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Motion Palpation in the Next Century, Part III

By Keith Innes

The Analysis of Normal and Abnormal Segmental Movement Requires a Well-Founded Knowledge of Functional Anatomy! Do You Have It?

The concepts of a ventral oblique sling to stabilize the pelvis and postural habits are inseparable. To understand the ventral oblique sling and its impact on spinal aberrant motion, it is necessary to review the simple aspects of tonic (postural) and phasic muscles as they relate to posture and, therefore, the art of motion palpation. A quick glance at the physiology of these muscles tells us that the primary function of postural (tonic) muscles is to maintain upright (trunk) posture, and that phasic muscles are responsible for rapid motions. There are other differences as well. These include the following:

Tonic

- A. slow-twitch (type I fibers)
- B. oxidative metabolism
- C. slow fatigability
- D. high capillary density
- E. high number of spindles
- F. a2 motor neuron
- G. shortening due to dysfunction

Phasic

- A. fast-twitch (type II fibers)
- B. glycolytic metabolism
- C. fast fatigability
- D. low capillary density
- E. low number of spindles
- F. a1 motor neuron
- G. weakening due to dysfunction

The significance of the above is that in the presence of segmental dysfunction or disturbance, the postural muscles tend to shorten, whereas the phasic muscles responsible for rapid movement tend to weaken. This situation alters the cooperative, harmonious relationship between muscle and fascia, leading to imbalance and articular compensations. From this statement alone, if one does not take this to heart, clearly what the doctor is palpating will not be a diagnosis based in reality, nor will it be interexaminer reliable (as examiners have a huge variance in the understanding of functional anatomy). See just about every study done on reliability, and see the April 19th issue of *Dynamic Chiropractic* for two new studies on motion

palpation.

Here is an overview of the tonic (postural muscles) and phasic muscles:

Tonic	Phasic
Trunk	Trunk
A. cervical and lumbar erectors	A. mid-thoracic erectors
B. quadratus lumborum	
C. scalene muscles	
Shoulder Girdle	Shoulder Girdle
A. pectoralis major	A. rhomboid muscles
B. levator scapulae	B. trapezius (ascending portion)
C. trapezius (descending portion)	C. trapezius (horizontal portion)
D. biceps brachii (short head)	D. pectoralis major (sternal portion)
E. biceps brachii (long head)	E. triceps brachii
Pelvic Area	Pelvic Area
A. biceps femoris	A. vastus medialis
B. semitendinosus	B. vastus lateralis
C. semimembranosus	C. gluteus medius
D. iliopsoas	D. gluteus maximus
E. rectus femoris	E. gluteus minimus
F. tensor fascia lata	
G. adductor longus	
H. adductor brevis	
I. adductor magnus	
J. gracilis	
K. piriformis	
Calf and Foot	Calf and Foot
A. gastrocnemius	A. tibialis anterior
B. soleus	B. peroneal group

As a result of abnormal physiologic movements, motion patterns involving the fascial planes are altered, i.e., the prevertebral fascia of the cervical spine is continuous with the thoracolumbar fascia and is effected by its abnormal function. This means that cervical spine aberrant coupling patterns may be a function of abnormal thoracolumbar fascia loading. Spinal curves as seen on x-ray may be altered by this fact. This is another reason why diagnosing spinal dysfunction from an x-ray alone is not logical.

The ventral oblique sling is made up of these components:

1. linea alba
2. transversus abdominus
3. rectus abdominus
4. inguinal ligament and investing fascia
5. external oblique
6. internal oblique
7. piriformis

From reading the proceedings of the Third Interdisciplinary World Congress on Low Back Pain and Pelvic Pain, we find that there is a continuum of the abdominal fascia with the thoracolumbar fascia. It is therefore easy to visualize that abdominal or the oblique ventral muscle tendon sling has an impact on the function or tension of the thoracolumbar fascia and vice versa. From Porterfield and De Rosa's text, we learn that "The pectoralis major muscle and its fascial elements blend into the aponeurosis of the abdominal muscles and often cross the midline to blend with the abdominal fascia on the opposite side and the superficial aspect of the rectus sheath." We can see from this quote that there is a functional relationship between the shoulder girdle, the abdominal musculature and the lateral raphe of the thoracolumbar fascia.

