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Fascia as an organ of Communication

Fascia as an organ of Communication by Robert Schleip



More than twenty years ago, I was involved in a dispute between instructors of the Feldenkrais Method of somatic education and teachers of the Rolfing Method of Structural Integration.

Advocates of the second group had claimed that many postural restrictions are due to pure mechanical adhesions and restrictions within the fascial network, whereas the leading figures of the first group suggested that “it’s all in the brain”, i.e., that most restrictions are due to dysfunctions in sensorimotor

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regulation. They cited a story by Milton Trager, which deals with an old man in a hospital whose body was very stiff and rigid (Trager, 1987). But under anaesthesia his muscle tonus got lowered and he was as limber and soft as a young baby. As soon as his consciousness returned he got stiff and rigid again.

Subsequently, a small 'experiment' was set up involving several representatives of those two schools, in which three patients undergoing orthopaedic knee. I was given a consent to do some passive joint range of motion testing with the 3 patients before and during anaesthesia. With the patient in a supine position I elevated the arms superiorly above the head and noticed the freedom of movement in this direction. With one of the patients, the elbow dropped all the way to the table above the head before the anaesthesia, and this was no different after he lost consciousness. However, with the other 2 patients I could not elevate their elbows all the way in their normal state, i.e. their elbows kept hanging somewhere in the air above the head. Five minutes later, when they had lost consciousness I again elevated their arms above the head and to my surprise, their elbows dropped all the way down to the table – no restrictions whatsoever, they just dropped! Additionally, I dorsiflexed the feet of all 3 patients. Here I could not detect any increased joint mobility during anaesthesia. (I used my subjective comparison only, without any measuring devices).

I must say that I was quite shocked by the result of my tests. From my Rolfer's point of view I had expected that remaining fascial restrictions would prevent the arms dropping all the way under anaesthesia. (I was not surprised by the unchanged mobility of the ankle joint, since none of the 3 patients seemed to have any limitations there that would concern me as a Rolfer). Given the limited scientific rigour of this preliminary investigation, the result nevertheless convinced me that what had been perceived as mechanical tissue fixation may at least be partially due to neuromuscular regulation.

The ongoing interdisciplinary dispute after this event led to a rethinking of traditional concepts of myofascial therapies, and several years later a first neurologically oriented model was published as a proposed explanatory model for the effects of myofascial manipulation (Cottingham 1985), later expanded by many others in the field (Schleip 2003) (Figure 1).

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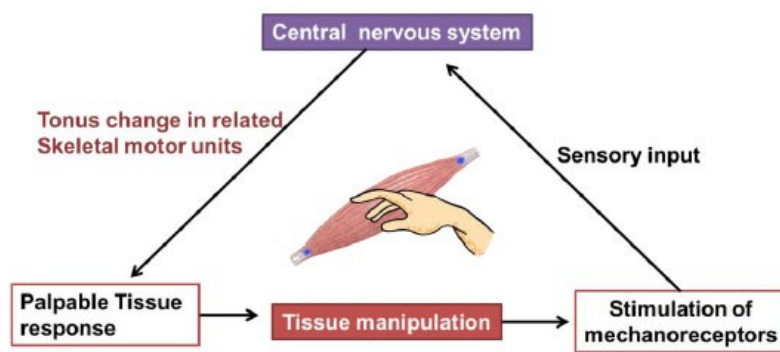


Figure 1. Stimulation of mechanoreceptors leads to a lowered tonus of skeletal motor units, which are mechanically linked to the tissue under the practitioner's hand. The involved intrafascial mechanoreceptors are most likely Ruffini endings, Pacinian corpuscles (with more rapid manipulations), some of the interstitial receptors, and possibly some intrafascial Golgi receptors.

The body-wide network of fascia is assumed to play an essential role in our posture and movement organization. It is frequently referred to as our organ of form. However for decades, ligaments, joint capsules, and other dense fascial tissues have been regarded as mostly inert tissues and have primarily been considered for their mechanical properties. Nonetheless, in the 1990s advances were being made in recognizing the proprioceptive nature of ligaments, which subsequently influenced the guidelines for knee and other joint injury surgeries. Similarly, the fascia has been shown to contribute to the sensorimotor regulation of postural control in standing.

It is now recognized that fascial network is one of our richest sensory organs. The surface area of this network is endowed with millions of endomysial sacs and other membranous pockets with a total surface area that by far surpasses that of the skin or any other body tissues. Interestingly, compared with muscular tissue's innervation with muscle spindles, the fascial element of it is innervated by approximately 6 times as many sensory nerves than its red muscular counterpart. Additionally even the spindle receptors in the muscles are themselves found primarily only in areas with force transfer from muscle to connective tissues. This includes many different types of sensory receptors, including the usually myelinated proprioceptive endings such as Golgi, Pacini, and Ruffini endings, but also a myriad of tiny unmyelinated 'free' nerve

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endings, which are found almost everywhere in fascial tissues, but particularly in periosteum, in endomysial and perimysial layers, and in visceral connective tissues. If we include these smaller fascial nerve endings in our calculation, then the amount of fascial receptors may possibly be equal or even superior to that of the retina, so far considered as the richest sensory human organ. However, for the sensorial relationship with our own body – whether it consists of pure proprioception, nociception or the more visceral interoception – fascia provides definitely our most important perceptual organ.

