The AAO
FORUM FOR OSTEOPATHIC THOUGHT
JOURNAL
Official Publication of the American Academy of Osteopathy®
TRADITION SHAPES THE FUTURE
VOLUME 19 NUMBER 4 DECEMBER 2009

Osteopathy – The Journey That Doesn't End

Kenneth H. Johnson, DO, FAAO Presents the 2009 Thomas L. Northup Memorial Lecture

Page 13...

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SILENT AUCTION

Portable table used by Harold Magoun Sr., DO, FAAO • 14 x18 picture of Dr. Still with quote "to find health should be the object of the doctor, anyone can find disease" • 20 x 24 classic picture of Dr. Still • 13 x 18 photo of Dr. Still originally obtained by Harold Magoun Sr., DO, FAAO • 22 x 28 framed picture of famous Osteopathic patients: Mark Twain, Teddy Roosevelt, Buffalo Bill, and Nelson Rockefeller • 22 x 28 framed picture of famous Osteopathic patients: George B. Shaw, William H. Taft, Helen Keller, and William R. Hearst • 22 x 26 picture of the dissection of the complete nervous system; *the original in the museum in Kirksville* • Plastic models of the foot & ankle, knee, sacrum, sacrum & lumbar spine, shoulder, hand, hip, joint, and cervical spine • Copy of the book *Structured Healing* by Harold I. Magoun Jr., DO, FAAO • Copy of the book *Never Give Up* by Ron Heagy • and much much more …

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5:00 pm - 6:30 pm

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P: (317) 879-1881
F: (317) 879-0563
www.academyofosteopathy.org

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FORUM FOR OSTEOPATHIC THOUGHT

THE AAO
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TRADITION SHAPES THE FUTURE • VOLUME 19 NUMBER 3 • DECEMBER 2009

The mission of the American Academy of Osteopathy® is to teach, advocate and research the science, art and philosphy of osteopathic medicine, emphasizing the integration of osteopathic principles, practices and manipulative treatment in patient care.

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Professional Card 3.5" x 2"	$60		
Classified	$1.00 per word		

Contributors

Murray R. Berkowitz, DO, MPH, C-NMM/OMM, our Associate Editor, has contributed his article, "Osteopathic Education and Training – Advocating the Adoption of an External Paradigm for Residency Training in NMM/OMM." In this editorial, Dr. Berkowitz presents some ideas for "thinking outside the box" when it comes to designing and implementing post-graduate training in the field of NMM/OMM.

Leslie Mae-Geen Ching, OMS IV, has written an interesting and thought-provoking essay entitled "There Are More Things in Heaven and Earth…". This paper was the first prize winner in the AOA's Bureau of Osteopathic History and Identity's 2008 essay competition. The subjects of this essay are osteopathic education and osteopathic identity.

Kenneth H. Johnson, DO, FAAO, has honored us with his 2009 Thomas L. Northrup Lecture, "Osteopathy – The Journey That Doesn't End." He discusses some of the influences that shaped his career so far, and gives us some ideas about how to preserve and increase our distinctiveness by considering innovations in our osteopathic undergraduate and postgraduate training programs.

Daniel J. Kary, DO, FAAO, has provided us with his FAAO thesis entitled, "The Transversus Thoracis Muscle in Humans. Diagnosis and Treatment of Associated Pathology: An Osteopathic Perspective." Here he discusses the anatomy, physiology, and the diagnosis and treatment of pathology and somatic dysfunction associated with this underappreciated and little known, muscle.

Michael O'Brien, Lic. Ac., OMS I and Jerry Haman, MA, DO, AOBSPOMM, have written "El Savador Mission Trip - Infant's Wheeze gets relief with Osteopathic Manipulation." They illustrate, through this case report, the beneficial use of OMM in pediatric asthma.

Regular Features

"Dig On"

Jamie Archer, B(Ost) MICO, shares with us some interesting historical information. See his article "Dr. A. T. Still's Treating Chair" for a discussion of one of our Founder's many inventions.

From the Archives

This issue we present a discussion of osteopathic principles and philosophy from a source written in the early days of osteopathy. See the exerpt from from : Chapter XIII. The Principles and Practice of Osteopathy. In: Booth, ER. *History of Osteopathy and Twentieth-Century Medicine*. Cincinnati: Press of Jennings and Graham, 1908.

AAO Calendar of Events

Mark your calendar for these Academy meetings and educational courses.

December 2009	December 5: AOA Bureau of Osteopathic Education, Chicago, IL
January 2010	January 22-24: Exercise Prescription, AZCOM in Glendale, AZ
February 2010	February 3: PS&E Committee Teleconference at 7:30 pm (EST) February 5-8: AOA Midyear Meeting of the Board of Trustees, Chicago, IL
March 2010	March 14-16:Visceral Approach for the Sacrum and Pelvis, Colorado Springs, CO March 15-16: Pelvic Pain: Mechanisms and Evidence Based Diagnosis & Treatment, Colorado Springs, CO March 17-21: AAO Convocation, Pelvis & Sacrum: Where It All Comes Together, Colorado Springs, CO March 17: Board of Governors Meeting at 8:00 am (Mountain Time), Colorado Springs, CO March 17: Board of Trustees Meeting at 1:00 pm (Mountain Time), Colorado Springs, CO March 18: PS&E Committee Meeting at 6:30 am (Mountain Time), Colorado Springs, CO March 18: AAO Annual Business Meeting, Colorado Springs, CO March 20: Board of Trustees Meeting at 12:15 pm (Mountain Time), Colorado Springs, CO
June 2010	June 9: PS&E Committee Meeting at 7:30 pm (EST) via teleconference
July 2010	July 12-18: AOA Annual Meeting of the Board of Trustees & House of Delegates Chicago, IL
August 2010	August 11: PS&E Committee Meeting at 6:00 pm (EST) via teleconference
October 2010	October 24-28: AOA OMED in San Francisco, CA

View From the Pyramids

More Osteopathic Storytelling

Raymond J. Hruby

I recently received an interesting communication from a long time friend and colleague who also shares my interest in osteopathic history. We've had similar exchanges occasionally in the past. Given below is a letter written by the late great Perrin Wilson, DO, to my colleague and several of his colleagues, all of whom had been studying with Dr. Wilson. His letter illustrates another osteopathic story, showing the marvelous things we can accomplish with our unique osteopathic methods, especially when applied along with real osteopathic thinking. The letter was handwritten, but I present it here in typewritten form with virtually no editing, except to protect the identities of a couple of individuals where appropriate (my edits are italicized and in brackets). Enjoy!

10/29/77

Dear John,

Here is one you fellows just can't believe. God moves in a mysterious way his (*sic*) wonders to perform.

I gave up my car on November 1st, 1976, (cataracts). Our church has a special visitation minister for shut-ins and hospitals. I made a deal with [the minister] to swing in and pick [my wife] and me up on Sundays to take us to church.

[*The minister's* wife] always got out of the front seat to sit in back with [my wife]. They became very fond of each other and [*the minister's* wife] told [*my wife*] she had been unable to urinate normally. "It just dribbles out, and it is getting worse. I take Lasix but that makes me feel terrible." On one trip I said "[*My wife*] tells me your plumbing isn't working normally. I want to see you."

She came to the apartment on June 5th 1977. In 1963 (age 48) she started having cystitis attacks. They came so often that she was hospitalized at the Mass. Gen. Hospital for two weeks. She had a severe fall down icy steps the year before. The specialists were "frustrated" to account for her condition. They thought the fall might have injured the nerves to the bladder which might be partially paralyzed. They gave her something to take as it got worse (Lasix).

Some years back she had had a few osteopathic treatments that seemed to help a little.

I got out my portable table that [*another DO colleague*] leaves here, when he comes in to swap treatments. Her DL area was like a rock D11 & 12 were in left rotation right sidebending. I worked out the area and then tried the old two hand thrust with her on her face. No luck. I sent here away with orders to sit on a stool and rotate the thorax right and left six times twice a day.

I saw her next on June 27. She had noticed some improvement in the urinary stream but not much. I tried all my usual techniques but T11 & T12 would not unlock. The [*minister and his wife*] were on vacation so the next visit was on July 29th.

On this visit I had her lie on her right side. I stood in back of her. I reached across her pelvis with my left hand grasping the edge of the table and my left humerus locking the pelvis so that it could not move. I placed my right hand on the left transverse process of T11 and my shoulder against my hand to get the weight of my body to increase the power of the thrust. She relaxed beautifully and I let go with all the power and speed I could. The pop was so very loud that I was afraid I had broken something. I said: "Did I hurt you?" "Not a bit," was her reply. I put that area through physiologic motion several times.

The next time they took us to church I said "How is your plumbing?" She said, "Very much better."

Yesterday they dropped in to bring us a "peace rose." I said "How is the plumbing?" "Perfectly normal." Two weeks ago she had said she felt better than she had for 15 years.

The question for you fellows is: How can the kidneys get enough blood not to get damaged if they are not functioning to remove anywhere enough urine? She doesn't ever feel bloated now.

[*The minister*] says that it is a miracle. Osteopathy is the only <u>universal</u> therapy. Osteopathic manipulation is indicated in every situation. It is not only curative medicine but also preventative medicine.

I'll be 89 years of age next month, and have had five remarkable results since I retired nine years ago.

Give my regards to the gang including Dr. Korr.

Fraternally,

Perrin

Raymond J. Hruby, DO, FAAO
Scientifc Editor

UNIVERSITY of NORTH TEXAS
HEALTH SCIENCE CENTER at Fort Worth

SEEKING OMM CHAIR IN FORT WORTH, TX

General Responsibilities: The Chair of the OMM Department at the Texas College of Osteopathic Medicine (TCOM) is the senior administrative officer, responsible for development growth strategies, implementation of daily operations and management of all activities related to OMM education of students and residents, research and clinical practice. The OMM Chair must demonstrate excellent organizational, communication, interpersonal and collaborative skills, as well as ethical character.

Candidate Qualifications:

- Certification by the AOBNMM in OMM or NMM
- Ability to obtain an unrestricted license for the practice of medicine in the State of Texas
- Recognized for excellence in teaching, clinical care, leadership, peer reviewed grant funding and publications
- Qualify as an Associate Professor or Professor in OMM
- Qualify for medical-staff privileges at Fort Worth hospitals
- 5 years experience teaching in an osteopathic Educational program

The OMM Department: The department of OMM provides a 7-year plus progressive and integrated medical curriculum, teaching courses to Year 1 and Year 2 in the fall and spring semester, and a required Year 3 clerkship. Other programs include a Year 2 OMM Teaching Assistant program, a Year 3-5 OMM Pre-doctoral Fellowship program, and a NMM and OMM 2-year residency and Plus-one GME program through Plaza Medical Center. The OMM department is currently developing curricula in collaboration with the newly developed Physical Therapy (PT) School. The OMM clinic is comprised of five clinical faculty, 3rd year students, residents and OMM fellows and provides approximately 5,200 patient visits annually averaging a revenue stream of $1.1 million. The OMM Department has extensive opportunities for collaboration with the Osteopathic Research Center (ORC), the Physical Medicine Institute (PMI) as well as within UNTHSC's many departments, schools, and its 12 Research Centers and Institutes.

TCOM: TCOM is a leader in comprehensive primary care and rural medicine, named as one of the nation's top 50 medical schools for primary care and the only osteopathic medical school in the state. Graduates place highest on the osteopathic profession's board scores and get accepted to some of the most demanding residency programs in the nation.

UNTHSC: the University of North Texas Health Science Center is one of the nation's distinguished graduate academic institutions, dedicated to education, research, patient care and service, with a growing 33-acre campus located in Fort Worth's Cultural District.

UNT Health: The physician group is the largest, multi-specialty practice in Tarrant County, with 170 physicians and 51 non-physician providers and has over 500,00 patient visits per year. Faculty has access to the latest in technology in more than 45 different clinic sites across the area, including EMR. Resources include managed care contracting, risk management, a call center and malpractice insurance.

Fort Worth, TX: Texas has been stated as the best place in America to practice medicine due to tort reform, low malpractice insurance costs, lack of state income tax and low real estate costs. We are the 17th-largest city in the U.S., located in the cultural district of Fort Worth and one of "America's Most Livable Communities." We have a thriving center of education, arts, Botanical Gardens, commerce, Stockyards and a vibrant downtown area!

Application Procedure: Position available January 30th, 2010. This is an EEO/AA Institution. Please apply to www.unthscjobs.com and contact Blair Chappell, Physician Recruiter, at 817.735.5106 or cchappell@hsc.unt.edu for more information.

Osteopathic Education and Training – Advocating the Adoption of an External Paradigm for Residency Training in NMM/OMM

Murray R. Berkowitz

"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." (emphasis added)

Clearly, teaching is an important aspect of the Academy and Osteopathy as a profession. We teach our patients, we teach our students, interns, and residents, and we teach other physicians and health care providers. We teach regionally, nationally, and internationally. The program at the Academy's annual convocation emphasizes this important component of our mission. Those of us whose interests cover the manipulative aspects of osteopathy have long found a home and professional camaraderie in the Academy.

This teaching component of our mission gives rise to a wide range of opportunities and challenges in the realm of osteopathic education and training. These include both somewhat obvious and some more obscure considerations. The former includes the education and teaching of osteopathic medical students, interns, and residents. It includes the continuing medical education of osteopathic physicians, both specialists in Neuromusculoskeletal Medicine/Osteopathic Manipulative Medicine and physicians in other specialties who feel themselves to be "ten-fingered DOs." I consider those of us who hold multiple specialty Board Certifications including NMM/OMM to be in the former.

While one distinguishing feature of osteopathic medicine, manipulation is not the sole distinguishing characteristic of this profession. Yet there are many physicians who would like to become more qualified to provide manipulative care to their patients and to achieve official recognition of this mastery via Board Certification. There is a need for increased numbers of Board Certified NMM/OMM specialists. Merely one example is the requirement of faculty needed in the new osteopathic medical schools. Another important need is generated by the certification and credentialing of NMM/OMM physicians in healthcare organizations and insurance plans.

Several ideas in this regard have been advanced and discussed over the past few years; however, ever since the closure of the "clinical pathway", the only pathway is the completion of a residency in Neuromusculoskeletal Medicine/Osteopathic Manipulative Medicine. While this can be accomplished by those with residency training or Board Certification in other specialties via completion of a one-year program in NMM/OMM (the "Plus-One" program), many physicians who would like to achieve certification cannot literally afford to take one year away from practice to attend a program. Also, the financial burden is compounded by there being only a limited number of such programs and the need for physicians to uproot their families or become "geographical bachelors" for a year. For most, these sacrifices are too difficult.

The above comments demonstrate the need for a formal residency that can be accomplished on a "part-time" external basis. There is a model for just this at the University of Pennsylvania in Occupational and Environmental Medicine. This ACGME-accredited formal residency has been in existence for over a decade. Its historical origins are at the Thomas Jefferson University Hospital in 1997 with the move to its current location at the University of Pennsylvania Medical Center and School of Medicine in 1999. It follows the competency-based paradigm. Features of this residency training program include three full days of didactics on-campus over a contiguous Thursday, Friday, and Saturday each month. The residency education and training is supervised by a full-time faculty preceptor, one or more faculty supervisors for each competency module, and an on-site supervisor where the resident physician is employed. The first-time pass rate for the certification exam in Occupational and Environmental Medicine by the American Board of Preventive Medicine has been consistently above the national pass-rate and for the period of 1997-2001, it was 89-percent. A unique feature of this formal residency is that each resident pays a tuition of $29,000 per year (for 2009-2010), plus an additional $2,000 if they are located more than 200 miles from Philadelphia to help defray the costs of travel of the home campus supervising faculty.

The need for such a program exists. The experience of this Academy, the Departments of OMM at the Osteopathic Medical Colleges, and the faculty at both, certainly allow for this paradigm to be adopted within the specialty of NMM/OMM. An initial home at one of the schools could be found and the curriculum could be specified for the formal on-campus didactic sessions. The competency-based learning components could be delineated and specified. The only final determination of the competency of the physician would remain the passing of all components of the board certification examination of the American Osteopathic Board of Neuromusculoskeletal Medicine (AOBNMM).

