

Interdisciplinary Work and the Scientific Basis for Visceral Manipulation: Soft Tissue Fascial Mobilization

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This letter discusses for the need to integrate basic science research with clinical PT practice and how the literature supports Visceral Manipulation; a rationale for a more extensive neurophysiological model in the field of manual therapy; and peer-reviewed research in Visceral Manipulation.

I have been a PT in New Mexico for 30 years. I have two Master's Degrees, one in Exercise Science with distinction and the other in Orthopedic Manual Therapy. For the past 15 years, I have exclusively studied the osteopathic visceral coursework. Visceral Manipulation coursework is anatomically based and functionally related to various structural systems in the body.

The Visceral Manipulation curriculum teaches the anatomy and physiology of the organs and their associated skeletal structures, vascular and nerve pathways, along with the techniques utilized to evaluate and treat the organs. Palpation skills are an integral part of Physical Therapy (PT) practice; in Visceral Manipulation, the palpation skills taught in this curriculum are highly refined. For example, in the Visceral Manipulation training the students look at how the liver's suspensory ligamentous system influences the movement of the spinal column and the thorax. These anatomical relationships are presented and supported in work published in video format by Robert Acland MD (2004) and in a second, separate dissection by Gil Hedley PhD (2009). These two published DVD's on the visceral organs provide dissections in great detail and reveal the comprehensive nature of functional relationships of organs to the skeleton.

Both DVD's clearly demonstrate how the liver's suspensory ligamentous system (coronary, triangular ligaments, falciform ligament) are attached to the thorax. The suspensory system of the liver as presented in Visceral Manipulation, and in these two DVD's, can be injured in trauma and can influence function particularly in the thorax. This would be most difficult to prove experimentally on a living subject although post-mortem studies clearly capture the traumatic forces on the viscera and other body tissues. One need only take a class in Forensics or observe dissections in the Office of the Medical Investigator to learn how force vectors influence different tissue structures in the body.

Another clinical example is a 12-year-old appendectomy scar and its influence on the low back, hip, and pelvis through its connective tissue/ fascial pulls. In fact, one of my recent patients at University of New Mexico Student Health and Counseling Center had lower thoracic /upper lumbar pain on the right that was reproduced when his old appendectomy scar was fascially loaded around the caecum. These intermittent symptoms have been present for about 5 years. He was delighted to learn that the root of his symptoms can now be addressed once the acute symptoms quiet down. Without this visceral training, I would not have been able to address the root of his problems; nor would I have been able to assess and recognize how the interrelationships between this tight scar tissue and other anatomical structures within the patient's body were being impacted; or how this interrelationship resulted in lower thoracic/upper lumbar pain-let alone how to treat it. Mueller et al. (2002) point out in their

article on Physical Stress Theory that physical stresses cause a predictable adaptive response in biological tissue. In the above example, my hypothesis was the lower thoracic/upper lumbar paraspinals had exceeded their adaptive responses in relationship to the tight fascial tensions around the appendectomy scar.

Cooper (1979) states a "loss of intra-abdominal fat and flaccidity of the abdominal wall result in ptosis (lowering) of the movable abdominal viscera, with tension on peritoneal and fascial attachments". For example, a tensional pattern around the fascial envelope of a kidney on one side can change the dynamics of the torso being pulled to the effected side (Schwind 2006). This could be the case from a fall on the back with a rotation at the time of impact. It could also occur in a multitude of other situations, one being chronic inflammation in the region of the kidney, ureter or bladder.

Clinical practice disciplines like Physical Therapy have always drawn knowledge and application from other disciplines: Anatomy, Physiology, Neurology, Neurodevelopment, Orthopedics, Biomechanics, Physics, Social Sciences, etc. Physical Therapy has never been insular or exclusive in its vision, research efforts, or its practice paradigm. Earlier research analyzed the systems of the body compartmentally; but as noted above, the results of recent research across disciplines has recognized the need to implement a more complex, integrated approach to clinical practice. This is, in part, the emphasis for the growing holistic, complementary, and alternative medicine movement. A movement that continues to rapidly grow as measured by patient visits and dollars spent for care (Eisenberg, 1993). Dollars spent even when they are not reimbursed by health insurance but come out of the patient's pocket.

