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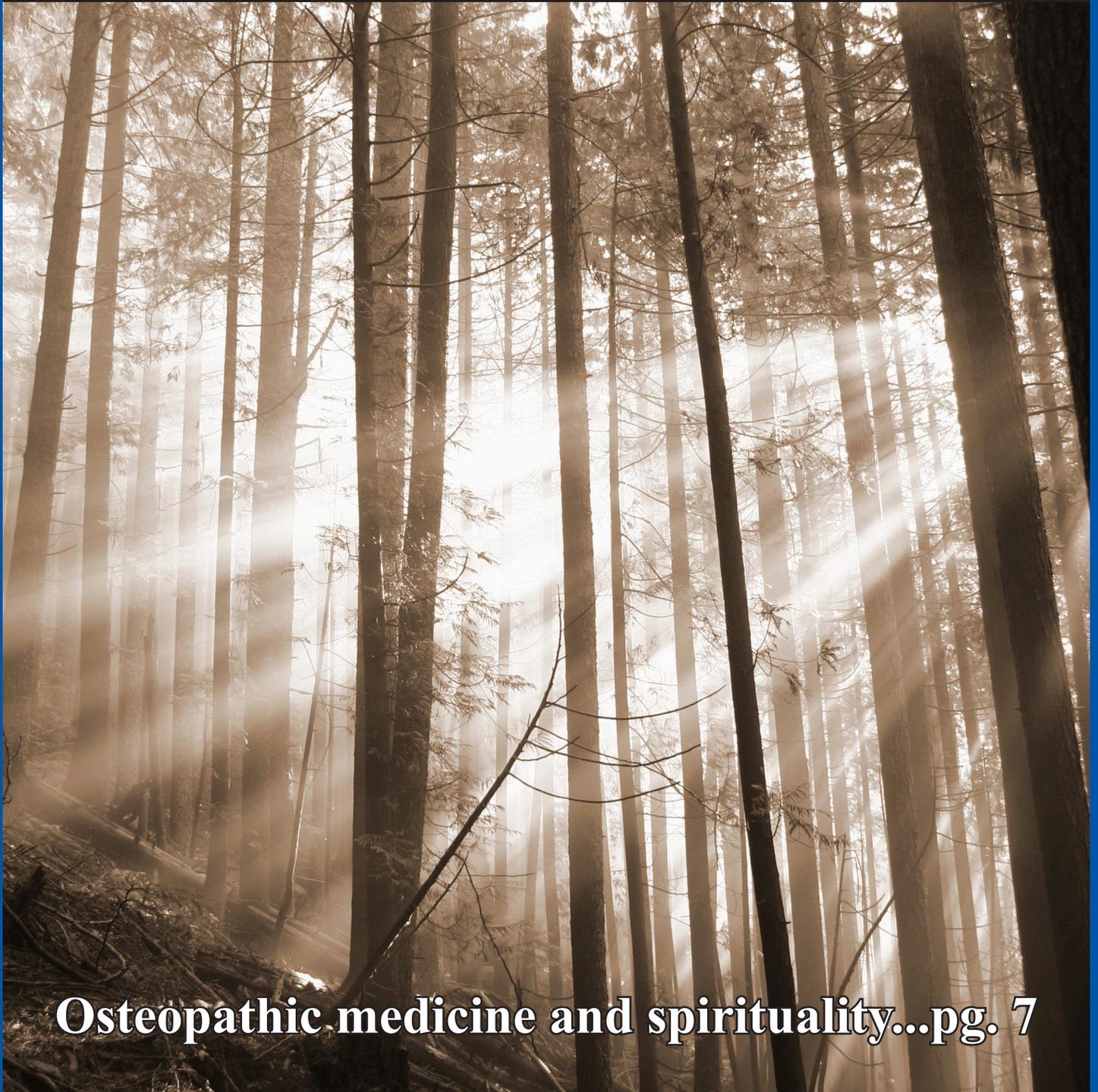
FORUM FOR OSTEOPATHIC THOUGHT

JOURNAL

Official Publication of the American Academy of Osteopathy®

TRADITION SHAPES THE FUTURE

VOLUME 23 NUMBER 2 JUNE 2013



Osteopathic medicine and spirituality...pg. 7

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TRADITION SHAPES THE FUTURE • VOLUME 23 NUMBER 2 • JUNE 2013
The mission of the American Academy of Osteopathy® is to teach, advocate and research the science, art and philosophy of osteopathic medicine, emphasizing the integration of osteopathic principles, practices and manipulative treatment in patient care.

IN THIS ISSUE:

AAO Calendar of Events.....5
CME Certification of Home Study Forms.....14
Component Society Calendar of Events.....32

EDITORIALS:

Reflections on our recent past and thoughts about our future.....4
Murray R. Berkowitz, DO, MA, MS, MPH
View from the Pyramids: Osteopathic medicine and spirituality.....7
Kate McCaffrey, DO
Distance learning and osteopathic manipulative medicine.....9
Janice U. Blumer, DO

ORIGINAL CONTRIBUTION:

Treatment of a posterior rib utilizing a multimodal sequence of osteopathic manipulative treatments.....10
Joshua P. Baker, DO, FAAFP; Rachel Ely, MHA, OMS III

CASE STUDY:

Relief of persistent jaw pain with the use of osteopathic manipulative medicine.....15
James A. Lipton, DO, FAAO, FAAPMR; J. Daren Covington, OMS IV

INTERNATIONAL CONTRIBUTIONS:

In the hands of an angel.....19
Jamie B. Archer, DO (UK)
The liquorodynamic model of the primary respiratory mechanism.....24
Yuri E. Moskalenko, DSc., DO (Hon.); Tamara I. Kravchenko, PhD, DO; Gustav B. Weinstein, PhD; Terence C. Vardy, DO

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Reflections on our recent past and thoughts about our future

Murray R. Berkowitz, DO, MA, MS, MPH

I submitted my letter of resignation as Scientific Editor for this journal and the Board of Trustees of our Academy has accepted it. Thus, this is my last formal editorial as Scientific Editor. I realized that I needed to step away from the duties and responsibilities of Scientific Editor to concentrate on other equally important and challenging things in my life.

Among these is returning to work toward achieving the degree of Fellow of the American Academy of Osteopathy (FAAO), as well as continuing to develop my research goals, especially regarding clinical applications of Osteopathic Manipulative Medicine (OMM)/Osteopathic Manipulative Treatment to Traumatic Brain Injury (TBI) and Post-Traumatic Stress Disorder (PTSD) in our military service members and veterans. I would also like to increase my work with the Joining Forces Initiative Working Group, and further add to our base of evidence in the osteopathic medicine milieu.

As I depart, I have looked back at some of the things I accomplished for our journal, and also looked toward goals I leave for my successor. Reflecting on our recent past, I increased the scientific and professional content of our journal. You have undoubtedly noticed changes in the table of contents, and I hope you approve. I published more FAAO theses and increased the contributions of our osteopathic medical students, interns and residents, and international colleagues.

I also discussed ways for the osteopathic profession to increase formal training opportunities leading to board certification in Neuromusculoskeletal Medicine (NMM)/OMM, open osteopathic graduate medical education to allopathic physicians, and increase evidence-based osteopathic medicine research. A little over a year ago, I began working with the editors of the *Journal of the American Osteopathic Association (JAOA)* to provide closer ties between our journals and increase publishing opportunities for peer-reviewed research papers in NMM/OMM. I encourage this journal to continue to work closely with the *JAOA*.

I also tried stimulating thought through my editorials and by publishing Letters to the Editor (and author responses). I feel I was successful to some degree. I wanted

to stimulate intellectual dialogue, and the publication of ideas and proposed studies, on some of the controversial and unknown areas of OMM. I hoped that more of my colleagues would reflect on what was published and contribute their thoughts by submitting Letters to the Editor, commentaries or review articles, as well as original research papers.

I thank those who did submit manuscripts for consideration and hope submissions continue to increase. I leave my successor with my goal of getting our journal listed in PubMed. I feel once we are included there, and in other citation indexes, more of our scientific and research colleagues will consider the *American Academy of Osteopathy Journal (AAOJ)* as a forum for their work.

Thinking about our future, I encourage this journal to continue to publish a special, themed issue once each year. I am most proud of the special military-themed issue the *AAOJ* published intentionally on July 4, 2012. This journal had an opportunity to use momentum from the White House Joining Forces Initiative and be the first within the osteopathic community to publish in the areas of TBI and PTSD. For a number of reasons, this did not happen and our esteemed colleagues at the American College of Osteopathic Family Physicians (ACOFPP) published their special, military-themed issue of *Osteopathic Family Physician* in March 2012. My hat is off to Jay H. Shubrook, Jr., DO, FACOFPP (Editor) and Merideth Norris, DO, FACOFPP (Associate Editor) on a very fine job and for being able to produce a quality issue so quickly.

However, their accomplishment does not diminish the quality of what this journal published or our achievements in contributing to this important area. These two issues of our respective osteopathic medical journals provide the entire medical community with important information, and serve as much needed, peer-reviewed resources for rendering care to our military service members, veterans and their families. It was indeed a labor of love.

I am very proud of the 75th Anniversary issue of the journal last year. This special issue included what I felt to be seminal papers in the osteopathic profession. As previously stated in my editorials, I followed and stood on the shoulders of Anthony G. Chila, DO, FAAO; Robert C.

continued on page 7



Mark your calendar for these upcoming Academy meetings and educational courses.