References

1. Emmett EA and Green-McKensie J. External Practicum-Year Residency Training in Occupational and Environmental Medicine: The University of Pennsylvania Medical Center Program. Journal of Occupational and Environmental Medicine. 2001. 43(5)501-511
2. Supervised Practicum-Year Residency in Occupational Medicine, University of Pennsylvania Health System, External Track 2009-2010. http://www.med.upenn.edu/oem/residency.shtml accessed 11/18/2009

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

Exercise Prescription - Greenman's Method -

January 22-24, 2010 at AZCOM

Dr. Greenman's LAST Exercise Prescription course with the Academy. DON'T miss this opportunity to learn from one of the Masters! Register TODAY.

Course Description: Level II

How to access muscle balance of the musculoskeletal system, particularly in reference to somatic dysfunction. The primary goal is to prescribe an exercise program and self-mobilization techniques to fit the patient's somatic dysfunction in order for the patient to manage themselves.

Presenting:

Brad S. Sandler, DO, Program Chairperson

Philip E. Greenman, DO, FAAO

Learning Objectives

1. To understand the functional anatomical connections of upper and lower quarter musculature to the proximal trunk and pelvis.

2. To introduce the concept of neuromuscular imbalance as a contribution to chronic musculoskeletal dysfunction.

3. To learn exercises to address specific somatic dysfunctions found in the vertebral column and pelvis.

4. To be able to design and sequence a home exercise program for patients to complement manual medicine.

5. To be able to instruct the patient in an exercise program based upon his/her functional goals and life-style.

Prerequisites

Functional Anatomy; (1) Level I course or equivalent

CME:

The program anticipates being approved for 20 hours of AOA Category 1-A CME credit pending approval by the AOA CCME.

Program Time Table:

Friday, January 22 ..... 8:00 am - 5:30 pm
Saturday, January 23 ..... 8:00 am - 5:30 pm
Sunday, January 24 ..... 8:00 am - 1:30 pm

Friday & Saturday include (2) 15 minute breaks and a (1) hour lunch; Sunday includes a 30 minute break.

Course Location:

Midwestern University
Arizona College of Osteopathic Medicine
19555 North 59th Ave
Glendale, AZ, 85308
www.midwestern.edu

Register online at www.academyofosteopathy.org.

Registration Form
Exercise Prescription - Greenman's Method -
January 22-24, 2010

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Nickname for Badge: _____

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City: _____ State: _____ Zip: _____

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Lunch on your own

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Intern/Resident/Student	$580	$680
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Physician	$780	$880
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AAO accepts Check, Visa, Mastercard, or Discover

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Date of Expiration _____ CW2#_____

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

Signature _____

Dig On:
Dr. A. T. Still's Treating Chair
Jamie Archer

A while ago a patient who works as a joiner and welder asked me if it would be possible for me to design a chair that would traction the spine when sitting comfortably at home and he would make it. I replied that it was not a chair that needed inventing but encouragement to stop people spending long hours sitting, often in very poor positions. A chair would only encourage people to sit longer, treating the symptom and not the cause. There are many devices out there that will traction the spine; some effective and some that belong back in the medieval age. I told him that the point is not to instill bad habits but advise patients on how to improve their health.

This conversation, however, did get me thinking about a chair that I had seen a picture of many times. Being fortunate to own several original volumes of the *Journal of Osteopathy* from 1900-1904; I had regularly seen the advertisement for 'Dr. Still's Treating Chair' (Figure 1). I came across papers relating to the chair on a recent visit to Kirksville. Intrigued by this invention, I did a little research to find out more; how it worked and why none seem to exist today.

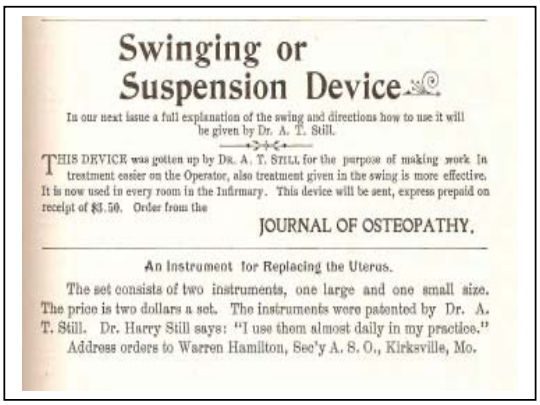
Dr. Still was constantly instructing his students and graduates to be specific in their treatments. Even in the early days there were those who practiced the so-called 'general treatment.' These treatments were known as the shot-gun approach, that is, manipulate everything and you can be sure that you may have corrected something. These kinds of operators were referred to by Still as 'engine wipers.' In the *Journal of Osteopathy*, Fred W. Gage (1901) states that many operators in the field would consult Dr. Still for treatment who were:

> *"all complaining from injuries by stooping and lifting while treating."* (Gage, 1901, p.68)

There was a danger that in order to make things easier for themselves operators would be tempted by adjuncts or resort to less specific approaches in their treatments (a factor that still exists today). A.T. Still, of course, knew how labor intensive and difficult

Figure 1: Dr. A.T. Still's Treating Chair. (Advertisements 1902) *Reproduced with kind permission of the Still National Osteopathic Museum*

osteopathic treatment could be; remembering the early days when he would treat his patient in all manner of places and positions such as on a goods box, against a tree or door casing, on the ground or the floor depending on what was most convenient or best suited the needs of the case. He began to think of ways to make practice less intense on the operator, but no less specific. We know he was, amongst other things, an inventor and had already produced a uterine spoon, a treatment table used by many operators, as well as an osteopathic swing (Figure 2). However, these did not meet all the requirements and it was later admitted that the operator had not been given adequate consideration when designing or constructing the table or swing. With this in mind, A.T. Still began to plan a device that would both save labor as well as get results.


Swinging or
Suspension Device.

In our next issue a full explanation of the swing and directions how to use it will be given by Dr. A. T. Still.

THIS DEVICE was gotten up by DR. A. T. STILL for the purpose of making work in treatment easier on the Operator, also treatment given in the swing is more effective. It is now used in every room in the Infirmary. This device will be sent, express prepaid on receipt of $3.50. Order from the

JOURNAL OF OSTEOPATHY.

An Instrument for Replacing the Uterus.

The set consists of two instruments, one large and one small size. The price is two dollars a set. The instruments were patented by Dr. A. T. Still. Dr. Harry Still says: "I use them almost daily in my practice."

Address orders to Warren Hamilton, Sec'y A. S. O., Kirksville, Mo.

Figure 2: Dr. Still's inventions (Professonal cards, 1900) *Reproduced with kind permission of the Still National Osteopathic Museum*

The Old Doctor considered that lesions of the spine and ribs were best detected when the patient was in a sitting position and, therefore, best treated in many cases with the patient sitting. After days and nights spent in thought and study, his plans took the form of a treating chair. Drawings in Dr. Still's notebooks, thought to be early representations of the chair, are held at the Still National Osteopathic Museum in Kirksville, MO. The chair made its appearance in July, 1900. Gage (1901) gives the following description:

> *"This chair is made from a stool about thirty inches high, the top of which is eighteen or twenty inches in diameter with an iron back made on angles to fit the spine. Upon this back plays a slide which extends out each side to about the angles of the ribs, by adjusting the slides some seventeen or more specific points are made between the first dorsal and the fifth lumbar, thereby allowing the operator to move any vertebra or rib in this region. On the chair muscles may be easily relaxed and ribs and vertebra set without so much preliminary work as heretofore. All who have seen the chair think it fills a long felt osteopathic want and that it will do all that is claimed for"* (Gage, (1901), pp.68-69).

A one-page article in the *Journal of Osteopathy* (September, 1901) goes on to say that the chair:

"places the patient at a convenient height so that stooping over is avoided. The raised part on the top of the stool prevents the patient from sliding forward or to either side, the tuberischii fitting on each side of the elevation thus the patient's own weight holds him solidly on the chair. The two pads on the back are about an inch and one half apart and fit snugly on each side of the spine. The pads are constructed on a cross bar that slides up and down on the back part of the chair, thus the sliding portion can be placed over any part of the spine. The back part of the chair is made so as to accommodate the normal curve of the spine." (*Dr. A.T. Still's Treating Chair* (Anon., 1901, p.303).

The article goes on to say that the movements for certain lesions will not be given in the text as the operator, after some practice, will be able to devise their own. It states that the chair is now being used by quite a large number of practitioners and all have reported that they are very pleased with it.

Born in 1874, Dr. Guy Dudley Hulett was a famous early osteopathic pioneer. He held the post of 'Assistant in Theory and Practice of Osteopathy' at Kirksville in the early 1900s. Coming from a family of osteopaths, he began his osteopathic studies in the fall of 1898. He is reported as having a special advantage of an 'intimate association with the Old Doctor throughout his entire course' (*Faculty of American School of Osteopathy* (Anon., 1900, p.126). Dr. Hulett wrote an excellent text, *The Principles of Osteopathy,* first published in 1903, and running into several editions. In the third edition (1905), there were several references to Dr. Still's chair. Dr. Hulett gives a description of the chair similar to the one above as well as describing certain techniques:

"with the adjustable piece at the point of lesion and the physician in front or behind, the shoulders are grasped and by a figure of eight movement the body is rotated, the only moveable part of the body being that above the fulcrum, the remainder being held by the pressure against the latter and downward upon the stool. In this treatment the spine above the fulcrum represent the lever arm, the 'breaking' occurring more or less entirely at the fulcrum. By sliding the moveable part up or down, each of the involved vertebrae may be acted upon" (Hulett, 1905, p 281).

The 'breaking up' treatment is not to be confused as being a high velocity thrust technique but more rotational and articulatory in character designed to try and overcome rigidity by stretching the thickened ligamentous and connective tissues, thus encouraging them to yield. Hulett (1905) agrees with Dr. Still that little importance is to be attached to the sounds made during treatment as they can be produced easily in most individuals. A much used technique at the time was the knee fulcrum, where the patient was usually sitting; the operator in most cases behind the patient with their knee on the lesioned area acting as a fulcrum. Then by the movement of the shoulders, the patient is rotated and articulated around this fixed point. This is a valuable and underrated technique that requires great skill, but poorly performed can result in distress and damage. This may have been the case in the early days as Hulett (1905) states in regard to Dr. Still's chair:

"owning to the interference presented by the arms of the standard supporting the moveable fulcrum, there is little possibility of drawing the patient too far posteriorly and hence doing harm" (Hulett 1905, p.281)

In discussing rib lesions, Hulett (1905) again mentions Dr. Still's chair:

"with its sliding fulcrum, additional advantages are gained. The patient sits, the fulcrum rests against the angles on each side of the spine and a fixed point is therefore gained. Then with appropriate movement of the arms or body standing in front or behind, the ribs are quite satisfactory under control. Standing in front the thumbs may be inserted so as to grasp the pectoral muscles on either side. Then by lifting and rotating, the ribs may be quite easily adjusted" (Hulett, 1905, p.305).

Further reference to Dr. Still's chair is made by Ashmore (1915) in her book when discussing techniques in the treatment of rib lesions. The technique is referred to as the A.T.S. Chair Movement.

When considering pelvic lesions A.T. Still according to Hulett (1905) argues with reason that in most cases the treatment of sacral and inominate lesions may be simplified into one or two methods designed to make use of the fact that many times the sacrum has been driven downward between the iliac structures. Hulett gives Still's analogy of freeing a wedge that has been driven into a log, being easier to withdraw it by a side to side movement rather than just a straight traction force. This treatment can be performed on Dr. Still's chair. Thus with the inominate bone(s) fixed, the body can be lifted and moved from side to side with some rotation, gently withdrawing the wedged shaped sacrum and releasing it from its strained condition.

As you may imagine, I was excited to see this chair that the Old Doctor had invented, having only read about it and seen it in pictures. Although at one time one of these chairs was to be found in all treatment rooms at the A.T. Still Infirmary, I was to discover not one exists today.

Figure 3

Faced with this disappointment, the decision was made that there was only one thing for it and that was to make one. So, with just old black and white pictures, the above descriptions and my own osteopathic technical knowledge, my friend and I after several attempts managed to recreate and bring back to life Dr. A. T. Still's treating chair. (Figure 3).

But why are these chairs not in use today or at least exist? Well, the answer, firstly, may lie in the design. The legs of the original stool were made from wood as can be seen in the original photographs. The first observation my joiner friend made when seeing the picture was that many would have just fallen to pieces after continued use especially as the chair was reported to be particularly useful for heavy patients. This along with repeated strong leverages may have slowly weakened the chair eventually leading to structural failure. Secondly, and perhaps more likely, was that rather than the invention leading to more specific work as Dr. Still had hoped, it, in fact, led to operators no longer thinking about the treatment, thus making it less specific. Although Dr. Still made it clear from the start that the chair was not to be used in place of accurate examination, diagnosis and manual work, but

merely as an aid to treatment, it may have been that this chair, under some operators, removed all the above and they proceeded to give the unfavourable routine general treatment, but on the chair. Indeed, Dr. Still may have already been having his doubts from the beginning as George W Riley (Hildreth,1938) explains in a personnel tribute to Dr. Still:

> *"One day I met Dr. Still just inside the front entrance of the college building and he said, 'New York,' that was always his term of greeting me, 'come with me'. He led the way to a room I think on the garret floor, and there he showed me a treatment chair he was building. He explained that he was trying to build a chair that possibly might be helpful in the correction of vertebral and rib lesions. He asked my opinion of it and I told him it did not appeal to me as a very effective device. The Old Doctor agreed and then added, 'Riley, there is nothing that can beat the hands for correcting lesions'. Such an observation, such an estimate as that, from such an authority, should cause every osteopathic physician to give it some very careful thought. No matter how perfect nor how marvellous a piece of mechanism you may have, it is never the less a mechanical device and as such can never take the place of that matchless combination of brain and skilled hands, hands that know well both the normal and the abnormal, that sense the resistance of lesions and enable the brain to control the amount of force to be applied, the exact direction, and the exact moment for its application in the correction of lesions. As he expressed it in his Autobiography, 'An intelligent head will soon learn that a soft hand and a gentle move is the hand and head that get the desired result'"* (Hildreth, 1938, p.420).

Even today, new devices (contraptions, equipment and adjuncts) are coming onto the market which only serve to remove the fundamental principle of osteopathy from treatment; the adjustment of the body by the use of the osteopath's hands. Dr. Still may have realized that his device was, in fact, more of a hindrance than help and was removing the delicate palpatory and manual work needed in osteopathic treatment with operators using it as a convenient short cut. As a result, this may have caused him to discontinue the production of his invention. With this and the high possibility of the chairs falling to pieces they just disappeared. What ever the reason, this device shows us that Dr. Still, our discoverer, was constantly striving, thinking, reasoning and testing, never being satisfied. The subject that he gave us was Osteopathy enough to fill a lifetime of learning. The chair now stands proudly in my office as a piece of osteopathic history and as a testament to his skill. It is used in certain cases but only as the Old Doctor advised, as an aid to my treatment.

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Address correspondence to:
Jamie Archer, B(Ost)
Alma Osteopathic Practice
10 Holmgate Road
Clay Cross
Chesterfield
Derbyshire
S45 9PH
01246 866947
E-Mail: jamie.archer@btconnect.com

Figure 4: Rib raising. Chair fulcrum providing a fixed point.

Figure 5: Rib raising using arm leverage.

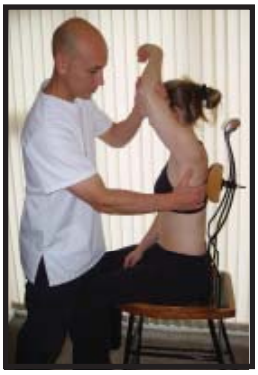

Figure 6: Rib adjustment.

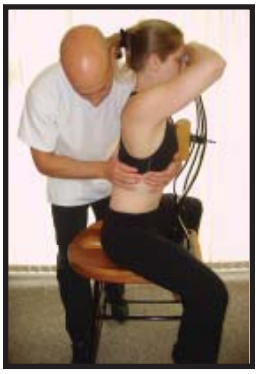

Figure 7: Rib adjustment.

Figure 8: Clavicle adjustment.

Figure 9: A.T. Still shoulder treatment

Figure 10: Figure of eight 'Breaking up' treatment

Figure 11: Dorsal adjustment

Osteopathy – The Journey That Doesn't End

The 2009 Thomas L. Northup Memorial Lecture

Kenneth H. Johnson

Early in my career, I discovered that osteopathy wasn't a profession, it was a journey. This is a unique journey in that it never ends. There is no time in your professional life as an osteopathic physician that you will say "I finally got there". Osteopathy is about discovering universal truths, understanding them and using these truths in the care of our patients. Norm Gevitz characterizes osteopathic medicine as "both a profession and a social movement."[1] We will explore the individual osteopathic physician's journey as a developing professional and the profession's responsibility to help along the way in this professional and social movement.

