A PRI ANALYTICAL OVERVIEW OF FUNTIONAL THORACIC POSITIONING AND THORACIC-SCAPULAR STABILITY

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There are three main muscle groups in need of greater understanding that aid in activation or inhibition of the Anterior Interior Polyarticular Chain and the Brachial Chain muscle groups. These muscles directly and indirectly affect ribcage and scapular position and stability. A clearer understanding of these muscles will facilitate a more appropriate prescription of non-manual techniques and, more importantly, allow the clinician to better analyze performance of these techniques. The following overview is designed to aid in greater illumination of these muscle groups.

ABDOMINAL ACTIVATION FOR THORACIC-SCAPULAR POSITIONING

Synchronous activation of L Internal Obliques (IO's) and Transversus Abdominis (TA's) during the two phases of respiration (inhalation and exhalation) results in the following:

1. inhibition of the L AIC and activation of the R AIC
2. inhibition of the R BC and activation of the L BC
3. saggital rotation of the L innominate toward L AF IR
4. restoration of a Zone Of Apposition (ZOA) to the L Diaphragm
5. movement of L ribcage into a state of exhalation
6. movement of R ribcage into a state of inhalation
7. R upper trunk rotation above the diaphragm as a result of 4, 5, and 6

These results, plus many others not highlighted, produce movement of the ribcage underneath the scapulae which aides in normalization of reciprocal torso movement which normalizes positioning of the scapulae. Movement of the thorax underneath the scapulae is described as Thoracic-Scapular motion (TS) rather than Scapulo-Thoracic motion (ST) which is movement of the Scapulae on the Thorax. TS and ST dynamics are important to understand because **activation of Scapular-Thoracic (ST) musculature without first (or simultaneous) accounting for proper positioning of the Thorax under the Scapulae (TS) is folly since the results would produce neither proper positioning of the scapulae nor the ability to maintain proper positioning of the scapulae if any repositioning occurred.** A lack of ability to maintain normal positioning of the scapulae is always illuminated with objective testing of the Brachial Chain.

RIGHT LOWER TRAPEZIUS ACTIVATION FOR THORACIC SCAPULAR POSITIONING

Thoracic-Scapular (TS) Activation of R lower trapezius aids in appropriate spinal <u>orientation</u> to the left (rather than compensatory spinal <u>rotation</u> to the left as noted with a dominant L AIC and R BC) provided the above criteria for the abdominals are met. When L TS abdominals are accounted for and R lower trapezius activity is conducted during the two phases of respiration then the consequential leftward orientation of the spine (as a result of TS R lower trapezius activity) reinforces the L ZOA established by the abdominals (see above) as well as the following:

1. inhibition of the L AIC and activation of the R AIC
2. inhibition of the R BC and activation of the L BC
3. rotation of the medial border of the right scapula toward the spine on a vertical axis (ST)
4. a properly positioned R lower trapezius and scapula which can then draw the upper thorax (above the diaphragm) (TS) to the R for true R counter-rotation (above the diaphragm) of the ribcage without loss of the ZOA
5. a properly positioned L lower trapezius and scapula which can then aid in R ribcage and L spine rotation above the diaphragm for true reciprocal trunk rotation

LEFT LOWER TRAPEZIUS ACTIVATION FOR THORACIC-SCAPULAR STABLILIZATION

Once a solid L ZOA is established via proper activation of L abdominals and R lower trapezius the L lower trapezius muscle is in a position to better perform its role in trunk rotation and stabilization. During establishment of a L ZOA eccentric elongation of L lower trapezius occurs during the leftward orientation of the spine. Subsequent R trunk rotation above the diaphragm can be correctly executed via ST concentric contraction of the R lower trapezius and TS eccentric contraction of the L lower trapezius.