2013

- July 12-13** AAO Board of Trustees Meeting—Embassy Suites North, Indianapolis, IN
- July 15-18** AOA Board of Trustees Meetings—The Fairmont Hotel, Chicago, IL
- July 18-22** AOA House of Delegates Meetings—The Fairmont Hotel, Chicago, IL
- August 9-10** Education Committee Meeting—The Westin Hotel, Indianapolis, IN
- August 9-10** SAAO Council Meeting—The Westin Hotel, Indianapolis, IN
- August 28** Fellowship Committee Web Conference, 8:30 pm EDT
- September 29** AAO Board of Trustees Meeting—Mandalay Bay Resort, Las Vegas, NV
- September 29** *Case-Based Osteopathic Sports Medicine (Pre-OMED)*—Kurt P. Heinking, DO, FAAO
Mandalay Bay Resort, Las Vegas, NV
- Sep. 30-Oct. 2** *Osteopathic Approach to Common Office Complaints (AAO Program at OMED)*
Laura E. Griffin, DO, FAAO—Mandalay Bay Resort, Las Vegas, NV
- October 10-12** *Prolotherapy Weekend*—George J. Pasquarello, DO, FAAO; Mark S. Cantieri, DO, FAAO
UNECOM, Biddeford, ME
- November 8** AOBNMM Meeting—Crowne Plaza Hotel, Indianapolis, IN
- November 9** AOBNMM Oral & Practical Exams—Crowne Plaza Hotel, Indianapolis, IN
- November 10** AOBNMM Written Exam—Crowne Plaza Hotel, Indianapolis, IN
- December 6-8** *Heart and Vascular Course*—Kenneth J. Lossing, DO—AZCOM, Glendale, AZ

2014

- March 15-18** *New Approach to Osteo-Articular Manipulations Including the Superior and Inferior Limbs (Pre-Convo)*
Jean-Pierre Barral, DO (France); Kenneth J. Lossing, DO—The Broadmoor Hotel, Colorado Springs, CO
- March 17-18** Pediatrics Course (Pre-Convo)—Heather P. Ferrill, DO—The Broadmoor Hotel, Colorado Springs, CO
- March 17-18** Myofascial Trigger Points Course (Pre-Convo)—Michael L. Kuchera, DO, FAAO
The Broadmoor Hotel, Colorado Springs, CO
- March 19-23** AAO Convocation—*Trauma: An Integrated Osteopathic Approach*—Denise K. Burns, DO, FAAO
The Broadmoor Hotel, Colorado Springs, CO

Osteopathy and Swedenborg

by David B. Fuller, DO, FAAO

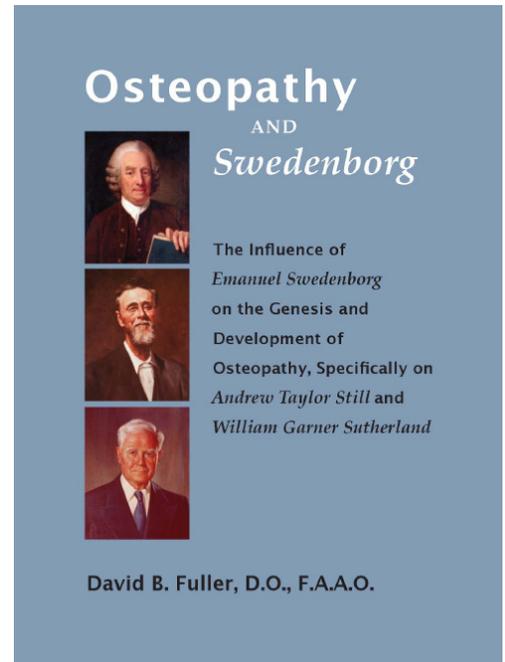
Now available in the AAO bookstore!

Osteopathy & Swedenborg demonstrates the previously unrecognized influence of Swedenborg's ideas on the creation and development of osteopathic medicine, especially in regards to body/mind/spirit and the anatomical inter-relationship of the nervous system, fascia and fluids throughout the body. This includes a study of cranial osteopathy and Swedenborg's paradigm of the brain and soul-body interaction, comparing concepts such as Swedenborg's spirituous fluid and Sutherland's Primary Respiratory Mechanism.

In the process of making these connections, the book traces the influence of Swedenborg's ideas through and across the America of the 1800s, specifically through the metaphysical/healing movements of Transcendentalism, Spiritualism, New Thought and Theosophy.

624 pp. Hardback

ISBN: 978-0-910557-82-5



David Fuller's text, Osteopathy and Swedenborg, is a thorough analysis of the influence the writings of eighteenth-century Swedish scientist and theologian, Emanuel Swedenborg, had on Andrew Taylor Still, William Garner Sutherland and other seminal osteopathic thinkers. It behooves any serious osteopathic practitioner, scholar or educator to read this thought-provoking work.

—Kenneth E. Nelson, DO, FAAO, FACOFP (Dist.), Professor, Department of Osteopathic Manipulative Medicine, Chicago College of Osteopathic Medicine, and Editor of Somatic Dysfunction in Osteopathic Family Medicine



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Osteopathic medicine and spirituality

Kate McCaffrey, DO

“Dear God, please save my brother.”

“Doctor, is there anything else you can do for my mother?”

How many times have we encountered clinical scenarios like these while taking care of our patients? As osteopathic physicians, we deal with end-of-life issues, serious illnesses and devastating injuries on a daily basis; some of us more frequently than others. How can we comfort our patients and their families in times of medical need when traditional Western medicine is already on board?

Spirituality is one answer. Spirituality has been defined as “a person’s experience of, or a belief in, a power apart from his or her own existence.”¹ Spirituality is about the relationship between us and something larger. It means being in the right relationship with all that is. Spirituality comes into focus in times of emotional stress, physical illness, loss, grief and death.²

What does the history of osteopathic medicine say about spirituality? Dr. Andrew Taylor Still taught us about providing emotional support and encouragement to our patients dealing with end-of-life conditions.³ Our Five Model approach to the philosophy of medicine teaches us about spirituality in its Behavioral Model; we are taught to “assess and treat the whole person – physical, psychological, social, cultural, behavioral and spiritual.”³

So what are we to do with this information as trusted physicians and physicians-in-training? One of the strengths of osteopathic medicine is the philosophy of evaluating the whole person and treating the body as a unit. Many of my patients have commented that I listen well. We are taught to listen to our patients with this philosophy in mind. I am a trained listener and I do this in the context of the four general osteopathic principles we know well.

As a physician, I am a highly trained technician and mechanic. I have also been trained to set aside my own beliefs (except to inform patients of rational and modern medical options) and to support them in their spiritual and cultural paradigm. When I listen in this way, I give patients the dignity, support and respect they deserve.

None of us has all the answers to life and death and everything in between. I do not know why a beautiful 18-year-old female was carried into my emergency room by her mother after being shot through the chest. I know only some of the reasons why fetuses spontaneously abort. I do not know why people get cancer other than the reason we were taught in medical school.

Medicine can explain a lot scientifically, but it cannot account for everything. There are questions that my medical training did not prepare me to deal with when taking care of patients. I know I have a compassionate framework in which to place these events and from which to counsel my patients. This is the osteopathic philosophy, and for this tool I am forever grateful.

References

- 1 Mohr WK. Spiritual issues in psychiatric care. *Perspect Psychiatr Care*. 2006;42(3):174-183.
- 2 Murray RB, Zentner JP. *Nursing Concepts for Health Promotion*. London: Prentice Hall; 1989.
- 3 Chila AG, ed. *Foundations of Osteopathic Medicine*. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2011:13-14.

continued from page 4

Clark, DO, MS; and, most recently, Raymond J. Hruby, DO, MS, FAAO, as editors of this journal. In preparing the 75th Anniversary issue, I noted that I also built on the work of such luminaries as Thomas L. Northup, DO; George W. Northup, DO, FAAO; Perrin T. Wilson, DO; and so many others. As stated then, “By this knowledge, I am even further humbled.” I can only hope these leaders would approve of my work in advancing the art and science of osteopathic medicine.

Kate McCaffrey, DO, joined the *AAOJ* as Associate Editor last fall. Her editorials have been intelligent, articulate and thought-provoking. The Board of Trustees has appointed her Interim Scientific Editor. I hope you will join me in wishing her the very best in her new role and that you will also join me in helping her as she leads our Academy’s efforts to make the *AAOJ* even better.

Case-Based Osteopathic Sports Medicine

September 29, 2013, in Las Vegas, NV (Pre-OMED)

Course Description

This one-day, pre-American Osteopathic Association Convention (OMED) course will be an interactive discussion and demonstration of manipulative techniques for common sports injuries of the extremities. Time will be divided between case presentation, demonstration of orthopedic testing, palpatory assessment, and manipulative treatment for extremity injuries. Both indirect and direct osteopathic manipulative treatment (OMT) modalities will be demonstrated. Discussion on rehabilitation goals, return to play and injections are welcome.



Course Objectives

The participant will be able to:

- Learn how to find and treat the axial component in extremity issues.
- Diagnose and treat shoulder impingement syndromes and rotator cuff pathology.
- Learn lymphatic techniques for the upper and lower extremities.
- Diagnose and treat trochanter bursitis, iliotibial band friction syndrome and fibula somatic dysfunction.
- Apply manipulative techniques to the wrist and foot.

Program Chair

Kurt P. Heinking, DO, FAAO, is a 1994 graduate of Chicago College of Osteopathic Medicine, where he currently serves as Chair of the Department of Osteopathic Manipulative Medicine. He is board certified in Osteopathic Manipulative Medicine, Family Medicine and Sports Medicine, and has a private musculoskeletal medicine practice in Willowbrook, IL.



CME

8 hours of AOA Category 1-A credit are anticipated.

Course Times

Sunday: 8:00 am - 5:30 pm

Includes (2) 15-minute breaks and a (1) hour-long lunch.

Coffee will be provided, but participants are responsible for their own meals.

Course Location

Mandalay Bay Hotel
3950 S. Las Vegas Blvd.
Las Vegas, NV 89119

Travel Arrangements

Call **Tina Callahan** of Globally Yours Travel at 1-800-274-5975.

Registration Form

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Distance learning and osteopathic manipulative medicine

Janice U. Blumer, DO

“I expect that when I am gone... I will come back every week or so to see what Osteopathy is doing.”¹

Andrew Taylor Still

“What would A.T. Still think?” replays in my mind as I see images of a high velocity low amplitude technique being taught 900 miles south of me displayed on a giant screen. I am faculty at a distant campus, which is now becoming the norm in osteopathic medical education. With the explosion in growth of osteopathic medicine and the addition of many new sites, one of the greatest challenges is keeping up with hands-on training while also using distance learning modalities.

Systems such as HaiVision and Lync allow real-time interaction with a professor at a distant site. With this high-tech version of the traditional classroom, one might ask, “What does it take to learn Osteopathic Manipulative Medicine (OMM)? How much direct contact is needed? And, in this age of YouTube, are professors of OMM becoming obsolete?”

My assessment is that these tools provide an adjunct to traditional hands-on training, but will by no means replace the one-on-one instruction it takes to learn a psychomotor skill. They allow for the basis of a concept or technique to be presented, while the “meat and potatoes” is still the direct instruction received from either a teaching assistant, fellow or faculty member. It also allows for the dissemination of knowledge and utilization of faculty from a primary site, therefore keeping the need for faculty at a distant site to a minimum.

There are challenges to this high-tech learning, especially for the distant site. It is difficult to assess the pace of the class or lab when one is not physically present. It is also very easy to lose the attention of those at the distant site when someone is only present onscreen. We have overcome many of these issues by having a camera view of both campuses, and using interactive tools such as clickers. Engaging the distant site is crucial to keeping focus.

It is also important to know when to utilize this tool. We have found we can often connect for a portion of the hour, then leave the remainder of the hour for hands-on, site-specific practice. In this way, each campus can move independently and utilize on-site resources. We were also successful in the first ever, distance-site linked, 40-hour osteopathic cranial course. In discussion with the table

trainers who had previously taught traditional cranial courses, the consensus was reached that it was no different than having the presenter on stage.

As our profession has grown exponentially in the last 10 years, it is becoming increasingly more difficult to meet the needs of the more labor-intensive psychomotor courses. Technology, when used wisely, can help meet these needs. Though it does not replace the one-on-one instruction that allows for the refinement of techniques, it can help maximize the resources needed for psychomotor training. I can only think that A.T. Still would be smiling at these innovations to support osteopathic medicine’s hands-on traditions.

