A STRUCTURAL INTEGRATOR'S REFLECTIONS

ON THE 2015 FASCIA RESEARCH CONGRESS

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Abstract

The Fascia Research Congress attracts leading fascia scientists from around the world. The 2015 event held in Reston, VA September 15-17, 2015, included several dozen presentations. The author reports on the findings presented and draws her own conclusions about how they may affect the practice of Structural Integration.

Introduction

Fascia has been fundamental to this Structural Integrator's viewpoint. It is the lens through which I view my clients' structure, and much of my continuing education has involved extending my knowledge of fascia beyond the muscular system to investigate the interfaces of myoskeletal fascia and the fascia of the nervous and circulatory systems. I have had the pleasure of attending three of the four Fascia Research Congresses, including the fourth international Fascial Research Congress (FRC) held in Reston, VA September 15-17, 2015. It was attended by nearly 800 people from six continents, including a few dozen Structural Integrators.

Although the FRC does not benefit my practice with new techniques or hands-on practice, it does help me to think scientifically, to question the assumptions of what Structural Integration (SI) does, to clarify my intentions, to step back from making unsubstantiated claims about my work, to inspire my professional creativity, and to view the context of SI within a broader framework. The FRC never disappoints in speakers who challenge assumptions.

Dr. Rolf called fascia the "organ of support" (Rolf, 1989, p. 37). She noted that this tissue is continuous through the body, transmits strain from one area to another, and creates environments of tone and span. Using the knowledge of fascia at that time, she attributed this transmission to properties of collagen and ground substance. In the decades since, scientists have found that fascia itself and its relationship with the body is multi-faceted, and some of our assumptions about how Structural Integration affects fascia, such as changing collagen alignment, have not been supported by science. This has even led some to question whether we work with fascia at all or if the changes we witness are attributed to some other function of the body. Based on my understanding, it is premature to discount the role of fascia. Until we have more clarity about how SI affects fascia, at the least this substance gives us an improved anatomical map, and at the most, our manipulations to the body create change through fascia which affects the entire system.

The medium of fascia used to be the domain of Structural Integrators and osteopaths. Now massage therapists, Pilates and yoga teachers, and physical therapists commonly include fascial release techniques, and various fascial techniques have been developed including Fascial Manipulation®, fascial Strain Counterstrain, and fascial taping. The majority of the attendees at the FRC were clinicians, of which SI practitioners represented less than ten percent.

In this article, I will summarize what I learned at the FRC 2015 and list what I believe are the potential implications for Structural Integration. I do not have the background of a fascia scientist nor experience as a clinical researcher. I write this article as a Structural Integrator with a preliminary understanding of the science and the intent to report what I understood from the conference to my colleagues. There are gaps in what I report: gaps in sessions I attended, gaps in what I absorbed, and gaps in my understanding. To fill many of those gaps and to learn from a fascia scientist and Structural Integrator, I highly recommend Tom Findley's articles, Fascia Research from a Clinician/Scientist's Perspective (2011) and Fascia—Current Knowledge and Future Directions in Physiatry (Kwong & Findley, 2014), and also suggest watching his presentation on the Fascia Research Congress recordings.

Nomenclature

A body map of separate parts might work well for orthopedic surgeons, but for those of us who work with a holistic view of each client, a more interconnected representation is needed to make assessments and communicate about the functionality of the body. Because fascia science is still in its infancy, there has not yet been general agreement on fascial anatomy nomenclature.

However, a working group met the day before FRC 2015 and agreed on a two-part (anatomical and functional) definition method:

1. Anatomical findings that refer to sheaths, sheets, and dissectable aggregations of connective tissue will be restrictive to comply with the Terminologia Anatomica. This will help professionals communicate with each other, for example, in surgery reports.

2. The group also noted that it is difficult to distinguish fascia from tendons and other connective tissue structures in clinical practice. Therefore, a second way of referring to fascia will be used for functional findings that recognize the interconnectedness of this tissue. An example I

often give my clients with hamstring pain is that the epimysium of the hamstrings, the tendon of the hamstrings, and the sacrotuberous ligament have individual names, but they are a continuous sheath of connective tissue. In addition, these layers are connected by fibrils to surrounding layers. Perhaps Tom Myers' Anatomy Train nomenclature will be adopted by a larger community as part of a larger framework of fascial definition.