The National Institutes of Health (NIH) have recognized the need for interdisciplinary health research and have directed funding towards interdisciplinary rather than narrowly focused individual disciplinary work. Indeed, like every other major Health Sciences Research Center in the country; the University of New Mexico Health Sciences Center recently submitted a revised proposal for an interdisciplinary, translational (bench to bedside or basic science to clinical application and treatment) research center. This was done because of new federal funding requirements emphasizing these areas. New funding guidelines have eliminated federal funding for the old style, compartmentalized clinical research centers such as the one that had existed at the University of New Mexico Health Sciences Center and required Health Science Centers who wanted to obtain NIH center funding to submit new grant proposals emphasizing and demonstrating interdisciplinary and translational research as part of their core mission.

The scientific basis for Visceral Manipulation work by Jean-Pierre Barral, DO, RPT is drawn from research in multiple biological and health care disciplines. The changing nature of the biological sciences and clinical practices in fields such as Medicine and Physical Therapy has been dramatic in the 30 years I have practiced, with an increasing emphasis on multi-discipline approaches to clinical knowledge and clinical practice. Recent advances in related sciences are now making it necessary to look across disciplines for some of the answers to our questions regarding the manual therapy's mechanisms of action.

Khalsa et al. (2006) in their editorial review state that research and practice need to draw on different areas of science (neuroscience, biomechanics, endocrinology, imaging, and immunology) to answer questions regarding the mechanisms of manual therapy. They point out "the complexities of studying the manual therapies, translating research findings into clinical practice, and that some of the most important questions will come from clinicians themselves".

They also state “the value of networks of clinicians and scientists who can work together to explore common areas”. They report that “the manual therapies may trigger a cascade of cellular, biomechanical, neural, and/or extracellular events as the body adapts to external stress”. Schmid et al (2008) report the need to establish a more expansive model to look at the effects of the manual therapies, which includes the central nervous system and quite possibly the supraspinal centers. Bialosky et al. (2008) state “the mechanical force from manual therapy initiates a cascade of neurophysiological responses from the peripheral and central nervous systems, which are then responsible for the clinical outcomes”.

Visceral Manipulation is soft tissue mobilization. The abdominal and thoracic organs are enveloped in their connective tissue/fascial membranes. As soon as we manually manipulate this visceral soft tissue, we are effecting changes locally and in surrounding areas because of their fascial connections (Schleip, 2003).

One explanation of how manual therapy works is provided by Donald E. Ingber MD, PhD, at Harvard Medical School (2008) who argues for the “concept of cellular mechanotransduction, the process by which cells sense mechanical forces and transduce them into changes in intracellular biochemistry and gene expression.” Based on a prolific, federally funded research program over a number of years, Dr. Ingber has been studying cells on the nanometer scale. He views “the cytoskeleton as an architectural structure that actively generates tensile forces and distributes them to other components inside the cell”. Ingber (2006) suggests that in the living body “the process of cellular mechanotransduction might be more a phenomena of structural hierarchies and biological architecture than the action of any single mechanotransduction molecule”. This has significant implications for the field of manual therapy. Ingber (2006) states that to “seek out and study individual biological parts in isolation without considering contributions of multiscale architecture and invisible internal forces means we will never be able to fully understand how physical forces influence biological form and function.”

Ingber is talking in terms of a systems approach. Johnston et al. (2001) further state “systems theory provide a thoughtful alternative to the long-held mechanistic view of structure in which science breaks down physical components to examine and analyze their elementary aspects. Recognizing a living structure and its functional units, this theory draws attention to analysis of the interactions between the subdivisions and each system as a whole. Studying functional relationships is a central theme.”