While fascial stretch therapies and manual fascial therapies often seem to have positive effects on palpatory tissue stiffness as well as on passive joint mobility, it is still unclear which exact physiological processes may be underlying these responses. Some of the potential mechanisms may be due to dynamic changes in water content of the ground substance, to altered link proteins in the matrix, to an altered activity of fascial fibroblasts, as well as other factors. However, today an increasing number of practitioners bases their concepts to some extent on the mechanosensory nature of the fascial net and its assumed ability to respond to skilful stimulation of its various sensory receptors. The question then is: what do we really know about the sensory capacity of fascia? And what specific physiological responses can we expect to elicit in response to stimulation of various fascial receptors?

Fascia has important roles in proprioception, interoception, and nociception. Proprioception is the kinaesthetic sense that enables us to sense the relative position of the parts of the body, posture, balance, and motion. It is usually distinguished from exteroception with pertains to the stimuli that originate from outside the body, and interoception pertains to how one perceives the sensation related to the physiological needs of the body. Fascial tissues are important for our sense of proprioception (Van der Wal, 2012). While, in the past, much emphasis was placed on joint receptors (being located in joint capsules and associated ligaments), more recent investigations indicate that more superficially placed mechanoreceptors, particularly in the transitional area between the fascia profunda and the fascia superficialis, seem to be endowed with an exceptionally rich density of proprioceptive nerve endings. Fascia as a network extends throughout the whole body and numerous muscular expansions maintain it in a basal tension.

Thus, it was hypothesized that during a muscular contraction these expansions could also transmit the effect of the stretch to a specific area of the fascia, stimulating the proprioceptors in that area (Stecco et al., 2007). While this may be relevant for the practice (and often profound beneficial effects) of skin taping in sports medicine -as well as for other therapeutic fields – further research is necessary to clarify how stimulation of this superficial fascial layer influences proprioceptive regulation in healthy as well as pathological conditions.

A newly rediscovered field is fascial interoception, which relates to mostly subconscious signalling from free nerve endings in the body's viscera – as well as other tissues – informing the brain about the physiological state of the body and relates it to our need for maintaining homeostasis (Schleip and Jäger, 2012). While sensations from proprioceptive receptors are usually projected via their somatomotor cortex, signalling from interoceptive endings is processed via the insula region in the brain, and is usually associated with an emotional or motivational component. This field also promises interesting implications for the understanding and treatment of disorders with a somatoemotional component, such as irritable bowel syndrome or essential hypertension.

The sensory nature of fascia includes also its potential for nociception (nociception is the ability to feel pain, caused by stimulation of a nociceptor). Researchers from Heidelberg University (Hoheisel et al., 2012) have conducted research about the nociceptive potential of the lumbar fascia. Their choice of investigating the lumbar fascia is not accidental. While some cases of lower back pain are definitely caused by deformations of spinal discs, several large magnetic resonance imaging studies clearly revealed that for the majority of lower back pain cases the origin may be elsewhere in the body, as the discal alterations are often purely incidental. Based on this background, a new hypothetical explanation model for lower back pain was proposed by Panjabi (2006) and subsequently elaborated on by others (Langevin & Sherman 2007; Schleip et al. 2007). According to these authors, microinjuries in lumbar connective tissues may lead to nociceptive signalling and further downstream effects associated with lower back pain. The new findings from the Heidelberg group showed the nociceptive potential of the lumbar fascia; in patients with nonspecific lower back pain their fascial tissue maybe a more

important pain source than the lower back muscles or other soft tissues. The findings have potentially huge implications for the diagnosis and treatment of lower back pain. As this is a newly emerging field, their research will definitely trigger further research investigations into this important field within modern health care.

These exciting new topics from research might lead to new insights to clinical applications. They are fully discussed in the book *Fascia: The Tensional Network of the Human Body. The Science and Clinical Applications in Manual and Movement Therapy*. Edited By Robert Schleip, Thomas W. Findley, Leon Chaitow, Peter A. Huijing.

See <http://www.tensionalnetwork.com/> for more information.

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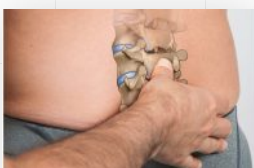
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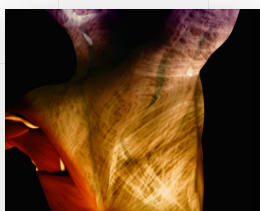
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