SI practitioners who have an anatomical focus are well served to become versed in terminology, so we can communicate with each other, inside our profession, as in our trainings and continuing education classes, as well as with other professionals. Having a clear understanding of what is under our hands is also necessary to be clear of our intentions.

Knowing the relationship between the fascia of the large intestine and the psoas—parts of the large intestine overlay the fascia covering the anterior part of the psoas—helps me in the core session. I'm often told by clients that my psoas work is intense, but not painful like they have experienced before. I attribute that to knowing when I'm working on the psoas versus the colon and avoiding the ureter that runs through this fascia as well. Carla Stecco's *Functional Atlas of the Human Fascial System* is a great resource to learn fascial anatomy.

After the brief update on the fascial nomenclature committee's progress, the congress proceeded to outline the latest fascial science in plenary sessions that were well-organized into sections that roughly follow the categories listed below.

Nerves and Fascia

The relationship between the nervous system and fascial system was mentioned in several presentations. A variety of research found distinctions in nerve endings that are most prevalent in different fascial layers. Robert Schleip's findings of proprioceptive nerve endings in the fascial layers (2003 and 2006) has been supported by continuing studies that point to the role of fascia as a container for a mechanism of coordination between different body systems. Dr. (Carla) Stecco began discussion of this topic in the Fascia Nomenclature section with a theory that nerves endings in superficial fascia are more related to exteroception, in deep fascia to proprioception, and in epimysium to motor coordination. This viewpoint is starting to be demonstrated in dissection and imaging studies.

Siegfried Mense, MD, PhD from Heidelberg University reported that the thoracolumbar fascia (TLF) in rats and humans was densely innervated and the types of nerve endings varied based upon the layer. The majority of sensory nerve endings were found in the superficial and middle layers (he called these layers the sliding layers) and a type of nociceptive nerve known as SP-positive (which reacts to a neuropeptide called substance P and plays a pivotal role in the interpretation of pain) were found exclusively within these subcutaneous layers, except in inflamed TLF where they were also found within the deeper layer. They also found that 40% of the nerve endings in the TLF are sympathetic; some, around blood vessels, are related to ischemia and inflammation. Elastic fibers were found only in the deep layer (Tesarz, Hoheisel, Wiedenhöfer, & Mense, 2011).

SI Implications

What I take away from this information is that it is important to address the superficial sliding layer so this entire layer is free to glide over the underlying loose connective tissue, but to not expect the superficial layer to be elastic in itself. For me, it gives credence to the standard SI protocol of addressing the superficial layers first. It also underscores the need to avoid disturbing restricted nerve endings in the layer under the skin to get to deeper layers. My first goal is to facilitate healthy glide in the loose connective tissue between the superficial fascia and the layer over the muscles.

In her paper in the IASI 2013 Yearbook of Structural Integration, Caryn Davidson Pierce refers to fascia as a "proprioceptive blanket that surrounds and protects vital structures by providing sensory input that not only controls tension in the fascia but recruits skeletal muscle to prevent overstretching or strain . . . " (Pierce, 2013, p. 87). This analogy is supported by the findings of nerve endings in fascia. The idea that certain types of nerve endings are found in different layers could explain how the proprioceptive blanket functions. While science is refining this concept, I have changed my outlook from fascia as a substance that needs to be stretched, to a series of layers that communicate information through the nervous system based on organization.

Mense's team's research also found that nerve impulses which occur in these layers can run opposite of the normal direction (antidromic potentials). When that happens, biochemicals are released that create neurogenic inflammation. Also, a painful lesion can create facilitated nerve input from surrounding tissues that can contribute to neuroplastic changes in the spine.

Robert Schleip, PhD and Certified Rolfer™, leads the Fascia Research Project at Ulm University. His presentation reviewed numerous studies and confirmed some points covered by Dr. Mense; particularly, the number of sympathetic nerve endings in superficial fascia. He reported on research which showed: of the 4,200 axons in gascroc-soleus fascia, 40% were sympathetic, 40% sensory (most unmyelinated), and 17% motor. Other research has found fascial bands that transmit force have low/poor proprioceptive innervation, and there is high innervation in retinacula.

Dr. Schleip also reported on the inverse relationship between proprioception and nociception and the architectural difference in the thoracolumbar fascia (TLF) in patients with chronic low back pain, specifically that the superficial layers of the TLF don't slide as well in these patients. He also reported increased adhesions in superficial fascial layers with age, which decreases proprioception. He said that this decreased proprioception is related less to position control (where the body is in space, i.e., posture) and more to acceleration and deceleration and the regulation of speed and rhythm (such as in walking). These effects on movement have important implications for balance and falling.