The journey of the osteopath has many milestones along the way. "A milestone (from the Latin milliarium) is one of a series of numbered markers placed along a road or boundary at intervals of one mile or occasionally, parts of a mile. Milestones are constructed to provide reference points along the road. This can be used to reassure travelers that the proper path is being followed."

What are the milestones or markers that reassure us that we are on the right path and when do we become osteopaths? Is it when we enter medical school, when we first start learning in our OPP classes, when we start rotations, when we graduate, pass our boards or finish residency? These are all tangible markers or milestones in our development as professionals. Maybe it is a gradual evolution or journey that starts when we decide to go down this path. It may be a gradual acquisition of knowledge, skills and attitudes with each area slowly evolving over time as we move from novice to competent and hopefully to a master. Each of these things – knowledge, skill and attitude also seems to evolve gradually and at different paces, but needs the combination of desire of the traveler and the support and nurturing of the profession to develop adequately.

I wanted to share some of the other things that I have learned on my journey so far, some of the memorable milestones that have kept me moving along my path. I remember the first time that I saw the sphenoid bone. It was at a workshop with Jim Jealous, DO, and a number of other very talented osteopathic physicians within the first 3 weeks of starting school. They came and volunteered their time one Saturday every month to teach osteopathy in the cranial field to the students at UNE. I remember thinking that this thing looked like some Sci-Fi space ship like something out of Star Trek.

As a student it is all so overwhelming – anatomy, physiology, OPP, etc. What did I learn in those early days? I think that we all have probably had a few of those very powerful moments on our journeys, moments where there is a distinct change, a time when we see things in a very different light. It is almost like we can now see the path more clearly than ever before. I had spent lots of time treating patients and doing things to them – soft tissue, muscle energy, HVLA etc. I spent a lot of time observing how I was doing and reviewing to see if could I do anything better or different. I loved treating people, especially with cranial – you got quiet, and they got quiet. Sometimes I would just get lost in the Tide or on the Tide. It was very peaceful. Sometimes I was helping people, sometimes I was not. However, it was a good space to observe from. Things would happen during these treatments. I got more and more interested in what was going on. I started to observe more and more. One day I had the "ah ha" that what I really was, was an enzyme. I was an osteopathic enzyme. "Enzymes are biological catalysts, or chemicals that speed up the rate of reaction between substances without themselves being consumed in the reaction." I participated in the state of change. I helped someone go from state A (hurt) to state B (better). I also observed that I wasn't doing anything. It was the innate powers from within the body that were doing the work. Imagine the change that was for me. I went from doing to helping or assisting. From trying to help to letting go and letting the body do what it does best. Because I was an enzyme I also found that I did not get used up in the process. I no longer had to try, I just did. As soon as you are "trying" to help you are no longer helping. The process of "trying" implies that you are not actually doing the thing that you wish to do. I found that I just needed to simply help. It is like being on the beach and "trying" to hear the waves crashing up on the shore versus just hearing it. I understood better that I was just using one of the fundamental truths of nature – the body is always trying to heal.

One of my first realizations of this truth that the development of the osteopathic physician was actually a journey was when I started spending time with Anne Wales, DO. She was one of Dr. Sutherland's students. She was such a great person. I felt so lucky to have had as much time with her as I did. I distinctly remember a meeting of the New England Still Sutherland study group where she was teaching about CV4s, when she stated to the participants - "When you get a little experience in treating patients you will come to understand this better." At that point she had been treating patients for over 50 years. I remember looking around the room at the people that had been in practice for 10, 15 and 20 years and thought "Man if they need to get a little more experience then I need to get a lot!" I spoke with her about this idea of the journey of development as an osteopathic physician. She told me that she was still learning so much as an osteopathic physician (even as she was in her late 80s). She once sent a note to me about an article that I had written on heel lift therapy and thanked me for helping her to understand something better. I almost had to laugh at that one. Ha, me teaching her something!

I have been very fortunate on my journey as an osteopathic physician. I had great people as mentors and role models – Anne Wales, Jim Jealous, Boyd Buser, John Harakel, and so many more. I was also able to seek out experiences that allowed me to continue my development. However at many times it was not so easy, but I loved what I was learning and felt so fortunate to be given the opportunity to do so. Each of you had a similar process of seeking opportunities that allowed you to develop such a high level of skill and integrated thought. You were able to create your path and many of you had to create that path. With the explosive growth of

our profession, how is the profession going to create the right path for our students and residents? What are the milestones that we are going to create to help our young to stay on their path?

So to answer that question let's look at the recent journey of our profession and some of its milestones. As of this August our profession passed a major milestone. This entering class of 1st year students now represents 20-percent of all medical students in the US.[2] (Figure 1 and 2) Think about that, 1 in 5 students in the US are now in osteopathic medical schools. I graduated medical school in 1992. At that time there were 15 colleges of osteopathic medicine and we made up 10-percent of the medical students in the US. Both the number of students and colleges has doubled in the last 15 years. It is estimated that by 2019, upwards of 25-percent of all US Medical school graduates produced annually will be graduates of osteopathic colleges.[3] We are the fastest growing health profession in the world and probably the universe!

As we look at our profession and the training of our students we need to make sure that they are on the right path and that they have the opportunity to pass milestones so they are "reassured that they are on the right path." We need to give them the opportunity to have their own "Ah Ha" moments. Thomas L. Northrup knew this when he stated "The art of palpation is one that must be developed. The ability to evaluate the "feel" of the tissues can be developed only by practice and conscientious application to an extraordinary degree."[4]

I am a very optimistic person. I see great things as we look down the road. However, I also see some very important problems on our path. One is that we are very disintegrated in our clinical training. Most students train in allopathic hospitals from third year of medical school through the end of residency. Let's review that. A typical student spends two years or about 4,160 hours training on our academic campuses. In turn they spend five years from third year medical student through residency or 20,800 hours training in allopathic hospitals. (Figure 3) Many are training in tertiary academic medical centers. What kind of milestones are they passing and where are they going on their journey? May be not the right place.

Evidence suggests that osteopathic physicians that practice in AHCs offer less distinctively osteopathic care to their patients. They spend less time with their patients than allopathic physicians,

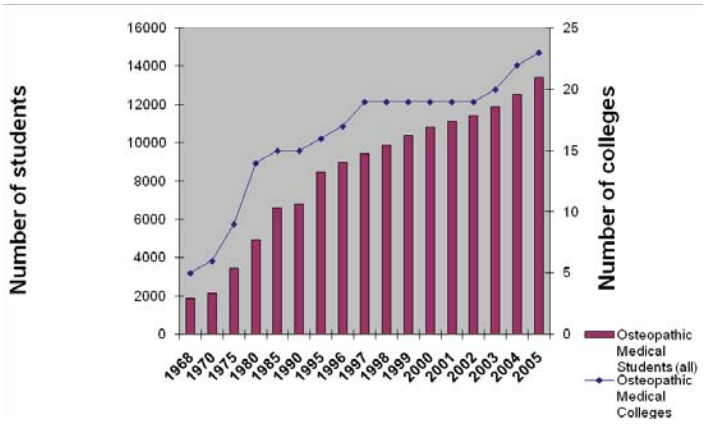

Figure 1 Growth of osteopathic medical students and colleges of osteopathic[1]

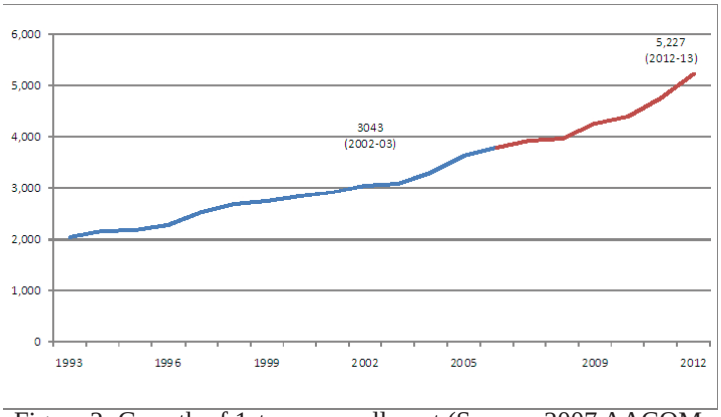

Figure 2: Growth of 1st year enrollment (Source: 2007 AACOM Enrollment Survey: Preliminary Findings)

order more drugs and do not provide as much counseling. However, osteopathic physicians that practice in non-AHCs are essentially the opposite including using OMT to a greater degree on their patients. Osteopathic training has traditionally been in smaller non-academic hospitals.[5] This model of education was once criticized but is now actually applauded by many as answering the health care needs of our country and providing a successful model that produces primary care physicians.[6]

So let's take a closer look at the path (our curriculum) and in particular the concentrated experiences in OPP/OMM during training. The typical osteopathic medical school has 150 hours of OPP. Many have a required OPP rotation in third or fourth year. Let's see what it would look like if a resident did an elective in each of their 3 years of residency. As you can see this does not add up to much in the big scheme of things. (Figure 3)

So what is the answer? Let's change an accreditation standard to say that all medical students must do a required OMM rotation in third or fourth year. Let's make the standard very stringent and of the highest quality possible. Therefore it must be done with a NMM certified physician. According to AAO statistics, there are approximately 750 NMM certified physicians in the US. According to AACOM, there will soon be over 5000 third year and 5000 fourth year students on rotations. So that would mean that each and every one that is boarded certified would have to take six students every month with no breaks. If we increased the standard to have a student do a required OMM rotation in both third and fourth year with an NMM certified physician, that would mean that each would have to have 12 students with them each month without a break. So obviously we should just increase the

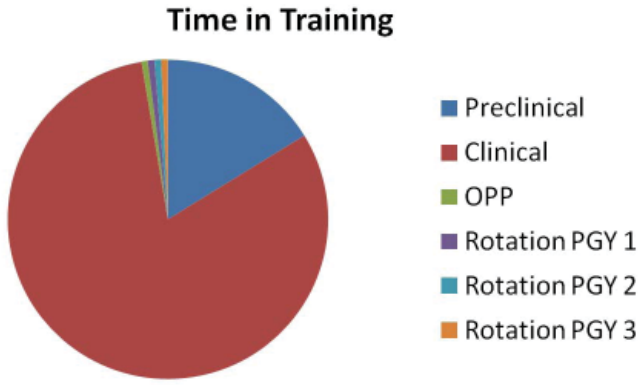

Figure 3: Osteopathic Training

number of NMM certified physicians. Currently, the number of people graduating from NMM and NMM-Plus-One programs is so small that it can in no way meet the gap.

How can we help our young on their journeys? The only way that we are going to be able to foster the growth of our own is to develop models of training that are doable in these environments. We need to be very clear what the milestones are that they must pass to get them to the right destination. We also need to have a crystal clear picture of the knowledge, skills and attitude that we want them to have when they finish training. Currently we are getting what we are creating. Would you expect to have a world class championship basketball team without letting them practice basketball? Function follows structure as we know. So why are we surprised at what we are getting now?

Some call for the increasing strictness of standards as the answer. I have sat on both the Commission of Osteopathic College Accreditation (osteopathic medical school accreditation) and the Bureau of Osteopathic Education (post graduate and CME standards). While this may be part of the answer, I believe it is only a part. We need to take bold steps to change how we think about education and how we actually educate our students and residents. We have to develop models of training and education that can be accomplished in this environment. There is a principle called the "Stockdale principle."[7] It states that to continue moving ahead on your journey you have to both face the cold hard reality of where you are at, while at the same time looking forward on the path that you want to be on. Therefore, we need to face the cold hard reality of where we are at and come up with plans that span multiple decades to help us get to the place that we all want to be. There is both good and bad here. I have already mentioned that our students now represent 20-percent of the medical students in the US. It is likely that that will continue to grow to 25-percent in the near future. That is a very significant number. However, let's tie that back to where students and residents are doing their clinical training. Most of the training is in allopathic institutions. So how do our young continue on their journey? What are the milestones that we must create to help assure that our students are on the right path? I believe that the answers are multi-layered.

On the individual level, we need to instill in our students a sense of independence with the ability to think critically and act independently. In helping my students on their path I challenge them to examine at least one patient from an osteopathic perspective per day as part of their normal routine while on rotations. This is difficult for some and probably many don't do it. They don't get feedback, mentoring and guidance. There is a principle in education that states "they don't value what you expect, but what you inspect." If we are not closely looking at what they are doing in an integrated fashion, then why would we expect to get anything else?

We need to increase the training that is occurring in third and fourth year as well as residency. This can be done through distance education, regional educational events, combined meetings with OPTIs in the region, etc. We can use modern forms of assessment such as portfolios for our students where they are responsible for amassing the documentation showing that they are accumulating the necessary experiences.

We need to think of a curriculum structure for clinical education that recognizes this Stockdale principle. The journey for our students is a rocky one at times, dis-integrated at others and many times they get lost going down the wrong path simply because we didn't have good milestones for them to follow "to reassure them that they were on the right path."

Most of our students have the desire to be fully integrated and activated osteopathic physicians. Those of you that are sitting here have been able to continue that journey. You did not let anything stop you from getting there and I don't think that there is a force in the universe that could have stopped you! Many of our students are not so lucky. We need to find the best way to bring the most students along and not let them get diverted when their destination and desire is to be a fully activated and integrated osteopathic physician.

On a more global level, we need to rethink some of our organizational structure. One possible solution could be that you could require that an NMM physician be part of every OPTI/Clinical campus site for students and residents. If I were to apply that rule to the University of New England we would need 8 NMM physicians. They would be responsible for the osteopathic clinical education at that site and helping to ensure that the milestones are clear. If we were to generalize nationally, we would likely need approximately 230 NMM physicians. This is still a tall order, but achievable. Alternatively we could have a smaller number of NMM physicians, but they would be part of a clinical curriculum team that is addressing the needs of the students and residents at all of the clinical sites. In some ways this may be better as members of each specialty and the NMM physician can work together as a team to help the learners integrate their thought as a developing osteopathic physician and create the deep and meaningful learning experiences necessary to foster growth.

Sixty percent of our graduates are entering ACGME residency training programs. The profession is actively working on this issue and looking at the three main reasons that students choose the ACGME path – geography, quality and specialty type. These are well within our ability to address and change. That being said, it is likely that we will have an increasing number of our students entering ACGME programs for the foreseeable future. There is not all bad news here. Many allopathic institutions have a strong interest in osteopathic training. If we were very successful at recruiting students into AOA approved programs over the next 20 years and decreased the percentage by half (to 30-percent), we would still have about 2000 graduates in ACGME programs.

Therefore, I think that we should expand the ability of students or ACGME programs to participate in OPTIs. I would create a category that would allow institutions to send residents to OPTI programs even if they are not full members. There could be individual membership in our OPTIs for our residents to be able to access both live and remote asynchronous training. This could be more closely tied to their being able to sit for an AOA board.

I have a residency program whose hospital system is strongly affiliated with an allopathic medical school. They have tried for years to get permission to apply for AOA approval but have been denied. They have a consistent number of our grads, many have been chief residents and gone on to be faculty. They have an OMM

clinic for their trainees, but politics has gotten in the way. There are many other examples of barriers to being in the osteopathic house of medicine. We need to examine these closely and take a cold hard look at where we are at and discover how we are going to keep our profession headed in the right direction on its journey.

I am encouraged by some of what I am seeing. We have had two osteopathic medical education summits that have tried to tackle these issues. There are many good people working long and hard to clear the path for us on our journeys as individuals and as a profession. I am encouraged by the type of leadership that we have at the AOA with John Crosby as Executive Director, Larry Wickless, DO as President and Karen Nichols, DO as President Elect. Dr. Wickless has been tackling the issue of osteopathy on the international stage and Dr. Nichols has been chairing the summit groups. I am very encouraged by the AAO leadership and them having the bravery to do the right thing. It takes real guts to be a leader at this point on our journey as a profession and the AAO has it!

