Dynamic Chiropractic

CLINICAL CORNER

Microscopically Manipulating Fascia to Improve Flexibility and Function?

Donald DeFabio, DC, DACBSP, DABCO

Fascia is dynamic, highly innervated, involves viscera and approximately 30 percent of all muscle fibers attach to it. It can be dissected and microscopically analyzed or described as a "fascial system" – a functional, three-dimensional continuum of collagen-containing, loose and dense fibrous connective tissue. Regardless of your definition, our understanding of fascia continues to evolve.

Understanding Fascia

Morphologically, anatomists define fascia by function and location. The superficial fascia is loosely packed and contains more elastic fibers - consider the elastic properties of the skin around a dog's neck. The deep/muscular fascia is subdivided into visceral fascia (surrounds viscera), neural fascia (around nerves and meninges), aponeurotic fascia (covers broad groups of muscles, potentially serving as attachment sites) and epimysial fascia (around individual muscles and attaching to the periosteum).

Realizing the integration of fascia to these body systems, it is evident that the ability to manipulate fascia will have an impact on proprioception, pain and movement.

Fascia likes to glide and move. Loss of fascial gliding has been termed *stiffness* or *densification*. Healthy fascia is 1 mm thick and when thickening occurs, its mechanical properties change, leading to reduced joint motion, pain and loss of flexibility.

Wilke contends that "fascia thickness may become a valuable outcome parameter in the prevention and treatment of MSK disorders, such as neck or backpain." Fascia contains approximately 15 percent elastic fibers and therefore has elastic properties.

Clinical Tip: Fascia contains CBD 1 and CBD 2 receptors. This could account for the analgesic effect of hemp oil extracts in myofascial pain management.

The extensibility, or compliance, of fascia is related to the viscosity of its extracellular matrix, ECM. The ECM contains abundant amounts of hyaluronic acid, HA, which is directly related to cell survival, proliferation, adhesion, and migration. *Therefore, if you can impact HA, you can impact cell function.*

Stecco has isolated fasciacytes, cells that produce the HA-rich ECM. These are located within the ECM along with fibroblasts, which produce elastin and collagen.

Clinical Tip: HA is a glycosaminoglycan. It attracts water, required where lubrication is needed between two surfaces; a potent free-radical quencher; and highly concentrated in synovial fluid. Mechanical forces, heat and modalities can all increase the viscosity of HA.

HA in densified fascia is short chains, more viscous and tightly bound together; hence, extensibility (motion and function) of the fascia is limited. In healthy fascia, the HA strands are long. It is unclear if the HA becomes dysfunctional first, or the fascia adheres first. Regardless, they both need to be restored to normal physiology.

Pratt, Stecco and others have established that short-chain, dysfunctional HA is reversible through modifications of temperature, pH and mechanical strain (vibration, massage, IASTM, etc.).

Influencing the ECM

Modalities that improve the exchange of nutrients across the cell membrane can also positively affect the ECM. For example, microcurrent accelerates healing by activating cell differentiation, proliferation and migration. It has been shown to improve function, hasten recovery and decrease pain in post-operative rotator-cuff tears.

Pulsed electromagnetic field therapy, PEMF, can also impact the fascia at the cellular level. PEMF increases cellular activity, provides organization of collagen, increases oxygen uptake and vasodilates without an increase in local temperature. It has been shown to stimulate tendon cell proliferation with no adverse effects and is also used in bone healing. However, PEMF has not been shown superior to other modalities for the treatment of rotator-cuff disease.

Long-lasting fascial pain relief can also be achieved by extracorporeal shockwave therapy, ESWT. Its analgesic effect on the fascial nociceptive system is not clear; however, if massage can reduce fascial densifications, shockwave therapy can obviously be useful. Since ESWT creates an initial inflammatory response, some authors advise against the use of NSAIDS while under treatment.

Clinical Tip: CMT affects fascia by changes in proprioception, muscle tension and increased motion. Combining CMT with fascia-specific techniques will help your adjustments hold better and enable a faster return to ADLs.

Photobiomodulation, low-level laser, can also stimulate cellular function. It increases nitric oxide production, vasodilates and provides analgesic effects. The impact on the fascial system is similar to microcurrent and PEMF in that it stimulates cellular function, leading to a restoration of homeostasis. Class 4 lasers that produce heat will increase HA viscosity.

TECAR, transfer of energy capacitive and resistive, is a modality that has a significant impact on the ECM, HA and fascial densifications. A class of diathermy, it is termed *endogenous thermotherapy*.

The capacitive mode is more superficial, is absorbed in water-dense tissues such as muscles and tendons, and produces deep heat. The resistive mode penetrates deeper, into the cartilage, joints and capsules; and is generally athermal. The current flows through a closed circuit, allowing the energy to be concentrated in the areas of myofascial densification.

TECAR also increases cell permeability and oxyhemoglobin concentration. It facilitates fascial gliding by increasing viscosity of the ECM. Although it creates a deep heat, it is safe over joint replacements. TECAR is often stacked with ESWT and laser for synergetic effects.

Clinical Tip: TECAR can be applied during PNF, massage, CMT, IASTM or corrective exercises. Combining the physiologic effects with manual therapies creates a synergistic effect on the fascia and ECM.

Clinical Takeaway

Yes, you can manipulate the fascia to improve flexibility and function, and reduce pain. Peel back your fascial treatment to the microscopic level and use modalities to restore homeostasis at the cellular level to improve HA and ECM integrity.

Stack that with manual therapies such as cross-friction massage, ischemic compression, fascial manipulation, pin and stretch and IASTM. Manipulating the ECM, HA and collagen synthesis at the cellular level is *next-gen* in fascial manipulation.

Resources

- Fede C, Pirri C, Fan C, et al. A closer look at the cellular and molecular components of the deep/muscular fasciae. *Int J Mol Sci,* 2021 Jan 30;22(3):1411.
- Özdemir M et al. Effect of pulsed electromagnetic field therapy in patients with supraspinatus tendon tear. *Rev Assoc Med Bras,* 2021 Feb;67(2):282-286.
- Pratt, RL. Hyaluronan and the fascial frontier. *Int J Mol Sci*, 2021 Jun 25;22(13):6845.
- Ryskalin L, Morucci G, Natale G, et al. Molecular mechanisms underlying the pain-relieving effects of extracorporeal shock wave therapy: a focus on fascia nociceptors. *Life*, 2022 May 17;12(5):743.
- Yi D, Lim H, Yim J. Effect of microcurrent stimulation on pain, shoulder function, and grip strength in early post-operative phase after rotator cuff repair. *Medicina*, 2021 May 13;57(5):491.

DECEMBER 2022