. *Greenman's Principles of Manual Medicine*. 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2011:254.
10. Wallace E, McPartland JM, Jones JM III, Kuchera WA, Buser BR. Lymphatic system. In: Ward RC, ed. *Foundations for Osteopathic Medicine*. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2003:1062-1063.
11. Heinking KP, Brolinson PG, Goodwin TA. Large joint injury in an athlete. In: Chila AG, executive ed. *Foundations of Osteopathic Medicine*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2011:945-950.
12. Zink JG. Respiratory and circulatory care: the conceptual model. *Osteopath Ann*. 1977;5(3):108-112.
13. Kuchera ML. Lymphatics approach. In: Chila AG, executive ed. *Foundations of Osteopathic Medicine*. 3rd ed. Lippincott Williams & Wilkins; 2011:787-807.
14. Lewis DD. Osteopathic approach to diagnosis and treatment of dysfunction at the thoracolumbar junction. *J Am Osteopath Assoc*. 2020;120(2):e3–e4. doi:10.7556/jaoa.2020.023.
15. Nelson, KE. *Somatic Dysfunction in Osteopathic Family Medicine*. 2nd ed. Lippincott Williams & Wilkins; 2015:64.
16. Morgan N, Irwin M, Chung M, Wang C. The effects of mind-body therapies on the immune system: meta-analysis. *PLoS One*. 2014;9(7):e100903. doi:10.1371/journal.pone.0100903.
17. Pascoe M, Thompson D, Jenkins Z, Ski, C. Mindfulness mediates the physiological markers of stress: Systematic review and meta-analysis. *J Psychiatr Res*. 2017;95:156-178. doi:10.1016/j.jpsychires.2017.08.004.
18. Komori T. The relaxation effect of prolonged expiratory breathing. *Ment Illn*. 2018;10(1):7669. doi:10.4081/mi.2018.7669.
19. Gerritsen RJS, Band GPH. Breath of life: the respiratory vagal stimulation model of contemplative activity. *Front Hum Neurosci*. 2018;12:397. doi:10.3389/fnhum.2018.00397.
20. Greenman, PE. Pelvic girdle dysfunction. In: *Principles of Manual Medicine*. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2003:340.
21. Venero Galanternik M, Stratman AN, Jung HM, Butler MG, Weinstein BM. Building the drains: the lymphatic vasculature in health and disease. *Wiley Interdiscip Rev Dev Biol*. 2016;5(6):689-710. doi:10.1002/wdev.246.
22. Ertlanger H, Willard FH. Anatomy and physiology of the lymphatic system. In *Foundations of Osteopathic Medicine: Philosophy, Science, Clinical Applications, and Research*. 4th ed. Philadelphia, PA. Wolters Kluwer Health/Lippincott Williams & Wilkins; 2018:175-194.
23. Towns L, Jacobs AW, Falls, WM, The concepts of anatomy. In: Chila AG, ed. *Foundations of Osteopathic Medicine*. 3rd ed. Lippincott Williams & Wilkins; 2011:72.
24. Naik G, Gaur GS, Pal GK. Effect of modified slow breathing exercise on perceived stress and basal cardiovascular parameters. *Int J Yoga*. 2018;11(1):53-58. doi:10.4103/ijoy.IJOY_41_16. ■

Neuro-Ocular Release: A New Osteopathic Technique For Resolving Somatic Dysfunction

Richard A. Feely, DO, FAAO, FCA, and Jillian L. Smith, MS, DO

SPECIAL COMMUNICATION

Abstract

Neuro-ocular release (NOR) is a new osteopathic treatment modality that can be used in conjunction with any indirect osteopathic technique. It is proposed that NOR utilizes the recruitment of the visual system to access the descending pathways, while counterstrain access the ascending pathways, resulting in a resetting of the central and peripheral nervous systems. This resetting allows for dampening of the potentiation of somatic dysfunction (SD). The ascending pathways integrate with many of the vision and ocular reflex pathways influencing the descending response to the peripheral tissues, the location of palpable somatic dysfunction. The authors purport the NOR technique allows for more time efficient and effective treatment by changing the central nervous system entrainment of SD.

Introduction

Osteopathic manipulative techniques continue to evolve with the discovery of neurological mechanisms and their interactions between the somatic and nervous systems. Each osteopathic manipulative treatment (OMT) procedure has its benefits. In the case of counterstrain (CS), it is an effective indirect treatment method, but efficiency (time) is an issue. To address this deficit, the principal author founded this new technique, neuro-ocular release (NOR).

CS, an indirect positional release technique developed in the 1950s by Lawrence H. Jones, DO, FAAO, has broad applications for acute or chronic somatic dysfunction (SD) in all age groups. The principles of treatment are to modulate neuromuscular dysfunction effectively, reducing hypertonicity of a muscle in spasm.¹ The physician palpates a tenderpoint in the affected area, monitoring the tenderpoint while placing the patient in a position of ease (disengaging the restrictive barrier) resulting in softening of the tenderpoint. The position is held for 90 to 120 seconds, the patient is passively returned to a neutral position, and the tenderpoint reassessed, with the goal of pain reduction, improved motion, and physiology.

NOR is a new osteopathic manipulative procedure discovered by the primary author to treat neurologic model SD more efficiently by 3 vs. 90-120 seconds and effectively by addressing entrainment

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of SD. NOR utilizes the visual/ocular nervous system in conjunction with indirect OMT. Recruiting the visual system during OMT itself is not novel, e.g., oculocephalogyric recruitment during cervical muscle energy; however, NOR is a novel combination using ocular reflexes, a fixed stare, closing eyes, and indirect positioning. NOR utilizes CS positioning, then the physician directs the patient to visually focus (stare) at a specific point in the room that when aligned correctly, results in further softening of the tenderpoint. The authors propose ocular recruitment allows for a reset of the central nervous system (CNS) memory (entrainment) of the SD, allowing for a “warm reboot of the computer,” so to speak, of the CNS. This technique theoretically provides a more complete activation/deactivation of the neuro-chemical complexity of SD centrally and peripherally.

Many patients present to primary care with pain, and the majority have neuromuscular pain associated with SD.² SD is impaired or altered function of related components of the somatic (body framework) system: skeletal, arthrodiagonal and myofascial structures, and their related vascular, lymphatic, and neural elements.³ The

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principle treatment for SD is OMT. NOR is specifically designed to address the pain pathway as well as CNS components that maintain the feedback loop (dysfunction-pain-dysfunction) found in SD. In 2016, the primary author had difficulty treating a patient's shoulder SD/pain and decided to use a CS technique with the thought, "If I align the whole body including the visual system in the position of injury, it may facilitate a more complete and rapid release." And it did in ~3 seconds.

NOR's resetting of the biological mechanisms that sustain the SD are specific, complex and sophisticated. SD is identified and reflected in the soma, but it is learned/maintained centrally, in the spinal cord, sensory and motor cortex. Most manual manipulative

techniques have focused on peripheral symptoms, signs, and effects. However, there are few osteopathic manipulative procedures that address the treatment of both peripheral (PNS) and central (CNS) components of SD.

SD is found and maintained peripherally through the effect of muscle tone, muscle spindles, neurological apparatus, and muscle twitch (slow/fast) fibers. The peripheral-central interplay begins in the PNS where the neural gamma efferent nerves, stretch receptors, and afferent sensitization responses, including chemical, mechanical, long term/sensitizing effects of pressure and edema, are the actors that cause learned and maintained SD.⁴ These structures are thought to be modulated by the CNS, particularly the spinal cord, where learned patterns of behavior and central entrainment