References

- 1 Still AT. *The Autobiography of A.T. Still*. Kirksville, MO: Published by the author; 1908: 276.

Sutherland Cranial Teaching Foundation Upcoming Courses



SCTF Intermediate Course:

Beyond the Basics: Additional Sutherland Procedures

October 11th (beginning at noon), 12th and 13th, 2013

Midwestern University • Glendale, Arizona

Register Prior to August 31, 2013: \$750

Register After September 1, 2013: \$825

Prerequisites: Successful completion of two (2) Basic

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Treatment of a posterior rib utilizing a multimodal sequence of osteopathic manipulative treatments

Joshua P. Baker, DO, FAAFP; Rachel Ely, MHA, OMS III

Introduction

Individual techniques (i.e., High Velocity Low Amplitude, Muscle Energy, Facilitated Positional Release, Myofascial Release, etc.) typically focus on a single component of somatic dysfunction, such as the fascia, bone, tendon, ligament or muscle, depending on the technique used. However, dysfunctions are typically a complicated mixture of dysfunctional tissues. Utilization of a single technique will treat one component of a dysfunction, but can leave remaining dysfunctional tissues behind. For Osteopathic Manipulative Treatment (OMT) to be maximally efficacious, a variety of techniques may be needed to address even a single dysfunction.

The authors propose that, over time, many practitioners have developed what we refer to as “multimodal sequences” of OMT for the treatment of specific somatic dysfunctions. These are defined as the simultaneous and/or sequential application of a variety of different techniques, each in immediate succession and all to treat a single dysfunction. There is no published literature on the concept of multimodal sequences of OMT, even though this application is likely common in the practices of those who utilize OMT. The authors also propose a multimodal sequence of OMT, which consists of a series of five established techniques, for the treatment of a posterior rib dysfunction.

Methods

For review purposes, these individual techniques and their target tissues are defined in the order of application within this multimodal sequence.

Strain-Counterstrain: As defined by its developer, Lawrence H. Jones, DO, Strain-Counterstrain is the “relieving [of] spinal or other joint pain by passively putting the joint into its position of greatest comfort.”¹ More specifically, Jones defines it as the relief of pain by “reduction and arrest of the continuing inappropriate proprioceptor activity...by markedly shortening the muscle that contains the malfunctioning muscle spindle by applying mild strain to its antagonists.”¹ These positions of comfort are traditionally maintained for 90 seconds¹ and address mainly myofascial and muscular dysfunctions.

Using Strain-Counterstrain to address a posterior rib, the patient should be placed in a seated position with the physician standing behind. Once a posterior rib lesion is identified, the tender point is localized to begin the process with a modified Strain-Counterstrain technique. The physician supports the arm ipsilateral to the dysfunction in approximately 90 degrees of abduction. The thorax and



Figure 1



Figure 2

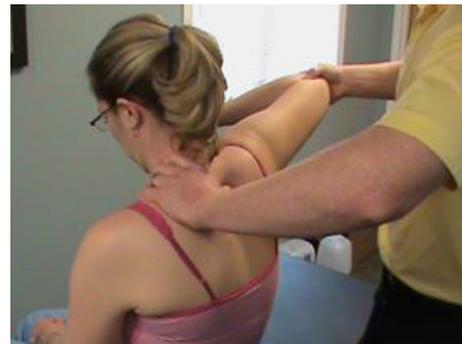


Figure 3

neck are flexed and sidebent away from the dysfunction.² See Figures 1 and 2. This position may be held for the traditional 90 seconds, although therapeutic tissue texture changes may occur at a shorter time interval, at which point the multimodal sequence should continue.

Facilitated Positional Release (FPR): FPR principally treats muscle tissue dysfunction by placing a dysfunctional tissue passively into a neutral position with the addition of a facilitating force applied through the region. This effectively shortens the muscle and lowers excitatory output.³

To address the posterior rib in the multimodal sequence, the physician repositions the arm from the Strain-Counterstrain position into increased shoulder abduction with elbow flexion, and a compressive force through the shoulder is directed toward the dysfunction.⁴ See Figure 3. Once tissue release has been confirmed, the multimodal sequence should continue.

Still Technique: The Still Technique essentially follows a three-step pattern: lesion isolation and exaggeration, a compressive force and a low-velocity articulation directly through the restriction.⁵ This technique principally addresses bony restrictions.⁴

In the case of the posterior rib, FPR is converted smoothly into Still Technique by maintaining compression, and exaggerating the dysfunction with increased abduction combined with extension at the shoulder. See Figures 4 and 5. The glenohumeral and scapulothoracic joint are then articulated, with the arm passively moved into adduction and flexion and coming to rest across the patient's chest, where the treatment transitions to Muscle Energy.^{4,6}

Muscle energy: This technique requires the patient's cooperation to recruit specific muscle groups on request against a counterforce applied by the physician. Muscle Energy addresses musculature and can also mobilize joints.⁷

Muscle Energy is easily performed from the final Still Technique position, which is a modification of the

“Push Me, Pull You” technique as described by Mitchell.⁸ The physician places a hand on the elbow and resists the patient's attempt at abduction, while the arm is still across the chest, keeping the patient's elbow at the level of the dysfunction. See Figure 6. This motion recruits the middle trapezius and the rhomboids to treat the rib dysfunction indirectly.

These aforementioned muscles provide a force at the spinous processes, causing a rotation of the vertebrae contralaterally, which results in the ipsilateral transverse processes moving anteriorly. This simultaneously moves the attaching rib anteriorly by its action at the costotransverse joint, which simultaneously releases a restriction at the costovertebral joints. The final sequence utilizes an articular technique.

Articular Technique: This is a direct technique that forces a dysfunctional area through a barrier by applying a gentle force. This technique is especially useful for mobilizing joints.⁷

The final step in the multimodal sequence is an articular circumduction starting with the arm across the chest in approximately 90 degrees of flexion (depending on the level of the dysfunction), with full adduction traversing superiorly, then ending in full shoulder extension, adduction and internal rotation to ensure adequate motion at the scapulothoracic joint. See Figures 7, 8 and 9. This active mobilization of the scapulothoracic joint provides direct force on any posterior rib to gently mobilize it anteriorly.

The reader may refer to the following video which displays the aforementioned treatment in greater detail: <http://youtu.be/vf02yzlnxLA>.

Discussion

The authors have observed significant resolution of dysfunction using this multimodal sequence of OMT to treat a posterior rib dysfunction. There is no published literature regarding multimodal sequences of OMT, but it stands to reason that the combination of established



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9

techniques (even with minor modifications) is likely more efficacious since they address a wider variety of dysfunctional tissues comprising the totality of the somatic dysfunction. This method can also be more time efficient, as the dysfunction does not have to be readdressed if the initial technique proves not to fully resolve the dysfunction. It can additionally be performed without repositioning or reevaluating between techniques.

The education of osteopathic medical students currently utilizes a technique-based approach to OMT that is rigidly divided into categories primarily based on technique. This is mirrored in the layout of OMT techniques in the *Foundations of Osteopathic Medicine* textbook. The application of multimodal sequences of OMT utilizes a dysfunction-based approach, which is nearly the antithesis of a technique-based approach. The purely dysfunction-based approach to OMT presents an interesting dilemma on how OMT is taught to osteopathic students, residents and physicians. In addition, students are taught to adopt a stepwise approach to treatment; a subsequent

technique may be attempted after the first has left the dysfunction unresolved.

The authors propose that, in reality, those who employ OMT commonly treat lesions with multimodal sequences that transition seamlessly from one to another, often with no pause or reevaluation of the dysfunction in the interim. This presents a potential disparity between OMT in academia and in practice. A transition from technique-based training to region- or dysfunction-based training once the fundamentals are mastered may aid students in developing the multimodal sequences osteopathic physicians are likely to employ, and also allow patients to receive greater treatment benefit.

While examples of a sequential model undoubtedly exist in abundance, they currently benefit only the developer him/herself and perhaps a few fortunate students. The authors urge those utilizing multimodal sequences of OMT to submit them for publication for the edification of the entire osteopathic community. The authors have submitted this first multimodal sequence as an initial model for future publications.

Conclusion

The authors propose there be no change in the education of novice osteopathic medical students and suggest the continuation of a technique-based approach to OMT. However, there should be a transition to a dysfunction- or body-region based approach to OMT in residents, and it is recommended that continuing medical education activities also utilize multimodal sequences of OMT. The authors call for further publication of multimodal sequences of OMT by those who already utilize them in the treatment of their patients.

Acknowledgements

The authors would like to acknowledge Tony Nguyen, MLIS for his expertise in literature search.

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CME QUIZ

The purpose of the quiz, found on page 14, is to provide a convenient means of self-assessment for your reading of the scientific content in "Treatment of a posterior rib utilizing a multimodal sequence of osteopathic manipulative treatments" by Joshua P. Baker, DO, FAAFP and Rachel Ely, MHA, OMS III.

Please answer each question listed. The correct answers will be published in the September 2013 issue of the *AAOJ*.

To apply for Category 2-B CME credit, record your answers to the *AAOJ* CME quiz application form answer sheet on page 14. The AAO will note that you submitted the form, and forward your results to the AOA Division of CME for documentation. You must score a 70 percent or higher on the quiz in order to receive CME credit.

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Publication: *AAO J*, Volume 23, No. 2, June 2013, pp. 10-13

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1. The main idea of the article, Treatment of a posterior rib utilizing a multimodal sequence of osteopathic manipulative treatments, focuses on a single somatic dysfunction.

- a. True
- b. False

2. In Baker's article, the following description most closely describes which technique?: "relieving [of] spinal or other joint pain by passively putting the joint into its position of greatest comfort"

- a. A.T. Still
- b. Articular
- c. Facilitated Positional Release
- d. Muscle Energy
- e. Strain-Counterstrain

3. The following description most closely describes which technique outlined in the article?: "lesion isolation and exaggeration, a compressive force and a low-velocity articulation directly through the restriction"

- a. A.T. Still
- b. Articular
- c. Facilitated Positional Release
- d. Muscle Energy
- e. Strain-Counterstrain

4. The authors propose that utilization of a multimodal sequence of OMT be taught to residents and not novice medical students.

- a. True
- b. False

Relief of persistent jaw pain with the use of osteopathic manipulative medicine

James A. Lipton, DO, FAAO, FAAPMR; J. Daren Covington, OMS IV

The views in this article are those of the authors and do not reflect the official policy or position of the Department of the Navy, the Department of Defense or the United States Government.

Abstract

Residual jaw pain is a complication that can occur following removal of a lower third molar. This is the case report of a patient who reported right jaw pain after right lower third molar surgery. The patient underwent extensive testing and multiple examinations that did not determine the cause of the unexpectedly persistent pain. Multiple attempts at treatment without the use of Osteopathic Manipulative Medicine (OMM) by other providers failed to remove the patient's pain. The patient was evaluated and treated, and reported her jaw pain had been eliminated through the successful use of OMM.