From a motion palpation point of view, that is, before we begin to palpate, there is a wealth of biomechanically relevant information available to us. Consider the person with weak abdominals or a pregnant female with an anterior shear at the lumbosacral junction (excessive sacral nutation) and resultant low back pain. One way to reduce the shear forces is to walk with a toe-out gait (10 and two o'clock foot posture) and reduce the load applied to the pelvis by the psoas muscle. It is also not uncommon to find patients with weakened abdominals and tight hip flexors with a toe-out gait for the same reason, attempting to unload the lumbosacral junction. This and other relationships are critical to the patient's positioning prior to beginning motion palpation of the pelvis and spine.

The transversus abdominus, through its attachment to the abdominal aponeurosis, reinforces the fascial support at the level of the lateral raphe, thereby increasing tension to the thoracolumbar fascia and adding in the prevention of anterior shear at the lumbosacral junction.

Another model that uses the various slings of the body and adds other dynamic dimensions is the tensegrity system. The "tensegrity concept," tension and integrity, is one of continuous tension and discontinuous compression. This should sound somewhat familiar, as hyaline cartilage survives through compression and decompression activities.

Page 11 of the April 19th, 1999 edition of *Dynamic Chiropractic* shows a course by George Roth, DC, ND, for those interested in learning about this fascinating system. From this ad, we read: "Tensegrity therapy utilizes a rational approach to the assessment of tension within the connective tissue-fascial system and addresses the interconnecting links within the tissues to systematically detect primary fixations." When one learns this system and understands the current thought process of the various slings in the body, it is easy to understand that one main reason for poor interexaminer reliability in motion palpation studies is not so much the technique of doing it -- although that, too is a factor -- but rather a huge lack of understanding of the normal biomechanics of the human body.

Also contained within the same edition of *Dynamic Chiropractic* is a report by Dr. Robert Cooperstein, DC. He mentions the work of Dr. Tom Dorman and tensegrity. As an aside, Dr. Dorman's writing on fascial slings and gait is worth reading as it relates to the finding of joint dysfunction via motion palpation methods. Dr. Cooperstein states that the term "tensegrity" was coined by Buckminster Fuller in 1926. Dr. Cooperstein may be right in his date, however, Snelson received a U.S. patent for this in 1965 (U.S. Patent #3,169,611). Fuller named it and adapted it in his writings (*Synergetics*, McMillan, New York, 1975). In any case, it is a system well worth looking at and incorporating into the biomechanical model of the 21st century.

It is an interesting exercise to realize, after reading and studying most of the various techniques and examination procedures, that the chiropractic profession has to offer, that there are a few that continue to stand out as new and current research is available to us. The work of Logan was clearly supported by the work of Gracovetsky, Vleeming and others; the work of Gonstead was supported by authors far too numerous to mention when it comes to the motion of the fifth lumbar vertebrae; and the original work of Illi, Gillet and Faye is now starting to show just how far lateral these men were in their thinking and methodology. It's been my pleasure to know and work with them. From a motion palpation point of view, which changes

as new research comes to us, the understanding of fascial planes, postural muscles, the tensegrity system and the various loads that result from dysfunction makes the concept of an integrated system all the easier to understand.

The joint dysfunction complex of today needs to be expanded to include not just the spine segments, but the entire body.

The next article in this series will focus on the C0-C1-C2 complex and the various fascial layers of the cervical spine.

I would like to suggest that the readers of this column refer to the *JMPT* abstracts on page 6 of the April 19th edition of *DC*. Here you will find two new articles on motion palpation of the spine and pelvis that show reliability.



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