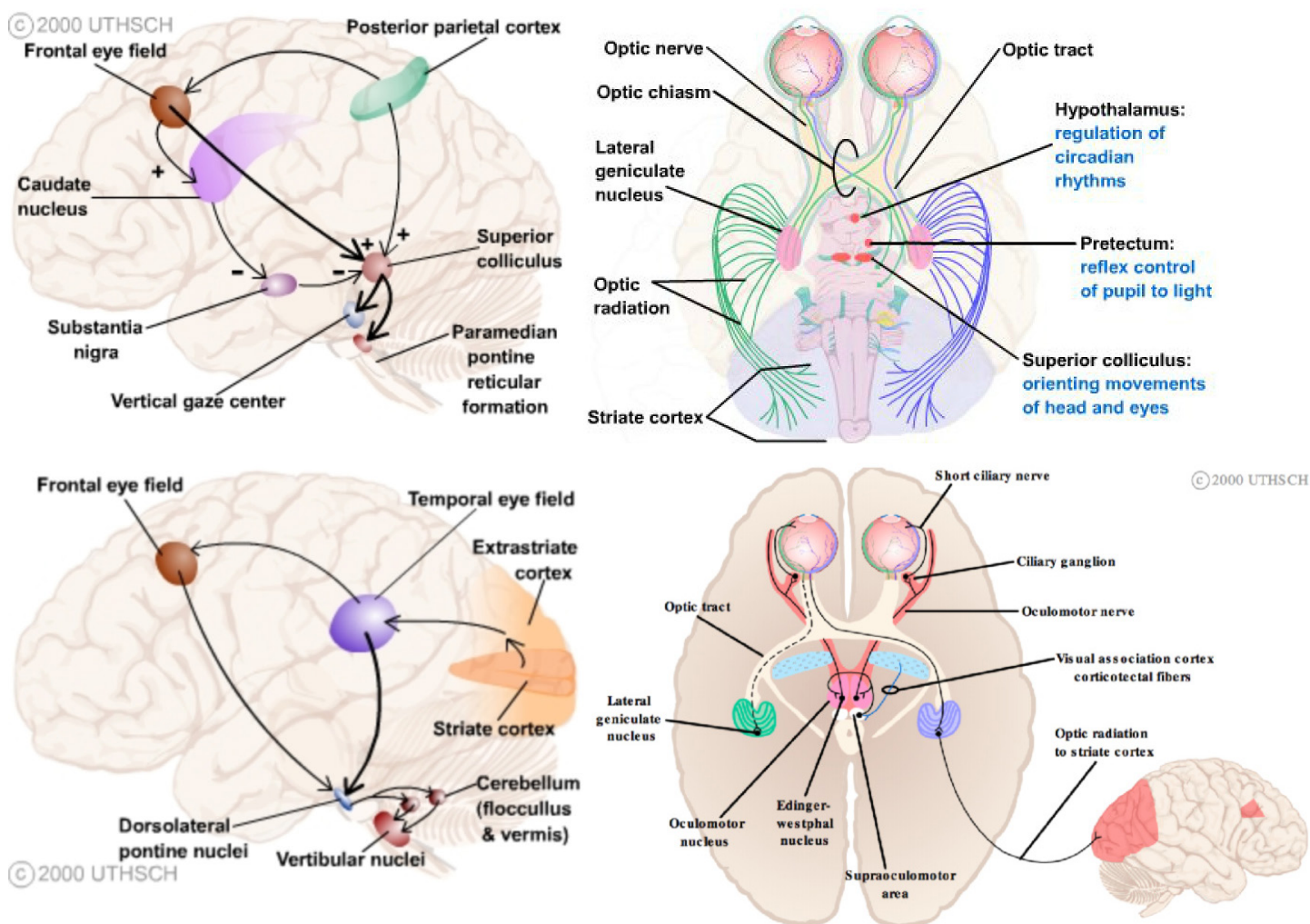


Image 1. Neuro Ocular Anatomy: Images reprinted from Neuroanatomy Online, an open access educational resource created by McGovern Medical School at UTHealth^{6,7}.

- **Top Left:** The voluntary saccades circuit.
- **Top Right:** The inferior surface of the brain illustrating the visual pathway.
- **Bottom Left:** The smooth pursuit pathway.
- **Bottom Right:** The accommodation pathway including the supraoculomotor area, and parasympathetic neurons (i.e., the Edinger-Westphal neurons) of the oculomotor nucleus.

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occurred, reinforced electrically and chemically. NOR is unique in addressing the central and peripheral SD interplay using osteopathic indirect methods via peripheral tenderpoints and NOR alignment technique.

Once the indirect method of OMT is initiated, such as CS, then the NOR procedure is introduced by having the patient stare at a point in the room. The point is usually in the direction of injury, verified by an increased softening of the tenderpoint under the physician's finger when the eyes are correctly aligned. The authors suspect the recruitment of multiple neural pathways when the patient's body and ocular reflexes are aligned to a position of ease, suggesting there may be differing functions of reflex mechanisms when different regions of the nervous system are recruited.⁵

Theory of the Mechanism

The mechanism begins with a position of ease accompanied by an optical reflex and stare. The image passes through the fovea centralis, optic nerve, optic chiasm, optic tract, lateral geniculate ganglion, optic radiation, and visual cortex, which has diffuse synapses with the thalamus, amygdala, hypothalamus, superior colliculus and corticospinal tract, the ventral horn affecting the peripheral nervous control of SD and the feedback through the dorsal horn anterior and lateral spinothalamic tract to motor cortex and thalamus, hypothalamus (see image 1).⁴ The electrical

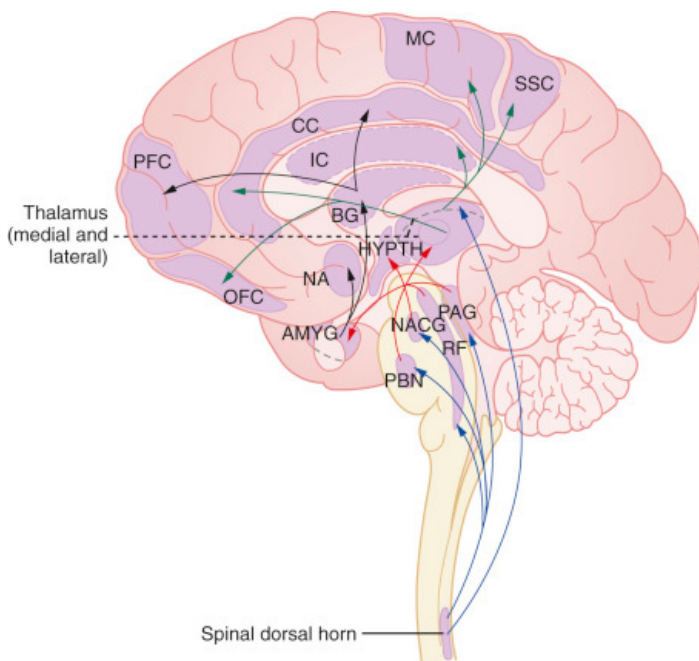


Image 2. Afferent Ascending Pathways: reprinted with permission from *Pharmacology and Physiology for Anesthesia (Second Edition): Foundations and Clinical Application*¹².

and chemical balancing of the CNS is likely key in resolving SD more completely than traditional segmental joint biomechanical procedures.

Ascending Pain Pathway

The induction of neuromuscular pain begins in the skin and joints. Various stimuli generate impulses through different receptors in the periphery of the body, especially the skin. Receptors located in the dermal, epidermal, and subcutaneous tissue provide specialized somatosensory functions.⁴ However, sensory qualities cannot be isolated to individual receptors at all times. Nociceptors consist of free nerve endings making up nearly 50% of all receptors. These impulses are transmitted through specific tracts, described below, to the sensory cortex of the brain. Proprioceptors found in muscle spindle fibers, tendons, and joint mechanoreceptors allow for the sense of position in space, motion, and force. General sensory afferent (GSA) signals coalesce within the cord and are transmitted to the cortex by a chain of neurons and axons located at specific sites in the CNS (see image 2). The primary somatosensory cortex (S1°) in the postcentral gyrus processes the conscious perception of pain including localization, quality, and intensity. The secondary somatosensory cortex (S2°) has proposed implications in the memory of sensory input.^{4,8}

Somatic pain is conducted by myelinated A-fibers for temperature, pain, and position. Unmyelinated fibers transmit temperature and pain in the trunk and limbs. The GSA fibers, located in the spinal ganglion, terminate at the posterior horn of the spinal cord gray matter in Rexed laminae I, II, IV, V, and VI.⁴ They synapse with the anterolateral system, composed of neospinothalamic and the paleospinothalamic tracts of the pain pathway.

The neospinothalamic tract synapses in the ventral-posterolateral nucleus of the thalamus and projects to the S1° and S2° cortex, through the internal capsule and corona radiata. Additional neurons project to the ventral-posteroinferior nucleus, intralaminar nuclei, and collaterals to the reticular formation. Intralaminar nuclei neurons ascend to the striatum, S1°, S2°, and cingulate gyrus, as well as the prefrontal cortex.^{4,6,7}

The paleospinothalamic path synapses in the reticular formation send projections to intralaminar nuclei of the thalamus, hypothalamus, as well as the limbic region and are primarily responsible for the emotional component of pain. The neurons ascending from the Rexed laminae are the spinomesencephalic and the spinoreticular tracts. Spinomesencephalic tracts terminate mainly in the periaqueductal gray (PAG), while others terminate in the midbrain raphe nuclei. The spinoreticulothalamic extends to the reticular formation

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in the medulla containing the gigantocellular nucleus and nucleus raphes magnus. These reticulothalamic fibers transmit pain impulses to the medial thalamus, the hypothalamus and the limbic system, components of the reticular activating system (RAS).^{4,6,7}

The third order neurons of the sensory pathway, located in the thalamus, send projections to the postcentral gyrus of the S1° cortex. Ascending axons of the spinal lemniscus, anterior and lateral spinothalamic tracts, travel alongside axons of the pyramidal tract in the dorsal part of the internal capsule.^{4,9}

The pathways for pain and temperature initiate at the skin, travel to the spinal ganglion of the afferent nerve fibers and terminate at the posterior horn of the spinal cord gray matter in the Rexed laminae. The pathway ascends the lateral spinothalamic tract to the ventral-posterolateral nucleus of the thalamus with termination in the postcentral gyrus sensory cortex.