Key words: inferior alveolar nerve (IAN), Osteopathic Manipulative Medicine (OMM), Osteopathic Manipulative Treatment (OMT), traumatic neuroma, soft-tissue technique, cranial technique, third molar, mandible.

Introduction

There can be many possible complications in jaw surgery. Nerve injury can occur following injection of a local anesthetic, removal of a difficult tooth, or from trauma to the jaw and face. During administration of local anesthetic, the needle has the potential to puncture the nerve sheath, causing paresthesia for days to weeks. The inferior alveolar nerve (IAN) is especially prone to injury following removal of a lower third molar.¹ This nerve is responsible for sensation in the lower lip, mandibular buccal gingivae and dentition. The IAN originates from the posterior division of the mandibular branch of the trigeminal nerve. This nerve enters the mandible through the mandibular foramen and runs directly below the root tips of the mandibular teeth, predisposing it to risk during tooth extraction. Temporary IAN injury following lower third molar surgery can occur in up to eight percent of cases. Permanent injury can occur in 3.6 percent of cases. If the third molar is closely associated with the IAN canal, temporary injury can occur upwards of 20 percent of the time and permanent damage between one and four percent of the time.²

Injury to the IAN during third molar extraction can result in a traumatic neuroma. Traumatic neuromas are

known as reactive tumors and are a result of interrupted axons. After injury, the nerve begins to regenerate. However, due to the destruction of the endoneurial tube, a disorganized group of axons begin growing in multiple directions. This can result in a painful and tender nerve mass.³

A 1990 study reviewing the frequency of traumatic neuromas determined that 45 out of the 48,944 dental procedures, or 0.09 percent of cases, led to the formation of a neuroma. Out of these 45 cases, 30 were asymptomatic and 15 were painful. Of the 15 painful neuromas, only three were identified as traumatic neuromas. The data did show a two-to-one ratio of female to male predominance, but the relationship could only be speculated.⁴

Another 1990 study described seven radiological signs in preoperative x-ray films that were associated with an increased risk of IAN injury. These signs were classified as root related or canal related. The root-related signs include darkening, deflection, narrowing and a bifid apex. The canal signs include interruption of the lamina dura, diversion and narrowing.^{5,6} Retrospective and prospective studies were conducted, and only three of the seven signs were found to be significantly related to IAN injury in both studies. These included diversion of the canal, darkening of the root and interruption of the lamina dura.⁵

Nerves can be under mechanical load while sliding within nerve canals. When the "neural container" is damaged and the dynamic protective mechanisms fail, the corresponding nerve is put at risk for injury, pain and disability.⁷ "Nerve gliding" and "neural mobilization" are techniques used in the treatment of peripheral nerves to reduce symptoms following a neurologic injury. A meta-analysis reviewed neural mobilization techniques and their outcomes, and eight of the eleven studies demonstrated a positive benefit for their usage.⁸ Similar techniques have been adapted to aid elsewhere in the body. William Garner Sutherland, DO, developed techniques based on the subtle yet palpable movement found in study of the cranial bones.⁹ One of Dr. Sutherland's students, Harold I. Magoun, DO, FAAO, used cranial osteopathic techniques to treat dental complaints.¹⁰⁻¹² Edna M. Lay, DO, FAAO, also described case studies where OMM was used to treat temporomandibular joint dysfunction.¹³

There are many indications for the use of OMM. In this case report, OMM was used to directly “address the muscular and fascial structures of the body and associated neural and vascular elements.”¹⁴ OMM can also be used to relax hypertonic muscles, increase the elasticity of fascia, improve circulation and improve abnormal somato-somatic and somato-visceral reflex activities.¹⁴

MEDLINE and the Cochrane Databases were searched for studies addressing the use of OMM to treat the IAN following dental surgery. The key words listed were used to search within MEDLINE, the Cochrane Library, Cochrane Oral Health Group Trials Register, the *Journal of the American Osteopathic Association* and EMBASE are presented above. No citations were found.

In the following case, a patient with residual jaw pain following remote right third molar extraction was evaluated and treated with OMM. This included the use of cranial and soft-tissue techniques employed to free restriction, reduce edema and restore normal anatomy and function in the surrounding area.

Report of Case

A thirty-year-old female underwent standard wisdom tooth extraction in 2002. Following the procedure, the patient complained of pain and paresthesia along the right inferior alveolar distribution of the mandibular branch of the trigeminal nerve. Over the course of 10 years, the patient visited the dental clinic on eight separate occasions for right jaw pain and dental pain.

The patient’s dentist examined her and noted fair oral hygiene and the absence of third molar teeth, caries or active periodontal disease. Dental bitewing four-view x-ray films showed no radiographic evidence of oral infection or osseous abnormality. No source for the patient’s jaw pain was identified.

The patient’s primary care physician prescribed Gabapentin for her jaw pain. Within the same month, the patient made her first appointment with our Physical Medicine and Rehabilitation clinic (PM&R). At this appointment, she said she was not feeling any relief with Gabapentin, but did feel occasional relief with Ibuprofen. She continued to rate her pain at seven out of 10. The patient denied having any allergies or the use of any tobacco products or illegal drugs. She did report occasional alcohol consumption. Her medical history included asthma, migraines, knee arthralgia, low back pain, carpal tunnel syndrome, and a 10-year history of recurrent jaw pain.

At this time, it was suggested that the patient obtain magnetic resonance imaging (MRI) to further evaluate her jaw pain. Other recommendations included biofeedback therapy, use of a transcutaneous electrical nerve stimulation unit and consideration of Tramadol as needed for pain

control. The patient also received a psychophysiological assessment. Based on the results, it was recommended she start eight weeks of electromyography, skin conductance biofeedback and at-home self-hypnosis.

On the patient’s second visit to PM&R, she had yet to receive baseline labs or MRI. She continued to complain of seven out of 10 jaw pain. Her exam showed a palpable soft-tissue prominence less than four millimeters in diameter near where the right IAN enters into the mandibular canal. This prominence was not palpable on the left and did not have the spongy feel of reactive lymph tissue, but felt rather fibrous. The prominence was not interdigitated and immovable like a malignancy, but slightly adherent to surrounding tissue as benign, yet restrictive soft tissue that needed to be freed up in order to restore movement in the area. The patient was told to continue biofeedback, obtain her MRI and follow-up in one week to begin OMM treatment.

The MRI of the patient’s orbit, face and soft tissues of the neck, with special focus on the right mandible and IAN, showed no masses, abnormal fluid collections, or other significant abnormality along the trigeminal nerve per the radiologist.

On the patient’s third visit, she continued to have seven out of 10 jaw pain with an unchanged physical exam. She still had the four-millimeter soft-tissue prominence that was roughly the consistency of the surrounding tissue, but slightly more formed. The patient confirmed palpation of this prominence reproduced her pain. At this time, consent was obtained for intraoral soft-tissue manipulative techniques. The goal in using these techniques was to normalize the surrounding anatomy, free any scar tissue, reduce any fluid accumulation and allow the IAN an unrestricted path through the mandible. Following manipulation, the patient’s pain was instantly reduced to three out of 10. A cervical spine x-ray was ordered to rule out any cervical pathology and clear the patient for cervical OMM.

On the fourth visit, the patient’s review of symptoms (ROS) and exam remained unchanged. The patient’s cervical spine film was interpreted as normal. Use of intraoral OMM successfully reduced the patient’s post-treatment pain score to zero out of 10. In addition, high velocity low amplitude (HVLA) OMM corrected her cervical somatic dysfunction of C4ERrSr and C3ERISl.

On the fifth visit, the patient presented complaining of three out of 10 pain. Cranial examination revealed multiple somatic dysfunctions of her cranial bones, including a right sphenoid torsion, and right temporal restriction. Decreased motion was present in her right maxilla, as well as increased tone in her right lateral pterygoid and right

medial pterygoid muscles. Following OMM, the patient's jaw pain was reduced to two out of 10.

On the sixth visit, the patient presented with three out of 10 right jaw pain and an otherwise unchanged ROS and exam. Similarly, OMM was used and reduced the patient's post-treatment pain score to one out of 10.

On the seventh visit, the patient presented with zero out of 10 pain with an unchanged exam that still showed a soft-tissue prominence on the right that was not present on the left. Post-OMM treatment, the patient's pain remained at zero out of 10.

On the eighth visit, the patient presented with zero out of 10 pain and an unchanged exam from her previous visit. She stated she felt much better and continued to report a post-treatment pain score of zero out of 10.

On the ninth visit, the patient continued to report zero out of 10 jaw pain. However, examination of the mucosal surfaces was equal, without any soft-tissue prominences bilaterally. The patient did complain of neck tightness and was diagnosed with cervical somatic dysfunction of C5ERISl and C3ERrSr. This was successfully treated with cranial, Muscle Energy and HVLA techniques. The patient remained at zero out of 10 pain following treatment.

Several months later, the patient remained at zero out of 10 pain with no ROS changes and a normal exam. Having a pain-free, normal exam over the course of four months for the first time in 10 years, she was considered successfully treated with OMM and discharged to her primary care physician.

Discussion

Traumatic neuromas are an uncommon occurrence in dental procedures.⁶ Surgical excision is one treatment option.³ As with all surgeries, though, there are risks. Sometimes surgery is not even an option. Our patient, with normal dental examinations and negative imaging, was not a surgical candidate. She had few options available besides continued use of pain-relieving medications, which had provided her minimal benefit. In the past, the use of drugs was directed at a presumptive diagnosis of IAN nerve injury, which was not yet apparent on imaging. In this case, the use of OMM provided complete pain relief without the side effects inherent in pharmacologic therapy. The palpable soft-tissue change remained unclassified. The disappearance of the soft-tissue change coincided with the patient's report of complete pain relief following the successful application of OMM.

Conclusion

The use of OMM was successful in the treatment of persistent jaw pain resulting from lower third molar

extraction. The success of the treatment was defined by the patient's report of successive post-treatment pain scores of zero out of 10 for the first time in 10 years. Her pain scores remained at zero out of 10 for four straight months. The successful treatment was directed primarily at normalizing the anatomic relationships near the entry point of the IAN into the mandible and resulted in palpable improvement, which objectively coincided with the patient's subjective self report of complete pain relief.

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Prolotherapy Weekend

October 10-12, 2013, at UNECOM in Biddeford, ME

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Friday and Saturday, October 11-12, 8:00 am - 5:30 pm: Participants will be divided into two groups—beginners and advanced. These two groups will alternate between lectures in anatomy and injection technique, and time in the anatomy lab performing injections under supervision and reviewing prosections.

Principles of Prolotherapy by Cantieri MS, Pasquarello GJ and Ravin TH, will serve as the course syllabus. Please see <http://principlesofprolotherapy.com/index.html> for details.