SI Implications

This has changed my frame of reference when working with retinacula to focus my attention to stimulating nerve endings as much as creating freedom for structures to glide underneath. SI work at retinacula is most often accompanied by client movement (and even passive movement, which comes naturally when freeing this area with attention to hinging at the joint). Client movement is an important indicator of effectiveness. We often see that the client is better able to control speed and rhythm of movement—dorsi and plantar flexion in the case of the ankle retinaculum—as a session progresses. The mechanism behind the improved fascial glide that we observe in sessions may be due to improved nerve reception rather than, or perhaps in addition to, changes in collagen and ground substance. I think of this as a chicken-and-the-egg situation: fascial glide between layers, improved nerve reception, and aligned movement all go together; to me, it doesn't matter much what comes first.

Fascia and Biomechanics

The presentation I remember most from the first FRC in Boston was research that showed the fascia lata is not merely a covering of a thigh; rather, it plays a role in the coordination of thigh muscles through compartmental pressure when muscles contract (Fourie, 2007). Over the years, additional research has shown there is some effect on range of motion and coordination of movement through the relationship between muscles, the fascia that envelopes them (epimysium), the fascia that interconnects muscles, and other fascial structures.

Can Yucesoy, Ph.D. from Boğaziçi University in Istanbul, sharing information from two studies with which he was involved, demonstrated the interrelationship of fascia and muscles systems. One study used Kinesio Tape and MRI (Pamuk & Yucesoy, 2015) and the other employed botulinum toxin type A (BTX-A, more commonly known as botox) (Ates & Yucesoy, 2013). In the Kinesio Tape study, tape was applied to the skin over a targeted muscle, which sustained a stretch on the skin and fascia in this area. They found deformation in the target muscle and also, to a lesser degree, in the non-targeted, surrounding muscles. The botox study had similar findings in surrounding muscles. In both studies, they found that a muscle's contribution to joint range of motion (ROM) depends on the mechanics of other muscles, which is coordinated through the epimysium.

SI Implications

If Kinesio Taping a muscle creates change in surrounding muscles, then our work may have the same effect, particularly if we engage client movement during the process. In past sessions, I have noticed that pressure on a hypertonic muscle with client movement often inhibits the muscle under my pressure, which can cause surrounding muscles to become more active (similar to the BTX-A study findings). Although we engage the fascia over a muscle for only a couple of minutes during a session and Kinesio Tape is affecting a pull for hours, when the client is engaged in movement in the session, I believe that her system has a chance to adopt the changes more actively. As a result, I am using even more client active movement participation in sessions to explore the results. In addition, in the core sessions, when I am trying to facilitate improved core muscle engagement, I focus more of my attention on the pulls through the epimysial layer.

In a very interesting experiment that looked at force transmission, Dr. Huijing from Vjrei University in Amsterdam did tendon transfer surgery on rats (Maas & Huijing, 2012). They moved the insertion of the flexor carpi ulnaris to the distal tendons of extensor carpi radialis brevis and longus muscles, a model similar to surgeries done for humans with tetraplegia and spastic cerebral palsy. After the surgeries, the rats were fairly quickly able to run with only moderate compensation, which the authors attribute to force transmission through fascial links. One thing the researchers noted is that the length of the muscle belly decreased and the length of the tendon increased, which Dr. Huijing presumed was an adaptation to facilitate force transmission.

SI Implications

One premise of Structural Integration is that the body's three-dimensional net adapts to tension and stress, and while these compensations work in the short-term, they can create strain and dysfunction in the long-term. Maas and Huijing's research shows that the first portion of this premise—the fascial net is adaptable—holds merit. As a side note, I think it is interesting that the video of the rat running post-surgery looked like nearly-normal running to the majority of the FRC audience, but the SI practitioners I spoke with at the congress, even those with average visual observation skills like myself, clearly saw the adaptation.

Thoracolumbar Fascia and Lateral Raphe

Dr. Andry Vleeming of Ghent Medical University, Belgium and University of New England, Maine presented on the functional coupling of deep abdominals and paraspinal muscles through the thoracolumbar fascia (TLF). He has co-authored two significant papers on this subject, both based on review of previous research and new experiments to determine how load is transferred. The first paper gives a detailed analysis of the TLF, accentuated by excellent drawings (Willard, Vleeming, Schuenke, Danneels, & Schleip, 2012). The second refines how load is transferred and reports a new discovery about the lateral raphe (Vleeming, Schuenke, Danneels, & Willard, 2014).