Unconscious proprioception starts at the muscle spindles, tendon, joint, and skin receptors to the spinal ganglion. The primary neuron of the afferent nerves within the spinal ganglion sends axons terminating at the dorsal column gray matter beginning the anterior spinocerebellar tract. Neurons run directly to the cerebellum, crossed and uncrossed, passing through the superior cerebellar peduncle to the vermian part of the spinocerebellum. The posterior spinocerebellar tract begins at the base of the posterior horn gray matter and travels to the cerebellum without crossing, passing through the inferior cerebellar peduncle terminating in the spinocerebellar vermis.^{4,9}

The pathways for position sense, conscious proprioception, vibration, and touch begins in the Vater-Pacini corpuscles of the skin, muscle, and tendon receptors traveling to the spinal ganglion. The pathway ascends the cord to the nucleus gracilis and nucleus cuneatus, of the lower medulla, synapsing and ascending, crossing midline, and traversing the medial lemniscus to the ventral-posterolateral nucleus of the thalamus with neurons traveling to the postcentral gyrus sensory cortex.^{4,8,9}

The vestibulo-ocular reflex (VOR) allows for gaze stabilization during head rotation, keeping the object in focus on the fovea. The slow phase opposes head rotation to keep gaze steady whereas the fast phase saccades allow for re-centering if the slow phase overshoots. The pathway for this reflex is initiated in the semicircular canals. Bipolar cells in the canals, via CN VIII, synapse on premotor cells in the vestibular nuclei. Premotor neurons of the nucleus synapse with motor neurons in the CN nuclei, which in turn act upon the extrinsic muscles of the eye.¹⁰

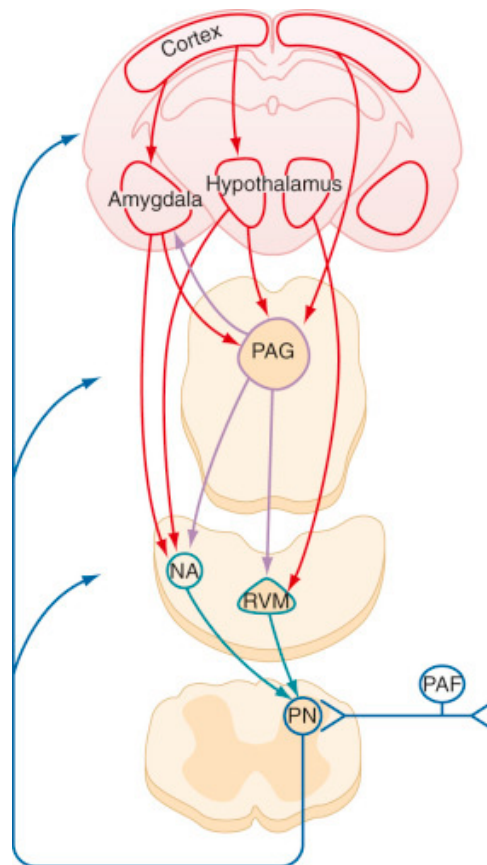


Image 3. Efferent Descending Pathways: reprinted with permission from *Pharmacology and Physiology for Anesthesia (Second Edition): Foundations and Clinical Application*¹².

The oculocervical reflex connects the vestibular system with proprioceptive afferent and efferent communication through the spinal tract, producing trunk rotation in response to a stimulus. This pathway plays a lesser role in a person with an intact vestibular system; however, it plays a more active role in patients with vestibular impairment.¹⁰

Optokinetic reflex maintains a moving object on the retina while the head remains stable. It produces optokinetic nystagmus consisting of alternating slow, compensatory movement in line with the object movement, and fast, anti-compensatory, movement opposite the movement of the object.¹¹ This reflex is mediated by the geniculo-transcortical-floccular pathway **and** works in conjunction with the VOR.¹⁰

Major components of the nociceptive system. An overview of the major anatomic components that process nociceptive information from the periphery to cortical structures. Its critical integrative function is underlined by connections to specific cortical and

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subcortical structures modulating emotional and behavioral processes. *AMYG*, amygdala; *BG*, Basal Ganglia; *CC*, Cingulate Cortex; *HYPHTH*, hypothalamus; *IC*, Insular Cortex; *MC*, Motor Cortex; *NA*, Nucleus Accumbens; *NACG*, Noradrenergic Cell Group; *OFC*, Olfactory Cortex; *PAG*, Periaqueductal Grey; *PBN*, Parabrachial Nucleus; *PFC*, Prefrontal Cortex; *RF*, Reticular Formation; *SSC*, Somatosensory Cortex.

Descending Pain Pathway

The PAG receives inputs from the cortex and is capable of activating a powerful analgesic effect. The rostroventromedial medulla (RVM) can facilitate or inhibit nociceptive inputs and acts as the relay station for descending pain signals.¹² These structures provide a mechanism through which cortical and subcortical sites can influence nociception (see image 3). Faull and Pattinson revealed activation and resting connectivity between the PAG and the visual cortex, S1°, the thalamus, medulla, PFC, occipital cortex, cerebellar lobes, and other higher cortical regions.¹³ Neuropsychiatric studies suggest that dynorphin and their associated kappa receptors have a dynamic influence over the emotional component of pain as well as modulation of the peripheral pain response.¹⁴ The cortex sends efferent fibers to the PAG, the Raphe Nucleus Magnus (RNM), and the RVM. The RNM contains monoamine pathways projecting to the dorsal horn, which can exhibit excitatory and inhibitory functions. The PAG-RVM pathway is the target of opioids and opioid-like substances and is influenced by stress and emotion. The effect is inhibition of the presynaptic primary afferents and postsynaptic inhibition at the spinal projections.¹²

The interrelationship of major neuroanatomical components exerting descending nociceptive control is shown. The [periaqueductal gray \(PAG\)](#) and rostral ventral [medulla \(RVM\)](#) integrate input from cerebral structures and relay to the spinal dorsal horn. Noradrenergic pontine and [medullary nuclei \(NA\)](#) directly project to the dorsal horn. Presynaptic and postsynaptic mechanisms modulate nociceptive information from primary afferents (*PAF*) to spinal projection neurons (*PN*). Inhibition or [excitation](#) of spinal [interneurons](#). Cortical areas, amygdala, and the [hypothalamus](#) exert top-down control. These structures modulate pain experienced by stress, emotion, and cognition.

The above pathways, afferent proprioception, vestibular afferents, and ocular feedback coalesce to produce efferent neuromuscular and pain modulating responses throughout the body. The afferent pathways ascend in close proximity within the spinal cord and synapse throughout the cortex and CNS. Disruptions along any of the pathways have the potential to influence adjacent pathways and ultimately the descending CNS response. This complex network has been previously described as the Pain Matrix, which is much

more entangled than a simple stimulus and response loop.^{8,15} Functional MRI studies have revealed that pain memory and integration occur throughout the brain and is further compounded by comorbid conditions, polypharmacy, and genetics.^{12,15,16}

Current osteopathic treatments targeting nervous system response focus mostly on the general afferent pain and efferent response pathways. NOR integrates the vestibular and ocular components' activating overlapping CNS tracts that help modulate the descending response. The authors propose NOR resets the neurovascular-somatic system to neurological normalcy by using the optical tract to influence the descending motor tracts, attempting to reset the cerebellum and cerebrum for normalized or optimized function (i.e., pre-SD state).¹⁷

Application

The primary author has created a video presented online outlining the procedure of the NOR technique (<https://youtu.be/eBYE-C7lCbuU>). The video demonstrates treatment for upper thoracic complaints, but NOR can be used in place of, or in conjunction with, any indirect osteopathic treatments.

For example, to use NOR to treat the anterior shoulder, the physician first palpates a tenderpoint. The patient is instructed and assisted to a position of ease, and tenderpoint pain has resolved; in this case, placing the affected side hand on the frontal over the coronal suture. The physician continues to monitor the tenderpoint while directing the patient to align their eyes with the position of ease, asking the patient to stare at the ipsilateral elbow. Correct alignment occurs when the tenderpoint softens more completely under the physician's finger. The patient is instructed to stare at their elbow for 3 seconds, then close their eyes, straighten up to their neutral position, and open their eyes. The tenderpoint is again palpated with the localized goal of complete resolution of pain.

Indications include:

- Somatic and visceral pain associated with acute, subacute, and chronic SD
- Neural, myofascial, and arthroal pain associated with SD
- Appendicular and axial pain associated with SD commonly having tender points

NOR Requirements

- Cooperative patient
- Patient with some vision (even 20/400)
- Patient with the ability to follow directions and focus

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(continued from page 21)

- Identifiable somatic dysfunction (tenderpoint)
- Highly skilled practitioner of Indirect OMT

NOR Contraindications

- Relative
 - No SD
 - No palpable tenderpoint
- Absolute
 - Uncooperative patient
 - Patient unable to focus/stare or with no orbital contents
 - Acute fractures and other acute medical emergencies

Conclusion

Neuro-ocular release (NOR) is an advanced, indirect osteopathic manipulative procedure that puts into play the visual/ocular nervous system utilizing the CNS as described above to deactivate entrainment, central facilitation, and local somatic dysfunction. By utilizing the neuro-ocular system in the manner described above, the inhibition of the presynaptic primary afferents and postsynaptic inhibition at the spinal projections modulate pain and diminish somatic dysfunction. The authors purport that NOR offers a faster and more complete treatment of somatic dysfunction that osteopathic clinicians should consider, particularly for recurrent neuromusculoskeletal pain with SD.

Limitations

A controlled study of this technique as compared to sham and other indirect OMT has not been performed. However, the primary author has performed NOR on 3000+ patients for the past 3 years with patient-reported 98% pain reduction following treatment. Additionally, the proposed mechanism of action of NOR above is theoretical, not proven.

References

1. Jones LH. *Strain-Counterstrain*. Boise, ID: Jones Strain-Counterstrain; 1995.
2. Nelson KE, Glonek T. *Somatic Dysfunction in Osteopathic Family Medicine*. Philadelphia, PA: Wolters Kluwer/Lippincott Williams & Wilkins Health; 2015.
3. Giusti R, executive ed. *Glossary of Osteopathic Terminology [PDF]*. Chevy Chase, MD: American Association of Colleges of Osteopathic Medicine; 2011:63. https://www.aacom.org/docs/default-source/default-document-library/glossary2017.pdf?sfvrsn=a41c3b97_0. Accessed December 15, 2018.
4. Johns P. *Clinical Neuroscience: An Illustrated Colour Text*. Edinburgh, Scotland: Churchill Livingstone/Elsevier; 2014.
5. Patterson MM, Wurster RD. Somatic dysfunction, spinal facilitation, and viscerosomatic integration. In: Seffinger MA, executive ed. *Foundations of Osteopathic Medicine*. 4th ed. Philadelphia, PA: Wolters Kluwer; 2018:300-317.