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Mark S. Cantieri, DO, FAAO, is a 1981 graduate of Des Moines University College of Osteopathic Medicine, and is board certified in NMM/OMM. He has served on various hospital staffs as a consultant in OMM—treating newborns, post-operative patients and patients in intensive care units. He currently operates a private practice, Corrective Care, PC, in Mishawaka, IN, which

specializes in the treatment of chronic musculoskeletal pain. Dr. Cantieri is a Past President and former Secretary-Treasurer of the AAO.

George J. Pasquarello, DO, FAAO, graduated from UNECOM in 1993. Board-certified in NMM/OMM, he has served as a Residency Program Director and Associate Professor of OMM at UNECOM. He has also worked as a clinical specialist at Maine Spine & Rehabilitation and University Healthcare. He is currently in private practice at East Greenwich Spine & Sport in East Greenwich, RI. Dr. Pasquarello is a Past President of the AAO.



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In the hands of an angel

Jamie B. Archer, DO (UK)

In 2009, I finished work on a replica of Dr. A.T. Still's treating chair.¹ This chair was invented and designed by the old doctor to aid osteopaths in treating their patients. I travelled to Kirksville, MO, with the chair and demonstrated its use during the Founder's Day celebrations at A.T. Still University. The chair was then donated to the Museum of Osteopathic MedicineSM in Kirksville, where it can be seen today.

Another of Dr. Still's inventions then began to intrigue me—the so-called Saint's/Angel's rest, which he used for relief when suffering from headaches. Dr. Still, as far we know, was a chronic headache sufferer, first experiencing headaches as a young boy. In his autobiography, he describes what he calls his first discovery in the science of Osteopathy (Figure 1).



Figure 1. *The first lesson/discovery in Osteopathy (Still 1897)*

One day, when I was about ten years old, I suffered from a headache. I made a swing of my father's plow-line between two trees; but my head hurt too much to make swinging comfortable, so I let the rope down to about eight or ten inches of [sic.] the ground, threw the end of a blanket on it, and I lay down on the ground and used the rope for a swinging pillow. Thus I lay stretched on my back, with my neck across the rope. Soon I became easy and went to sleep, got up in a little while with the headache all gone.²

Dr. Still goes on to say that he followed this method for twenty years before he really understood how it worked. However, suspending a rope (Figure 2) is not always practical or easy (especially between two trees), and Dr. Still soon found that a portable device was more ideal. (Similar-looking devices have been found in other cultures stretching back hundreds of years.) Over a number of years, he designed and built many versions based on the rope design, both for himself and for some of his patients (Figure 3).



Figure 2. *Head in swing (Murray 1918)*



Figure 3. *Dr Still and Elbert Hubbard. The rest can be seen on the treatment table next to the hat (Hubbard 1912).*

Dr. Still did this for himself because, as every osteopath knows, it is virtually impossible to treat oneself. His ever-increasing workload also meant he could not always see every patient. Some of these original rests survive today and can be seen in the Museum of Osteopathic Medicine.SM

As with the old doctor's treating chair, I wanted to know what they actually felt like to lie on and how they worked. However, the original rests are very fragile and trying them is out of the question. So the only thing for me to do was try to make working replicas. I chose three different designs, and my colleague Jason Haxton, Director

of the Museum of Osteopathic Medicine,SM and Debra Loguda-Summers, Curator, kindly provided me with detailed photographs of the delicate originals, along with appropriate measurements. I then set about making them in my spare time. What follows is the outcome of my efforts.

Saint's Rest 1

This rest is made out of two, roughly L-shaped pieces of wood attached to a central block in the middle. The feet are approximately 40 centimeters in length and flatten out into a smooth paddle shape at the point. The thick, vertical supports are set at an angle away from the horizontal and are flat at the top. This top has a thick piece of leather attached with metal pins and cut to the shape of the occiput to support the head (Figure 4).



Figure 4

Initially, it was thought the patient was to lie with the horizontal arms running down and pressing on either side of the spine, and the head resting on the leather support. I assumed it was designed to somehow affect/inhibit the upper dorsal nerve centers that influence circulation in the head, as well as free any constriction in the chest, much like Dr. Still's croquet ball design.³ However, this felt incredibly uncomfortable, and I was certain Dr. Still would not have designed something so awkward. I checked the measurements, and they were right, so I was stumped.



Figure 5

Then, my two-year-old son, who had been watching me, lay down, slid the feet of the rest under my desk so they were anchored, and put his head on the leather support. It was then I thought I may have been using it the

wrong way around and, in fact, the long feet acted more as a counter weight (Figure 5). Trying this position, the rest felt much more comfortable and many of my patients, who I asked to try it, agreed. Had my two-year-old worked it out? Maybe— it certainly felt right.

Saint's Rest 2

The next rest is also made of wood. The design is simpler, in that the base of the headrest is flat, but set at an incline (Figure 6). The two wedges of wood mounted on the base are set about four centimeters apart and curved to accept the back of the skull. To prevent pressure on the cervical and occipital regions from becoming too uncomfortable for the patient, a small piece of leather has been tacked on the wedges to form a crude sling on which the patient can rest his/her head (Figure 7).



Figure 6



Figure 7

In terms of comfort, this design exceeds the previous one, allowing the patient to experience potentially greater relief. The pressure from the wooden wedges appears to rest right in the region of the transverse processes of the atlas and upper cervical segments. These particular points are highlighted by Dr. Still when treating patients suffering from a headache.⁴

Saint's Rest 3

The final rest was very much a reflection of the rope between two trees. However, in this case, a belt is suspended between a metal frame (Figure 8). As seen in the photographs, a self-supporting, flexible metal frame was made and a custom replica of the gun belt Dr. Still used was slung over each end. The belt (minus the cartridge

loops) is attached to the frame with Chicago screws and is buckled underneath (Figure 9). The slack in the belt can be taken up by simply tightening or loosening the buckle, exactly as would be done if it were holding up a pair of trousers. The family, friends and patients who have all tried this design agree it is the most comfortable of the three, commenting that there is more of a feeling of suspension in this design, rather than compression from the wood in the others (Figure 10).



Figure 8



Figure 9



Figure 10

When using these three replica rests, it is worth bearing in mind they were made using the measurements taken from the originals in the museum. Dr. Still made many different versions of the same and different designs. He also made rests for patients, so it is plausible these rests are designed to fit someone else's anatomy. Dr. Still's own head was very asymmetrical, which may be why some individuals trying them feel they are uncomfortable.⁵ However, this is easily remedied, as rests can be made to fit an individual's anatomy.

Can it help?

For continued or periodic headaches, I begin in every case at the occiput, by laying my fingers flat on the back

of the neck over the occipital nerves. Here I bring a gentle and firm pressure for a few minutes, during which time I find the muscles relaxing under my fingers on both sides of the neck, from the base of the skull to the fifth cervical vertebra.⁴

The neck and sub-occipital region is clinically very important to osteopaths, both mechanically and physiologically, and therefore demands our greatest respect. For example, cardiac and vasomotor centers are found in this region, and their role in helping control and coordinate circulation through the cranium and the rest of the body is vital. In addition, there are various attachments for the many layered cervical fascia as it extends downwards from the skull, enveloping the neck, heart and diaphragm, and further linking the head and neck with respiration and circulation (Figure 11).

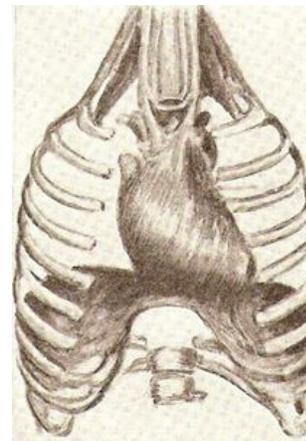


Figure 11. The continuation of the cervical fascia (Goldthwait 1934)

The deep and superficial cervical and occipital tissues are numerous, and their relationship with the dura and external scalp tissues is critical to understand. In addition, this region allows the passage of delicate neurovascular structures, which are most accessible to the delicate hands of osteopaths, in particular the great wandering or vagus nerve as it begins its long and busy journey down through the body. Therefore, pressure from Dr. Still's rest, much like pressure from our own hands, may begin to calm any aberrant afferent input, and settle the sympathetic nervous system, helping to open up circulation, inhibit occipital nerves, affect fluid motion and reduce tissue tension around delicate neurovascular structures. This would help to ease many uncomfortable and distressing conditions.

From the very beginning, the founders of our profession understood, respected and worked with this body unity, and those who care to delve into the rich archive left for us will find countless references to it. Dr. John Martin Littlejohn, a pupil of Dr. Still and first

Dean of the American School of Osteopathy, reminds us that, in terms of embryology, the head is an outgrowth of the cervical region of the spinal cord—the anterior cord becomes the brain and the anterior column the cranium. Therefore, the cervical region maintains the position of mediator between the brain and the rest of the nervous system below the cervical region throughout adult life. This means osteopaths may look for lesioning/dysfunction in the cervical region involving any part of the head or brain, or involving any part of the body organism, even down to the extremities.⁶

However, like Dr. Still's treating chair, the Saint's Rest is merely an aid, and can never replace an intelligently applied osteopathic treatment given by a physician who fully understands osteopathic principles. The next time you are in Kirksville, please take time to visit the museum and view the amazing exhibits and artifacts it has. Also try the Saint's Rests; I would be interested in your comments.

Acknowledgements

Special thanks to Jason Haxton, Director of the Museum of Osteopathic Medicine,SM and all the friendly, helpful staff.

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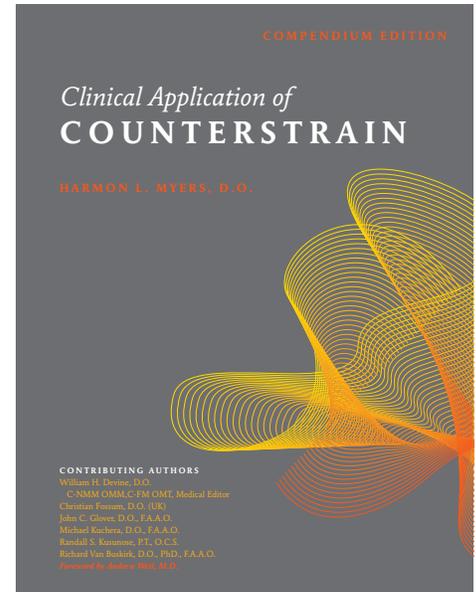
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The liquorodynamic model of the primary respiratory mechanism

**Yuri E. Moskalenko, DSc., DO (Hon.); Tamara I. Kravchenko, PhD, DO;
Gustav B. Weinstein, PhD; Terence C. Vardy, DO**

The “Primary Respiratory Mechanism” (PRM) is a term and fundamental concept that has been used for more than 80 years in osteopathic medicine. Until recently, the PRM was not a standard term for describing an organized physiological mechanism, and there was no clear idea of its physiological importance.

In Cranial Osteopathy in the beginning of the twentieth century, the summary data from several different researchers generalized the PRM as the Cranial Rhythmic Impulse (CRI) and as based on frequency. This was also based on periodic physiological processes ranging from two to 30 cycles per minute, as shown in the data provided. In this generalization, various conceptualized models regarding the origin of the CRI have also been expressed.