Based on previous research, it was thought the TvA transferred force through the middle layer of the TLF to the transverse processes. Instead, it was found TvA contraction pulls on the posterior layer of the TLF to a reticular, cylindrical compartment around the paraspinals. The different layers of the TLF create a vertical, triangular column at the lateral raphe, called the Lumbar Interfascial Triangle (LIFT), which transfers force between spinal and abdominal muscles. Also, the different layers of the TLF become a thick composite at L5-S1 and attach to the posterior superior iliac spines and sacrotuberous ligaments. This structure is important in force closure of the sacroiliac joints. Dr. Vleeming spoke about the three parts of the TvA (upper, middle, and lower part) that create a fascial belt; to provide support to the paraspinals, at least two sections must engage.

SI Implications

The lateral raphe has been a key point in my work since my initial training, as I was taught this structure is a fascial junction linking lattisimus dorsi, transverse abdominus, obliques, and erector spinae. In fact, I have frequently found that excess density in the lateral raphe and/or unequal tension from the erectors or the abdominal components is common in clients who complain of back pain. Knowing now that this structure is not a two-dimensional sheet, but a three-dimensional triangular column improves my ability to facilitate function in this area. In addition to feeling for the consistency in tone and gliding potential of the TLF, I assess the lateral raphe (or LIFT) as well. In several parts of the series, it has become a prominent focus of session-ending back work. In addition to using the backs of my hands to engage the larger layers in finishing work, I also use my fingertips at the lateral raphe (LIFT) and ask for client movement that facilitates even tone in this structure.

Also, as trained a yoga teacher, I include education about engaging the TvA on the exhale for my clients, and have been at a loss as to why this did not seem to help some people. Since I began teaching clients how to engage all three components of the TvA, I found many clients were missing awareness in one or two pieces of it. This new awareness allowed them to begin to engage the pelvic, lumbar, and rib sections together to create greater support for the lumbar spine and pelvis. Like knowing that the pelvic floor isn't one muscle, but six, just knowing that the TvA has three parts to engage adds new dimension to what clients have been taught about engaging their cores.

Biomechanics and Nerves

In addition to the plenary sessions, there were several concurrent sessions. I elected to attend the sessions on surgery. The most fascinating speaker in this segment, in my opinion, was Professor Millesi, a surgeon from Vienna who specializes in peripheral nerves and is also an associate professor at the University of Beijing. He spoke about the dynamics of soft tissue and emphasized the importance of maintaining glide between fascial layers. Without this glide, he said, voluntary, involuntary, unconscious, and passive movements are restricted, and those restrictions extend beyond the myofascial layers to other structures. Dr. Millesi gave examples of how neural fascia must also be adaptable:

- The epineurium must allow the nerve to change shape and volume. For example, the ulnar nerve has a 20% excursion and must be able to elongate and narrow, or also shorten and thicken, depending on the movement. This requires flexibility in the fascial covering of the nerve (the epineurium, equivalent to the epiomysium) as well as the surrounding myofascia.
- The radial nerve must be able to turn 360° around the head of the humerus, a movement requiring a flexible epineurium.

Based on his research, he recommends that surgeons use transverse, curving, or zigzag incisions to facilitate glide in fascial tissues.
Maribel Miguel, MD, PhD from University of Barcelona, Spain presented findings from a study that looked at nerves in fascia using ultrasound, dissection, dye diffusion, and histology (Miguel, et al, 2015). Her team found the nerves ran through different fascial planes to reach the structures they innervate. For example, the radial nerve ran on a plane between epimysium and periosteum **and also** between deep and superficial fascia. Other planes noted were intraperimysial (musculocutaneous nerve through the perimysium of the coracobrachialis muscle) and interepimysial (musculocutaneous nerves).

SI Implications

This information about how nerves exist within the fascia allows me to have a clearer intention: to free the pathways of nerves. Having more knowledge about these pathways, and the fact that myofascia and neurofascia must be able to adapt to allow the nerves as well as the muscles to change shape, helps define the nature of my touch and inclusion of client movement in sessions. And it has further sparked my interest in learning neuroanatomy. What I have already learned from Kirstin Schumaker and Jonathan Martine has greatly improved my ability to create the glide I look for in a session. I also spend more time paying attention to the nerves when looking at and reading anatomy texts.