6. Byrne JH. Propagation of the action potential. In: Byrne JH, ed. *Neuroscience Online: An Electronic Textbook for the Neurosciences*. Houston, TX: McGovern Medical School at The University of Texas Health Science Center at Houston; 1997. <https://nba.uth.tmc.edu/neuroscience/s1/chapter03.html>. Accessed December 28, 2018.
7. Byrne JH. Synaptic transmission and the skeletal neuromuscular junction. In: Byrne JH, ed. *Neuroscience Online: An Electronic Textbook for the Neurosciences*. Houston, TX: McGovern Medical School at The University of Texas Health Science Center at Houston; 1997. <https://nba.uth.tmc.edu/neuroscience/s1/chapter04.html>. Accessed December 28, 2018.
8. Waxman SG. *Clinical Neuroanatomy*. New York: McGraw-Hill Education; 2013.
9. Purves D, Augustine GJ, Fitzpatrick D, Hall WC, LaMantia AS, White LE. *Neuroscience*. 5th ed. Sunderland, MA: Sinauer Associates Inc; 2012.
10. Hunyor AP. Reflexes and the eye. *Aust N Z J Ophthalmol*. 1994;22(3):155-159. <https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1442-9071.1994.tb01710.x>. Accessed January 15, 2019.
11. London R. Optokinetic nystagmus: a review of pathways, techniques and selected diagnostic applications. *J Am Optom Assoc*. 1982;53(10):791-798.
12. Ottestad E, Angst MS. Nociceptive Physiology. In: Hemmings HC, ed. *Pharmacology and physiology for anesthesia: foundations and clinical application*. Philadelphia, PA: Elsevier, Inc.; 2013:235-252
13. Faull OK, Pattinson KT. The cortical connectivity of the periaqueductal gray and the conditioned response to the threat of breathlessness. *eLife*. 2017;6:e21749. doi:10.7554/eLife.21749.
14. Schwarzer C. 30 years of dynorphins – New insights on their functions in neuropsychiatric diseases. *Pharmacol Ther*. 2009;123(3):353-370. doi:10.1016/j.pharmthera.2009.05.006.
15. Apkarian AV, Bushnell MC, Treede RD, Zubieta JK. Human brain mechanisms of pain perception and regulation in health and disease. *Eur J Pain*. 2005;9(4):463-484.
16. Borsook D, Sava S, Becerra L. The pain imaging revolution: advancing pain into the 21st century. *Neuroscientist*. 2010;16(2):171-185. doi:10.1177/1073858409349902.
17. Takakusaki K. Functional neuroanatomy for posture and gait control. *J Mov Disord*. 2017;10(1):1-17. doi:10.14802/jmd.16062. ■

Osteopathy Is Like Cactus Conservation

Cherry Liley

SPECIAL COMMUNICATION

Note from the author: It is a challenge to explain osteopathy to medical students who have not experienced it. Osteopathy is Like Cactus Conservation is a story to help with this task.

I am a patient of osteopathy, and have an MFA in Creative Writing.

A group of student conservationists stands around a six-foot desert cactus, looking at it, wondering about it—people who are new to cactuses, having never seen one before. It has a central column with two branching arms. Understandably, initially the students take it at face value, as a simple, rigid structure.

No, you tell them: Appearances are misleading, given the complexity within. Under the waxy shell are many different cells. There is succulent tissue, and even a hydraulics system. This collects and stores water in reservoirs that other animals depend on also. What looks like a plain exterior will, in season, burst out with blooms of vivid soft flowers. These are pollinated by an array of insects with their own curious lifecycles. Look closely, you say, and notice that fur of delicate spines, a cleverly designed protective mechanism. Some cultures actually revere the cactus beyond its visible and material parts because there's also a spiritual aspect to it, a holy purpose, perhaps.

So, too, osteopathy.

The cactus is only a tiny part of a bigger picture. You remind the students that a conservationist must take the immediate environment into consideration. The cactus is specially adapted to the desert, so it can patiently abide a drought. The sandy hollows around are inhabited by mice, which are feasted on by owls that nest in cavities in the cactus. They, and the snake, and the beetles, all do what they are supposed to do. They each depend on energy from the Sun. They act as workers of the Sun, dispersing its power. It cycles through all the channels of these creatures' lives, adjusting and rebalancing. The wise cactus conservationist provides for them, but does not limit or proscribe—she's aware of the greater mystery. Since there are still species yet to be discovered and labeled by scientists, she will leave room for these possibilities. She can't make rain, but she can permit and encourage the resilience each species was born with, the full scope of its own resources, to deal with the challenges of an arid season.

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A wise cactus conservationist, you tell your students, holds space for it all. He has studied the inter-relationships, knows the correct soil pH, the necessary temperature ranges, the beneficial microorganisms. He also appreciates the beauty of the moonlight's bath, the role of the poetry of light in the cactus moth's life.

“ **Some cultures actually revere the cactus beyond its visible and material parts because there's also a spiritual aspect to it, a holy purpose, perhaps.**

So, too, osteopathy.

In this particular climate, even a fingerprint leaves an impact, introducing traces of moisture and salt. A hasty or clumsy move could scuff the sand and uproot the cactus—it's roots are not deep—or knock off a flower. That's why attention, watchfulness, and patience, along with gentle precision, are all attributes of an effective cactus conservationist.

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Management of energy is fundamental—the vitality of each part contributes to the whole. Adjust nutrients little by little, you caution the students. A pollinating beetle requires only one rodent dropping in which to lay its egg. On the other hand, a cactus stressed by an over-proliferation of rodents will benefit from relief. Balance is key.

Yes, you respond, in answer to a student's question—in one situation, perhaps you will take out from the area an invasive species; but in another case, you might leave it, allowing that it appeared to compensate for something missing. Yes, if tire tracks near the cactus have caused compaction of soil, you can aerate the ground to allow nutrients to flow again and root tips to revive. Put supports in place if an arm of the cactus cracks, but be watchful; don't harm the helpful ants that excrete their own chemical bindings, or limit their opportunity. Primarily hold the space rather than actively interfere. Listen and respond lightly and gently to what is actually going on. Intense attention and awareness makes for presence, which is in itself an energy resource. Sometimes a demonstration of looking and listening is enough, is action in itself.

At first, it had seemed to them so rigid, but by now the students can see how adaptable is the cactus. Be alert to the tiny details, you tell them—how, for example, by night, coolness draws moisture across the top layer of sand and the slightest indents from mice feet and snake tracks after sundown pocket drops of dew. This gentle refreshment encourages the cactus roots to fan out, for better support.

Finally, wrapping up, you advise them to consider time: Complexity builds over time. This cactus has become accustomed to certain habits, such as the behaviors of the mice, the particular way the breeze blows here, and how the air flows over this tiny ridge. The cactus has adjusted itself. Particularities have been incorporated. These reactions over the seasons to certain peculiarities make it unique. That's why there is no manual for cactus, only the consideration of individual cacti. The beauty of the world lies in its diversity, differentiation, and subjectivity, which the mind and awareness of the wise conservationist will strive to encompass.



Primary Care Physician opportunity in Waterville, Maine

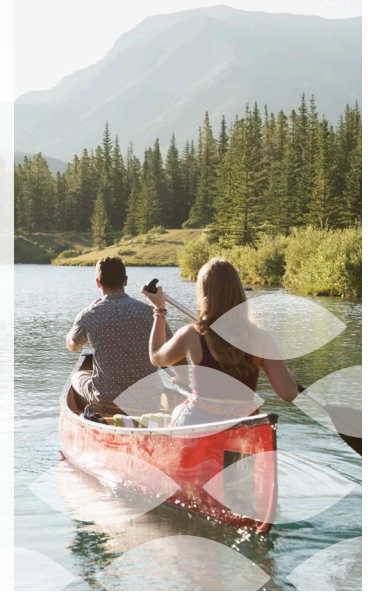


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For more information, contact: MaryKate Friend, AASPR, Physician Recruiter, Northern Light Health
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3. Licensed or eligible for licensure to practice medicine in the state of Nevada;
4. Proficient in basic communication tools including email, Word and PowerPoint

PREFERRED QUALIFICATIONS:

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Hypertension: An Osteopathic Perspective

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CLINICAL PRACTICE

Introduction

Current estimates report that approximately 65 million people (about 1 in 3 adults) in the United States live with hypertension (HTN), of which only 44% have achieved target blood pressure (BP) ranges below 140/90 mmHg.¹ The impact of HTN on heart disease, myocardial infarction, stroke, nephropathy, and retinopathy, makes BP one of the most critical conditions to treat with better success than currently achieved. Just one of the sequelae of hypertension is heart disease, which is the number one cause of death in the US.²

Despite advances in pathophysiology and pharmacotherapy, we have not been able to systemically control hypertension and stop heart disease as a leading killer. We need to understand why current methods or implementations of treatment are falling short and what the tools are that may be underutilized. Osteopathic manipulative treatment (OMT) has been used to help treat hypertension for more than 100 years. This article examines what is known about OMT and hypertension, how the cumulative knowledge can influence an osteopathic treatment, and what areas need further examination.

Review of Literature

The information contained in this manuscript was obtained by searching databases in June 2017, including: OSTMED-DR, PubMed, Scopus, Mantis, ProQuest Health and Medicine, CINAHL, and ScienceDirect. Keywords included osteopathic manipulative medicine, osteopathic manipulative treatment, OMT, OMM, manual medicine, and chiropractic plus hypertension, cardiovascular disease, or heart disease. Additionally, the Touro University (California) archives were accessed for osteopathic texts published in the 19th and early 20th centuries on the topic of treating hypertension. Extensive research into citations found in articles led to a thorough compilation of published material on this topic within osteopathic medicine. While a broad search of the literature was performed, the references were narrowed down, and those ultimately used for this manuscript were the ones most directly related to this text. Research was again updated December 2018 to take into account newly published work. Only articles published in English were considered.