I want to tell you a story. It is 20 years from now. One of you is admitted to the hospital with community acquired pneumonia. A 1st year resident enters the room and introduces himself. He expertly examines you including an integrated focused osteopathic exam. He explains that he is a DO resident and asks if it is OK to treat you. You are amazed because you happen to know that this hospital only has ACGME residencies. You enthusiastically give permission and receive a thorough treatment that makes you feel relaxed and able to breathe more easily. You ask how he got so good at this. He tells you that he had completed his required OMM rotations in both 3rd and 4th year of medical school. He was required to do a longitudinal distance learning experience in OMM where he had to reflect each week on how to integrate osteopathic thought into the care of the patient regardless of the rotation. He goes on to tell you that despite training at this allopathic hospital he has been participating in the ACGME pathway for individual membership in OPTI. His program is tightly aligned with an allopathic medical school and it hasn't been allowed to seek AOA approval. His wife's family is from around here and with small children they felt they needed to be near them. You are amazed to hear that his MD faculty has just completed the 1 year fellowship in osteopathic faculty development from the Center for Osteopathic Medical Education. They have a great degree of support for osteopathic training and anticipate holding a continuing medical education program there next month in OMM. The resident gets paged and excuses himself. You close your eyes and fall asleep thinking our profession sure is on the right path.

In closing I want to thank the AAO and all of you for your support, friendship, mentoring and path clearing for me on my journey. I am deeply dedicated to continuing to help our profession on its journey and would ask each of you here today and those of you reading this to do whatever you can to continue to look down the road at your journey, to get help moving along if you need it, and finally to help clear the path for someone else (student, resident, colleague) and for our profession by being active and involved in any way that you can. We all have our own special talents. Stop for a minute on your journey, reflect on these talents and try to see how they can best be used to move yourself along on this journey and the profession in its evolution. I wish you peace on your journey. Thank you and God Bless!

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Address correspondance to:
Kenneth H. Johnson, DO, FAAO
Associate Dean for Clinical Affairs, UNECOM
11 Hills Beach Rd.Biddeford, Me 04005

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There Are More Things in Heaven and Earth…

Leslie Mae-Geen Ching

Abstract

The current lack of strong osteopathic educational standards in osteopathic medical schools is contributing to the general decline of identity within the osteopathic profession. The challenge is raising educational standards in osteopathic medical schools without relying on the allopathic model of a medical education. Schools need to incorporate osteopathic principles into the basic science classes and show how these principles can be applied in all specialties. Additionally, there should be caution in the expansion of student numbers. To address the decline of identity in the general profession, the entire osteopathic profession needs to agree on a basic working definition of osteopathic medicine and adhere to it. If these can be accomplished, the profession will begin to be able to clearly delineate in thought and practice how osteopathic medicine is distinct from allopathic medicine. However, if we cannot do this, we risk losing the separate osteopathic medical profession.

There are more things in Heaven and Earth, Horatio, than is dreamt of in your philosophy.

-Hamlet

Introduction: Structure and function

Structure and function are interrelated: it is a tenet of osteopathic medicine and one of the very first things we learn in medical school. We learn that if the structure of the body is not optimal, the functioning of the body will be adversely affected.

Osteopathic education today has many structural problems that are affecting its function. The number of osteopathic medical schools are multiplying rapidly, but most are privately funded,[1] highly dependent on student tuition money to operate, and have a much higher student to faculty ratio than the publicly funded osteopathic schools.[2] There are not enough osteopathic manipulative practitioners who are willing and/or able to teach at these multiplying schools, and these physicians are usually sequestered into their own department.

These structural problems are causing a major functional problem: a gap in students' understanding of how osteopathic philosophy relates to the practice of clinical medicine. Students are exposed to manipulative techniques but not the usage of them within the context of osteopathic philosophy. As a result, the percentage of graduates who use osteopathic manipulative medicine (OMM) declines every year.[3] In addition, the osteopathic profession itself is facing, much as we always have, the lack of recognition without and within our ranks of our distinctiveness.[i] This disassociation of osteopathic physicians from the practice of osteopathy is one of the biggest challenges facing the schools and the profession as a whole.

More dangerously, as many people throughout the years have observed, we cannot justify our profession if it is indistinguishable from allopathic medicine.[ii] Yet we teach all subjects, including osteopathic medicine, allopathically: that is, with a reductionist approach. All classes are taught by their own separate departments, with little or no overlap. When we are in anatomy lab, we only learn anatomy. When we are in OMM class, we learn manipulative medicine techniques, derisively known to previous generations as "manips".[4] Some of us become quite proficient in "the Kirksville Krunch" or "FPR," but we don't learn how to treat or evaluate a patient osteopathically. In short, we cannot see the forest for the trees. Therefore, our challenge is to elevate standards in osteopathic education without relying on the allopathic paradigm.

Hamlet and Horatio

Osteopathy and allopathy are two entirely different approaches to health care: osteopathy assesses the pathogen within the context of the patient's life and allopathy sees the patient's life and the pathogen as two separate entities. To an osteopathic physician, a patient will become more susceptible to pneumonia if there is a mechanical restriction to breathing, such as a rib restriction. Therefore, removing the rib restriction potentiates the effectiveness of an antibiotic regimen. Allopathic physicians would treat the entity causing pneumonia solely through antibiotics. Norman Gevitz, PhD, contrasted the two nicely when he explained osteopathy as a "social movement," while allopathy "has pointedly rejected the adoption of any philosophical belief system governing health and disease, equating philosophy with dogma and arguing that its professional approach to medicine is dependent solely upon scientific evidence."[2] Osteopathy can be seen as a health care approach that values the intangibles of human interaction while incorporating the scientific approach, while allopathic medicine strives to be purely scientific in its approach to medicine.

Attempting to describe osteopathy within the allopathic paradigm is impossible: it is as impossible as Hamlet trying to explain to his rationalist friend Horatio that he saw his father's ghost. Yet trying to describe and integrate one philosophy within a diametrically opposed paradigm is what we do in our schools every day.

Osteopathic Philosophy

What is osteopathic philosophy? Part of the problem is that there is no definitive answer to this question.[iii] Like any philosophy, of course, there is a great deal of individual interpretation that takes place. However, there should be a strong base image of osteopathic medicine on which most can reach a consensus opinion and project to those outside the profession. Although there are many specialties in medicine, everyone agrees with the basic definition that all specialties relate to treating illness. In contrast, the term "osteopathic physician" is currently so amorphous that it means everything and nothing.

In cognitive psychology, schemata are models of behavior in situations. They are important in order to know what to expect in a given situation. For example, eating in a restaurant: one knows that one may or may not have to wait to be seated, but there will always be a menu of some sort. One orders the meal one prefers, eats the food, gets the check, and then pays for the meal. There is always some variation in how the steps are actually done: menus

vary in presentation and food delivery varies in time and quality. However, you know the steps will occur and usually in the same order. This creates a sense of comprehension and definition to what would otherwise be a series of random events.

The schema of going to see an osteopathic physician can be fragmented. Depending on the practitioner, the visit could be similar to an appointment with an allopathic physician, or there may be some manipulation, or the patient may only vaguely sense that the osteopathic physician is more empathetic and may not strictly follow "the usual" line of questioning. Thus, because osteopathic physicians have widely varying interpretations of their profession's philosophy, patients of osteopathic physicians and the public at large do not have a clear sense of what the term "osteopathic physician" actually means. It is similar to confusion about what kind of food one would expect at a bistro, which can mean, for instance, French or Asian fare.

Previous generations emphasized the fact that osteopathic philosophy is rooted in anatomy and physiology. Andrew T. Still, DO, MD, likened the osteopathic physician to a "skilled mechanic"[5] who uses his or her knowledge of anatomy and physiology to restore balance to the whole system. Harrison H. Fryette, DO, commented, "If a thing is physiologic it is osteopathic. If it is not physiological it is not osteopathic. Osteopaths are not restricted to manipulation but they are restricted to physiological principles."[6] This original interpretation of osteopathy has gotten lost somewhere in the retelling.

Currently, most of the overt teaching on osteopathic manipulation is done by teaching techniques as an endpoint of treatment. Using techniques as an endpoint, rather than as a means to an end, is antithetical to osteopathic principles. Dr. Still never wrote a technique manual, although he wrote volumes on osteopathy itself. Instead, he taught his students how to think. One of his students, Asa Willard, DO, declared, "Dr. Still's greatest concern was to make us think osteopathically. Reason osteopathically."[7] Several decades later, Edward G. Stiles, DO, wrote, "Still realized that if we understood the philosophy of how the musculoskeletal system impacts on health and disease [then] we would find somatic dysfunction and we'd find a way of treating it. The important thing was not the specific technique, but to understand the philosophy, then figure out a way to apply it."[8] The real key to a truly nuanced practice of osteopathy, then, is contingent on a deeper knowledge of the body's structure and the evolution of an individual physician's interpretation of how to evaluate and treat.

This gets us back to the question of what osteopathy is. One definition could be: a system of medical practice that uses physical palpation to ascertain the structural restrictions that inhibit optimal functioning of the human body. Using knowledge of anatomy and physiology, the osteopathic physician attempts to restore the body to optimal structure with manipulation, thus restoring optimal function. The osteopathic physician also identifies dietary, emotional, and spiritual areas of restriction that may contribute to the well-being of the patient. Osteopathic physicians are not opposed to judicial application of pharmaceutical drugs and surgery, but are inclined to help the body's natural healing processes before trying anything more invasive.

A compact, comprehensive definition of osteopathic philosophy should be developed. Although practitioners should have their own interpretation, it is crucial to have a basis on which there is consensus. This is important to give a solid ideological basis to the profession and to give a concise explanation to those outside of the profession how osteopathic medicine is different. Once that schema is established and consistently practiced, the identity problems of osteopathy may begin to diminish.

Educational Standards

The quality of a formal medical education is based on the quality of the schools, including the curriculum, teachers, and students. To have a good educational system requires a well-balanced, well-designed curriculum, teachers with a strong sense of mission and ability to guide students to mastery of basic material, and students who are motivated and willing to learn.

A good educational system also demands a strong mission statement. The mission statement for the osteopathic education system should be to advance osteopathic medicine into its rightful place as a powerful alternative to allopathic medicine. One might also assume that part of the larger mission is to ensure that all levels of education are available and appropriately funded and managed.

There are many critiques to this. For example, the number of osteopathic schools and medical students is increasing rapidly, but one might reasonably wonder if the quality of osteopathic education is diminishing. Schools are not teaching osteopathic thinking. In fact, they are teaching osteopathy in an allopathic paradigm, rendering osteopathy incomprehensible. There is not much curricular interaction between the osteopathic medicine department and other clinical and basic science departments. There are a limited number of DOs who use osteopathic manipulation in practice and only a few who are willing to teach.[3] Expansion is admirable, but it must come naturally. In medicine, there is a word for this type of unorganized growth: cancer.

Nearly all schools are privately funded and almost completely dependent on students' tuition for their operating expenses. Aside from the practical matter of high debt load on these physicians, it is difficult for schools to operate for ideological reasons. Instead of the logic of educational standards, there is the logic of economics. Under those conditions, economics always wins.[iv, 9] There are good and bad points to publicly and privately funded schools, but the profession should examine more closely the effect that funding has on the quality of education that students are receiving.

In this situation, we should ask ourselves: what are we demonstrating about what is important to our profession?

A Functional Approach to Treatment

The problems mentioned above are all structural restrictions that affect the functioning of the profession. The current picture in the colleges is grim. If our goal is to turn out, in Dr. Willard's words, half-fish, half-bird physicians,[10] who are fully competent in neither allopathy nor osteopathy, then we are succeeding. If our goal is to turn out physicians who practice osteopathy, we are falling short by a long measure.

Luckily, Dr. Still himself has given us the solution: fix the structural problem and the restriction to function will resolve itself.

One place to start is our colleges. It is very important to make sure that the growth we generate is rooted in strong ideological and financial foundations and that we can give our students a proper education in osteopathy. Gevitz urges for similar caution.[v]

Osteopathic medical schools need a curriculum that promotes a thoughtful integration between the basic sciences and osteopathy. This statement is not unique: Charles O. Fleck, DO, made a similar observation in 1940.[vi] In 1956, Irvin M. Korr, PhD, advocated for a special curriculum for the DO, who is a special kind of physician. Among other things, he felt that learning techniques would be more valuable to students if taught in context of treating the whole patient.[11] Despite similar input over decades by many members of the profession, this special curriculum still has not been accomplished.

Dr. Still challenged his basic science professors to think osteopathically.[10] We as a profession should too. This requires much more interaction and sharing of ideas between all departments, which may be facilitated by faculty members considering problems of educational structure. To this end, interested faculty could be given small grants with a sabbatical leave to do research on curriculum development.[12]

There have been encouraging attempts in curriculum reform, but the process has been sporadic and inconsistent.[13,14,15,16] Fundamentally, the practice of osteopathic medicine should be less about the techniques and more about the encompassing philosophy. During the first two years of medical school, professors and the curriculum should strive to constantly teach osteopathic philosophy and demonstrate its clinical application.

A truly osteopathic education also requires students who are motivated and have open minds towards osteopathic medicine. This could be assessed by having applicants read an important osteopathic work and discuss how they might apply it in practice. During the interview process, schools should query applicants carefully about their motivation to enter osteopathic training. Some of the questions that may be kept in mind are: do they understand what osteopathic philosophy means? Does it seem likely that they would want to use it in practice? Do they have the tactile ability to apply osteopathic manipulation?[6, 17]

We also need students who can think in human terms as well as scientific ones. This is important especially for osteopathic physicians, who should see how people's lives can impact their physical health. Acceptance of this idea is important to diagnosis of the whole person. As Korr advised teachers,

> Teach about the human being, the life he lives, the demands that are placed upon his biological mechanism, his stresses and adaptations, the situations he encounters and creates for himself, at various ages—all these things and their biological impacts, so that when the physician does begin to practice he has a grasp of whence come man's frailties and what are the factors which he can influence to restore and maintain health.[11]

Additionally, patients desire physicians who are wise in the same sense that a priest is wise and skilled in the same sense as an accountant is skilled[18] because they require physicians more in trying times of their lives. Undergraduate training in social sciences, especially medical anthropology, sociology, psychology, and the arts may help foster thinking in human terms.[18]

Finally, while in medical school, students should also be encouraged to develop their own philosophy of the practice of osteopathic medicine, with input from physician advisors. In other fields, teachers are queried regarding their philosophy of education.[12] We should demand the same clarity of purpose from our osteopathic physicians.

There are solutions for all of the problems stated in this paper.[17] By resolving these problems, we can begin to work on the identity and purpose of the osteopathic profession.

Conclusion

A consistent critique of osteopathic education by physicians having an osteopathic mindset has been that medical schools do not do an adequate job of practical education in osteopathic concepts and philosophy. It is striking that most schools do not teach osteopathic thinking, which is our raison d'etre. Reductionist thinking when treating with OMM, as taught in the schools, changes osteopathic physicians into allopathic practitioners of osteopathic manipulation. And if that occurs, there is no practical difference between a DO and a MD.

It is undeniably difficult to teach a thought process to someone. Many books have been written on the subject. However, the basis of the approach of osteopathy is the different philosophy, the different thought process. Instead of a reductionist approach, we like to say, we think about patients in their whole contexts: mind, body, and spirit. But we do not do an adequate job of teaching it in school. This leaves only the most motivated to glean it, grain by grain. We can do a better job of this. If Socrates in ancient Greece could come up with a system to help his students to think in a certain way, then we, as an entire profession, can certainly come up with our own system of teaching.[vii]

We have talked about the differences between osteopathy and allopathy and that to use one to describe the other is untenable. Likewise, Hamlet cannot convey to Horatio his profound fear and confusion at seeing his father's ghost because of Horatio's radically different philosophy of the world, which doesn't allow for supernatural events. The great play by Shakespeare, however, is not about the rationalist, Horatio: it is about the dreamer and the thinker, Hamlet, and it is the tragedy and death of Hamlet that is on center stage. It is the tragedy of the dreamer and thinker, Dr. Still, and the death of his profession that we are hurtling toward today.

The driving necessity of the profession is to emphasize our uniqueness or we will be subsumed by allopathy. We need to fling the banner of osteopathy to the breeze yet again and declare who we are and why we are important and necessary. Dr. Still's words gave purpose to the early generations of practitioners. Over a century later, people are still searching for alternative health treatments. For those people, we should be their first choice for a medically sound approach to well-being. For those people, we should be able to articulate how osteopathy is relevant to the 21st century, much as Dr. Still did for previous centuries.