Mechanotransduction and Fascia

Force loading is not just a matter of mechanics. Force on tissues creates changes in biology in a process called mechanotransduction. Ingber's research presented at 2007 FRC showed that force on tissues affects the cytoskeleton of fibroblasts all the way into the cell nucleus, which affects gene expression (Ingber, 2008). Other research has shown that biochemicals such as growth hormones and inflammatory compounds are secreted by cells based on force loading (Eagan, Metzler, & Standley, 2007; Langevin, 2008; Chiquet, Gelman, Lutz, & Maier, 2009). In this congress, a study was presented about the effects of hyaluronan, which also may be affected by force loading.

Information about the role of hyaluronan on spasticity in stroke victims was presented by Preeti Raghavan, MD, physician-scientist and professor from NYU Langone's Rusk Rehabilitation. Hyaluronic acid (HA), glycosaminoglycans, and adipose cells are the main components of extracellular matrix (ECM), with HA being the chief component, per Dr. Raghavan. Fasciacytes produce hyaluronic acid, and these molecules contribute to muscle and tissue sliding by their viscosity, but when these molecules are too concentrated, the ECM becomes even more viscous, which inhibits movement, and can be perceived or interpreted as stiffness (Stecco et al., 2011).

Spasticity increases the tonic stretch reflex and hyper-excitability of the stretch reflex. Additionally, spasticity correlates with lack of individuation in muscle control. In research that looked at connective tissue's relationship to spasticity following central nervous system (CNS) injury, the authors found a cycle of stiffness composed of increased viscosity of the ECM, increased spasticity due to changed reflexes, and increased fibrosis due to excess collagen in the tissues along with muscle stiffness (Stecco, Stecco, & Raghavan, 2014). Because spasticity increases following stroke, Dr. Raghavan theorizes that immobility following stroke is not only due to CNS injury, but also to changes in the connective tissues. Follow up research will look into whether injections of hyaluronidase can affect the densification.

SI Implications

What I learned from this study is that interrupting the cycle of connective tissue densification has the potential to reduce spasticity. It also confirms my belief that immobility is a major factor in tissue change, and it is in every client's best interest to move more. Even though only one of my clients has *had a stroke, the rest still suffer from some degree of densification and some have a level of spasticity, even if minor. Whatever I can do to facilitate movement will help, whether a client has had a stroke or not. Also, for Structural Integrators involved in research, it would be interesting to use the study protocol that Dr. Raghavan's team is using to determine if manual therapy can decrease tissue density as well as injections.*

Fascia and Pain

Though Structural Integration is a holistic process for overall body re-patterning rather than an area-specific or medical treatment, many clients come to us because they are in pain. Indeed, SI can be effective in relieving pain, and understanding pain better can help us be of service to these clients even when treating pain is not our primary objective.

Andreas Schilder is on the medical faculty at the University of Heidelberg. His team injected hyperdermic saline into fascia, muscle, and skin and found that injections into fascia created longer lasting pain than injections into muscle, based on subject reports (Schilder, Hoheisel, Magerl, Benrath, Klein, & Treede, 2014). Fascial pain was not due to distention. Patients in the study reported the following sensations based on whether the aggravation was coming from fascia, muscle, or both:

Hot	Beating	Dull
Stinging	Throbbing	
Scalding		

SI Implications

Empowering clients who have pain is one of our most effective tools. I have found education to be the most empowering tool. Based on a client's sensations, we can draw some conclusions about what tissue could be triggering the pain. That knowledge itself is a kind of power and also gives us the opportunity to reframe a pain story. A client who comes in with searing pain in the low back often believes a disc is pinching a nerve to cause that pain. But based on this study, I can offer my clients the possibility that the pain sensations might be based on signals coming from nerves in the thoracolumbar fascia rather than from a pinched disc. This possibility is often comforting to clients.