Langevin (2005) states the unspecialized connective tissue surrounds and permeates not only the musculoskeletal system in the body but all other tissues and organs. Because of this, unspecialized connective tissue plays a role in “integrating the function of diverse cell types existing within each tissue (e.g. lung, intestine – Swartz et al. in Langevin 2005 pg. 261). Moreover, the connective tissue matrix is a key participant in mechanotransduction, or mechanisms allowing cells to perceive and interpret mechanical forces (Chiquet et al. in Langevin, 2005 p. 261)”. Langevin (2005) states these connective tissues influence, and are influenced by, normal and pathological function of a wide variety of organ systems although the exact mechanism by which the connective tissues interpret and integrate mechanical information is not yet known.

Bessou and Laporte (in Langevin, 2001, p 2280) report “how pressure, stretch, and mechanical stimulation could result in mechanical connective tissue deformation thus influencing the group 3 muscle afferent found in perimuscular fascia and adventitia of muscle blood vessels”. Early

seminal work by Gerald Cooper (1979) elaborated on the importance of the visceral ligamentous attachments. Leon Page DO (Role of Fascia in the Maintenance of Structural Integrity, ND) emphasizes the interrelationships of connective tissues including the visceral ligaments. Clinical work published by Barral and Mercier (1988) supports this and states that gentle manipulation of a visceral ligament can induce an immediate and palpable release within that ligament. Schleip (2003) hypothesizes that these changes underneath the practitioner's hands may be due to alterations in the ground substance, which can alter physiological organ function in surrounding areas.

The cellular/tensegrity research of Ingeber (2008), connective tissue research of Langevin et al. (2001 and 2002), and the fascial research of Schleip (2003) are critical in our understanding of connective tissue and its applications in the manual therapies. Today, the physical therapist specializing in manual therapy must concern herself with many different systems in the body (musculoskeletal, visceral, lymphatic, neuromuscular, connective tissue/fascial, cranial/dural, neural, vascular, etc.) in order to acquire the skill, experience, and competence for practice. Physical therapists currently using Visceral Manipulation in their clinical practice need to keep pace with the research in other disciplines and utilize interdisciplinary research approaches and develop new methodologies for research based on their clinical practice.

Wyke's mechanoreceptor research (1980) has been instrumental in understanding the effects of the manual therapies and in particular joint mobilization/manipulation. Schleip (2003) explains the importance of fascial mechanoreceptors, and with manual manipulation changes can occur in the viscosity of the ground substance and a lowering of sympathetic tonus. Schleip (2003) has also found smooth muscle cells in fascia that appear to be involved in active fascial contractility and have only been reported in large fascial sheets. Pacinian corpuscles are also found in the peritoneum (Stilwell in Schleip 2003 page 15) and can be influenced by manual therapy (Schleip 2003}. Mechanoreceptors have been found in the visceral ligaments (Schleip, 2003). The "belly (enteric) brain" (Gershon in Schleip 2003 p. 17) contains more than 100 million neurons. Many of these sensory neurons function as mechanoreceptors.

Mid-Range Theories Relevant to Visceral Manipulation

In the past, the stress/strain curve was an important concept to be concerned with in manual therapy (and still is important). Spinal manipulation is thought to occur within this microfailure zone of the stress/strain curve (Threlkeld in Schleip, 2003 p. 13). Slower, soft tissue manipulation techniques can lead to relaxation in motor units and autonomic nervous system changes. (Schleip, 2003) Mueller and Maluf 's Physical Stress Theory (2002) also provides a useful framework to approach patient care by describing and explaining factors which influence physical stress in the tissues and how the tissues respond to the stresses.

The gate control theory of pain (Melzack and Wall, 1962,1965) has also been broadened and expanded on the basis of recent research. Current research recognizes the fact that pain is very complex and can have many different characteristics and origins. (Dillard et al., 2005) Patients can have "nocioceptive pain arising from visceral organs or capsules or from obstruction of a hollow viscus causing intermittent, poorly localized pain." (Dillard et al., 2005, p 530) Since pain is a costly healthcare problem and accounts for 21% of all emergency room visits and 25% of days lost at work (Gureje et al. in Dillard et al. 2005 p 530), it is of the utmost importance that we study its pathways, complexities and other measures for treatment.