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Resources

i. For a recent demonstration of this, one could read the letters to the editor of *The DO*. April 2008; 49: 9-11. Available at: https://www.do-online.org/pdf/pub_do0408letters.pdf. Accessed October 5, 2008.

ii. For an allopathic perspective, examine: Howell JD. The paradox of osteopathy. *N Engl J Med*. November 4, 1999; 341: 1465-8. Available at: http://content.nejm.org/cgi/content/extract/341/19/1465. Accessed October 5, 2008.

iii. For a discussion of the history of osteopathic thinking and practice, examine: Schuster RG. "Who are you?": A question of osteopathic identity. *Fam Physician*. April 1998; 2: 4, 8-9; May 1998; 2: 4-9, 17.

iv. This was also an observation by Alexander Flexner. Cf: Gevitz N. *The DOs: Osteopathic Medicine in America*. Baltimore: Johns Hopkins University Press. 2004: 86.

v. "I believe that for the survival and flourishing of the osteopathic medical profession, it is much more important to ensure that all of a smaller number of osteopathic medical students have a distinctive, continuous and meaningful osteopathic medical education on both the undergraduate and graduate level than it is to provide a much larger number of DOs whose distinctive osteopathic medical education is brief, without lasting value, and who will come to the conclusion that an independent profession of osteopathic medicine is vestigial and unnecessary." Gevitz N. The danger of complacency. *AAO Yearbook*.1995-1996: 64.

vi. E.g., "The only secret in osteopathic manipulation is to be found in knowledge of structure. The mechanical inter-relation of structure and function gives a scientific basis for the art of osteopathic manipulation. If in the modern education of the osteopathic physician this inter-relation were emphasized and ingrained in the teaching of all the basic sciences in our curricula the graduate would not be so often without a definite realization of the scope and inherent value of our characteristic manipulation." Fleck CO. Osteopathy and manipulation. *AAO Yearbook*.1940: 2.

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Address correspondance to:

Leslie Mae-Geen Ching, OMS IV
Edward Via Virginia College of Osteopathic Medicine
2265 Kraft Drive
Blacksburg, VA 24060
Email: lching@vcom.vt.edu

The Transversus Thoracis Muscle in Humans

Diagnosis and Treatment of Associated Pathology: An Osteopathic Perspective

Daniel J. Kary

Abstract. The transversus thoracis is a relatively little known muscle. Perhaps because of its somewhat obscure intrathoracic location, clinicians have given it scant attention. It is an expiratory muscle with attachments to posterior sternum, manubrium, and ribs two to six.

My exploration of this muscle began after a young adult reported chest asymmetry and rib pain following a motor vehicle collision. Examination revealed a unilateral group exhalation dysfunction of ribs two to six, and thoracic scoliosis. This suggested the transversus thoracis muscle was involved. Both the scoliosis and rib dysfunction resolved following osteopathic manipulative treatment.

A literature search showed no reference to treatment of the transversus thoracis muscle, and only a few articles regarding its physiology and function in humans. This article describes the anatomy, physiology, related pathology, and diagnosis and treatment of associated somatic dysfunction. Clinical cases are presented, which demonstrate positive outcomes of osteopathic manipulative treatment of thoracic outlet syndrome, upper airway obstruction, scoliosis, persistent chest pain and prolonged nonunion of rib fractures, associated with transversus thoracis dysfunction.

Key words: transversus thoracis; transversus abdominis; idiopathic scoliosis; rib dysfunction; thoracic outlet syndrome; nonunion rib fractures; osteopathic manipulative treatment; post-thoracotomy pain; post-sternotomy pain

Thesis statement

Anatomy textbooks describe the action of the transversus thoracis muscle as to draw down the costal cartilages to which it is attached; however, the study of its anatomy and physiology, combined with clinical observations, shows a more expansive functional role in humans. Somatic dysfunction involving the transversus thoracis muscle may occur due to trauma, surgery, or idiopathic cause, and may affect overall thoracic structure and function, resulting in significant and lasting morbidity. This paper will discuss its anatomy, and physiology, and the diagnosis and treatment of pathology and somatic dysfunction associated with this under appreciated, and little known, muscle.

Introduction

My study of the functional changes associated with transversus thoracis muscle dysfunction began when a young adult stated that her ribs had been "sticking out" since an auto accident several months earlier. She had been a belted driver. A deceleration injury caused breathing difficulty and persistent neck, chest and rib pain. Structural examination revealed a unilateral group exhalation dysfunction of ribs two to six, limited inspiratory excursions, segmental thoracic spine rotations at T2 and T6, and thoracic scoliosis.

The transversus thoracis muscle (TT) attaches to posterior sternum, xiphoid process and the costochondral junctions of ribs 2-6.[1] The correlation between the findings on physical examination and the TT muscle attachments suggested its involvement.

As no discussion of problems associated with this muscle or its treatment were found in the literature, a novel method of treatment was devised which led to improvement in cases of rib and chest pain, breathing difficulty, rib asymmetry and thoracic scoliosis.[2] A literature review of physiology articles regarding the TT muscle in humans provided a broader understanding of its function. Treatment of patients with similar findings revealed associated medical conditions. This, in turn, allowed refinement of pertinent history, examination and treatment.

Classic anatomy texts describe the attachments and expiratory action of the transversus thoracis muscle. However, clinical observations and review of its physiology suggest a more expansive function in humans, which includes thoracic flexion and rotation, phonation and expulsive maneuvers, and an important role in the physiology of breathing during upright posture.

Somatic dysfunction associated with persistent TT muscle contraction, may result from trauma, illness, surgery or idiopathic cause. Its effects upon the body's structure and function may be significant, and lasting. TT muscle anatomy and physiology are reviewed, structural and functional relationships, diagnosis and treatment are discussed and cases demonstrating associated pathology and treatment outcomes are presented.

Anatomy of the transversus thoracis muscle in humans

The transversus thoracis muscle is also called triangularis sterni, sternocostalis and transverse thoracic muscle. It originates from the caudal half of the inner surface of the sternum and inner surface of xiphoid. Its muscle slips insert radially to any of the first six ribs, but most commonly ribs two or three to six, attaching to the inner surfaces of their costochondral junctions. Its rib attachments are variable, even from side to side in the same subject.[3] The TT has discrete, flat, strap-like, highly ligamentous muscle bands. These bands course almost horizontally to the more declined 6th ribs, and swing obliquely upward and outward, becoming nearly vertical at the most superior ribs, attaching at an angle of 30-degrees to 45-degrees (Figure 1). This allows significant leverage upon each rib attachment, and provides a stabilizing inverted rhomboid-shaped layer to the anterior thorax, which may also increase both anterior-posterior and torsional stability.[4]

Its innervation is segmental, arising from the second to sixth intercostal nerves on each side. Its arteries arise from the internal mammary arteries, which travel in a pocket formed between TT muscle slips and pleura, along with the internal thoracic veins and nerves. This nerve arrangement, between muscle and pleura, is also true of the subcostal and innermost intercostal muscles.[5] The TT and transversus abdominis muscles are contiguous with, and interdigitate with, the diaphragm (Figure 1).

Holden (1901) described the TT as "a continuation upwards of the anterior portion of transversalis abdominis."[6] Functional continuity of both TT and transversus abdominis muscles was

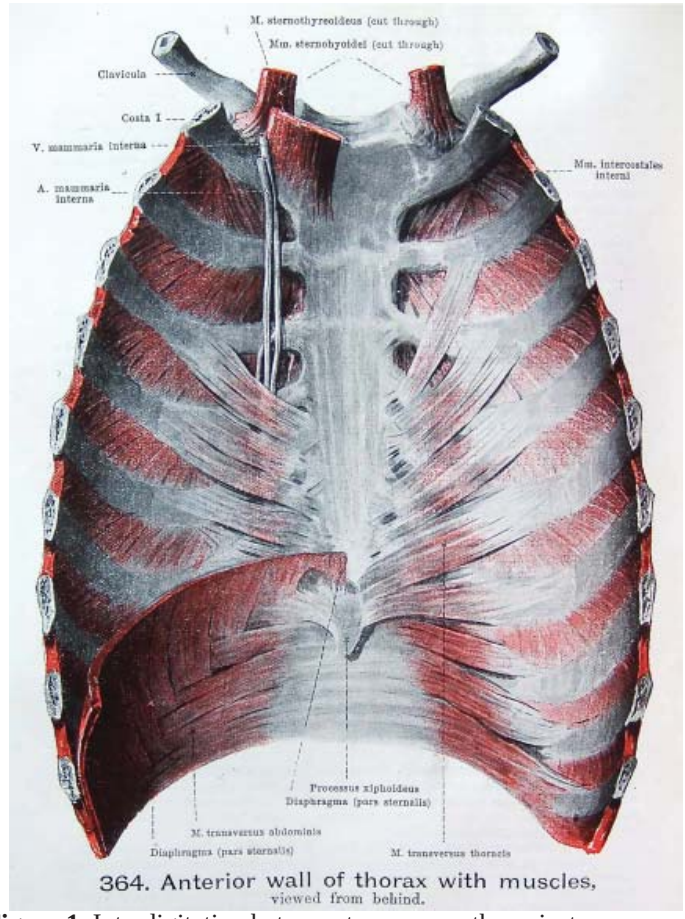

Figure 1: Interdigitation between transversus thoracis, transversus abdominis and diaphragm muscle slips, and the arrangement of mammary vessels. From Spalteholz W. Hand Atlas of Human Anatomy, Vol. II, Fifth Edition in English. p. 286. Reprinted with permission from Lippincott publishing company. All rights reserved.

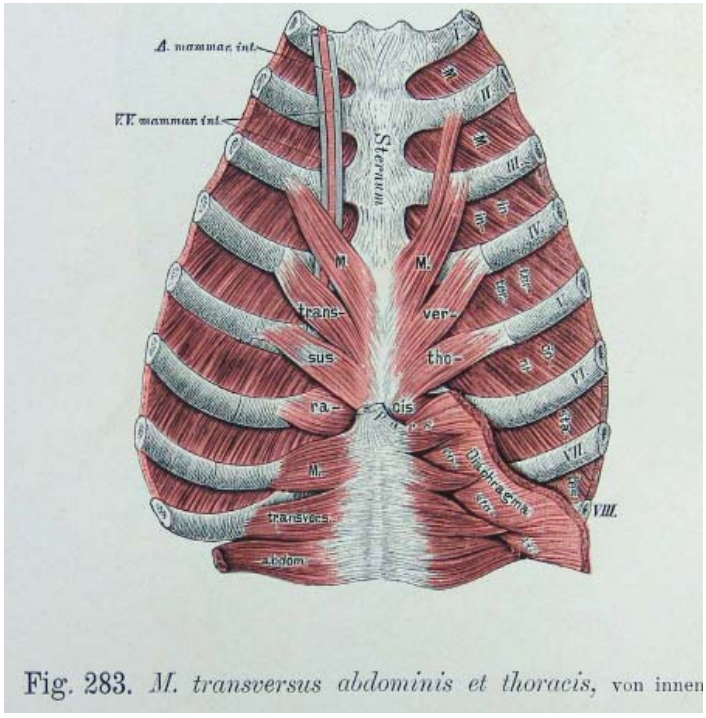

Figure 2: Functional continuity between transversus thoracis and transversus abdominis. From Heitzmann-Zuckerkandl, 1902.[11]

illustrated by Heitzmann and Zuckerkandl (Figure 2).[7]

The transversus abdominis muscle functions similarly to TT. It attaches anteriorly by its aponeurosis to linea alba, laterally to the seventh to twelvth costal cartilages and internal lip of the iliac crest and the lateral two-thirds of the inguinal ligaments, and posteriorly to lumbodorsal fascia from the anterior aspect of the five lumbar vertebra. It acts to pull the seventh to twelvth ribs downward and inward into expiration, diminishing abdominal volume.[8] Its innervation is from the seventh to twelvth intercostal and T12-L2 nerves.[9]

Physiology of the transversus thoracis muscle in humans

Physiologists have studied the electrical activity of the TT muscle in both quadrupeds and humans by using concentric needle electrode myography. It has long been considered a primary respiratory muscle in quadrupeds. Though most anatomists have considered it an accessory breathing muscle in humans, physiologists have recently shown the human transversus thoracis to be a primary muscle of respiration (De Troyer et. al. 1987).[10]

During quiet tidal breathing, electromyography showed neural activation of the TT muscle as largely coupled with that of the abdominal muscles. When supine, both TT and the deep abdominal muscles (transversus abdominis and external oblique) are quiet and expiration is generally passive.[12] During upright posture the muscular workload of tidal breathing is shared between diaphragm, TT and deep abdominal muscles. Estenne *et al*. (1988) stated: "this recruitment may compensate for the adverse effects of the standing posture on the diaphragm and inspiratory muscles."[13]

A variety of human activities associated with TT muscle activity have been demonstrated through electromyography. These include: voluntary expiration from functional residual capacity, expulsive maneuvers, isovolume maneuvers, and static positional maneuvers such as flexing the neck, rotating the thorax or lifting a leg, vocalization during a sustained expiration, or during spontaneous speech, coughing and laughter.[14] Expulsive maneuvers-coughing, vomiting and sneezing, are life protective functions. Some have referred to the TT as the "sneeze muscle."[15]

De Troyer *et al*. showed that TT activation caused a "marked decrease in rib cage anteroposterior diameter and a significant increase in abdominal anteroposterior diameter."[16] Both pleural and abdominal pressures increased >3 cm H_2O, while the trans-diaphragmatic pressure gradient remained <1.0 cm H_2O.[17]

Estenne *et al*. graphed simultaneous recordings of abdominal motion and electromyography tracings of transversus thoracis, external oblique and transversus abdominis muscles, during supine and upright posture. They found invariable TT activation "in concert with the abdominal muscles during expiration below functional residual capacity."[18]

Surprisingly, an age related increase of TT muscle activity was demonstrated in the elderly, with "strong invariable activity" in six of ten subjects between 50 and 81 years of age, but in only two of ten subjects between 18 and 30. "Low-level, intermittent activity was recorded in the remaining four older subjects and three of the younger group." They postulated this was an adaptation to age related postural and thoracic elasticity changes; rather than becoming atrophic and ligamentous due to the effects of aging,

muscular function of the TT not only remained, but also possibly increased throughout life.[19]

Kobayashi *et al*. (2003), showed increased contralateral TT muscle activity in their study of thoracic rotation in upright subjects. Contraction was static during breath holding, but phasic while breathing.[20]

The presence of unilateral activity during thoracic rotation suggests a mechanism for the clinically observed unilateral exhalation rib dysfunction. An abrupt lengthening of the TT muscle during thoracic rotation may cause a persistent unilateral TT contraction. This could occur due to traumatic thoracic rotation from acceleration or deceleration injuries, rib fractures, thoracic surgery, or protracted severe coughing (Cases 1-4).

Anatomy and motion mechanics of ribs and sternum

Ribs allow spring-like flexibility 90-degrees to their flat surfaces but resist deformation in the plane of their flat sides. Motion caused by a force acting at one end of a rib produces opposite motion at its other end. Physiologic rib motions are dictated by: their anterior and posterior attachments, limits of excursions, positions of rotational axes, ratio of lever arms with respect to the fulcra, muscle placement and dynamics. Those dynamics are altered by changes in body position, posture, activity, respiratory effort and resiliency.[21]

In early life, the sternum is segmented into four sternebrae. The inferior intersternebral junction begins to fuse at puberty, and the middle and uppermost, between puberty and age twenty-five.[22] Divisions of the sternebrae typically occur at the junctions of ribs 3, 4 and 5. In some, the manubrium and upper sternebra may fuse, forming a manubrium to which the upper three ribs attach, changing the location of the sternal angle.[23] Articulations also occur at the manubriosternal and xiphisternal junctions. The manubriosternal articulation is a fibrocartilaginous disc, which may become more like a synovial joint. About ten percent may eventually ossify. The cartilaginous xiphisternal joint usually ossifies after age forty.[24]

Injury to sternebrae before physiologic fusion may result in a post-fusion intraosseous strain. Rib dysfunction, which affects a single sternebra, may cause segmental vertebral and sternebral rotations. This presents clinically as a parallelogram-like shift involving bilateral ribs, sternebra and vertebra at the affected level. Treatment before fusion yields the best response. Pectus carinatum and pectus excavatum may involve a group flexion or extension dysfunction of the sternebrae.

Transversus thoracis muscle dysfunction and the tensegrity concept

In 1975, Buckminster Fuller wrote: "The word 'tensegrity' is an invention: a contraction of 'tensional integrity.' Tensegrity describes a structural-relationship principle in which structural shape is guaranteed by the finitely closed, comprehensively continuous, tensional behaviors. Tensegrity provides the ability to yield increasingly without ultimately breaking or coming asunder."[25] Structural failure occurs when force exceeds the ability to yield and a balance of tensile and compressive forces can no longer be maintained.