In the second round of concurrent sessions, I elected to attend the low back pain and lumbar fascia segment that included presentations from clinical researchers. Studies on Structural Integration were not presented here (although Sharon Wheeler, Karen Price, and Eric Jacobson did present in other segments), but the protocols and findings in the programs below give food for thought about what might be studied in research using SI as an intervention:

- •A study using the MELT method (a fascial therapy using soft balls) showed decreased fascial thickness, measured by ultrasound, and signs of increased flexibility, but no effect on fascial stiffness and elasticity. (Sanjana, Chaundhry, & Findley, 2015).
- •A preliminary study on yoga showed decreased pain and improved range of motion, but what impressed me most was the vast variety of measures used including nociception, body listening, and trusting. These are important skills that SI practitioners can help our clients develop (Corey et al., 2015).
- •Another study that used physical therapy and myofascial release techniques found no significance in pain sensitivity, but did find that myofascial release and heart rate variability do effect flexibility (Gordon et al, 2015).
- •A physical therapist from Portugal presented findings from yet another study which showed that participants had improvement in postural and modulating neuromuscular control after a 20-minute, four-exercise Pilates session (Lopes, 2015).

SI Implications

Treatments don't always affect the measures that we believe they will. In the Gordon study, either the myofascial release, or change in heart rate variability, or the combination of both could have affected flexibility. It is by subjecting a treatment to the scientific process that we can determine if the things we assume about our work are true. By following research studies such as these, I can make informed decisions about what approaches to include in my sessions. Based on the MELT study, I infer that Structural Integration may not necessarily affect fascial elasticity, although it may improve flexibility. Movement forms such as yoga and Pilates appear to have good effects on overall body movements, which leads me to conclude that the time I spend with clients on SI movement lessons may deserve more of the credit for results than the time clients spend on the table.

Fascial Diagnostics

Measurement is at the heart of scientific inquiry and it is particularly problematic in a field as subjective as Structural Integration. Because measures vary widely, from "How level is that pelvis?" to "Ease in movement," it can be tempting to disregard the issue of measurement all together. Fascia science is not exempt from these ambiguities. Accordingly, a section of the FRC was devoted to imaging and measurement technologies.

Trigger Points

The theory and evidence of myofascial pain syndromes caused by myofascial trigger points (MTrPs) have been called "inventions that have no scientific basis" (Quinter, Bove, & Cohen, 2015, p. 392). Many scientists think that pain syndromes, including those from trigger points, are produced by the nervous system, not by muscles or fascia. I was pleased to hear a presentation on trigger points to get further information on this controversy. Using greyscale ultrasound, Siddhartha Sikdar, PhD, associate professor at George Mason University, did research to determine whether trigger points were simply ultrasound "shadows" or if they corresponded to physiological processes in the body. He found myofascial trigger points were located near significant blood vessels, and blood flow was altered near active MTrP (Sikdar et al., 2009). They also found that sometimes blood flow was retrograde in diastolic and increased in systolic flow.

SI Implications

I have found it useful to be aware of trigger points in my practice, as stiffness in the tissues and client aversion to pain from them often interferes with achieving session goals. If I can relieve the points quickly, I find that clients are better able to feel and hold the effects of the session. I already knew that many trigger points have close proximity to nerve bundles, such as the ubiquitous trapezius trigger point near the supraclavicular nerve. But realizing that there may also be a blood vessel component gives me another layer of distinction that I can try to affect.

Fascia Science and Science in General

Attending a scientific conference is different than attending a typical continuing education workshop. The scientific method underpins the very fabric, or matrix if you will, of the event, and the attention to thought processes throughout can make it quite cerebral. (Although several movement practitioners led the group in movements between presentations.) Dr. Jean Claude Guimberteau, a hand surgeon, presented video of internal movement of fascia layers. Starting his plenary presentation with a caution to us all, "You can never be sure of what you think," he relayed his own paradigm shift which changed his understanding from a cylinder model of tendons to one that reflected what he saw during surgery and what he demonstrated in his videos: high-density connective tissue everywhere that does not separate into distinct structures. Contrary to what he was taught about connective tissue in medical school, Dr. Guimberteau has found, “It’s not nothing. It’s everything. . . . It’s an essential tissue.”

While performing surgery, Dr. Guimberteau noticed different movements in separate layers and first hypothesized that some fibers were used in flexion and others in extension. After further study, he did not find that to be the case. His new proposal: With repetitive strain, connective tissue transforms into a megavacuole, which is a slow adaptation of multi-fibular network. A megavacuole was seen as an empty space in the videos, a place devoid of microfibrils, a place devoid of connectivity.

SI Implications

First and foremost, Dr. Guimberteau’s call to challenge assumptions stays with me. I do not find these questions heretical; rather, I find them essential to staying in the open-minded field of attention during which Structural Integration work seems most effective. By staying aware and open to what is happening in my client and in the interaction, changes become increasingly available.

