The Key May Be in the Muscles

By Anthony Rosner, PhD, LL[Hon.], LLC

It was no less a personage than Thomas Edison who once opined, "Great ideas originate in the muscles." Roll the tape forward some 75 years and one starts to observe an interesting parallel in functional medicine. For it was at this time that applied kinesiologists and others turned to the muscle as an exquisite indicator and adjunct to the nervous system, either indicating or generating changes in efferent or afferent activity. Put in other terms, the movement characteristics, spasms and electrical activity of the muscle became important tools with which to assess pain and motor function.

For chiropractors, the potential for evaluating muscular recruitment and how muscles acted upon spinal structures presented itself through the use of surface electrode [sEMG] studies of loading and fatigue to assess muscular recruitment and activity. The basic premise was that motion-segment disorders were closely allied with changes in the intensity of local muscle activity.

While the unbridled use of surface electromyography was challenged as a definitive diagnostic tool in the 1990s, there was a suspicion that such instrumentation could be applied to a combination of flexion and postural tasks to discriminate healthy from unhealthy subjects. Indeed, the correlation of disability as shown on the Oswestry index with aberrations shown on surface electromyography upon bending was clearly evident from the work of Triano and Schultz in 1987, in which the normal quiescence of muscle activity after 70 degrees of trunk inclination was eliminated in individuals who had significant restrictions in their activities of daily living. In other words, the musculature associated with the low back was found to keep firing with virtually no interruption throughout the entire flexion-relaxation cycle.

This hypothesis had actually been supported up to 20 years earlier, in that Stary in the 1960s and Grice, Triano and Jayasinghe in the 1970s all presented evidence to the fact that major sEMG asymmetries and functional disorders of the spine were significantly related. All these findings led to the conclusion that such recordings of the activities of muscles suspected of contributing to joint dyskinesia could eventually elicit underlying functional disturbances of the mechanisms of the locomotor system.

Leaping ahead into just the past year, we find a bloom of clinical findings that clearly points the finger toward altered muscle activity as an important site to study both pain and the mechanisms of analgesia.
which accompany spinal manipulation. This, in turn, opens the door to a variety of refined
electromyographic approaches, including sEMG.

De Camargo’s group, for example, found in 37 subjects with mechanical neck pain that the sEMG
amplitude signal and fatigue resistance in the middle deltoid muscle undergoing 30 seconds of isotonic
contraction was increased by cervical spinal manipulative therapy to the C5/C6 segment. The pressure-pain
threshold was also increased in the manipulated group. No such increases were seen in a similar group
randomized to receive no treatment.

This was stated to be the first study investigating sensory and motor efficacies after a cervical manipulation
over nonspinal muscles conducted on patients with mechanical neck pain. It was hypothesized that the
neurophysiological basis for EMG changes could be attributed to the activation of mechanoreceptors and
proprioceptors of several structures, including the muscles, muscle spindles, or Golgi tendon organs.9

An additional probe into the effects of spinal manipulation was offered by Clark, et al., demonstrating that
patients with chronic low-back pain who demonstrated an audible response to spinal manipulation revealed
a 20 percent decrease in the stretch reflex amplitude, suggesting that such treatments could have decreased
the sensitivity of the muscle spindles and/or segmental sites of the 1a reflex pathway. The speculation was
that an increased stretch reflex gain underlies increased muscle tone in painful muscles, such as observed in
low back pain.11-12

Finally, Arab and Mosely conducted a cross-sectional study to compare muscle activity during prone hip
extensions in 10 women with chronic low back pain and 10 asymptomatic women with no such history, ages
30-34 on the average. Normalization was carried out to rule out the thickness of tissues overlying the
muscle, as well as skin impedance.

The result was that there was a significant increase in the percent of maximum voluntary contraction during
prone hip extension in women with low back pain in the erector spinae, gluteus maximus, and hamstrings.13
Thus, the previously proposed altered activation pattern of lumbopelvic muscles during various tasks in
people with low back pain was confirmed.14

All of these recent studies provide a compelling rationale for pursuing the central element of applied
kinesiology, which is the testing of a given muscle. As proposed by George Goodheart in 1964,1 the
response of a given muscle to resistance applied by a trained professional examiner is stated to be the
summation of all the excitatory and inhibitory inputs of the anterior horn motoneurons, such that a failure of the muscle in the test could be directly linked to a dysfunction of the nervous system. In other words, muscle changes evaluated by the manual muscle test are proposed to be reflective of a change in the peripheral or central nervous system, with treatment being effective only if it is directed at the correct neural disruption.

It turns out that the utility of analyzing disturbed body functions by assessing changes which affect the muscles has been supported from a variety of sources for 60 years. What distinguishes AK from previous concepts of postural disturbances is that the latter investigates the immediate changes in muscle function as the result of sensorimotor challenges to biomechanical, biochemical, and/or psychosocial aberrations that produced changes in muscle function upon testing.

Simons previously demonstrated that muscle dysfunction and myofascial trigger points specifically result from biomechanical, biochemical, and psychosocial influences. Indeed, biochemical and emotional factors are now accepted to be fundamental components in holistic models of muscle dysfunction.

D.D. Palmer once declared: "Life is the expression of tone. In that sentence is the basic principle of chiropractic. Tone is the normal degree of nerve tension. Tone is the expression in function by normal elasticity, activity, strength and excitability of the various organs as observed in a state of health. Consequently, the cause of disease is any variation of tone – nerves too tense or too static." Considering the proliferation of electrophysiological evidence, both new and old, and bringing chiropractic back to its emphasis upon the nervous system, we cannot ignore the muscle and muscle testing. These are clearly essential gateways to understanding not only pain and its alleviation, but also any biochemical or psychological aberrations that are detrimental to optimal health.

References


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