

Beware of the Anatomical Muscle Insertion

Warren Hammer, MS, DC, DABCO

[Manual muscle testing](#) is used to determine if a muscle is injured or causes pain, if weakness is associated with the pain or if there is weakness without pain. When the tendon is involved, there usually will be more of a full range of motion than if the belly is involved, due to possible muscle belly rupture and protective spasm limiting the range of motion.

With muscle testing, palpation and questioning of the patient, we try to determine the local sites of involvement. Often we are surprised by the patient's response. For example, most lateral epicondylopathies (tennis elbow) are painful on resisted wrist extension because the wrist extensors attach to the lateral epicondyle. But often the patient states that they feel pain on the medial side, in the triceps area or in the elbow and forearm flexor area. We might think this is referred pain, but more likely it is due to broader insertional areas that are being stressed by the muscle test.

According to the [latest edition of Gray's Anatomy](#),¹ muscles are bound together into functional groups by collagenous fascia, which contributes to the resistance of a muscle to tension. Unfortunately, anatomists have been dissecting individual muscles and describing their attachments without paying enough attention to the surrounding and penetrating fascia. I recall that during dissection, I never paid attention to the whitish stuff around the muscles.

Robert Schleip, PhD, wrote in the forward of a new textbook, [Fascial Manipulation](#),² that muscles hardly ever transmit their full force directly via tendons into the skeleton, but rather distribute a large portion of their contractile or tensional forces onto fascial sheets. These fascial sheets extend not only to synergistic muscles, but also to antagonistic muscles. Even distal areas and joints may be stressed. A good example is the fascia lata that surrounds the glutei muscles, adductors, quadriceps, hamstrings and tensor fascia lata.

The gluteus maximus and tensor fascia lata insert into the fascial iliotibial tract (a thickening of the fascia lata) and when these muscles contract, tension is also transmitted through the fascia to the lateral hamstrings and quadriceps. The supraspinatus insertion has fascial attachments beneath the biceps tendon to the subscapularis and coracohumeral ligament, extends over the biceps tendon, and interdigitates with the infraspinatus. A far cry from just inserting into the greater tuberosity.

The extensor carpi radialis brevis has fascial attachments to at least seven other structures, as described [in my previous article](#) in *DC*.³ When performing surgery for final-stage lateral epicondylosis, many surgeons do not bother to reattach the extensor carpi radialis after cutting it from the lateral epicondyle, since the other attachment sites act as stabilizers. Also, not attaching the tendon results in less postsurgical complications. Since individual muscle fibers do not run the length of whole muscles or bundles, the connective tissue sheath of the endo, peri and epimysium not only hold the components together in an elastic framework, but also help to transmit the force of the contraction to the tendons.

The central nervous system is more an interpreter of function rather than structure. In his forward to *Fascial Manipulation*, Schleip states that muscles are not functional units since most muscular movements are generated by many individual motor units distributed over some portions of one muscle, plus other portions of other muscles. The tensional forces of these motor units are then transmitted to a complex network of fascia that convert them into the final body movement. He also states that the question discussed in textbooks as to "which muscles are participating in a particular movement thus becomes almost obsolete."²

It is important when muscle testing to ask the patient where they feel the stress and evaluate those areas for treatment. It appears that in about 50 percent of the cases with low back pain and restricted hip lateral rotators, when I move, for example, the right hip into medial rotation to stretch the right lateral rotators, the patient often describes pain in the left lumbar flank. After freeing the left lumbar flank by manual methods, there is often an increase in right hip medial rotation and absence of pain in the left flank.

With the fascial concept, we should be very conscious of where patients complain upon muscle testing or stretching. As is often stated, the site of the pain is not necessarily the source of the pain.

References

1. Standring S. *Gray's Anatomy, 40th Edition*. Churchill Livingstone (Elsevier), 2008.
2. Stecco L, Stecco C. *Fascial Manipulation, Practical Part*. Piccin Nuova Libreria S.p.A., Padova, 2009.
3. Hammer W. "[Manual Loading for Lateral Epicondylopathy](#)." *Dynamic Chiropractic*, April 22, 2009.

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