And, of course, the videos shown by Dr. Guimberteau give image to what might be happening under our hands and elbows: fibers arranging themselves in response to tension on the tissue. The idea of a vacuole or megavacuole being created by repetitive strain gives me another image to work with. A void in the connective tissue would limit adaptation. Working the edges of the vacuole to introduce additional fiber engagement could potentially reduce strain on the tissues and over time spread the tension throughout a broader section of tissue.

Jaap van der Wal trained as a medical doctor and is a retired associate professor of anatomy. His viewpoint coincides with the holistic nature of many modalities, including Structural Integration. For example:

- Embryology never stops. We are a process, not an object.
- Every form comes out of motion.
- Parts come out of the organisms, not the other way around. (i.e., the organism doesn’t come from the parts.)
- Fascia is a how, not a what. Rather than studying the *what* of force transmission and gliding, it is more useful to consider the *how* of force transmission and gliding.

He also presented some applicable anatomical nuggets:

- Ligaments are not parallel to and separate from muscles, but are connected through the fascial net and work together in series.
- Mechanoreceptors are organized by the architecture of connective tissue.

SI Implications

In my training, great emphasis was given to the process of Structural Integration. I learned the sequence of objectives and making space and time for change to happen are more important than any set of techniques or strokes or formula. However, in the daily activities of my office, it is easy for me to fall into a groove of techniques and strokes and formula. In general, thinking of my work as a method to support continuation of the embryological process has provided a quantum leap for me. Specifically, considering how good architecture in the connective tissue helps my clients find more graceful ways to move has helped me to skip a few steps in my thinking. It used to be, “If I can free the retinaculum and balance flexion and extension across the joint, then the ankle can move and set up better mechanics for the knee and hip.” Now my intention seems more integrative, “If I place my hands here and encourage movement in the tissue in this way, the fascial matrix will flow from ankle to hip better.” A bit of client movement on the table is all it takes to verify or disprove my hypothesis, and facilitate the change. Instead of thinking of how the parts combine to make the whole, I find my viewpoint to be how the whole is organized by the parts.

Fascial Therapies

The FRC was attended by many different practitioners who all believe their work affects fascia. The scientists have always been careful to avoid making leaps from the laboratory to miracle cures in practitioners' offices. It reminds me of my first day as a junior year in high school. After hearing the chemistry teacher explain the syllabus, I asked him when he was going to tell us how chemistry related to what we learned in biology. When was he going to tell us what elements created the molecules that create the cells? I will never forget the look of incredulity on his face as he explained that not only was that not going to be taught in a high school chemistry class, but the PhD programs were (and are) still figuring that out. Science is shedding light on the building blocks of connective tissue and it is also using clinical studies to verify the efficacy of treatments, but there is a wide gap of knowledge that doesn't allow us to connect the two yet.

Serge Gracovetsky, retired professor and author of *The Spinal Engine*, has spoken at each FRC as a voice of reason against wild claims. In his 2015 address, he told us that reviews of Cochrane research library studies have shown that manual treatments are fairly equal to each other and have marginal success in achieving functional or reduced pain outcomes (Gross, et al., 2015; Rubinstein, van Middlekoop, Assendelft, de Boer, & van Tulder, 2011). Despite the type of therapy used, a person's preferred motion will be that which creates minimum stress on the central nervous system.

He also addressed the effect of the gravity field on structure. Fascia is essential in proper loading of the skeleton and to minimize overall energy consumption. An animal must reinforce its skeleton to resist shear forces. In a structural sense, it is preferable to have force act perpendicularly to bone end plates. If the force is not perpendicular, then deformation of bone surface results. Fascia's job is to put force in perpendicular relationship to end plates with little or no force on facets.

Geoffrey Bove, originally trained as a chiropractor and now a neurobiologist professor at the University of New England College of Osteopathic Medicine, continued the topic of how manual therapists cannot make claims about affecting fascia, as research so far has not shown that bodywork affects fascial deformities. He proposed instead that we look at interfaces for potential effects. An interface is a common boundary between adjacent regions or boundaries such as loose connective tissue (LCT) between superficial and deep fascia. For example, in Mary Barbe's RSI study with rats, they found that LCT becomes dense with repetitive strain injuries, but when they were treated at first sign of symptoms, the LCT could return to normal.