In 1998, Donald Ingber expanded the concept of tensegrity to include biological systems. He described the architecture of biologic systems as having a mechanically self-stabilizing system in which forces are distributed and balanced throughout the structure. Bones take up compression and muscles, ligaments, tendons and fascia provide tension.[26] As structure and function are interrelated at all levels, functional changes occur when somatic dysfunction is present.[27]

If a bicycle wheel were to have the tension of several spokes altered, the wheel would become warped and the hub would shift. The new shape would be maintained until the previous tensions of the spokes were restored. Pushing on the wheel or hub in an attempt to straighten it would effect an apparent change while pressures were maintained. However, the abnormal shape would reappear upon removal of the external force.

TT dysfunction creates abnormal tension. When present, the affected ribs are drawn down at their costochondral junctions creating a group exhalation dysfunction. The resultant new balance of tensile and compressive forces not only changes thoracic symmetry, but also compression and tension throughout the body.

Functional fascial links associated with the transversus thoracis muscle

Thorax and ribcage:

Physiologic, unilateral contraction of the TT muscle causes a temporary increase in tensile force at its attachments. Compressive forces, transmitted through bone, balance those tensile forces. Those effects are transmitted throughout the body by functional fascial connections. Both structure and function of the rib cage and thoracic contents may be affected by trauma, disease, postural changes, developmental variations, or by somatic dysfunction.

TT muscle dysfunction commonly causes segmental thoracic spine rotations. If treated without addressing the sternal and rib cage dysfunction, thoracic spine dysfunction may persist. TT muscle dysfunction decreases thoracic volume and resiliency. A change of tension and compression may affect any intrathoracic structure, including the heart, great vessels, diaphragm, lungs, mediastinum, lymphatics, nerves and esophagus. TT muscle dysfunction commonly causes rib pain and thoracic scoliosis, and may be a factor in pectus excavatum.

Weber, Huemmer and Reingruber (2006) studied 100 patients during surgical correction of pectus excavatum.[28] In their study, patients were divided into four groups, each undergoing different surgical procedures. They used a tensiometer to measure the pre- and postoperative force required to reduce the pectus excavatum.

Resection of TT muscle and sternal slips of diaphragm led to a dramatic reduction of the sternal force exerted in pectus excavatum. The postoperative median sternal tension in males aged 5-17 years, by procedure, were as follows:

1. Division of xiphoid: 195 N (Newtons).[29]
2. Medial chondrotomy: 80 N.
3. Osteotomy of ventral cortex of sternum: 60 N.
4. Resection of slips of diaphragm and transversus thoracis: 30 N

The respective tension following the four procedures in males

aged 18-48 years were 250 N, 140 N, 90 N, and 25 N. 250 N is approximately 55 pound feet, and 25 N: 5.5 pound feet. Similar ratios were measured in females.

They concluded that slips of diaphragm (Figure 1: "diaphragma pars sternalis") and TT exerted "substantial pressure" on the sternum, stating: "in other surgical methods in which retrosternal attachments are left in place, their tensile forces might cause relapse once the metal implants have been removed."[30]

Thoracic inlet:

Myofascial drag upon the anterior cervical region, caused by TT muscle dysfunction, alters tension and compression at the thoracic inlet. Three muscles pass through the inlet: sternothyroid, sternohyoid and longus colli.[31] The longus colli is contiguous with the prevertebral fascia, and sternothyroid and sternohyoid with the pretracheal fascia. Other structures, which pass through the thoracic inlet include the carotids, left subclavian, internal mammary and superior intercostal arteries; vagus and phrenic nerves, sympathetics and anterior branches of the first thoracic and recurrent laryngeal nerves; jugular and inferior thyroid veins; trachea, esophagus, thoracic ducts, thymus remnants and lung apices.[32]

A fascial suprapleural membrane (Sibson's fascia) defines and strengthens the cervical pleura, and may contain a few muscular fibers from the scalenus minimus muscle into the pleural dome. *Gray's Anatomy* describes this suprapleural membrane as "the tendon of scalenus minimus."[33] Travell and Simons cite Eisler (1912) and Clemente (1985), stating: "The pleural dome, or cupola, is strengthened by Sibson's fascia and anchored by this fascia to the anterior tubercle of C7 and to the inner border of the first rib. The scalenus minimus reinforces this fascia and can be a strong, thick muscle."[34] This suggests the thoracic inlet may function as an active diaphragm in some.

Thoracic inlet compromise may affect lymphatic drainage from head, neck, upper extremities and trunk. While A.T. Still was living, osteopathic instructors stressed the importance of freeing the circulation of fluids at the foramen magnum and at the superior and inferior openings of the thorax.[35]

Head, neck, and upper airway:

TT dysfunction changes the shape of the thorax by drawing the ribs into exhalation.[36] The resultant drag on the retrosternal, pericardial, prevertebral and pretracheal fascia may affect both head and neck function. Strachan described the firm attachment of investing layers of cervical fascia to the hyoid body and greater horns. This fascia also forms the external carotid sheath.[37] Both asymmetric muscle contraction and fascial drag may cause an oblique position of the hyoid. Fascial connections exist between the hyoid and scapula, and manubrium and clavicle. The anterior, middle and posterior scalene muscles span from anterior tubercles of C3-C7 transverse processes to the first and second ribs, and may be affected by exhalation rib dysfunction.[38]

The longus colli spans from C2-C4 to C5-T3. It lies along the anterior border of the anterior longitudinal ligament. Anteriorly it relates to: "pharynx, esophagus, the great vessels of the neck, the inferior thyroid artery, the sympathetic cord, the pneumogastric nerve [Vagus], and the recurrent laryngeal nerve."[39] Longus colli is contiguous with the prevertebral fascia, which is dragged caudally by TT dysfunction. Limited neck extension and oblique hyoid position are common in TT dysfunction. This may cause upper airway and pharyngeal compromise with obstructive airway symptoms (Case 1).

Ascending intrathoracic fascia attaches from central tendon of diaphragm to pericardium, mediastinum, great vessels and trachea, thyroid, hyoid, stylohyoid ligament, carotid artery within its sheath and by extensive fascial attachments to the cranium.[40, 41, 42, 43] The prevertebral fascia joins the anterior longitudinal ligament at T2-T3 and follows longus colli superiorly to the basiocciput. The cardiac fascia attaches to posterior sternum by superior and inferior sternopericardial ligaments, blends superiorly with fascia of the great vessels and is continuous with the pretracheal fascia.[44]

Sympathetics travel with the arteries to the brain. Distortion or compression of the carotid sheath, may affect cranial arterial flow, venous drainage and contiguous cranial nerves, as in Eagle syndrome. In 1937, Eagle described a syndrome most often associated with elongated styloid, in which cranial nerve or carotid artery impingement occurs.[45] Cranial nerves seven, nine, ten, eleven and twelve (Facial, Glossopharyngeal, Vagus, Accessory and Hypoglossal) descend with, or cross the carotid sheath in the area of stylohyoid. Fracture or injury to styloid process, stylohyoid ligament, prevertebral fascia, or carotid artery, may cause: syncope, neck pain, difficulty swallowing, headache, throat pain, ischemic brain symptoms, visual changes, cervical and facial pain.[46, 47, 48] This may include exophoria (Case 4).

Cranial motion may become obtunded by dysfunctional fascial and muscle drag affecting temporal bones, facial bones and cranial base.[49] Rectus capitis major spans from: anterior tubercles of C3-C6 to basiocciput near the pharyngeal tubercle, and rectus capitis minor, from lateral masses of C1, to basiocciput, anterior to foramen magnum.[50] Both are invested by prevertebral fascia. The stylohyoid and sternocleidomastoid attach to the temporal styloid and mastoid processes respectively. Suprahyoid fascial attachments continue to the superior nuchal line as they follow the trapezius and sternocleidomastoid muscles to the occiput, also attaching to parotid gland, mandible, zygoma, carotid artery and tympanic plate.

Upper extremities:

The pectoralis minor attaches to the medial aspect of the coracoid process of scapula and to second to fifth ribs. If those ribs are drawn into exhalation, as during TT dysfunction, increased tension occurs upon the coracoid process. As the neurovascular supply to the upper extremity transits deep to the proximal pectoralis minor, neurovascular impingement may subsequently occur at the thoracic outlet. Upper extremity findings in TT dysfunction include limited arm flexion, edema, numbness and weakness (case 3).[51]

Abdomen, lumbar spine, sacrum, pelvis and lower extremities:

Fascial connections from the pelvic bowl ensheath the psoas major and quadratus lumborum and blend with the fascia of the diaphragm at its crura. The central tendon of the diaphragm is contiguous with the pericardium, which connects to the deep fascia of the neck.[52] The effects of TT dysfunction on the diaphragm and

transversus abdominis are carried directly to ribs seven to twelve and the left and right crura. These connect inferiorly to the fascia of psoas, quadratus lumborum, lumbar spine, iliac crest, sacrum and lower extremities.[53, 54]

Recognition and treatment of dysfunction associated with the TT

TT dysfunction may play a role in sleep apnea and snoring and restrict head extension secondary to drag upon the hyoid, cranium and cervical spine by pretracheal and prevertebral fascia (Case 1). It may alter posture, cause thoracic scoliosis, which is typically considered idiopathic, and affect respiratory excursions and thoracic volume. It may lead to thoracic outlet syndrome and a perceived need for cosmetic breast surgery (Case 2). It may also lead to delayed recovery following rib fractures (Case 3), post-sternotomy or post-thoracotomy pain, and brain and cranial nerve pathology (Case 4). Limited arm flexion, upper extremity paresthesias, chest pain syndromes, including post pneumonia pain, pectus excavatum and refractory cranial dysfunction may also occur. The effects may persist for years, yet still respond to treatment.

Symptoms:

The most common symptoms include breathing difficulty, a deep chest aching, poor posture, limited neck extension, restricted ipsilateral arm flexion, intermittent arm numbness and a feeling that the ribs are shifted.

History:

One should inquire about prior chest trauma, rib fractures, chest surgery and motor vehicle accidents. Symptoms and signs may include snoring and obstructive sleep apnea, postural compromise, scoliosis, upper extremity paresthesias, limited arm flexion, limited neck extension, dyspnea and gastroesophageal reflux disease. Styloid, carotid sheath or internal carotid pathology may cause a plethora of neurologic symptoms.[55, 56]

Examination:

Simultaneously palpate bilateral rib pairs, contacting their superior borders near the sternum. Screen while seated and verify in supine position. Rib cage asymmetry and a unilateral exhalation group dysfunction of ribs two or three through six is the most important diagnostic finding. Segmental thoracic vertebral rotation is common at the upper and lower levels of the rib dysfunction, most commonly the second and sixth vertebrae (figure 3).

Due to extensive myofascial relationships, evaluation for secondary areas of somatic dysfunction is important. Evaluate for transversus abdominis involvement (which may affect ribs 7 to 12 and the diaphragm), scoliosis, ipsilateral coracoid process tenderness at pectoralis minor attachment, hyoid asymmetry, limited cervical extension and limited ipsilateral arm flexion.

Treatment:

The TT attachments may be engaged through hand contacts on the sternum and rib cage of the supine patient. While contacting the sternum or ribs, consider a mental image of the anatomy under the treating hand.

Place one hand over the inferior half of sternum, backed up by the other hand. Use sufficient pressure to maintain contact and then translate the sternum ipsilaterally (within reasonable tissue and structural limits). Encourage relaxation of the chest, arms and shoulders. Hold until a release is felt (usually within two minutes). This may be felt as a subtle easing of resistance, an increase in tissue compliance or an improvement of the intrinsic primary respiratory motions.[57] Repeat examination of all pretreatment findings.

Figure 3: Rib and thorax findings on structural examination.
Ventral view: Affected ribs are in exhalation.
Dorsal view: Arrows represent right rotation of T2 and T5 with respect to T3 and T6.

Cases, which demonstrate associated dysfunction:

Case 1: Upper extremity neurovascular impingement, obstructive sleep apnea and narcolepsy, which resolved after treatment of transversus thoracis muscle dysfunction.

Patient identification: W. K. a 28 year-old male

Chief complaint: A deep left-sided chest ache, difficulty sleeping, forearm tingling, especially in the first three digits, midback pain for as long as he can remember, loud snoring, and falling asleep during the day.

History of chief complaint: Evaluations of chest pain showed no cardiac cause. An injury when he was 18 months old reportedly caused a skull fracture. Both grand- and petit- mal seizures continued since childhood. Seven years prior, an episode of daytime narcolepsy, as a result of obstructive sleep apnea, led to an auto accident and a C7 fracture. His neurologist referred him for osteopathic medical evaluation.

Medical history: Seizure disorder, obstructive sleep apnea, chronic back pain, arm numbness, skull and C7 fractures, obstructive cholestatic pancreatitis and nephrolithiasis.

Surgical history: Cholecystectomy.

Social history and habits: Nonsmoker, no alcohol use, married, equipment operator.

Allergies: Morphine.

Medications: Divalproex sodium 1500 mg daily, Phenobarbital 100 mg three times daily and topiramate 800 mg daily.

Positive review of systems: ENT: obstructive sleep apnea and narcolepsy, with intolerance of CPAP. GI: cholelithiasis and

obstructive pancreatitis. Musculoskeletal: chronic cervical, thoracic and left anterior rib cage pain and limited neck movement. Neurologic: seizure disorder, arm numbness, stable cervical syrinx and intermittent occipital headaches.

Physical examination: A 28-year-old male, in no apparent distress, height 76 inches, weight 240 pounds, blood pressure 110/72, heart rate 72, respiratory rate 12. Ears, nose, throat, lymphatic, GI and GU: normal.

Heart and lungs: Heart regular, without murmur, lungs clear.

Neuromusculoskeletal examination: Romberg's test, Spurling's maneuver, foraminal compression testing and DTRs were normal. Ambulation and extremity strength were normal, left shoulder was low, his head and left shoulder were protracted and there was a mild pectus excavatum. Cervical extension and right rotation were limited, with C1 rotated left, left condylar compression and hyoid obliquely depressed on the left side. Cranial: sphenobasilar symphysis compression. The left second to sixth ribs were in exhalation, with T6 flexed, rotated and side bent left. Left upper extremity flexion was restricted, with tenderness at medial aspect of left coracoid process. Fascial restriction was present in the left radioulnar interosseous ligament and biceps aponeurosis.

Diagnostic studies: Cervical MRI demonstrated a small, stable syrinx from C4-C6, without Arnold-Chiari formation. Recent evoked potentials were normal.

Diagnoses:

1. Somatic dysfunction: head, cervical, thoracic, rib cage and upper extremities.
2. Chronic cervical, thoracic, head and rib cage pain.
3. Left-sided thoracic outlet syndrome and bilateral, distal upper extremity entrapment paresthesias.
4. Obstructive sleep apnea and narcolepsy.
5. Seizure disorder, controlled by medications, and a stable cervical spinal cord syrinx.

Course of treatment:

Initial visit: Balanced membranous tension was used to treat the cranium, with myofascial release to treat thorax, rib cage, abdomen, and cervical areas including hyoid,[58] and upper extremities.

The exhalation dysfunction of ribs two to six and the T6 dysfunction were not evident after treatment. He was breathing easier, reported significant pain reduction and had improvement of head, neck, thorax rib cage and upper extremity movement.

When seen five days later: He reported improvement of all prior complaints, with no chest or back pain, arm tingling, snoring, sleep dysfunction or breathing problems. He was alert and wakeful during daytime, no longer fatigued, and snoring had resolved.

Posture was normal, the pectus excavatum was reduced, and prior areas of somatic dysfunction were improved.[59] No tenderness or rib asymmetry remained. The remaining pectus findings were mild. He was not formally rescheduled.

Discussion: This case shows resolution of obstructive sleep apnea and narcolepsy following treatment of the transversus thoracis muscle. Addressing the TT dysfunction within the context of organized pericardial and pretracheal fascial relationships led to rapid improvement.

Case 2: Thoracic scoliosis, postural and breast asymmetry, and chest pain, which resolved after treating transversus thoracis muscle dysfunction.

Patient identification: J.K. a 21 year-old female.

Chief complaint: Back stiffness, midback pain, a feeling her chest and left breast were pulled downward, and difficulty twisting her torso.