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Framework

To facilitate ease of understanding and ease of adoption for clinical practice, this article employs the framework of the ABCs of osteopathic medicine, as outlined by Nuño et al in this journal in June 2018.³ In using this model, the student or physician is invited to consider autonomics, biomechanics, circulation, and screening of the overall patient. Autonomics generally consider both sympathetic and parasympathetic systems; biomechanics include muscle, fascia and joints; and circulation involves lymphatic, venous, and arterial systems. The screen looks at the global picture and includes all mind, body, spirit components. The ABCs of osteopathic medicine are not a prescriptive application of osteopathic principles, but rather a framework for organizing a clinical approach and facilitating communication with colleagues on a basis of anatomy and physiology.

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Functional Anatomy/Pathophysiology

While causality is incompletely understood, the vascular remodeling that alters circulatory fluid dynamics has been well researched. Endothelial cell hypertrophy, apoptosis, vascular fibrosis, and low-grade inflammation all lead to increased velocity of blood flow over a smaller area of vessel wall, which then causes an increased pressure and tissue hypoxia.^[4-6] Furthermore, the strong interrelationship between the renal system and cardiovascular system cannot be underappreciated. It has been shown that much of hypertension and cardiovascular burden can be attributed to first abnormalities in the renal system.⁷ The biochemical connection between systemic inflammation and coronary heart disease, for example, is well-reviewed by DeJongste and Horst, who describe the toxic effects of shear stress, oxidized low-density lipoprotein (LDL), sensitized lymphocytes, and infections, viruses and bacteria have on the cardiovascular system, and the body's response in terms of increased C-Reactive Protein (CRP), acute-phase proteins, IL-1, IL-6, and other immunological markers of inflammation.⁸ Recently, systemic inflammation has been gaining momentum as a contributor to chronic disease.⁹

S: Screen

The source of this inflammation can be within the body or driven by external environmental factors. For example, Clearfield et al recently explored the connection between climate change on the inflammation of cardiovascular disease.¹⁰ To go even further, inflammation and hypertension have been linked via studies of the human gut microbiome.^[11, 12] For example, researchers recently discovered that patients with hypertension have decreased microbial richness and diversity; in turn, gut dysbiosis, permeability, and leakiness have been linked with increased sympathetic activity. This seems to be related to the gut dysbiosis contributing to chronic inflammation and increased sympathetic activity, leading to increase in blood pressure.^[11, 12] Furthermore, oral dysbiosis is connected to the nitrate-nitrite-nitric oxide signaling pathway because we rely on bacteria in our mouth to reduce nitrate to nitrite, which later becomes nitric acid and thus helps promote blood vessel relaxation and many other important autocrine and paracrine functions.^[11, 12] Clinical hypertension may be one of the ways the body self-regulates changing demands from a variety of influences, including lifestyle and environmental factors.

A: Autonomics

The autonomic nervous system (ANS) has been consistently implicated in hypertension, and it is generally divided into the sympathetic (SNS), parasympathetic (PNS), and enteric portions.¹³ The efferent pathway of both the SNS and PNS consist of a pre-ganglionic and a postganglionic neuron. The SNS has its origin in the lateral horn of the spinal cord in segments T1-L2, while the

PNS exists in cranial nerves III, VII, IX and X, as well as in spinal segments S2-4.¹⁴ The major relevant parasympathetic nerve for the cardiovascular system is the vagus nerve, CN X, which emerges from the medulla in the brainstem, exits the cranium through the jugular foramen between the occipital and temporal bones, descends the neck inside the carotid sheath, and enters the mediastinum posterior to the sternoclavicular joint and brachiocephalic vein.¹⁵ There it integrates into the pulmonary plexus, esophageal plexus, and cardiac plexus. The cardiac plexus consists of these portions of the vagus nerve, as well as the sympathetic trunk postganglionic nerves from T1-T4. The right vagus portion of the cardiac plexus innervates the sinoatrial (SA) node and, during times of excess stimulation, causes sinus bradycardia, while the left Vagus portion innervates the atrioventricular (AV) node, and in extreme stimulation can cause AV block.^{15,16} Cell bodies of postganglionic neurons of the PNS are located near the SA and AV nodes, as well as in the atrial wall and interatrial septum. Hormonally, acetylcholine aids in decreasing atrial contractility and slowing of pacemaker cell contraction. The sympathetic postganglionic nerves have cell bodies in the cervical and superior thoracic paravertebral ganglia of the sympathetic trunk. Stimulation from these nerves causes increased heart rate, impulse conduction, contractility, and increased coronary blood flow. Contractility is further stimulated by neurochemical signals from the adrenal organs via B2 receptors.¹⁵ Additionally, the cardiac plexus carries the visceral afferent fibers with reflexive and nociceptive input from the heart itself.

Foundational research by Burns demonstrated the connection between the structures of the thoracic spine with heart rate and rhythm.¹⁷ This research was built upon by Korr and Patterson, who connected increased sympathetic stimulation with facilitation of thoracic spinal segments, resulting in higher coronary blood flow and higher sympathetic tone of the heart, eventually leading to the model of viscerosomatic reflexes.¹⁸ Some of the earliest mentioning of the viscerosomatic relationship was documented in 1905, when Tasker proposed the interscapular region as referring pain from heart, pericardium, lungs and pleura.¹⁹ More recently, research has looked at centralization of pain, which underlines this bidirectional connection between the central nervous system and the periphery.²⁰ While this specific research looks at the modulation of pain messages from the brain and spinal cord, it again highlights the ongoing self-regulation and modulation between center and periphery, between viscera and soma.

B: Biomechanics

The heart is physically enveloped in the pericardium, which is attached anteriorly to the sternum and is composed of the parietal and visceral layers. The parietal pericardium has an external fibrous

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layer that is continuous superiorly with the great vessels and visceral fascia of the neck and inferiorly with the central tendon of the diaphragm and a serosal layer composed of simple squamous epithelium. The visceral layer, also known as the epicardium, lies directly on the heart itself. The diaphragm is innervated by afferent fibers of the left and right phrenic nerve which emerges from the anterior rami of C3, 4 and 5 before continuing on to the diaphragm with efferent fibers.¹⁵ The pericardium's attachment just superior to the diaphragm at the central tendon via the pericardiophrenic ligaments gives the heart and diaphragm a very real, firm, and direct connection.²¹ During inspiration, the heart descends along with the diaphragm's decent and flattening as the ribcage widens in anterior-posterior and lateral views. The diaphragm descends 1.5 cm with normal inspiration, and as much as 7 cm with deep inspiration, something that is taken advantage of for obtaining quality chest x-rays.²¹ Furthermore, major fluid structures such as the inferior vena cava and the aorta pass through the diaphragm in their connection between the thorax and abdomen. Overall, the diaphragm acts as a piston, the motion of which accounts for 75% of intrathoracic volume changes during quiet inspiration.²¹

C: Circulation

Sutherland also described the diaphragm as functioning like the “piston” to the “combustion engine” of the body, which helps illustrate the effect of the pressure changes caused by diaphragmatic motion, and acting on the body fluids.²² The effect of breathing on venous return has been well established, wherein the negative pressure during inspiration greatly increases the venous and lymphatic flow returning to the heart, and vice versa during expiration.^[21]²³ Frymann describes the excursion of the diaphragm as “utmost important” in cardiovascular function since the diaphragm has “sphincter-like function for the inferior vena cava,” and dysfunction can “increase the burden on the left ventricle or decrease the venous return into the right side of the heart.”²⁴ Furthermore, in the second edition of *Foundations of Osteopathic Medicine*, Ettlenger notes his experience of congestive heart failure patients in the hospital setting consistently develop fluid congestion in the liver and lower extremities in part due to this exact mechanism, with improvement once the restricted diaphragm is addressed osteopathically.²⁵ The central portion of the diaphragm is the most mobile part of the diaphragm, while the periphery consists of fixed muscles. These attach to the posterior portion of the xyphoid process, the internal surface of ribs 6 through 12, and the anterior portions of lumbar vertebral bodies 1 through 3 via the right and left crura.¹⁵ Again, the diaphragm intimately relates to fluid dynamics of the body and correct breathing is literally vital for proper cardiovascular function.

The above highlight a few portions of anatomy and physiological function as they contribute to hypertension. However, blood pressure is not controlled by a single organ, but instead, by a complex orchestration of the whole person.¹³

Patient Assessment

Physicians come to understand their patients in the context of their lives. Ideally, this includes an understanding generally of the patient population, level of poverty, access to medical care, and environmental factors, as these variables all correlate to mortality of cerebrovascular and hypertensive disease.²⁶ Furthermore, the osteopathic principles guide us to also consider spiritual aspects of patients' lives, such as feeling a sense of connection to their community, a sense of purpose, or a connection to a god and nature.

While hypertension typically presents asymptotically, clinicians can observe level of distress, gait, and posture to help assess overall health and function. Ideally, the blood pressure reading is performed under proper circumstances including patient resting for 5 minutes prior to measurement with feet resting on the floor. In 2017, a surprise finding showed that only 1 out of 159 students demonstrated all 11 skills of correct blood pressure measurements (see Table 1) at the American Medical Association (AMA) House of Delegates Meeting.²⁷ Additional physical exam components may include direct visualization of blood vessels via a fundoscopic exam to look for arteriolar light reflex, AV nicking, hemorrhage, and exudates, possibly even Hollenhorst plaques. Checking for edema, jugular venous distention (JVD), and auscultation for bruits will help assess the CV system, as well as auscultating the heart and lungs at every encounter.