Some of these concepts are now thought of as improbable with our knowledge of modern biomechanics and biophysics. Others are more realistic and demand serious analysis as to the genesis of the CRI from a scientific and quantitative perspective. Due consideration has not been given to the physiological sources defining this phenomenon. The factors frequently listed as participating in the formation of the CRI and the PRM, are unfortunately considered separately. Another idea is that they are the interaction of two separate mechanisms in an intricate, combined process.

More realistic ideas as to the origin of the PRM are given in a recently published monograph,¹ which includes a description of the phenomenon based on the mobility of the skull bones. It is defined by the ratio of the volume of liquid in the craniospinal space and possible overflow of cerebrospinal fluid (CSF) into the spinal cord. One model considers the primary link in the chain of phenomena described as the PRM to be the CRI, which actually represents a very short period of time, but the intensive inflow of liquor to the skull cavity. This in turn causes an increase of intracranial pressure (ICP), and thus initiates the processes resulting in the PRM.

However, it is not yet clear what actually constitutes the CRI. There are many different points of view, even mystical representations. A more realistic approach to the

problem is to determine the forces which could provide an impulse causing an overflow of spinal liquid in the caudo-cranial direction, thus forming the CRI, and initiating the motion of the skull bones. One must also consider what forces could initiate the return of liquid in a cephalic-caudal direction and create conditions for a new cycle of the PRM.

From a physiological viewpoint, only the muscular system can be the force initiating the PRM. There could be two types of forces related to the CSF. First, the cardiovascular system as a whole could be responsible for the movement of liquids, and thus define CSF activity. In the skull cavity, the CSF is determined by the arterial pressure and pulse motion of the arterial vessels, combined with changes in the regional volumes of blood due to changes in the tone of the brain blood vessels.

Second, contractile structures (essentially paravertebral muscular structures) located outside the craniospinal cavity may affect the PRM. These may be the source of forces that direct movement of the lymph and can influence the mobility of a liquid. Electrical forces and electromagnetic fields may also act as factors in liquor movement. Other mechanical and physiological factors may be considered, too.²

There are a number of conceptual models regarding the nature of the PRM due to the complexity of this phenomenon. To truly consider the nature of the PRM, it is necessary to look carefully at each of the proposed models mentioned previously, and determine if there is a source of all these physical forces that is capable of providing an overall mechanism for interchanging movement of the CSF and blood.

With the new data as measured by our current equipment and advanced computer capabilities, it is now possible to reappraise our ideas of the PRM and its structural and functional organization.

Methods

It is known that the basic mechanism of PRM liquorodynamics is in the craniospinal cavity, and is

defined by a combination of physical forces influencing the liquorodynamics. This occurs in a strict sequence of space and time. It is necessary to establish adequate methodology to determine the PRM. The most effective is the combination of Transcranial Dopplerography (TCD – DWL, Germany) and a new method of Rheoencephalography (REG – Mitsar, SPb). This impedance REG signal is based on simultaneous use at three frequencies, allowing the measurement of a particular liquor component for a registered signal, and thus revealing factors related to the PRM.

This measurement combination, together with an electrocardiogram and chest respiratory movements through a transformer (PowerLab-4 – ADInstruments, Australia), has program opportunities (Chart-5) allowing calculation of the amplitude phase and spectral analysis of the registered signals. Because the optimal quantification for CRI and PRM investigations are not known, the maximal possible quantization—128kHz—was initially used. Research was conducted with 18 healthy young adults (18 to 24 years old) in a comfortable, relaxed horizontal position. TCD was registered at the base of the middle cerebral artery.

Results and Discussion

To consider the primary mechanism of the PRM, one must take into account all the liquor streams of the entire cranosacral system. For this purpose, we placed REG

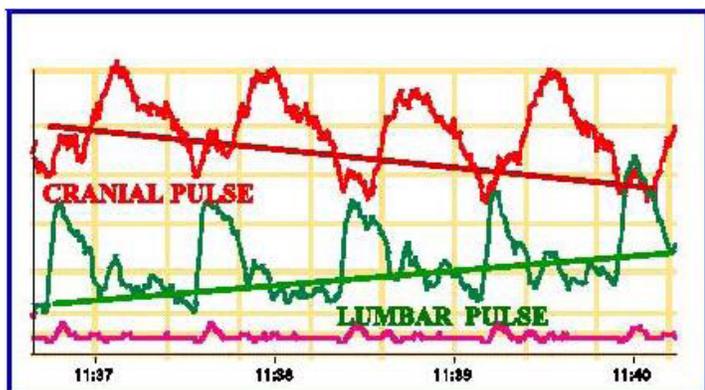


Figure 1. Simultaneous registration of rheoencephalogram at the head and lumbar region of the vertebral column.

electrodes—two on each side of the spinous processes—simultaneously on the skull (bi-temporally) and at the lumbar level of the vertebral column. The recordings (Figure 1) showed that both pulse changes and slow waves of the REG were inversely related.

The small, inversely related shifts indicate reciprocal liquor overflows in both the caudal and cephalic directions. This measurement was first observed in 1957, but with

much more primitive measuring equipment in experiments on animals.³ These results were only recently repeated on humans with significantly modernized equipment,⁴ and indicate the existence of the opposite movement of liquor streams to both the head and lumbar regions alternately.

Further study of this phenomenon, by placing four pairs of electrodes on the head (bi-temporally), cervical, thoracic and lumbar levels of the vertebral column, showed that, from each pair of electrodes, it is possible to observe

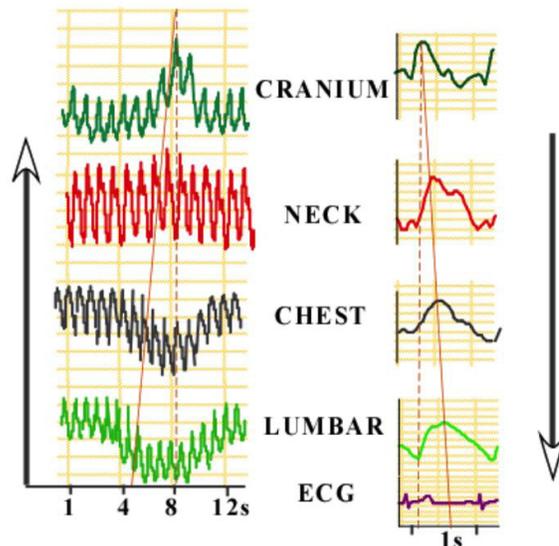


Figure 2. Simultaneous registration of rheoencephalogram from four pairs of electrodes placed along the cranio-vertebral system to observe the liquorodynamics in different parts of the craniospinal cavity.

two features of comparative changes of REG (Figure 2). One (Figure 2, right section) shows there is some delay between the measurement points at the beginning and peak of the pulse waves. Thus, there is a time delay of a pulse wave in liquor movement from the head to the lumbar vertebral region. The time delay of the pulse wave is approximately 0.6 to 0.8 seconds along the length of the craniospinal cavity, from the head downward along the entire spinal cavity.

This corresponds to data provided by means of longitudinal magnetic resonance imaging (MRI) in the sagittal plane, where consecutive pulse movements of some portion of spinal liquid in the cranio-caudal direction⁴ are visible. Therefore, it is logical to conclude that shifts of pulse waves of REG in the vertebral column correspond to movement of pulsating “portions” of liquor in the same direction.

The second observation is that the periodical (following eight- to 15-second) shifts in groups of pulse

waves in the caudo-cranial direction (Figure 2, left section), and the number of pulse waves from level to level in such a “package” decreases while their size conversely increases. In other words, shifts of these “packages of pulsations” in the caudo-cranial direction are observed. These movements begin in the lumbar part of the vertebral column for 1.2 to two seconds until they reach the thoracic level, for the following one to 1.5 seconds up to the cervical level, and between 3.5 to five seconds reaching the skull.

With each “package” of pulsations, 10 to 15 milliliters (ml) of liquor is delivered into the skull over four to six seconds. These studies show there are two simultaneous, counter-directed streams of liquor.

This data allows us to conclude that these “packages” of pulsations represent the CRI. The CRI may then cause movement of the skull bones and reciprocally support the CRI. The measurements were made to quantitatively assess the true amount of intracranial volume changes, and if they are capable of causing the skull bones to move.^{5,6,7,8} It was shown that the size of intracranial liquor volume fluctuations constituted 0.6 to 1.2 percent of the total volume in a healthy person, and are on average six to 15 ml. It was therefore of interest to compare the results of direct intracranial injection of x-ray-contrast solution during an angiographic procedure and measure the movement of the skull bones.

The infusion of a fixed volume (20 ml) of such a contrast solution into a carotid artery for one second creates a shift in the skull bones approximately 2.5 to three times greater than their average mobility under normal conditions. From the data collected, the CRI volume is six to 10 ml under normal conditions. This volume is consistent with the results of indirect measurements carried out by means of tilt-table, head-down studies.⁹ The comparison of the analyses of measurements using several techniques confirms the above conclusion regarding the total volume of the PRM. CRI duration, derived from REG data, indicates a volume of 10 ml, lasting three to five seconds and capable of causing resultant mobility of the skull bones as observed in osteopathic manual techniques.

The source of forces that are truly capable of forming the CRI and causing articular mobility of the skull bones is an important question.

The cranio-caudal stream of liquor corresponds with the cranial “portion” of stroke blood volume, and is determined by a liquor pressure gradient along the craniospinal cavity. This is created by pulsatile increments of liquor pressure in the rather rigid skull, while the spinal dural sac has significant elasticity. The lumbar region is cross-sectionally four times more elastic than the longitudinal caudal/cephalic direction.¹⁰

However, these forces are insignificant. The heart systole stroke action provides the skull with approximately 20 percent of heart stroke volume (about 10 ml). Most of this volume is distributed in the skull cavity, and, according to nuclear magnetic resonance, only about two to three ml of liquor is forced out into the spinal cavity. This size can vary under different conditions. In particular, it depends on body position. Sufficient liquor volume must accumulate for CRI emergence or initiation, and this takes a period of seconds. It is possible that the process of liquor accumulation in the lumbar region is initiated by gravitational movement in the caudal direction, in addition to an increase in pressure due to its actual production.^{11,12} As a result, for some seconds, liquor volume sufficient for CRI initiation builds up in the lumbar region. While this process can vary over a wide range depending on specific conditions, it corresponds to the average pulsating frequency of the CRI.²

If the process of liquor accumulation in the lumbar region and the forces involved are explainable, the forces responsible for liquor flowing in the cranial direction remain unclear. This question is important to answer for an accurate explanation of such a complex phenomenon as the PRM. First of all, it is necessary to emphasize that the source of forces causing the CRI, arising periodically as fluctuations, is an intensive, short-term stream of liquor in the cranial direction, most likely created outside the craniospinal cavity. It is difficult to find the necessary powerful and active contractile structures in this region. However, the caudal region of the vertebral column and sacrum are surrounded by powerful muscles of a tonic type, which could definitely influence vertebral column dynamics and cause an increase in liquor pressure in the lumbar region. We can postulate that stretching of the lumbar dural sac by hydrodynamic forces may result in stretching of the surrounding spinal muscles and subsequent reciprocal contraction. This would cause sacral movement, which in osteopathic practice is evidenced by external palpation.

