Massage Today
June, 2005, Vol. 05, Issue 06

The Amazing Fascial Web, Part II

By Leon Chaitow, ND, DO

Editor's note: Part I of Dr. Chaitow's article appeared in the May 2005 issue and can be accessed online at www.massagetoday.com/archives/2005/05/03.html.

Author's note: Research information summarized in this article has been drawn from content in the 2nd edition of my book, *Clinical Applications of Neuromuscular Techniques: Volume 1*[Churchill Livingstone, 2001], due for publication early in 2006.

To understand how this signaling system works we need to be aware of the role of integrins - tiny projections emerging from each cell, that act like mini-transmitters and receivers.
To continue with the story we now need to travel into space. Ingber conducted research (1989, 1993), much of it for NASA, into why astronauts lose bone density after a few months in space. He showed that as cells deform, when gravity is removed or reduced, the behavior of cells changes to the extent that, irrespective of how good the overall nutritional state is or how much exercise (static cycling in space) is taking place, individual cells cannot process nutrients normally, and problems such as decalcification emerge. The cell's communication systems, via integrins, also diminish in efficiency when the cells distort.

What Helene Langevin and her colleagues are now showing is that when deformation of cells and tissues occurs - such as that which happens to all of us when areas of the body are chronically shortened, crowded, compressed, stretched or twisted due to age, disease, trauma or progressive adaptation - the cells cannot function or communicate normally, or even demonstrate normal gene expression.

And consider, from the bodyworker's point of view, the reverse of that scenario. When we normalize tissues that are tense/tight/deformed/compressed by means of massage, stretching, mobilizing, etc., we are not just normalizing the biomechanical aspects of the function of those tissues - so that, for example, the shoulder or

elbow or neck or whatever, "feels" better - we are also improving internal cellular function, enhancing cellular communication and gene expression. If that's not a "wow" I don't know what is!

The observation of Langevin et al, (2005) is: "The dynamic, cytoskeleton-dependent responses of fibroblasts to changes in tissue length demonstrated in this study have important implications for our understanding of normal movement and posture, as well as therapies using mechanical stimulation of connective tissue including physical therapy, massage and acupuncture." (Langevin et al, 2005)

Consider the connections I have attempted to put together in this brief communication regarding different elements of our understanding of how the body works:

1. The fascial cleavage planes seem to have a great deal to do with where acupuncture (and many or most trigger points) are situated;
2. Cells communicate via (among other methods) mini-projections (integrins) that are capable of becoming deformed and distorted though age, overuse, misuse, abuse and disuse (and loss of gravity!), with negative effects on cellular (and therefore tissue) function, including communication, nutrition and reproduction (gene expression); and
3. The function of tissues, down to the cellular level, can be enhanced by appropriate massage, bodywork, movement and manipulation (and it seems, by acupuncture).

Our work can really change the way the body works, and not just on the mechanical level. We influence emotion, the mind, the nervous system, immune function, and now we know that we also influence the way cells communicate and nourish themselves.

In a future article for *Massage Today*, I will highlight another recent "wow" (for me) relating to the presence in fascia of contractile (smooth muscle) cells. The sites where these have now been identified include cartilage, ligaments, spinal discs and the lumbodorsal fascia. (Ahluwalia et al, 2001; Hastreite et al, 2001; Murray & Spector 1999; Meiss 1993). The implications are enormous. For example, Yahia & Pigeon (1993) have observed that: "Histologic studies indicate that the posterior layer of the (lumbodorsal) fascia is able to contract as if it were infiltrated with muscular tissue."

If you are one of the many readers who have had the good sense to read Tom Myers wonderful book, *Anatomy Trains*, my guess is that the implications of a contractile potential in fascia will be another "wow" for you.

And there's more. One more piece of the jigsaw puzzle has recently fallen into place. German research (not yet complete, on which I will report in a future article) has shown that fascia acts in a sponge-like manner, so that when stretched it loses a great deal of its water content, and afterwards, if the stretch has been long enough and strong enough, and if no more activity occurs over a period of 30 minutes or so, it reabsorbs more water than it lost in the stretch, and becomes stiffer than previously.

Resources

1. Ahluwalia S. Distribution of smooth muscle actin-containing cells in the human meniscus. *Journal of Orthopaedic Research* 2001; 19(4)659-664.
2. Hastreite D, et. al. Regional variations in cellular characteristics in human lumbar intervertebral discs, including the presence of -smooth muscle actin. *J. Orthopaedic Res*. 2001; 19(4):597-604.
3. Ingber D E, Folkman J. Tension and compression as basic determinants of cell form and function: utilization of a cellular tensegrity mechanism. In: Stein W, Bronner F (eds). Cell shape: determinants, regulation and regulatory role. *Academic Press*, San Diego, 1989 pp 1-32.
4. Ingber D E. Cellular tensegrity: defining new rules of biological design that govern the cytoskeleton. *Journal of Cell Science* 1993; 104:613-627.
5. Kawakita K, Itoh K, Okada K. The polymodal receptor hypothesis of acupuncture and moxibustion, and its rational explanation of acupuncture points. International Congress Series: *Acupuncture - is there a physiological basis?* 2002; 1238: 63-68.
6. Langevin H, Churchill D, Cipolla M. Mechanical signaling through connective tissue: a mechanism for the therapeutic effect of acupuncture The *FASEB Journal* 2001; 15:2275- 2280.
7. Langevin H, Cornbrooks C, Taatjes D, et. al. Fibroblasts form a body-wide cellular network. *Histochem Cell Biol* 2004; 122(1): 7-15.
8. Langevin H, Bouffard N, Badger G, et. al. Dynamic fibroblast cytoskeletal response to subcutaneous tissue stretch ex vivo and in vivo. *Am J Physiol Cell Physiol* 2005; 288:C747-756.
9. Meiss RA. Persistent mechanical effects of decreasing length during isometric contraction of ovarian ligament smooth muscle. *J Muscle Res Cell Motil* 1993; 14(2): 205-18.
10. Murray M, Spector M. Fibroblast distribution in the anteromedial bundle of the human anterior cruciate ligament: the presence of alpha-smooth muscle actin-positive cells. *Journal of Orthopaedic Research* 1999; 17(1):18-27.
11. Wall P, Melzack R. *Textbook of Pain* (2nd edition). Churchill Livingston, Edinburgh, 1990.

12. Yahia L, Pigeon P, et. al. Viscoelastic properties of the human lumbodorsal fascia. *Journal Biomedical Engineering* 1993; 15:425-429.

Click here for more information about Leon Chaitow, ND, DO.