An abbreviated integrated structural exam can give the osteopathic physician a wealth of additional information in assessing a patient's health and compensation ability. At its briefest, this may simply include a scan looking at autonomic and biomechanics for TART (tissue texture abnormalities, asymmetry, restricted range of motion, tenderness) of the cervical and thoracic spine in order to identify any areas of somatic dysfunction and possible facilitated segments. TART in the thoracic and upper lumbar region may give the clinician information regarding the functioning of the sympathetic nervous system (SANS). Further structural evaluation of the ribs, sternum, and diaphragm add to the assessment of the SANS, as well as the biomechanics of the diaphragm and ribcage in order to feel the quality of the heart's encasement. Assessment of the occipitomastoid (OM) suture between the temporal and occipital bones to feel for the jugular foramen's freedom of passage for CN IX and X, can demonstrate potential restrictions affecting

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the parasympathetic nervous system and ability for the heart to effectively relax. In fact, Magoun writes that in his experience, head trauma as manifested by a “jammed occiput” and locked temporal bones has been linked to be the ultimate cause of “vagal syndromes” involving especially the heart.²⁸

Thus, in addition to a targeted cardiovascular exam, structurally we can especially focus on assessing the OM suture, cervical spine, T1-4, sternum, ribs 6-12, xiphoid, L1-3, and restriction of the diaphragm. It is worth mentioning that Barral has found a strong connection specifically with C4-6 and T4-6 in patients with cardiac problems.²⁹

Table 1. Proper blood pressure measurement protocol.²⁷

1. Patient rests for 5 minutes prior to measurement
2. Legs uncrossed
3. Feet on floor
4. Arm supported at heart level
5. Correctly size the cuff to equal at least 40% of arm circumference & length of cuff bladder encircle at least 80% of arm circumference
6. Cuff placed over bare arm
7. No talking, reading, mobile phone use
8. Deflate the cuff at a steady rate of 2 mmHg/s
9. Measure BP in both arms
10. Identify the more clinically relevant BP reading as that from the arm with the higher reading. (This is also the arm used in future BP measurements.)
11. When evaluating for hypertension, clinicians also should measure BP in supine and standing positions to check for postural hypotension.

If patient is less than 30 years old, also measure BP in at least 1 leg.

Treatment

No matter what we chose for treatment, a pertinent reminder from S. Hitch in the 1950s holds true even today, that “instead of endeavoring to get the patient to conform to whatever treatment may be available, the treatment is given in conformation with the needs of the patient.”³⁰ Today, we might call this patient-centered care and shared decision-making. The 8th Joint National Commission suggests that blood pressure above 140 mmHg systolic or 90 mmHg diastolic in patients less than 60 years of age needs to be clinically addressed.³¹ In patients above 60 years, the threshold for treatment of hypertension has an increase in the systolic value to 150 mmHg while the diastolic value remains at 90 mmHg.

One of the most common tools for HTN treatment is pharmaceuticals. There are a large number of effective agents, and most reportedly lower systolic BP by about 7mmHg to 13 mmHg and diastolic BP by 4mmHg to 8 mmHg.³² The main first line agents include angiotensin converting enzyme inhibitors (ACEI), angiotensin receptor blockers (ARBs), calcium channel blockers (CCBs), and diuretics. Choice of agent typically depends on side effect profile, insurance, and preference by provider. For example, other systemic effects such as the reno-protective effects of ACE-inhibitors can factor into treating patients with diabetes. Further nuances of the pharmacologic approach to hypertension are well documented elsewhere.³³

Aside from pharmaceutical interventions, best practices in the management of hypertension includes lifestyle modifications, which also helps complete the osteopathic ABCs with a screen of the overall patient picture. Healthy diet and exercise have been recommended against hypertension for more than 100 years.³⁴ We are coming full circle now. After recommending lifestyle changes only briefly in the final remarks of the JNC7 report in 2014, the updated 2017 JNC8 devotes 5 pages with detailed guidelines for not only diet and exercise, but also encouraging a societal approach to increase activity levels and access to healthy food.³³ Essentially, the recommendations include following a Dietary Approaches to Stop Hypertension (DASH) diet, while also reducing salt and alcohol consumption. Other topics in lifestyle modifications typically include regular moderate to vigorous aerobic exercise, weight reduction, even if small amounts, and stress reduction. Exercise alone has been shown to reduce blood pressure by 5mmHg to 7 mmHg over time.³⁵ Furthermore, a pilot study in 2011 suggests possibly favorable effects just on deep breathing exercises of an average 10 mmHg for patients with hypertension and obstructive sleep apnea (OSA) after 8 weeks.³⁶

For a variety of reasons, lifestyle changes continued over a lifetime can be difficult for patients to commit to. We also know that pharmaceuticals carry risks and side effects that accompany their benefits. How else can osteopathic physicians manage hypertensive patients? The scope of OMT has always been greater than simply treating musculoskeletal complaints.

Clinical Trials

Despite the non-invasiveness and speed of measuring blood pressure, there are surprisingly few clinical trials looking at manipulative techniques’ ability to address hypertension. Of course, studies on OMT encounter a number of barriers, including issues related to blinding, sham treatments, paucity of financial interest, time

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involvement per treatment, and so on. Additionally, while it is easier to set up, measure, and reproduce a treatment protocol study, this does not actually reflect how we treat individual patients, where we treat what we find specific to the individual's somatic dysfunction. If an OA is not restricted, then OMT at the OA is not indicated on the basis of no somatic dysfunction existing there.

In 2003, Spiegel published a thorough review of published studies looking at osteopathic manipulative medicine in the treatment of hypertension.³⁷ He examined 8 studies published mainly in the 1960s and 1970s, and readers are referred to his text for an examination of earlier works. Since then few studies have been published to greatly expand that list. See Appendix for details.

The highest quality modern study was conducted by Cerritelli and his team in Italy. The researchers recently studied the effect of blood pressure on subjects wherein OMT was used as an “approach,” not as an isolated technique.³⁸ The researchers used myofascial release, craniosacral, high-velocity low-amplitude (HVLA), balanced ligamentous tension (BLT), muscle energy, biodynamic, counterstrain, and other modalities based on what the “operator” chose as “the more appropriate to apply on a patient in a given moment.” With 63 eligible participants, the number of subjects is fairly low. All participants received routine care by a cardiologist, with half receiving OMT. There was no sham treatment offered, and patients were not randomized. Specific endpoints included systolic and diastolic blood pressure, as well as intima media thickness, and were measured at baseline and after 12 months, after bi-monthly OMT. Significantly, the participants all had diagnosed essential hypertension, and the study showed treating their bodies osteopathically did decrease blood pressure measurements as compared to baseline and as compared to the control. The researchers reasoned the effect as due to the decrease of inflammatory factor production and improvement in autonomic nervous system function.

Another 2 studies used active techniques, such as vigorous lymphatic pumping, on normotensive volunteers without an assessment of somatic dysfunction.^[39, 40] Both of these showed short-term increases in diastolic blood pressure. This leads to the question of the role actual somatic dysfunction plays on the effects of blood pressure through manipulation. Perhaps manipulating a structure that does not display dysfunction causes an increase in allostatic load and stress on the body, thus increasing blood pressure? Perhaps also the modality of intervention matters, as conceivably, direct and active manipulation can act in a stimulatory manner, in contrast to indirect and passive manipulation. This question has not been examined experimentally.

The anti-inflammatory effects of OMT mentioned by Cerritelli appear to be a relatively new observation. A thought-provoking study using human fibroblasts with modeled strain and OMT published in 2007 by Meltzer and Standley demonstrated the inflammatory effect of induced cellular strain and the reduction of this inflammatory response after application of counterstrain or myofascial release technique.⁴¹ When examining cytokine changes after OMT for low back pain, as part of the OSTEOPATHIC trial, Licciardone et al found a decrease in TNF- α correlating with the OMT intervention group.⁴² While more clinical research connecting OMT with anti-inflammatory effects is needed, this was considered a landmark finding. Considering the clear connection between inflammation and cardiovascular disease, a better understanding of OMT's effect on the immune system and the inflammatory response in particular may help us understand and distinguish what OMT can accomplish for hypertensive patients.

A different line of inquiry that bears mentioning is the examination of Chapman reflex points for the adrenal gland in subjects with low renin–high aldosterone level hypertension in 1979.⁴³ Aldosterone levels significantly and reproducibly decreased, though the researchers unfortunately measured blood pressure only immediately after treatments, without tracking the BP to check for a hormonally induced reduction in blood pressure.⁴³ Considering that aldosterone measurements took about 36 hours to shift post-treatment, a slower response in blood pressure changes is a reasonable question to pursue.⁴³ A clinical study of diagnosing and treating cardiac Chapman points has also not been formally studied, despite observational evidence.⁴⁴ A revisit of a blood pressure study focusing on Chapman reflex points may be worthwhile. While this study examined a variety of secondary hypertension, further exploration may expand on our understanding of neuro-hormonal responses to blood pressure and give us further tools for intervention.

The limited research should encourage the osteopathic profession to expand their examination of the connection between osteopathic manipulation and hypertension. Ideally, participants would be divided into treatment group, sham treatment group that includes non-therapeutic touch (such as ultrasound), and a control receiving no touch. Researchers can create blinding in having treatment provided by osteopathic physicians who are unaware of the research question. And considerations would have to be given into protocol types, modality types, number and frequency of treatments, and length of follow-up.

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Appendix. A brief review of studies examining relationship between osteopathic manipulative treatment and hypertension.