Such a viewpoint is not new. More than 25 years ago, this concept was expressed as the source of the forces for movement of liquid located in the cranium.^{13,14} It revolved around the role of the accumulation of cranio-caudal liquor in the head, causing pulse volumes and subsequently CRI formation. It is very probable that the contraction of spinal muscles can be initiated by neuro-reflectory mechanisms, as the spinal dura mater contains a large number of mechanoreceptors. Their participation in regulating system hemodynamics, respiration and liquor pressure is well known. Therefore, the assumption that, in branches of the spinal nerves leaving the spinal cavity through intervertebral foramen, there are sensory and motor fibers which, in response to an increase in lumbar pressure, can

stimulate contractile paravertebral and parasacral muscles¹⁵ seems logical.

In turn, by stimulating the sacral and lumbar musculature, the sacral movement induced is capable of causing liquor to move in a cephalic direction.^{12,15,16} Thus, the caudal spinal muscular system can be a source of forces forming the CRI. The initial cause for this mechanism is the increase in lumbar pressure and stretching of spinal dura mater, which in itself can stimulate the actual vertebral segments and influence their muscular neurological reflex by stimulation of the dural mechanoreceptors.

Thus, the Primary Respiratory Mechanism may be considered a complex physiological process in which the following four consecutive processes participate:

1. Accumulation of liquor in the lumbar region of the vertebral column due to the accumulation of increased volumes of liquor from intracranial pressure during the pulsation phases. This is apparently the result of a rising pressure gradient in the caudal direction created by the process of increased liquor production.
2. Deformation of the lumbar spinal dural sac and the sacrum due to stretching of the muscles surrounding the lumbo-sacral joint system.
3. Contractions of the muscles surrounding the lumbo-sacral joint resulting in sacral motion. Increase of liquor pressure in the lumbar region and consequent CRI formation.
4. The CRI moves along the spinal cavity in a cranial direction by decreasing changes in liquor pressure. The liquor flows upward into the skull, causing motion of the skull bones to occur. During this process, the brain membranes serve as a passive modulator.

Each of the phases listed above is not the single causative component. Therefore, the duration and size of each phase and pulsation can vary. This explains the fact that the data collected by different researchers to describe the origin of the CRI and its frequency varies significantly.

In analyzing the functioning of any physiological mechanism, it is always expedient to raise the question of its importance in the overall function of the total organism. The PRM is the primary mechanism controlling the organism's functionality. The PRM is constantly renewing the liquor streams that control craniospinal liquor, and its physical parameters can be modulated quickly within the entire craniospinal cavity. Considering the reabsorption of liquor happens mainly by Pacchionian bodies, it is reasonable to consider that this activity of the PRM

promotes and accelerates the evacuation of brain waste products to the brain sinuses, where they are passed into the blood.

The complexity of the craniospinal cavity's organization and the tissues involved are extremely important for the whole organism, and it can be reasonably suggested that the PRM plays a significant, but not fully understood, role. Important correlations have already been established. The PRM significantly changes during the application of some osteopathic manipulative techniques, particularly biodynamic techniques, and with extended periods of a subject in a head-down body position. The PRM can sometimes nearly disappear for some periods of time and reappear again later. Activity of the PRM is usually suppressed or disappears entirely during a surgical anesthesia,¹⁷ but increases during a time of emotional or physiological stress, as observed when training astronauts on a centrifuge.¹⁸

When studying any significant physiological phenomenon, there is always the question of measuring it. In the case of the PRM, it is possible to ascertain absolute units. However, for a more accurate assessment of the PRM, it is expedient to utilize certain relative measurement increments, which can be used for analysis and allow mathematical calculation of their dynamics to determine changes in the organism. As illustrated above, for an assessment of the PRM, it is practical to use the average frequency and wave size, which can be expressed by the average number of cycles per minute for a time period of 70 to 90 seconds.

The amplitude of the mobility of the liquid contents in the cranium can be regarded as another indicator. It is effective to non-invasively measure this indicator by means of impedance REG, which depends on such features as the position of the electrodes. The analysis may be expressed relative to units of pulse volume, as this also minimizes data collection and measurement errors. In osteopathic practice, there is still evaluation of PRM forces by manual palpation. In principle, it would be possible to create such a palpatory measurement device, but it would be difficult to make exact measurements of the counteraction of the CRI. Measurements would, in any case, be limited to the average frequency and the maximum deviation as a ratio between the intracranial liquid components. The change in frequency of the CRI and its amplitude can be obtained from spectral analysis using the Chart-5 software as transformed by PowerLab-8. An example of such analysis is shown in Figure 3, where the REG recordings are accurately visible as both pulse and respiratory waves. The periodic pulsations of two to four pulse waves may be regarded as indications of PRM activity.

It should be noted that similar phenomena have been observed previously with multiple REG recordings. However, they have usually been regarded in the category of recording elements connected with other physiological processes, i.e., eye movement. Only in this research was it determined that the measurement displayed was of an actual intracranial nature. For an assessment of the amplitude of the PRM, REG analysis was used, and the scale of the ordinates of the spectral chart normalized by pulse amplitude (average size was accepted as a measurement unit). From the data presented in Figure 3, the amplitude of the PRM varies 0.15 from pulse size at an average frequency of five to six cycles per minute.

21st century at the Sechenov Institute of Evolutionary Physiology at the Russian Academy of Sciences, in cooperation with Viola M. Frymann, DO, FAAO, Director of the Osteopathic Center for Children in San Diego, CA.)

An obstacle for a measurement device of the PRM is the fact that slow-wave processes in the craniospinal cavity are caused by a number of factors, which are in turn connected with the functioning of the cerebral vasculature and intracranial pressure, as well as with brain metabolism as a whole. Therefore it is not simple to measure PRM in a “pure” data collection sample, since the processes listed above are closely linked to PRM activity by their very frequencies.

Figure 4 illustrates this concept by showing the spectral analysis of a two-minute fragment of an REG recording taken from both hemispheres, with TCD and respiration in the frequency range of zero to 0.3 Hz.

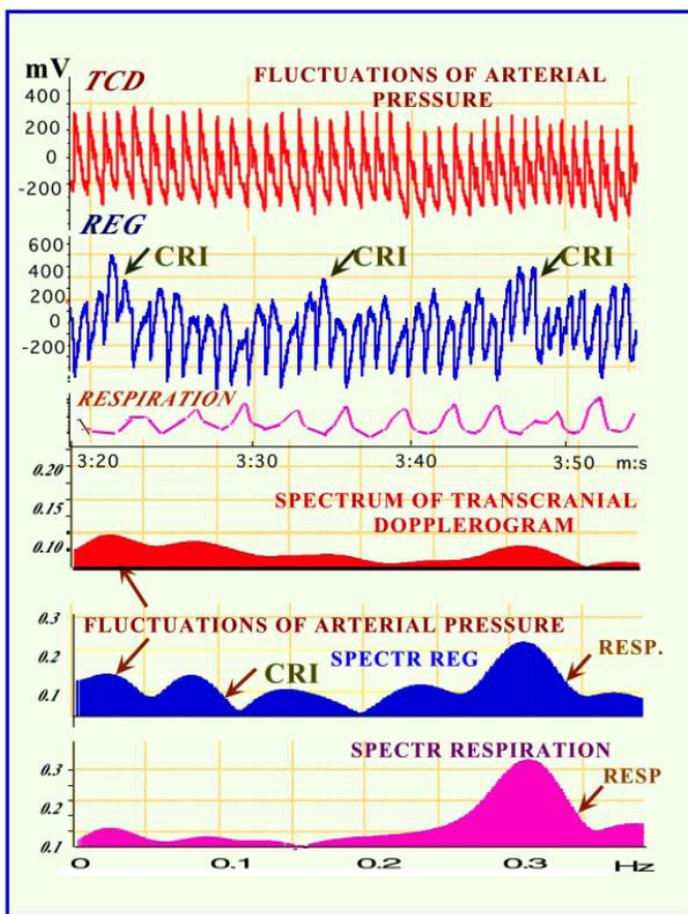


Figure 3. 25-second fragments of REG, TCD recordings and chest respiratory movements in a volunteer at rest, and spectral diagrams of these processes with quantification at 128 kHz.

On the basis of 87 investigations where the amplitude of the PRM was compared with the results of manual measurements, the CRI in children eight to 15 years of age varied in frequency, ranging from four to 15 cycles per minute. The amplitude, according to REG measurements, was within 40 to 60 percent of the size of the pulsations. (The research was conducted at the beginning of the

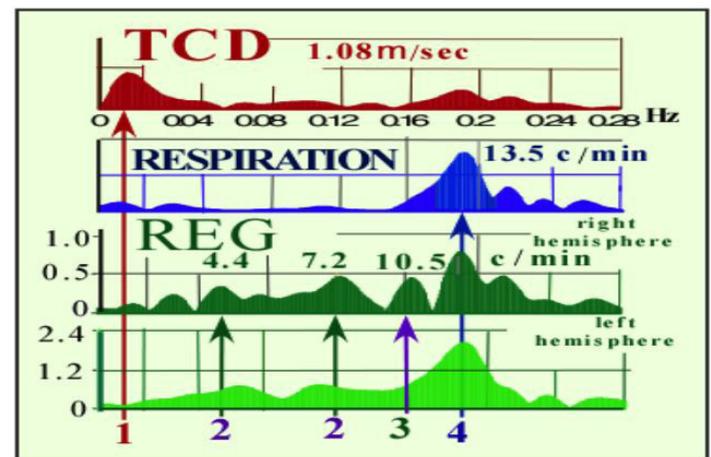


Figure 4. Spectral diagrams of TCD, REG (bilateral fronto-mastoidal electrodes) and chest respiratory movements – two-minute recording fragment with quantification at 128 kHz. Arrows show the peaks on the spectrograms and their maximal frequencies.

One can see in Figure 4 that each of the spectrograms has a number of peaks. The similarity of their origins is demonstrated by whether some of them coincide in frequency on different spectrograms. In Figure 4, the vertical line designates the peaks as being a reflection of the regulatory processes in the central haemodynamics. The peaks are, most likely, a reflection of fluctuations in cerebral vessel tone caused by metabolism, and a regional ratio of the liquid volume pressure environment in this brain region. On the REG measurement chart, it is possible to allocate a peak by frequency to reflect the CRI, but it is noteworthy that it only appears in one hemisphere. The peaks reflecting respiratory movements are clearly visible. Figure 4 shows that the spectral analysis of slow-

wave processes can be a long-term objective criteria—a measurement of the PRM and other oscillating processes taking place in the craniospinal cavity.