Peer Reviewed Research Supporting Visceral Manipulation

Evidence based practice requires a framework for ranking research. The New York Down State Medical Center provides one good example of this ranking among an estimated 100 different evidence based frameworks. It is provided here because it demonstrates the hierarchy of evidence. Clinical research is a building process with more complex clinical research built on evidence from less complex or other kinds of work. Research within different areas of a discipline progress and develop at different rates. Some areas are at a point where systematic reviews are feasible while other areas of research involve relatively small numbers of researchers because the specific area of investigation is new; or it involves new concepts or new relationships which require case control or case series reports in order to build enough evidence to design and conduct randomized clinical trials. No Human Subject Review Board would permit a randomized clinical trial without evidence from the literature to support the hypotheses driving the experimental intervention. This sequence in development of disciplinary knowledge involves both quantitative and qualitative research. It also holds across clinical disciplines including Physical Therapy.

1. Systematic Reviews
2. Meta-analysis
3. Randomized Control Trial
4. Cohort Studies
5. Case Control Studies
6. Case Series/Case Reports
7. Ideas, Editorials, Opinions
8. Animal Studies

Research cannot always be conducted using randomized double blind clinical trials although this is considered the gold standard for clinical work. Ethics, harmful side effects, new concepts introduced to the discipline that have not been defined, developed, and fully measured; access to participants; and issues of funding all can and do limit the type of research being done. In addition, qualitative peer reviewed research does not utilize randomized studies. The philosophical and methodological approach of different qualitative researchers is based on a completely different inquiry paradigm - that of the lived experience and fieldwork based on the individuals experiencing the situation. Ethnography, Grounded Theory, Phenomenology, and Hermeneutics are all well established qualitative approaches with extensive peer reviewed published articles in the literature for multiple different disciplines researching the meaning, impact, and experience of health care should one wish to pursue them.

The point for Physical Therapy is this: qualitative research is important as well. The challenge of attending to the process of qualitative research as both an art and science requires “integration and innovation often taking knowledge into new directions outside the disciplinary box”. (Holloway et al. 2007) In the University of New Mexico Health Sciences Center there are multiple qualitative research studies in different disciplines (nursing, OT and medicine) funded by the National Institutes of Health.

Interdisciplinary research certainly supports manual therapy including the visceral and fascial work. Visceral Manipulation must be included as a critical body system to evaluate, treat, and educate our patient. Hedley (2009 DVD Viscera and their fasciae) elaborates “the rib basket is defined by the peritoneal relationships and the organs move around inside the visceral spaces”.

Jean-Pierre Barral states so eloquently in the forward to Schwind's book *Fascial and Membrane Technique* (2006) "that every aspect of the organism is important and we must not neglect a single one of its elements". Thomas Myers articulates beautifully in the same forward in *Manipulative Therapy* "nothing is subtracted but strain, and nothing is added but information".

Visceral Manipulation and manual therapy are relatively new PT modalities in the United States having been introduced here only within the past 25 years. Perhaps one of the reasons why more clinical research is not done in this area is because to master any skill takes years of study, practice, patience, mentorship, and persistence. The number of practitioners in the field of manual therapy may be small in comparison to the number of therapists in other areas of Physical Therapy; and it takes time to build clinical expertise, so research and more appropriate treatments can be offered to patients. It also takes time and established programs of research before new paradigms for Physical Therapy are developed based on approaches like manual therapy.

Much of the initial research and clinical work in manual and visceral therapy has been done in Europe and the lag between European research and U.S. research for specific areas of research and clinical treatments is not unknown. For example, lumpectomy for breast cancer was an accepted treatment in Europe while radical mastectomy or modified radical mastectomy surgery procedures were still the standard surgery for breast cancer in the United States. Today lumpectomy is a standard tissue saving procedure in the United States.

Today there is increasing research interest in these areas within the United States. Interest in fascial research with clinical applications, such as Visceral Manipulation, has increased rapidly in recent years. As a result of the First International Fascial Congress held at Harvard Medical School in October 2007; the conference proceedings were published to "organize relevant information for scientists involved in the research of the body's connective tissue matrix (fascia) as well as professionals involved in the therapeutic manipulation of this body-wide structural fabric".