Article	Summary	Strengths	Weaknesses	Findings
Cerritelli F, Carinci F, Pizzolorusso G, et al. Osteopathic manipulation as a complementary treatment for the prevention of cardiac complications: 12-months follow-up of intima media and blood pressure on a cohort affected by hypertension. <i>J Bodw Mov Ther.</i> 2011;15(1):68-74. doi:10.1016/j.jbmt.2010.03.005	<ul style="list-style-type: none">• Ultrasound measurement of intima-media thickening (IMT) at carotid and femoral arterial bifurcations and measuring systolic and diastolic blood pressure on hypertensive patients• OMT consisting of individualized treatment based on TART and exam findings• 12-month follow-up	<ul style="list-style-type: none">• Treatment consistent with OMT practice (pragmatic design)• 1-year follow-up	<ul style="list-style-type: none">• No randomization• Unsure of strength of causal relationship	<ul style="list-style-type: none">• Treatment arm improved in endpoints: reduction in IMT and systolic BP
Rivers WE, Treffer KD, Glaros AG, Williams CL. Short-term hematologic and hemodynamic effects of osteopathic lymphatic techniques: a pilot crossover trial. <i>J Am Osteopath Assoc.</i> 2008;108(11):646-651.	<ul style="list-style-type: none">• Experimental study arm had 10 minutes of active lymphatic treatment; control arm had 10 minutes of rest for total of 15 healthy male subjects	<ul style="list-style-type: none">• Randomized• Repeat measurements at baseline, 20 min, 50 min, and 80 min after baseline• No adverse effects or complications	<ul style="list-style-type: none">• Healthy male subjects• Single event• Chiropractic	<ul style="list-style-type: none">• Increased diastolic BP after treatment• No change in systolic BP
Yates RG, Lamping DL, Abram NL, Wright C. Effects of chiropractic treatment on blood pressure and anxiety: a randomized, controlled trial. <i>J Manipulative Physiol Ther.</i> 1988;11(6):484-488.	<ul style="list-style-type: none">• N = 21• Chiropractic adjustment device used to adjust T1-5• Patients had elevated BP and anxiety	<ul style="list-style-type: none">• Randomized• 3 arms: active tx, placebo tx, no tx (control)	<ul style="list-style-type: none">• Chiropractic device	<ul style="list-style-type: none">• Intervention decreased BP
McGuinness J, Vicenzino B, Wright A. Influence of a cervical mobilization technique on respiratory and cardiovascular function. <i>Man Ther.</i> 1997;2(4):216-220. doi:10.1054/math.1997.0302	<ul style="list-style-type: none">• Whether posterioranterior mobilization over spinal process of C 5/6 affects sympathetic nervous system in healthy young volunteers	<ul style="list-style-type: none">• Randomized, controlled trial• Double-blind• 3 groups: mobilization (joint movement), placebo (light touch), control (no touch)	<ul style="list-style-type: none">• Single event• No follow-up• Chiropractic	<ul style="list-style-type: none">• Increased respiratory rate, heart rate, systolic and diastolic BP
Johnston WL, Kelso AF. Changes in presence of a segmental dysfunction pattern associated with hypertension: part 2. A long-term longitudinal study. <i>J Am Osteopath Assoc.</i> 1995;95(5):315.	<ul style="list-style-type: none">• 61 subjects followed up on after 3-10 years• Presence/absence of C6/T2/T6 somatic dysfunction pattern correlated with hypertension• No treatment/intervention	<ul style="list-style-type: none">• Long-term follow-up (years)	<ul style="list-style-type: none">• No treatment intervention	<ul style="list-style-type: none">• Somatic dysfunction pattern persisted in hypertensive patients, but had resolved in non-hypertensive patients at multiple-year follow-up
McKnight ME, DeBoer KF. Preliminary study of blood pressure changes in normotensive subjects undergoing chiropractic care. <i>J Manipulative Physiol Ther.</i> 1988; 11(4):261-266.	<ul style="list-style-type: none">• 75 healthy students separated based on cervical spine somatic dysfunction who were treated (experimental branch), and those students without the dysfunction who had no manipulation (control). Pre- and post-interventional BP measurements were taken.	<ul style="list-style-type: none">• BP-measuring doctors were blinded.	<ul style="list-style-type: none">• No long-term effects or cumulative effects measured	<ul style="list-style-type: none">• Statistical decrease in systolic (10-20 mmHg) and diastolic BP in experimental but not control group

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Conclusion

In summary, what can osteopathic physicians offer patients with hypertension? Osteopathic manipulative medicine recognizes the unity of body, mind, and spirit, which helps point to the importance of a good patient-doctor relationship. What does the future of osteopathic medicine look like? A 2018 study by Rizkalla found a correlation between empathy and interest/use of OMT.⁴⁵ This study theorizes that the hands-on patient approach is a vital component of what helps hands-on physicians maintain more open hearts and connections to patients. Further, osteopathic medicine recognizes the structure and function interrelationship, which is where offering OMT and lifestyle modifications, including exercise programs, can help guide patients towards optimal health along with standard of care using appropriate pharmaceutical agents. Thirdly, continuous encouragement of patients towards healthier diet, and avoiding/minimizing toxins such as tobacco, alcohol, and other drugs strengthen the self-healing properties of the body.¹¹ Perhaps even a bigger look at environmental pollutions and climate change as they affect our long-term health is worth examining with patients. Finally, to assure that treatments remain rational, the profession should continue to pursue high-quality research of OMT, beginning with case studies of what practicing DOs encounter, as well as clinical trials examining larger effects, and systematic reviews to examine overall risks and benefits.

References

1. Egan BM, Zhao Y, Axon RN. US trends in prevalence, awareness, treatment, and control of hypertension, 1988-2008. *JAMA*. 2010;303(20):2043. doi:10.1001/jama.2010.650.
2. Leading causes of death. Centers for Disease Control and Prevention website. <https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm>. Updated March 17, 2017. Accessed December 10, 2019.
3. Nuño V, Peña NJ, Hughes TNE, Cuny LAM, Pierce-Talsma SL. Teaching osteopathic principles and practices: easy as ABCs. *AAO Journal*. 2018;28(2):34-38.
4. Gutstein WH, LaTaillade JN, Lewis L. Role of vasoconstriction in experimental arteriosclerosis. *Circulation Research*. 1962;10(6):925-932. doi:10.1161/01.RES.10.6.925.
5. Niinikoski J. Cellular and nutritional interactions in healing wounds. *Med Biol*. 1980;58:303-309.
6. Hohn DC, MacKay RD, Halliday B, Hunt TK. Effect of O₂ tension on microbicidal function of leukocytes. *Surg Forum*. 1976;27(62):18-20.
7. Afkarian M, Sachs MC, Kestenbaum B, et al. Kidney disease and increased mortality risk in type 2 diabetes. *J Am Soc Nephrol*. 2013;24(2):302-308.
8. DeJongste, M.T., Ter Horst G.J., Mediators of inflammation in patients with coronary artery disease. In: Ter Horst GJ, ed. *The Nervous System and the Heart*. Totowa, NJ: Humana; 2000:467-487.
9. Ridker PM. Clinician's guide to reducing inflammation to reduce atherothrombotic risk: JACC review topic of the week. *J Am Coll Cardiol*. 2018;72(25):3320-3331. doi:10.1016/j.jacc.2018.06.082.
10. Clearfield M, Davis G, Weiss J, Gayer G, Shubrook JH. Cardiovascular disease as a result of the interactions between obesity, climate change, and inflammation: the COCCI Syndemic. *J Am Osteopath Assoc*. 2018;118(11):719-729. doi:10.7556/jaoa.2018.157.
11. Al Khodor S, Reichert B, Shatat IF. The microbiome and blood pressure: can microbes regulate our blood pressure? *Front Pediatr*. 2017;5:138. doi:10.3389/fped.2017.00138.
12. Galla S, Chakraborty S, Mell B, Vijay-Kumar M, Joe B. Microbiota-host interactions and hypertension. *Physiology*. 2017;32(2):224-233. doi:10.1152/physiol.00003.2017.
13. Hall J. *Role of the kidneys in long-term control of arterial pressure and in hypertension*. In: Hall JE, ed. *Guyton and Hall Textbook of Medical Physiology*. 13th ed. Philadelphia, PA: Elsevier; 2016:227-240.
14. Standring S. ed. *Gray's Anatomy: The Anatomical Basis for Clinical Practice*. 41st ed. New York, NY: Elsevier; 2016:20.
15. Moore K, Dalley AF, Agur AMR. *Clinically Oriented Anatomy*. 8th ed. Philadelphia, PA: Wolters Kluwer; 2018:62, 63, 128-132, 148-150, 163-165, 171, 172, 297, 306-309.
16. Kuchera ML, Kuchera WA. *Osteopathic Considerations in Systemic Dysfunction*. Rev 2nd ed. Dayton, OH: Greyden Press; 1994.
17. Burns L, Chandler LC, Rice RW. *Pathogenesis of Visceral Disease Following Vertebral Lesions*. Chicago, IL: The American Osteopathic Association; 1948.
18. Korr I. Spinal cord as organizer of disease processes. *J Am Osteopath Assoc*. 1976;76(1):35-45.
19. Tasker D. *Principles of Osteopathy*. Los Angeles, CA: Baumgardt; 1905.
20. Clauw D. Diagnosing and treating chronic musculoskeletal pain based on the underlying mechanism(s). *Best Pract Res Clin Rheumatol*. 2015;29(1):6-19. doi:10.1016/j.berh.2015.04.024.
21. Ganong W. *Review of Medical Physiology*. 20th ed. New York, NY: Lange Medical Books/McGraw-Hill; 2001.
22. Sutherland W. *Contributions of Thought*. 2nd ed. Fort Worth, TX: Sutherland Cranial Teaching Foundation; 1998.
23. Alexander R. Influence of the diaphragm upon portal blood flow and venous return. *Am J Physiol*. 1951;167(3):738-748. doi:10.1152/ajplegacy.1951.167.3.738.
24. Frymann V. The osteopathic approach to cardiac and pulmonary problems. *J Am Osteopath Assoc*. 1978;77(9):668-673.
25. Ertlanger H. Treatment of the acutely ill hospitalized patient. In: Ward RC, executive ed. *Foundations for Osteopathic Medicine*. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2003:1115-1142.
26. Interactive atlas of heart disease and stroke. Centers for Disease Control and Prevention website. [https://nccd.cdc.gov/DHDSAtlas?state=County&col=\[10\]](https://nccd.cdc.gov/DHDSAtlas?state=County&col=[10]). Accessed December 2, 2018.
27. Rakotz MK, Townsend RR, Yang J, et al. Medical students and measuring blood pressure: results from the American Medical Association Blood Pressure Check Challenge. *J Clin Hypertens (Greenwich)*. 2017;19(6):614-619. doi:10.1111/jch.13018.
28. Magoun H. *Osteopathy in the Cranial Field*. Denver, CO: the Sutherland Cranial Teaching Foundation; 2006.
29. Barral J. *The Thorax*. Seattle, WA: Eastland Press; 1991.
30. Hitch SH. Malalignment of the sternum and fascial strain. In: *Journal of the Osteopathic Cranial Association*. Swan K, ed., Meridian, ID: Cranial Academy; 1988 (1954):26-30.
31. James PA, Oparil S, Carter BL. 2014 evidence-based guideline for the management of high blood pressure in adults: Report from the panel