History of chief complaint: Symptoms began four months prior. No trauma was reported. She reported a progressive decrease of chest and midback motions when lifting, twisting while driving, and occasional tingling between the spine and left shoulder blade. She also had difficulty rotating her torso while backing her car.

Medical history: Obesity, polycystic ovarian disease and secondary amenorrhea.

Surgical history: None.

Allergies: None known.

Medications: Medroxyprogesterone acetate 150 mg and acetaminophen.

Social history and habits: She lives alone and denies tobacco or alcohol use.

Review of systems: GU: Gravida 0, with secondary amenorrhea and polycystic ovarian disease; musculoskeletal: back and rib pain; eyes, ears nose, throat, cardiopulmonary, GI, dermatologic, neurologic, and psychiatric: negative.

Physical examination: An alert oriented twenty-one year-old female, in no apparent distress. Height 61 inches, weight 160 pounds, blood pressure 110/68 and respiratory rate 16; dermatologic: hair pattern was consistent with polycystic ovarian disease; the left breast was positioned lower than the right; eyes, ears, nose, throat, lymphatic, GI and GU: normal.

Heart and lungs: Heart regular, without murmur, lungs clear.

Neuromusculoskeletal examination: She rose easily from sitting to standing. Gait, extremity strength, and range of motion were normal. The left second to sixth ribs were in exhalation, most notably at their costochondral junctions. The right costal margin was flared outward, and both T2 and T6 were FRS left. A thoracic dextroscoliosis was present. Balance, reflexes, Spurling's maneuver and foraminal compression testing were normal.

Diagnoses:

1. Somatic dysfunction of thorax, rib cage and abdomen
2. Back pain, postural asymmetry and thoracic scoliosis.
3. Polycystic ovarian disease.
4. Breast height asymmetry.

Course of treatment:

Initial visit: Myofascial release was used to treat the thorax, rib cage and abdomen, after which she was able to rotate her torso easily. She reported feeling more erect and no longer "pulled down in the front." Following treatment of the rib cage, the T2 and T6

dysfunction were not evident, cervical extension had improved, and chest wall and breast symmetry restored.

Second visit, one week later: She reported feeling pain free and still able to rotate her torso normally while driving. Examination revealed no thoracic or rib cage tenderness, asymmetry or restricted movements. She was released to "as needed" follow-up.

Discussion: This case shows resolution of postural and rib cage asymmetry, including asymmetry of breast height, thoracic scoliosis and back pain after treatment of somatic dysfunction involving the transversus thoracis muscle.

Case 3: Prolonged nonunion of rib fractures and thoracic outlet syndrome.

Patient identification: D.A. a 49 year-old male.

Chief complaint: Left-sided chest pain, prolonged nonunion of rib fractures, chronic back pain, breathing difficulty, inability to lie down, cold left arm and delayed injury recovery.

History of chief complaint: twenty-seven months earlier, while raising a dump truck bed, the trailer's left lifting strut jammed while the right strut extended, lifting the dump bed thirty feet. The unbalanced trailer fell left, accelerating the cab to the ground.

The left third to ninth ribs were fractured. He reported constant pain, his broken ribs still "cracking and shifting," a swollen and distorted chest, cold and swollen left arm and disturbed sleep. Treatment: pain medications, occupational medicine, psychiatric and neurology evaluations, cortisone injections, and twelve hours work per week.

Medical history: Type II diabetes.

Surgical history: Tonsillectomy, and skin grafting following a brown recluse spider bite.

Allergies: Penicillin.

Medications: Metformin 20 mg, three times daily, hydrocodone 10 mg, every eight hours, cyclobenzaprine 10 mg at bedtime.

Social history and habits: Married, truck driver, 8th grade education, smokes tobacco.

Review of systems: Eyes: negative; ears, nose, throat: dentures; endocrine: type II diabetes; cardiovascular: cold left arm; pulmonary: pain-limited respiratory effort; GI/GU: negative; musculoskeletal: flail-chest, midback pain, and (pre-injury) bilateral L5 pars interarticularis defects, low back pain and anterolisthesis; neurologic: left arm numbness; lymphatic: arm and chest edema.

Physical examination: A 49 year-old male, in apparent pain, height 72 inches, weight 245 pounds, blood pressure 144/84, heart rate 80, respirations 20. He could not lay prone and guarded left arm, rib cage and torso movements. Eyes, ears, nose, throat: eyes anicteric, neck supple, thyroid not palpable, no lymphadenopathy; dermatologic: edema and cool boggy skin over left chest and arm; endocrine, GI, GU, and psychiatric: negative.

Heart and lungs: Heart regular, without murmur, lungs clear.

Neuromusculoskeletal examination: Ambulation, cervical rotation, Spurling's maneuver, foraminal compression testing and deep tendon reflexes were normal; thorax: hyperinflation of left hemithorax; skin of left chest and arm was cool, boggy and edematous; the left fourth to seventh ribs were extremely tender, with mid-shaft mobility and crepitus. Left arm flexion was 100-degrees and radial pulse was lost beyond 30-degrees of abduction. T8 was FRS left, and an exhalation group dysfunction of right-sided ribs 2-6 and flattening of right hemidiaphragm was present. He declined evaluation of the low back.

Imaging: Lumbar radiographs: L5 spondylolysis and grade I anterolisthesis. Chest CT with 3-D and 4-D reconstruction, 14 months post injury: non-union of ribs 4-7 (figure 4).

Diagnoses:

1. Multiple nonunion rib fractures, with chronic pain.
2. Somatic dysfunction of left upper extremity, thorax, rib cage and abdomen.
3. Thoracic outlet syndrome: vascular insufficiency, numbness and edema of left arm.
4. Pars interarticularis defects at L5.
5. Type II diabetes, sleep dysfunction, hypertension and narcotic habituation.

Course of treatment:

Initial visit: Osteopathic manipulative treatment was done using myofascial release (MFR), to ribs two to six on right, to improve pulmonary function and reduce fascial drag. To enhance lymphatic drainage, the thoracic inlet was treated with MFR followed by effleurage to the left upper rib cage and arm. MFR was used to treat the left clavicle, scapula, ribs and pectoralis minor, following which the arm warmed and pulse remained present to 60° of abduction. T8 was treated using balanced ligamentous tension. The abdomen was treated with MFR. Chest symmetry improved after treatment.

He was advised to follow with his family doctor regarding hypertension.

Follow-up: one week later: He reported a "big improvement." He was able to lie supine, chest edema was decreased, the left

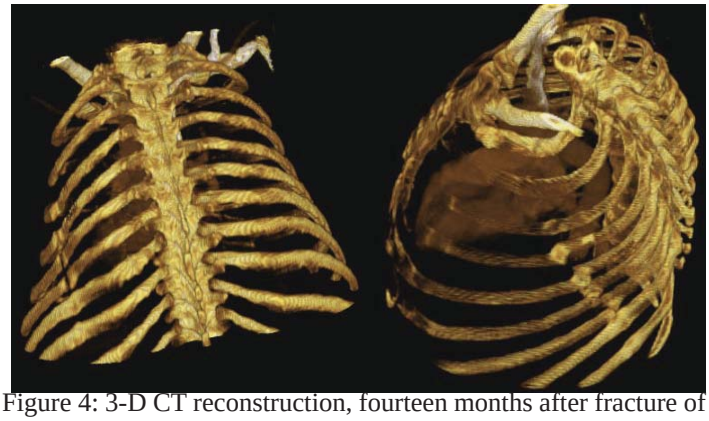

Figure 4: 3-D CT reconstruction, fourteen months after fracture of ribs three to nine.[60]

Left: Posterolateral rib displacement, nonunion of ribs four to seven.

Right: Left rotation of T2 and T8, nonunion of ribs four to seven and outward rib flaring.

arm was only occasionally cold, but back pain, sleep dysfunction and inability to lie prone persisted. Arm flexion increased from 100-degrees to 155-degrees. He allowed minor rotation and lateral-flexion of thorax and the radial pulse was palpable at full left arm abduction, no rib crepitus present. Treatment: articulation to T-spine.

After two weeks: Intermittent pain continued, with improved chest symmetry, breathing and rib pain. The left arm was "80% better." Tenderness and guarding continued in the left lateral thorax and 7^{th}-8^{th} costo-transverse articulations. Treatment: MFR to rib cage and facilitated positional release to thorax.

After 4 weeks: T7-8 pain persisted. He stated a requested medical clearance to drive dump trucks had been denied by the case managing physician, as he was taking narcotics. I explained my goals: full time light work capability and an improvement in quality of life. He reasserted his need for narcotic pain relief, stating that his limited education (grade 8) precluded light work options. He refused examination or treatment. I discussed this with the case manager, expressing my concern regarding depression.

After 7 weeks: He advised me that the insurer was pressing for a monetary settlement and he was pursuing a permanent disability determination. He withdrew from treatment.

Discussion: This case demonstrates healing of prolonged nonunion rib fractures, which were likely maintained by persistent unilateral contraction of the transversus thoracis muscle. Pretracheal and pericardial fascial distortion persisted following traumatic fracture of ribs three to nine. Nonunion of ribs four to seven remained evident at his initial visit twenty-seven months post-injury. Findings included: lymphedema of left hemithorax and arm, thoracic outlet syndrome, rib cage asymmetry, guarding, chronic painful crepitus consistent with nonunion of rib fractures and disabling rib cage, arm, and thoracic pain, with narcotic habituation.

The exhalation dysfunction of ribs two to six was likely caused by unilateral transversus thoracis contraction, which maintained sufficient thoracic asymmetry to prevent union of four rib fractures. One week after the initial treatment, rib crepitus was no longer present, pain was reduced, and arm mobility and circulation had improved.

Though improvements were noteworthy, this patient had limited education, few transferable skills, chronic pain, and faced a continued lengthy recovery and need for support. He had been out of work thirty months and complex behavioral, psychological, occupational, medical and socioeconomic factors were well established.[61] Earlier osteopathic treatment may have led to a different outcome.

Case 4: Post sternotomy pain and hemianopsia.

Patient identification: T.C., a 44 year-old male.

Chief complaint: Cannot move head into extension, inner left arm is numb to the wrist, pain from top of shoulder to left side of head, difficulty lifting the left arm, left side of chest is pulled down in front, midback pain with a deep breath, and several recent episodes of vision loss in the "lower half " of his left eye.

History of chief complaint: Symptoms began after sternotomy and mitral valvuloplasty four weeks prior, to treat progressive worsening of mitral regurgitation, dyspnea and irregular heartbeat. Ophthalmology evaluation had shown no cause for the intermittent hemianopsia.

Medications: 81 mg aspirin, warfarin and metoprolol 50 mg twice daily.

Allergies: None known.

Past surgery: Mitral valvuloplasty through sternotomy.

Social history and habits: Denies tobacco use.

Pertinent medical history: New onset hemianopsia and arm paresthesias, dyspnea and mitral regurgitation with recent sternotomy and valvuloplasty.

Physical examination: A forty-four year-old male in no apparent distress, height 74 inches, weight 252 pounds, blood pressure 118/76, and respiratory rate 16.

Heart and lungs: Heart regular, without murmur, lungs clear.

Structural examination: Well-healed sternotomy scar, no CVA tenderness, limited cervical extension, left greater cornu of hyoid was depressed and left arm flexion was 165-degrees, right was 180-degrees. Ascending left trapezius attachments were tender at occiput and posterolateral clavicle, and ligamentum nuchae was tight.[62] The left second to twelfth ribs were in exhalation, and T2 rotated left. Ambulation, extremity strength, muscle tone and reflexes were normal.

Diagnoses:

1. Somatic dysfunction: head, cervical, upper extremity, thorax, rib cage and abdomen.
2. Four weeks post sternotomy and valvuloplasty
3. Intermittent hemianopsia, likely secondary to fascial drag on both hyoid and carotid sheath due to the effects of transversus thoracis dysfunction.

Treatment:

Initial visit: Myofascial release was used to treat upper trapezius, anterior cervical fascia, sternohyoid, sternothyroid, prevertebral fascia, longus colli, ligamentum nuchae, rib cage and abdomen, and attachments of transversus thoracis and transversus abdominis.

Following treatment, the arm and neck movements were normal. He reported respiratory excursions as easier and less painful and being able to breathe deeply.

One week later: He reported significant improvement in all areas. He denied neck, shoulder and head pain, and no hemianopsia episodes. The fourth to sixth ribs were in exhalation, and responded to myofascial release.

Two weeks later: Cardiac rehabilitation was progressing and posture had improved; but lying prone and transitions from recumbency to sitting caused sternal pain.

Three weeks later: There had been no hemianopsia since his initial treatment, he had less pain when recumbent and had returned to work. He reported some difficulty maintaining an upright chest posture after ten minutes of computer work, which was improving.

Discussion: Dickey (1989) described hypo-mobility and somatic

dysfunction of thoracic vertebrae and rib cage as usually present following median sternotomy.[63] This led to disruption of fascial patterns through the mediastinum, thoracic pain and limited or distorted focal contraction of the diaphragm. This patient's hemianopsia was likely due to effects upon the carotid sheath, as in Eagle syndrome.[64,65] The central tendon of the diaphragm is connected to the deep cervical fascia by the pericardium.[66] Dysfunctional contraction of transversus thoracis and transversus abdominis likely caused a fascial drag upon the diaphragm, pericardium and the deep cervical fascia. The fascial strain could affect the contents of the carotid sheath and, due to affects on longus colli, limit neck extension as well.[67] Indirect myofascial release led to symptom improvement.

Summary and conclusions:

The most consistent findings in TT muscle dysfunction are a unilateral exhalation dysfunction involving consecutive true ribs, and a change of rib cage and abdominal shape. Physiology studies demonstrated a decrease in AP thoracic diameter, an increase in AP abdominal diameter, and an increase of both pleural and abdominal pressures during bilateral TT muscle contraction in supine subjects.[68] Similar changes in rib cage diameter are clinically apparent with unilateral TT muscle dysfunction.

A sudden deformation or rotation of the thorax may stimulate somatic dysfunction involving TT.[69] Causes include: deceleration injuries, blunt chest trauma, rib fractures, prolonged coughing, retching, and thoracic surgical procedures. Studies have shown a variety of physiologic TT muscle activities in supine and upright humans. Physiologists now consider the TT to be a primary respiratory muscle in humans.[70] In 2003, Kobayashi *et al*., demonstrated unilateral TT muscle activation during thoracic rotation in upright subjects, demonstrated phasic unilateral respiratory activity of the TT muscle during thoracic rotation.[71] Those findings suggest a mechanism for unilateral TT dysfunction. In 2006, Weber *et al*., demonstrated the considerable tensional force exerted upon the sternum, by slips of TT and diaphragm, in their study on the forces to be overcome during surgical correction of pectus excavatum. That study demonstrated that the TT develops significant tensile force, which is able to maintain sternal and ribcage dysfunction.

Recognition and effective treatment of transversus thoracis muscle dysfunction requires:

1. An understanding of associated anatomy and physiology.
2. An accurate diagnosis, based on the patient's history and physical examination.
3. Effective application of osteopathic manipulative treatment based upon an evaluation and management decision.

The cases presented demonstrate the importance of diagnosing and treating somatic dysfunction involving the transversus thoracis muscle.

As predicted by Fuller and Ingber, alteration of compressive and tensile forces involving the transversus thoracis muscle affects the entire body. Treatment, which effectively addresses those forces, may restore normal shape and function, even years after onset. During a panel discussion, Edna Lay was asked about the efficacy of treating chronic somatic dysfunction, she stated simply, "One should treat if, and as needed, and recheck on the next visit."[72]

Acknowledgements

Frank Willard, PhD, for assistance with the skeletal rib cage photographs, colleagues who graciously and patiently endured updates and revelations, and Herbert C. Miller, DO FAAO, with deep gratitude and special thanks; for encouragement, guidance and sage advice and for helping expand my horizons. I will never forget your answer to many of my questions, "Yep...but that's not all."

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Address correspondence to:

Daniel J. Kary, DO, FAAO
Central Maine Osteopathic Assoc. PA
287 Main St., Ste. 403
Lewiston, ME 04240-7056

CME QUIZ

The purpose of the quiz found on page 34 is to provide a convenient means of self-assessment for your reading of the scientific content in "The Transversus Thoracis Muscle in Humans. Diagnosis and Treatment of Associated Pathology: An Osteopathic Perspective" by Daniel J. Kary, DO, FAAO.

Answer each question the questions listed. The correct answers will be published in the March 2010 issue of the *AAOJ*.