Jacques-Marie Michallet – *Kidney Mobilization and Ultrasound* thesis experimental protocol of 25 patients with various medical diagnoses, clearly demonstrated that in 23 out of 25 cases, the kidney mobility measured before and after Visceral Manipulation via ultrasound had improved. Outcomes were independently measured by Serge Cohen MD (radiologist) who performed the measurements using ultrasound. This work was presented as part of a book chapter (Barral, 1989 p 227-245). In addition to the 23 cases that showed improvement in this study there were two remaining cases where kidney mobility did not improve. Jacques-Marie Michallet (in Barral, 1989, p.245) states that there was a diagnostic error for one of the two cases that did not improve. This patient should have been excluded from the study for not meeting sample selection criteria. In the second case that did not show improvement, the kidney was totally fixed in the iliac fossa. The results of this study support the author's hypothesis that visceral mobility is a real phenomenon and can be positively influenced by manipulation. Other reported outcomes included the disappearance of the study patients' presenting symptoms such as low back, thoracolumbar, atypical knee pain, and recurrent cystitis.

Nemett, D.R. et al. (2008) clearly demonstrate significant improvements in dysfunctional voiding in a pediatric population (N= 21) when the patients received manual physical therapy with an osteopathic approach (MPT-OA) compared to a similar group of pediatric patients receiving the standard treatment protocol. The manual physical therapy techniques utilized were

cranial, dural, visceral, vascular and lymphatic. Standard treatments included urology visits that included medications, establishment of timed voiding and evacuation schedules, dietary modifications, behavior modifications, pelvic floor retraining, biofeedback training, and treatment of constipation.

Nemett, D.R. et al. (2008) concluded the improvement in dysfunctional voiding in the treatment group who received MPT-OA was due to several factors including improvement in normal alignment and mobility. The authors reported that the somatovisceral relationships are another potential mechanism for improving dysfunctional voiding symptoms since these systems are intimately connected neurologically. Treatment outcomes were measured by portable bladder ultrasound or during a VCUG procedure. Furthermore, MPT-OA did not have any deleterious effects and in all cases it improved postural alignment and flexibility. Nemett et al. (2008) concluded the MPT-OA with standard-care treatments in dysfunctional voiding to have significant improvements in short-term outcomes of the children who participated in this study. The authors further stated “the traditional research methodology can be successfully used to rigorously evaluate the effectiveness of non-mainstream treatment approaches, resulting in evidence for new clinical paradigms”. Nemett et al. support a multi-center randomized controlled trial of MPT-OA in children with dysfunctional voiding.

A study by Wurn, B.F. et al. (2008) supports manual pelvic Physical Therapy as an adjuvant non-invasive procedure in addition to standard gynecological procedures in treating tubal occlusion. In their retrospective analysis of 28 infertile women, Wurn et al. (2008) used manual palpation of the abdominopelvic region to evaluate which abdominopelvic areas demonstrated decreased mobility. They utilized manual soft tissue techniques to access a variety of restricted areas including visceral, myofascial, and ligamentous structures. For the visceral tissues, the authors utilized their palpation skills to access restrictions in the peritoneum, uterine and ovarian ligaments, and neighboring structures.

Seventeen of the 28 patients revealed unilateral or bilateral patency as empirically measured by hysterosalpingography or natural intrauterine pregnancy post-treatment. Nine of the 17 patients reported a subsequent natural intrauterine pregnancy.

Diamond et al. (2001) state adhesions (e.g. infections, chemical irritation, surgery, endometriosis that disrupt the peritoneum and produce inflammation) remain a clinically relevant problem and in nearly every compartment in the body. Barral (2007) states “abdominal scars whether surgical, traumatic, or infectious origin, contribute to the destabilization of good visceral disposition”. Diamond et al. (2001) report “adhesions which are prevalent in all surgical fields can lead to impaired organ functioning, decreased fertility, bowel obstruction, difficult re-operation, possibly pain, and extraordinary financial sequelae. Even when adhesions are lysed they still have a propensity to reform” (Diamond et al. 2001, p.567). Kresch et al. (in Diamond et al., 2001, p 572) state adhesions can produce pain by restricting pelvic organs or placing them under tension. Diamond et al. (2001) conclude it is important in the future to reduce adhesions but also to prevent adhesions.