One now has the ability to present the PRM's structural and functional organization in coordination with a physiological basis that does not contradict any previously published papers, and, more importantly, adheres to the laws of biomechanics. Naturally, a number of questions still need additional supporting evidence and measurements. For example, features of the PRM due to cerebrovascular pathology demand special study. It is very probable there will be new research opportunities that can determine, at last, the exact nature of the PRM since the discussion was started by its original pioneer, Dr. William Garner Sutherland.

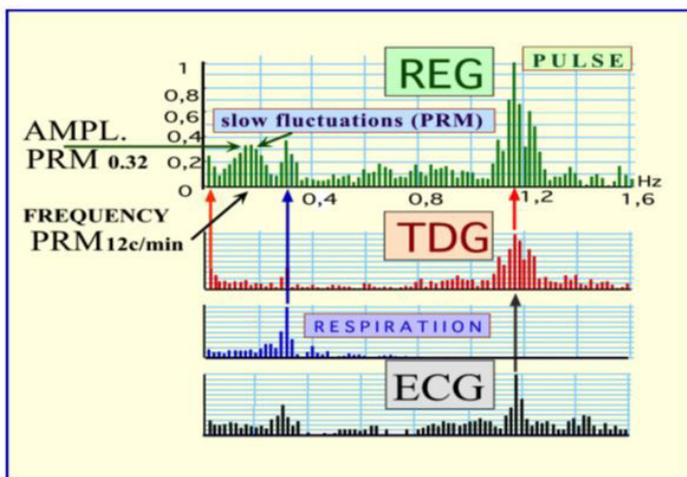


Figure 5. Spectral functions of REG, TCD, respiration and ECG obtained with quantification by four kHz (fragment of REG recording – 160 seconds). It can be seen that CRI and PRM look clearer at lower quantification, as the influences of numerous slow-frequency fluctuations, connected with the cerebrovascular system and brain metabolism, are suppressed.

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Osteopathic Approaches to the Heart and Vascular System

December 6-8, 2013 at AZCOM in Glendale, AZ

Course Description

This class will explore the heart and vascular system aspects of neuroregulation, viscoelasticity and compliance, micro perfusion, mechanical tension, function and dysfunction.

Participants will palpate, diagnose and treat the heart muscle, valves, connective tissue structures, cardiac coronaries and lymphatics, coronary conducting system, cardiac plexus and brainstem, as well as sensory and emotional connections.

It will cover the venous system with the superior and inferior vena cava, portal vein, lumbar plexus and sigmoid/rectal plexus.

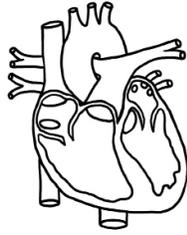
It will also address the major visceral arteries of the thorax, head and neck, and upper extremities (aorta, pulmonary vessels, subclavian, common carotid, facial artery, carpal tunnel area, thyroid vessels, internal carotid and breast vessels).

Participants will start cross-correlating osteopathic diagnosis and treatment with oriental medicine by palpating the meridians pre and post treatment, and using the "healing sounds."

If time permits, the vessels of the abdomen will begin to be covered.

CME

24 hours of AOA Category 1-A credit are anticipated.



Program Chair

Kenneth J. Lossing, DO, is a 1994 graduate of Kirksville College of Osteopathic Medicine. Dr. Lossing completed an internship and residency program at the Ohio University College of Osteopathic Medicine. He studied under the French Osteopath, Jean-Pierre Barral, DO, and has become an internationally known speaker on visceral manipulation. Dr. Lossing is a member of the AAO Board of Trustees.



Course Times

Friday, Saturday and Sunday: 8:00 am - 5:30 pm

Includes (2) 15-minute breaks and a (1) hour-long lunch.

Breakfast, lunch and coffee breaks will be provided

I require a vegetarian option

I require a gluten-free option

Course Location

Arizona College of Osteopathic Medicine

19555 North 59th Avenue, Glendale, AZ 85308
(623) 572-3215

Travel Arrangements

Call Tina Callahan of Globally Yours Travel at 1-800-274-5975. Locals hotels include the Country Inn & Suites in Phoenix (1-800-230-4134) and the Quality Inn & Suites in Glendale (1-800-230-4134).

Registration Form

**Osteopathic Approaches to the Heart and Vascular System
December 6-8, 2013 at AZCOM**

Name: _____ AOA#: _____

Nickname for Badge: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____

E-mail: _____

By releasing your fax/e-mail, you have given the AAO permission to send marketing information regarding courses to your fax or e-mail.

Click here to view the [AAO's Cancellation and Refund Policy](#)

Registration Rates

On or before October 8 After October 8

AAO Member \$ 960.00 \$ 1060.00

AAO Non-Member \$ 1060.00 \$ 1160.00

The AAO accepts check, Visa, Mastercard or Discover payments in U.S. dollars

Credit Card #: _____

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I hereby authorize the American Academy of Osteopathy® to charge the above credit card for the full course registration amount.

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AAOJ Submission Checklist

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Manuscript Submission

- Submission e-mailed to AAOJ Interim Scientific Editor at editoraaoj@gmail.com or mailed on CD-ROM to the AAOJ Managing Editor, American Academy of Osteopathy, 3500 DePauw Boulevard, Suite 1080, Indianapolis, IN 46268
- Manuscript formatted in Microsoft Word for Windows (.doc), text document format (.txt) or rich text format (.rtf)

Manuscript Components

- Cover letter addressed to the AAOJ Interim Scientific Editor, Kate McCaffrey, DO, with any special requests (e.g., rapid review) noted and justified
- Title page, including the authors’ full names and financial or other affiliations, as well as disclosure of the financial support related to original research described in the manuscript
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- “Methods” section
 - the name of the public registry in which the trial is listed, if applicable
 - ethical standards, therapeutic agents or devices, and statistical methods defined
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- Editorial conventions adhered to
 - units of measure given with all laboratory values
 - on first mention, all abbreviations other than measurements placed in parentheses after the full names of the terms, as in “American Academy of Osteopathy (AAO)”
- Numbered references, tables and figures cited sequentially in the text
 - journal articles and other material cited in the “References” section follow the guidelines described in the most current edition of the *AMA Manual of Style: A Guide for Authors and Editors*.
 - references include direct, open-access URLs to posted, full-text versions of the documents
 - photocopies provided for referenced documents not accessible through URLs

- “Acknowledgments” section with a concise, comprehensive list of the contributions made by individuals who do not merit authorship credit and permission from each individual to be named in print
- For manuscripts based on survey data, a copy of the original validated survey and cover letter

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- For authors serving in the U.S. military, the armed forces’ approval of the manuscript and institutional or military disclaimers submitted

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Authors are required to disclose all financial and non-financial relationships related to the submission’s subject matter. All disclosures should be included in the manuscript’s title page. See the “Title page” section of “AAOJ Instructions to Contributors” for examples of relationships and affiliations that must be disclosed. Those authors who have no financial or other relationships to disclose must indicate that on the manuscript’s title page (e.g., “Dr Jones has no conflict of interest or financial disclosure relevant to the topic of the submitted manuscript”).

Component Societies and Affiliated Organizations

Calendar of Upcoming Events

June 20-23, 2013

*Annual Conference: Coming to Our Senses—
An Osteopathic Approach to Cranial Nerve Disorders*

Course Director: Maria T. Gentile, DO
Associate Director: Dennis A. Burke, DO
Marriott Hotel, La Jolla, CA

CME: 20.75 Category 1-A AOA credits anticipated

Phone: (317) 581-0411 Fax: (317) 580-9299

E-mail: info@cranialacademy.org

Web site: www.cranialacademy.org

June 21-25, 2013

Muscle Energy: Part I

Course Chairperson: Lisa A. DeStefano, DO
Restore Motion, Rockville, MD

CME: 34 Category 1-A AOA credits anticipated

Phone: (517) 353-9714 Fax: (517) 432-9873

E-mail: cme@com.msu.edu

Web site: www.com.msu.edu/cme/courses.html

August 1-4, 2013

*Louisiana Osteopathic Medical Association
Annual Convention: Focus on Primary Care*

CME: 25-26 Category 1-A AOA credits anticipated

The Royal Sonesta Hotel, New Orleans, LA
Phone: (318) 385-7943 Fax: (318) 385-7934

E-mail: lomadocs@bellsouth.net

Web site: www.loma-net.org

August 8-11, 2013

*Colorado Society of Osteopathic Medicine
Annual Meeting and Summertime CME*

CME: 25 Category 1-A AOA credits anticipated

Beaver Run Resort & Conference Center, Breckenridge, CO
Phone: (303) 322-1752 Fax: (303) 322-1956

E-mail: rachel@coloradodo.org

Web site: <http://www.coloradodo.org/>

August 9-11, 2013

Oklahoma Osteopathic Association Summer CME Seminar

CME: 17 Category 1-A AOA credits anticipated

Sheraton Hotel at the Reed Conference Center
Midwest City, OK

Phone: (405) 528-8625 Fax: (405) 528-6102

E-mail: lany@okosteo.org

Web site: <http://www.okosteo.org>

August 15-17, 2013

*Utah Osteopathic Medical Association 17th Annual
CME Conference: Healthcare for the Whole Family*

CME: 24 Category 1-A AOA credits anticipated
The DoubleTree Suites, Salt Lake City, UT
Phone: (801) 860-3812

E-mail: director@utahosteopathicmedicalassociation.com

Web site: <http://utahosteopathicmedicalassociation.org/>

August 30-September 1, 2013

*Osteopathic Physicians & Surgeons of California
24th Annual Fall Conference*

CME: 22 Category 1-A AOA credits anticipated
InterContinental The Clement Monterey, Monterey, CA
Phone: (916) 822-5246 Fax: (916) 822-5247

E-mail: opsc@opsc.org

Web site: <http://www.opsc.org>

September 20-22, 2013

*The Next Step: Advancing Your Skills in
Osteopathy in the Cranial Field*

Course Director: Paul E. Dart, MD
Associate Director: Eric J. Dolgin, DO
DoubleTree Hotel, Portland, OR

CME: 22 Category 1-A AOA credits anticipated
Phone: (317) 581-0411 Fax: (317) 580-9299

E-mail: info@cranialacademy.org

Web site: www.cranialacademy.org

September 20-22, 2013

*Introduction to Osteopathic Medicine and
Evaluation & Treatment: Thorax and Rib Cage*
UNECOM, Biddeford, ME

CME: 20 Category 1-A AOA credits anticipated
Phone: (207) 602-2589 E-mail: cme@une.edu

Web site: www.une.edu/com/cme/manualmedicine.cfm

October 4-7, 2013

Exercise Prescription as a Complement to Manual Medicine

Course Chairperson: Mark Bookhout, MS, PT
MSUCOM, East Lansing, MI

CME: 26.5 Category 1-A AOA credits anticipated
Phone: (517) 353-9714 Fax: (517) 432-9873

E-mail: cme@com.msu.edu

Web site: www.com.msu.edu/cme/courses.html