To apply for Category 2-B CME credit, transfer your answers to the *AAOJ* CME quiz application form answer sheet on page 34. The AAO will record the fact that you submitted the form for Category 2-B CME credit and will forward your test results to the AOA Division of CME for documentation. You must have a 70% accuracy in order to receive CME credits.

El Savador Mission Trip - Infant's Wheeze gets relief with Osteopathic Manipulation

Michael O'Brien and Jerry Haman

Introduction

February 9th, 2009, a male patient age one year and eight months presented with a complaint of 'itch and rash.' Upon examination, erythramatous slightly raised patches were noted covering the anterior lateral aspects of both lower legs from the knee to ankle as well the dorsal aspect of his right foot. No discharge of pus or blood was noted. Wheezing lung sounds were heard bilaterally. The patient lived in an orphanage and when his caregivers were questioned they admitted that the child had a history of allergies with clear mucous discharge that 'comes and goes.' The patient appeared stable with a pulse of 96, blood pressure of 91/60, and weight 12 kg, height 33 inches, temperature of 98.6.

Diagnosis

The presentation of hives along with the history of mucous that comes and goes and the wheeze on auscultation suggest a diagnosis of atopic dermatitis and concomitant allergic asthma.

Osteopathic diagnosis was a depressed first rib with anterior tender point.

Discussion of Key Issues/Questions

Atopic dermatitis is an inflammatory reaction of the skin. It is non-contagious, pruritic and tends to come and go based on multiple factors. The condition of atopic dermatitis affects 15-25% of children. 95-percent of these children will have concomitant asthma or allergic rhinitis. Genetics plays a role predisposing those with a family history to having hyperactive immune responses with elevated immunoglobulin IgE, which subsequently results in the release of histamine, prostaglandins and cytokines.[1]

For infants and children this hyperactive response can be very strong, however it can lessen later in life. This response generates the overproduction of mucus as well as mucus cell hyperplasia[2] complicating the bronchoconstriction and inflammation of allergic asthma.

For pediatric patients with asthma osteopathic manual manipulation (OMM) can have significant benefit. In one clinical study OMM was shown to increase the peak expiratory flow rate from an average of 7 liters per minute to 9 liters per minute.[3]

Treatment Decision

As we were on a mission trip in El Salvador we were not in a position to offer long term drug therapy. However, as osteopath's we had the unique skill set to address the underlying somatic dysfunction. Dr. Haman evaluated the left first rib and then performed OMM. Wheezing lung sounds were clearly audible bilaterally before treatment. After Dr. Haman performed OMM the lungs were clear to auscultation bilaterally. This treatment was performed on an additional three patients while on the trip, all with success.

The treatment used was the counterstrain technique for depressed first rib with anterior tender point. The anterior tender point is pathopneumonic for the somatic dysfunction of an exhaled or depressed rib. The treatment position is neck flexion with rotation and side bending toward the side of dysfunction. The practitioner needs to position the patient so as to find a point that reduces the tenderness by 70-percent or more. Once that position is found it is held for 90 seconds. In the case of a baby where feedback is difficult the practitioner must rely on palpatory skills, feeling for myofascial changes or ideally a therapeutic pulse.[4] In these cases it is always found to be depression of the left 1st rib which in turn impinges the function of the vagus nerve, or pneumogastric nerve (old name).[5]

Conclusion

Allergic asthma has been shown to have multifactorial components. If one parent has allergic asthma there is a 30-percent chance that the child will, if both parents then there is a 50-percent chance. Also the allergic response will be worse, showing a dominant pattern of the genetic component. Living in an urban environment with poor air quality is a major contributor and stress plays a role as well. There is also a correlation between having allergic rhinitis (AR) and asthma. In children with AR and a positive family history there is up to 60-percent chance of asthma and when combined with atopic dermatitis the risk increases to as much as 80-percent.[6]

Minimizing exposure, drug therapy and allergen immunotherapy are all recommended treatments. Appropriate management of this disease is essential. The CDC reports that the cost of asthma in children is: lost school days - 14 million days/year, asthma treatment - 3.2 billion, hospitalization – third leading cause among children under 15.[7]

It can be very easy to get caught up in the power of drug therapy. As we have seen above OMM also has a role to play in the management and care of these patients. Dr. Haman theorizes "that these rib lesions happen at birth and this may be a lifelong cure in a child this young." Especially when treating children we should consider the least invasive options of treatment first. The longer we can delay or completely avoid the use of drug therapy in children the healthier they will be as adults.

Authors' Note: Please note that it is always the left anterior c.s. first rib tender point that is the culprit. This mission trip was sponsored by VCOM.

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Address Correspondence to:
Jerry Haman, MA, DO, AOBSPOMM
P.O Box 661
Kirksville, MO 63501
(660) 627-1812

Michael O'Brien, Lic. Ac., OMS I
250 Tall Oak Blvd
Christiansburg, VA 24073
(540) 553-1632
mobriendo@gmail.com

Book Review

Liem, Torsten: *Cranial Osteopathy, A Practical Textbook*. English language edition copyright 2009 by Torsten Liem. Published by Eastland Press, Inc. Hardbound, 827 pp. including Glossary, Appendices, Notes and Index

Anthony G. Chila

I have previously reviewed Liem's *Cranial Osteopathy, Principles and Practice* (The AAO Journal: Volume 16, Number 1, March 2006; 38). Another opportunity is given to observe the author's pursuit of study of Osteopathy in the Cranial Field.

The volume under consideration here is stated by the author to be "based on the 4th German edition of my book." The reader should note the extensive commitment of time given to revising that edition, followed by a nearly similar amount of time to translate into English. Liem's explanation: "All that lives is in constant flux and is ever changing. Osteopathy too is a living thing! Out of this living flow has come the writing of this book."

More than this, Liem demonstrates in this volume his attention to new insights and outdated ideas. As previous methods were revisited, placement in a wider context occurred. The effort has resulted in a considerable increase of scope. The text consists of 23 chapters, profusely illustrated and documented throughout. As in the former volume, full acknowledgment of the contribution of numerous practitioners and teachers to his effort is generously given.

The issue of practicality is addressed by Liem as follows:

- Enable better assessment of reactions to treatment
- Enable a more integral palpatory approach to the patient, with a deepening of the different dimensions of touch and resonance, including phenomenological views
- Enable better differentiation in the cranial examination of patients
- Facilitate the process of conscious listening during palpation
- Clarify the act of therapeutic synchronization with the homeodynamic forces in the tissues
- Provide an understanding of stages of growth and modes of ossification of bones, which explain certain windows of time in treatment
- Provide a more precise understanding of sutures to enable more satisfactory delivery of treatment
- Apply the many new insights concerning interactions, to aid the development of new palpatory treatment methods

In perspective, Liem's two volumes can be seen to complement each other, and very clearly to demonstrate evolution of thought. This is in keeping with the traditional view of Osteopathy as always being the shore of an uncharted and unexplored river.

Anthony G. Chila, DO, FAAO dist., FCA

From the Archives

From : Chapter XIII. The Principles and Practice of Osteopathy. In: Booth, ER. *History of Osteopathy and Twentieth-Century Medicine*. Cincinnati: Press of Jennings and Graham, 1908; pp. 397-400.

It is not claimed that no one ever recognized an osteopathic principle or put it into practice before Dr. Still. History shows that many had grasped and applied principles essentially osteopathic long before osteopathy, or anything like it, as a complete system ever entered the human mind. But in almost every case where the principle was seen, its application was never dreamed of. Men in all ages of the world had observed the force of steam, and many of them had seen it lift the kettle lid as often as Watt had; but only he thought of developing a machine which would enable him to use steam whenever power was wanted. So others knew much of anatomy, physiology, and pathology, but only Dr. Still thought of developing a system based upon that knowledge which would enable him to cope with all disease to which the human body is heir.

There is probably no one thing more noticeable in medical literature today than the almost universal failure to recognize the osteopathic idea that diseased conditions are, or ever may be, due to derangement of form and consequent disturbance of function. Any change of size, texture, structure, position, relation, is a change of form, an anatomical derangement, a lesion in the osteopathic sense, a possible cause for disease. A failure of any part of the body to do its duty is a disturbance of function, generally caused by some derangement of form. These are essential osteopathic ideas, but they are almost completely ignored by the drug schools of practice; hence the firm basis upon which osteopathy rests in contrast with those systems based upon symptoms in both diagnosis and practice.

It is remarkable how little the statement of the fundamental ideas underlying osteopathy have changed since first enunciated by Dr. Still in 1874. Yet not surprising, because he stated in plain language the truth, and truth then is the same now and will not change with the lapse of time. Dr. Still was the first to discover and announce a great truth, a scientific fact, the one upon which Osteopathy is built, and restatements of that truth must always mean the same thing, no more, no less, or the language in which it is stated is at fault. Chapter II contains a statement of those fundamental principles from which osteopathy was evolved, and it is not necessary to repeat them here. A later presentation of the subject by Dr. Still appears in the *Journal of Osteopathy* for August, 1902. It serves as a definition and makes clear the whole theory and practice as viewed by the founder of the science:

"Disease is the result of physiological discord. With this fact established in the mind of the doctor of osteopathy as a truth, he is warranted then in hunting the facts that would prove the position, that disease is the result of physiological discord in the functioning of the organs or parts of the physiological laboratory of life. Thus, as an explorer or seeker of the cause of disease he would naturally reason that the variations from the physiological perfection would naturally be found in disordered nerve connections to the degree of breaking or shutting off the normal circuit of nerve force from the brain to any part of the body that should be sustained by that force when normally conducted to any organ as the power necessary to its process of vital functioning. If this be true, there is nothing left in his procedure but to find the break or obstruction to the natural passage of blood or any other fluid that is necessary to a normal condition, which is health itself. Thus, the physician of any school of the healing art must know and act upon the philosophy that disease is the result of physiological discord. The cause of disease can be traced to bony variations from the base of the skull to the bottom of the feet, in the joints of the cervical, dorsal, and lumbar vertebras, the articulations with the sacrum, also the arms and lower limbs. Strains by lifting, jolts, jars, falls, or anything that would cause any organ of the chest or abdomen to be moved from its normal to an abnormal position, is cause sufficient to confound the harmony of natural functioning of the whole viscera both above and below the diaphragm and be the cause of an unhealthy supply of nerve fluid and force to the limbs and the organs of the body both internal and external with the brain included. Thus, we have given about what we consider a short philosophical definition of what we mean by the word Osteopathy. We use the bones as fulcrums and levers to adjust from the abnormal to the normal that the harmonious functioning of the viscera of the whole body may show forth perfection, that condition which is known as good health."

DR. A. T. STILL THE FIRST OSTEOPATH.

All history points to the fact that the measures used by osteopaths were not used, except in a few isolated and generally obscure instances, under the name osteopathy, massage, manual therapeutics, bone setting, or any other appellation, before they were employed by Dr. A. T. Still. Furthermore, it is not practiced in 1905, by any except graduates of regularly established schools of osteopathy. It is true that certain manipulative methods resembling Osteopathy are used by some who have taken a correspondence course or read an illustrated book; but they generally fall so far short of the osteopathic idea that it is as unreasonable and as incorrect to speak of them as osteopaths as to call a layman who gives a drink of catnip tea to a sick child a doctor, or one who takes a little splinter out of a finger or binds up a wound, a surgeon. Yet in a number of cases the essential facts of osteopathy have forced themselves to the attention of thoughtful men; *but not one of them, till Dr. Still, had the grasp of intellect, the accuracy of knowledge, the persistency of purpose, the thirst for truth, the desire to relieve suffering, the love for man, and the confidence in God to enable him to formulate those facts, and through them establish a complete system of therapeutics.*

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September 2009 AAOJ CME quiz answers:

1. B
2. C
3. D
4. D

Answer sheet to December 2009 AAOJ CME quiz will appear in the March 2010 issue.

Complete the quiz below by circling the correct answer. Mail your completed answer sheet to the AAO. The AAO will forward your completed test results to the AOA. You must have a 70-percent accuracy in order to receive CME credits

1. Somatic dysfunction associated with persistent tranversus thoracis muscle contraction may result from

   A. Trauma
   B. Illness
   C. Surgery
   D. idiopathic causes
   E. All of the above

2. Compressive forces, transmitted through bone, balance tensile forces and are transmitted throughout the body by functional fascial connections.

   A. True
   B. False

3. A consistent finding in transversus thoracis somatic dysfunction is

   A. Rib fracture
   B. Dyspnea
   C. Cardiac arrhythmia
   D. unilateral exhalation dysfunction involving consecutive true ribs
   E. Vertebral fracture

4. Physiologists now consider the transversus thoracis muscle to be a primary respiratory muscle in humans.

   A. True
   B. False
   .

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Pelvic Pain: Mechanisms and Evidence-Based Diagnosis & Treatment

March 15-16, 2010 in Colorado Springs, CO

Course Description:

This hands-on workshop will address treatment programs, including both manual medicine and exercise. In addition, the course will address psychological factors, emotional influences and the effect they have on motor control are receiving greater attention amongst practitioners. This course will be related to better diagnostics and treatment of pelvic girdle patients and contains both theoretical clinical content as well as hands on demonstrations on diagnostics and treatment.

Presenting:

Andry Vleeming, PhD, Clinical Anatomist
Frank H. Willard, PhD, Neuroanatomist

CME:

The program anticipates being approved for 16 hours of AOA Category 1-A CME credit pending approval by the AOA CCME.

Course Location:

The Broadmoor
1 Lake Avenue
Colorado Springs, CO 80906

Timline:

March 15: Functional anatomy of the pelvis, and it relation to treatment of chronic pelvic girdle and spinal patients.

- Topographic and Functional Anatomy of the Pelvic region and its clinical implications
- Anatomy of the Lumbosacral Ligamentous System
- Innervation of the Lumbosacral Spine
- The neuromyofascial system and its function on stabilizing the lumbopelvic region and hence effective motorcontrol

March 16: Clinical anatomy of the pelvis

- The ANS & the Pelvic Viscera
- Effective and evidence-based diagnosis of pelvic (girdle) pain.
- Anatomy-Radiology Correlation in the Pelvis
- Anatomy in vivo of the lumbopelvic region:

Andry Vleeming, PhD, Clinical Anatomist

Dr. Vleeming founded a clinical anatomical research team at the Erasmus Medical University in Rotterdam in 1980. His team studied the lumbar spine and pelvis, both from an anatomical and clinical perspective for 17 years. This research led to new insights how the body functionally works. In 1995 he founded the Spine and Joint Rehabilitation Centre in Rotterdam, The Netherlands, in cooperation with the Dutch government. New studies were published on the treatment of severe chronic patients with pelvic girdle pain. His anatomical and biomechanical research in the lumbopelvic region has been accepted worldwide and incorporated into rehabilitation programs for patients with lumbopelvic dysfunction. Many new pelvic diagnostic tests were published together with his colleagues. Dr. Vleeming has taught clinical anatomy in many countries and universities especially emphasizing the role of clinical anatomical knowledge to influence a better outcome of treating patients. In addition, he is the chairman of the Interdisciplinary World Congress on Low Back and Pelvic Pain in close cooperation with the office of continuing education of the University of San Diego. He has authored many clinical books on non-operative orthopaedic medicine, including the book, *Movement Stability and Low Back Pain*.

Frank H. Willard, PhD, Neuroanatomist

Dr. Willard is a professor in the Department of Anatomy at the University of New England College of Osteopathic Medicine. He has earned a Bachelor of Science in Zoology from the University of Maine and a PhD in Anatomy from the University of Vermont. He was elected Professor of the Year in 1993 at UNECOM and was elected to the Visiting Scholar list from the AAO in 1989. Presently Dr. Willard is a member of the Society of Neuroscience, Sigma Xi, International Society for Developmental Neuroscience; International Brain Research Organization; American College of Neuropsychiatrists and is an honorary member of the AAO and the Russian Osteopathic Association. Dr. Willard is the author of *Medical Neuroanatomy; A Problem oriented Manual with Annotated Atlas and Nociception and the Neuroendocrine-Immune Connection.*

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March 15-16, 2010

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The American Academy of Osteopathy® (AAO) Journal is a peer-reviewed publication for disseminating information on the science and art of osteopathic manipulative medicine. It is directed toward osteopathic physicians, students, interns and residents, and particularly toward those physicians with a special interest in osteopathic manipulative treatment.

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Reviews of publications related to osteopathic manipulative medicine and to manipulative medicine in general.

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