SERRATUS ANTERIOR ACTIVATION FOR THORACIC SCAPULAR POSITIONING (on the right)

The serratus anterior muscles function bilaterally to move the ribcage and/or the scapula. On the right, the serratus may have lost its ability to control the scapula (ST) because the R scapula has internally rotated about a vertical axis as a result of the dominant L AIC, R BC pattern. Internal rotation of the right scapula creates a poor anchor for the right serratus and results in a **more linear orientation (and mechanical disadvantage)** of the muscle which can heighten activation of accessory respiratory muscles like scalenes. Scalenes can then play a more-dominant role in R-side ribcage respiratory dynamics (T-4 Syndrome). With proper activation of abdominals and trapezius muscles as described in previous paragraphs the serratus anterior can become mechanically advantaged once-again and can then aid in ER of the R scapula (ST) and can work to overpower scalenes to draw upper ribs down into internal rotation. Lower ribs can be drawn into external rotation by the inferior fibers of right serratus during inhalation. One can visualize the upward and downward movement of the ribcage during gait and respiration as the main-wheel of a locomotive with serratus acting as the drive-arm concentrically pulling the ribs down and back on one side and, with the aid of airflow, directing torso rotation toward the opposite side while simultaneously the opposite serratus is eccentrically allowing ribcage expansion resulting in successful transition from one lower extremity to the other.

(on the left)

In the left AIC, R BC-patterned individual, the left ribcage is more externally rotated and has lost its normal kyphosis posteriorly. Left ribcage positioning results in at least some compromise of the left serratus anterior as a whole, but, in the opinion of the author, not as significant as the right because the curved orientation of the serratus is maintained on the left. An externally rotated L anterior ribcage will compromise the superior fibers of left serratus anterior. Since the L mid and lower trapezius is aiding in L <u>compensatory</u> torso rotation (TS) and subsequent L scapular retraction and external rotation (about a vertical axis) (ST) then functional protraction of the scapula and retraction of the anterior ribs is compromised. External rotation positioning of the scapula cannot be altered unless the conditions mentioned previously regarding L abdominals and R lower trapezius are accounted for. The role of left serratus anterior is to engage in order to draw the left anterior ribcage down and back. Serratus anterior activation on the L aids in posterior mediastinal fill on the L and more appropriate inhalation to occur on the right resulting in R ribcage rotation (TS) and lateral expansion. If all muscle groups outlined are functioning appropriately then L spinal rotation is maintained while ribs on the right ER and ribs on the left IR.

TRAINING HIERARCHY

Of primary importance is the understanding that no net effect of extremity treatment can be achieved or lasting without considering the position of the foundation to which that extremity is attached. In other words: outcomes of treatment of a knee, for example, will be limited if the pelvis is not considered since the pelvis directly influences the position of the femur. Further, outcomes with the upper extremities will also likely have a poor chance of lasting success without consideration of the ribcage to which the humeral-glenoid mechanism is attached.

In addition, the pelvis, spine and ribcage must be influenced together since they are inextricably related to one another. The relationship between the ribcage, pelvis and spine exists because of polyarticular chains of muscle (the AIC and BC) and these chains must be influenced via specific activities if one wishes to alter existing patterns of movement.

Reciprocal inhibition and activation of opposing chains of muscle that control the pelvis, spine and ribcage are the crux of a sound treatment program. To that end any program designed to influence these muscles outlined here should affect as much of a polyarticular chain as possible without loss of technique or functional failure. There can be only one way to succeed with a non-manual technique but there are many ways to fail. Instruction is critical and the patient must be carefully cued and muscles groups methodically isolated for inhibition and/or activation. If patients cannot successfully inhibit desired musculature then attempts at activation of desired muscle will produce compensatory activity as well as dysynchronous and asynchronous recruitment.

We have compiled a program of powerful, primary non-manual techniques that are ordered from lower to higher risk of possible functional failure. The higher-level activities are capable of producing a more-rapid desired rehab outcome since the patient must inhibit and facilitate more musculature and thus increase functional carryover following the activity. But, caution should be taken when prescribing the higher-level activities since the opportunity for functional failure is greater. Understanding the patients' abilities (which is accomplished via a thorough examination) is critical to successful prescription of appropriate non-manual techniques. In other words, assign only those exercises that the patient can accomplish successfully and progress only when success is evident in re-examination following the techniques.