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- members appointed to the eighth Joint National Committee (JNC 8). *JAMA*. 2014;**311**(5): 507-520.
32. Kotchen T. Hypertensive vascular disease. In: *Harrison's Principles of Internal Medicine*. Kasper DF, Fauci A, Hauser S, Longo D, Jameson J, Loscalzo J, eds. New York, NY: McGraw-Hill; 2014.
33. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. 2018;**71**(19):e127-e248. doi:10.1016/j.jacc.2017.11.006
34. McConnell CP, ed. *Clinical Osteopathy*. Chicago, IL: The AT Still Research Institute; 1917:643.
35. Pescatello LS, MacDonald HV, Lamberti L, Johnson BT. Exercise for hypertension: a prescription update integrating existing recommendations with emerging research. *Curr Hypertens Rep*. 2015;**17**(11):87. doi:10.1007/s11906-015-0600-y
36. Bertisch SM, Schomer A, Kelly EE, et al. Device-guided paced respiration as an adjunctive therapy for hypertension in obstructive sleep apnea: a pilot feasibility study. *Appl Psychophysiol Biofeedback*. 2011;**36**(3):173-179. doi:10.1007/s10484-011-9158-x
37. Spiegel AJ, Capobianco JD, Kruger A, Spinner WD. Osteopathic Manipulative Medicine in the Treatment of Hypertension. *Heart Disease*. 2003;**5**(4):272-278. DOI: 10.1097/01.hdx.0000080718.70719.88
38. Cerritelli F, Carinci F, Pizzolorusso G, et al., Osteopathic manipulation as a complementary treatment for the prevention of cardiac complications: 12-months follow-up of intima media and blood pressure on a cohort affected by hypertension. *J Bodyw Mov Ther*. 2011;**15**(1):68-74. doi:10.1016/j.jbmt.2010.03.005
39. Rivers WE, Treffer KD, Glaros AG, Williams CL. Short-term hematologic and hemodynamic effects of osteopathic lymphatic techniques: a pilot crossover trial. *J Am Osteopath Assoc*. 2008;**108**(11):646-651.
40. McGuinness J, Vicenzino B, Wright A. Influence of a cervical mobilization technique on respiratory and cardiovascular function. *Man Ther*. 1997;**2**(4):216-220.
41. Meltzer KR, Standley PR. Modeled repetitive motion strain and indirect osteopathic manipulative techniques in regulation of human fibroblast proliferation and interleukin secretion. *J Am Osteopath Assoc*. 2007;**107**(12):527-536.
42. Licciardone JC, Kearne CM, Hodge LM, Bergamini MV. Associations of cytokine concentrations with key osteopathic lesions and clinical outcomes in patients with nonspecific chronic low back pain: results from the OSTEOPATHIC Trial. *J Am Osteopath Assoc*. 2012;**112**(9):596-605.
43. Mannino JR. The application of neurologic reflexes to the treatment of hypertension. *J Am Osteopath Assoc*. 1979;**79**(4):225-231.
44. Rogers JT, Rogers JC. The role of osteopathic manipulative therapy in the treatment of coronary heart disease. *J Am Osteopath Assoc*. 1976;**76**(1): 21-31.
45. Rizkalla MN, Henderson KK. Empathy and osteopathic manipulative medicine: is it all in the hands? *J Am Osteopath Assoc*. 2018;**118**(9):573-585. doi:10.7556/jaoa.2018.131. ■

CONTINUING MEDICAL EDUCATION QUIZ

The purpose of the continuing medical education quiz is to provide a convenient means of self-assessing your comprehension of the scientific content in the article "Hypertension: An Osteopathic Perspective," by Helena Prieto, BA, OMS V; Nicole Pena, DO; Jay H. Shubrook, DO; and Joel Talsma, MS.

To apply for 0.5 credits of AOA Category 2-B continuing medical education, fill out the form on page 35 and submit it to the American Academy of Osteopathy. The AAO will note that you submitted the form and forward your results to the American Osteopathic Association's Division of Continuing Medical Education for documentation.

Be sure to answer each question in the quiz. You must score a 75% or higher on the quiz to receive CME credit. The correct answers will be published in the next issue of the *AAOJ*.

Below are the answers to *The AAO Journal's* March 2020 quiz on the article titled "Osteopathic Manipulative Medicine in the Era of the Single Accreditation System: Can the Past Guide the Way to the Future of OMM?" by David M. Kanze, DO, FAAO.

1. **b.** Osteopathic Cranial Manual Manipulation.
2. **b.** Mentoring on osteopathic principles and practices.
3. **b.** False.
4. **c.** Preclinical years of osteopathic medical school (years 1 & 2).

CONTINUING MEDICAL EDUCATION

This CME Certification of Home Study is intended to document your review of the CME article in this issue of *The AAO Journal* under the criteria for AOA Category 2-B continuing medical education credit.

CME Certification of Home Study

This is to certify that I, _____,
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read the following article for AOA CME credit.

Name of article: "Hypertension: An Osteopathic Perspective"

Authors: Helena Prieto, BA, OMS V; Nicole Pena, DO; Jay H. Shubrook, DO; and Joel Talsma, MS

Publication: *The AAO Journal*, Vol. 30, No. 2, June 2020, pages 31-34

AOA Category 2-B credit may be granted for this article.

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Complete the quiz to the right by circling the correct answers. Send your completed answer sheet to the American Academy of Osteopathy. The AAO will forward your results to the American Osteopathic Association. You must answer 75% of the quiz questions correctly to receive CME credit.

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1. The sympathetic neurons originate where in the spine?
 - a. Anterior horn
 - b. Lateral horn
 - c. Posterior horn
2. The main parasympathetic nerves of the body include:
 - a. CN III, VII, IX, X, L1-2
 - b. CN IV, V, VI, X, L1-2
 - c. CN III, VII, IX, X, S1-2
 - d. CN IV, V, VI, X, S1-2
3. The best osteopathic treatment for hypertension is to treat:
 - a. The OA and sacrum
 - b. T1-4 and diaphragm
 - c. The somatic dysfunctions of the patient on that day
4. What adjustment in blood pressure reading needs to be made for patients less than 30 years old?
 - a. Have patient rest for 30 minutes before measuring BP
 - b. Measure BP in at least 1 leg
 - c. Repeat BP measurement after 1 hour

Below are the answers to *The AAO Journal's* March 2020 quiz on the article titled "Introducing Short Lever Still Technique, a New Variant" by Richard L. Van Buskirk, DO, PhD, FAAO.

1. **c.** Using a force vector applied directly to the tissue.
2. **d.** All of the above.
3. **b.** Is difficult to teach and learn because it requires developing and maintaining a force vectored onto the restricted tissue during movement of its source.
4. **a.** It requires more force applied directly to the tissue.



Frontline Perspectives: COVID-19 and OMM

The AAO has partnered with the American Osteopathic Association to offer an e-learning module with first-hand accounts from the frontlines treating COVID-19 patients with OMM.

Frontline Perspectives: COVID19 and OMM

CME E-Learning Opportunity - Treating COVID-19 Patients Using OMM

The American Academy of Osteopathy (AAO) has partnered with the American Osteopathic Association (AOA) to offer a new online learning activity with first-hand accounts from the frontlines.

The e-Learning module, titled, “Frontline Perspectives On Treating COVID-19 Patients Using OMM” features Hugh M. Ettlinger, DO, FAAO, FCA, and OMM residency director at Saint Barnabas Hospital in the Bronx, New York and his colleagues sharing surprising insights from treating COVID-19 patients with OMM.

Free for all members and non-members.

Participants can earn 0.75 AOA 1-B credit or 0.75 AMA PRA Category 1 Credit through this activity.

After completing this activity, learners will be able to:

- Identify common physical findings being seen in COVID-19 patients undergoing OMM.
- Summarize modifications of OMM techniques appropriate for patients with COVID-19.
- Discuss the physical and emotional burdens on the clinicians treating COVID-19 patients

Learn more and enroll online today at
academyofosteopathy.org/frontlines-perspective-omm-covid-19

New eLearning CME

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Frontline Perspectives: OMM & COVID-19

FEATURING HUGH M. ETLINGER, DO
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