Leon Chaitow spoke about therapeutic mechanisms and referred to several studies that link manual treatments to physiological changes. For example, dysfunctional breathing (respiratory alkalosis) reduces pain threshold. Do our clients feel better because they breathe better? Probably. McPartland (2005) found that myofascial release and muscle energy technique, both create shear and stretching, and increase AEA, an essential fatty acid messenger molecule that plays a role in pain and other functions. It has been shown that the direction and amplitude of strain affects fibroblast function, which in turn plays a role in inflammation, pain reception, and range of motion (Standley & Meltzer, 2008) and Bialowski suggests that manual treatments affect neurophysiology (2009). It may be the manual treatments have a roundabout effect rather than a direct effect, and it may be the accumulation of effects.

SI Implications

In other words, we have many theories and little proof. And although studies have found potential mechanisms for manual therapy in general, there is a paucity of evidence for specific manual treatments. Unfortunately, we aren't standing on solid ground when we talk about why our work works. The truth is we don't know. (And neither do the other manual therapists.)

Clinical Implications

Fortunately, Tom Findley, CAR™, MD, PhD, gave the final presentation to help us put into perspective the torrent of information we received. Tom reminded us that A.T. Still, the father of osteopathy, who called himself an anatomy mechanic, identified fascia as an important component of health and injury. His ideas, developed over 100 years ago, started receiving scientific attention in just the past couple of decades. Although the study of fascia is in its infancy, there are compelling reasons to continue to study treatments that address fascia.

The continuity of fibrils from connective tissue to cell and the cell's response to forces through this network, makes it possible to deduce that outside pressure, tension, and shearing affect function on many different levels including biochemistry and mechanics. Compression and shear have different effects on different types of tissues (Chaundhry, Bukjet, Zhiming, Stecco, & Findley, 2014). Dr. Findley suggested the effect of manual therapies on proprioception and locomotion comes from:

- facilitating glide between fascial septa,
- addressing mechanoreceptors at the interfaces between muscle and fascia, and
- working with the muscle and fascia as functional units.

But again, the body is more complicated than a simple case of pressure causing a single chemical to release layers. Pressure is one component of a multi-factor environment. According to research by Reed et al. (2010), cellular tension in fascial fiber network influences fluid flow, which affects the cells—and vice versa. Dr. Findley likened the extra-cellular matrix (ECM) to a sponge wrapped up by the string of fibrils; which means ECM, as well as capillary action, can pump fluids. Rutkowski and Swartz also found that stresses on tissues affect interstitial flow and that fibroblasts orient perpendicularly to this flow (2007). The relationship between components plays a role that we are just beginning to understand. For example, Hocking et al. found that connective tissue releases fibronectin during muscular contraction, which regulates blood flow and vascular tone. The fluid component of fascia, rather than the fibers, may be the source of much change.

SI Implications

The body is a complex, inter-related structure. As connective tissue, fascia inter-relates with the nervous system, with the circulatory system, with the endocrine system, even with gene expression. When we work with the body through the fascial network, we affect all these systems, even if we don't understand exactly how. I find it fascinating to follow the science as it opens my mind to possibilities I never would have considered.

The several cases where organization in the fascia was discussed—fascial forces perpendicular to bone end plates for optimum bone health, endotendon perpendicular to muscle and blood vessels parallel, fibroblasts orienting perpendicularly to interstitial flow—seems relevant to Structural Integration and the information we transmit to the tissue with our intention of aligning on the x, y, and z axes.

It is also a mind-opening experience to have Structural Integration studied as an intervention. The question for me is what measures do we use in studies? Using measures that are reliable and have been used in other studies is helpful. But they may not accurately reflect the entirety of what our work accomplishes. Rather than looking at standard pain scales and flexibility, perhaps results that are more unique to Structural Integration such as body awareness and quality of movement would be more appropriate.

Conclusion

There is considerably more to study about the role of fascia in the body and the way it is affected by different therapies. In the meantime, we can glean valuable information for our practices, but it is too early to draw many conclusions. As a matter of fact, science is a never-ending process. Multiple studies are needed to validate and refine theories. The process requires being continually open to new thought.

Those of us who want to participate in the scientific process will benefit by better understanding our work. We will also benefit the larger community by making Structural Integration better known. Several SI practitioners have already been involved in scientific research and all of them whom I have met remarked how it has helped their practices and personal connection to the work.

To learn more about fascia research, consider joining the Fascia Research Society. You can obtain copies of digital video download of the Fascia Research Congresses and the proceedings book at www.fasciaresearch.org.

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