Binnebosel et al. (2008) collected tissue specimens from 40 patients undergoing laparotomy. Tissue samples were evaluated using cross-polarization microscopy (CPM) by 2 independent blinded observers. The maturity range of the adhesions ranged from .5 months to 20 years with a median of 18 months. Eighteen of the 40 patients had one, 4 out of 40 had 2 and 18 out of 40 had more than 2 previous abdominal and/or pelvic surgeries. The findings revealed “even in mature

surgical adhesions the distinct cellular components as well as the extracellular matrix proteins may reflect an interactive cross talk between adhesion and stroma derived cells as a consequence of a permanent process of disturbed remodeling” (Binnebosel et al. 2008, p.59). Like Diamond et al. (2001), Herrick et al.; Liakakos et al.; Menzies et al.; and Monk et al. as cited in Binnebosel et al., 2008, p. 59) conclude that “adhesions create a lifetime risk for the development of potentially relevant complications as small bowel obstruction, chronic abdominal pain or female infertility”.

In another study, Johannes Mayer et al. (2007) treated 40 patients with scars and chronic pain patterns from 2004-2007 using various treatment techniques based on a osteopathic classification system of local, regional, or complex dysfunctions. These scars were related to accidents, surgeries, and radiation. In severe cases, the authors found impairments in multiple body functions, not just in the scar area.

In local dysfunctions, Johannes Mayer et al. (2007) used various myofascial treatment approaches. In regional dysfunctions, the various somatic-somatic, somato-visceral, viscerosomatic, and viscerovisceral pathways were evaluated and treated. In complex dysfunctions, Mayer et al. (2007) evaluated and treated myofascial chains, lymphatic congestion, visceral connections, cranio-sacral components, shock/trauma reactions, and emotional fixations. Mayer reports “in the treating of scars, it is important to find the hierarchy of dysfunctions - this means localizing the most important strain in the body”. He further explains, ” to improve the situation of complex scarring is to treat complex patterns in the body and to bring fluids into the scar area”.

Patients received 6 total treatments. Four treatments were done within a 2-week period, one follow-up treatment after 3 months and one after 6 months. After 6 treatments, the patient’s pain ratings decreased, daily activities improved, and depression scores fell. Mobility of joints and spine function also improved. Mayer et al. (2007) concluded that osteopathic scar treatment is effective in patients with chronic pain patterns and impaired mobility. The authors also stated the importance of demonstrating the systematic effect of osteopathic scar treatment.

Wetzler (1994) concluded in a retrospective clinical study referencing 90 charts using a systematic chart review by selecting every third chart between 1989 and 1991 with a diagnosis of low back spinal dysfunction that low back pain can be associated with the visceral system. Wetzler (1994) concluded longer pain relief was noted with Visceral Manipulation than without Visceral Manipulation when low back pain in these patients was evaluated after a 3-month period of treatment. Chart review also indicated spinal range of motion and strength was also positively influenced by Visceral Manipulation.

Additional peer-reviewed European research articles are available in German, French, and Polish if needed.

Today in New Mexico there is a thriving practice in manual therapy with patients willing to pay out-of-pocket, if necessary, for this therapy. While insurance companies reimburse New Mexico physical therapists for this treatment, it is also a fact that uninsured patients or patients that have used up their allotted amount of PT reimbursement can and consistently do pay out of pocket for this specific type of manual PT. This indicates their own perspective on the clinical effectiveness of manual therapy - including Visceral Manipulation: the key point is this—it works and patients are willing to pay for it.

Learning the visceral anatomy and system of evaluation and treatment is an integral part of musculoskeletal assessment in Physical Therapy. These Visceral Manipulation skills have added great depth to my manual therapy skills during the past 25 years since Visceral Manipulation has been practiced in the United States. Physical Therapists are in a unique position to offer the visceral work based on their educational training, variety of evaluation and treatment skills, and access to diverse patient populations.

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