

## POSTURAL RESTORATION & ATHLETIC INJURIES: Biomechanical Influences of the Thorax on the Shoulder



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## Shoulder Injuries & Athletes

- Predominantly occur in overhead athletes
- Biomechanical “malalignment” or poor movement patterns can contribute to overuse, repetitive injuries of the shoulder
- The shoulder (GH) joint and scapula are most often evaluated

***But, one must also consider what's below the scapula?***

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## The Thorax

- The position of the thorax is important when evaluating and treating shoulder injuries
- The thorax refers to the entire chest (the bony structures of the thorax are the sternum, costal cartilages, ribs and the bodies of the thoracic vertebrae)

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## The Shoulder

- When evaluating & treating the shoulder, it is important to consider all of the following positions & movements:
  - Glenoid-Humeral
  - Humeral-Glenoid
  - Thoracic-Scapular, and
  - Scapular-Thoracic

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## Movement Patterns

- The majority of our daily activities, including walking, running, and occupational activities require rotation throughout many joints.
- Although anatomical differences between the two sides of the body exist, we are functionally asymmetrical to variable degrees. Thus, we must appreciate how movement patterns on one side of the body may directly influence movements on the opposite/contralateral side.

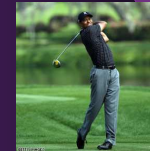
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## Movement Patterns

- Patterns evolve and exist in all of us to a degree.
- Patterns usually develop as one trains or repeats the same movement pattern habitually (ATHLETES) which would contribute to an undesirable asymmetrical state.



<http://www.nbcbaseball.com/news/article104.html>



<http://gsingy.wordpress.com/2010/04/05/tiger-returns-to-the-green/>

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## Left AIC/Right BC Pattern

- Hruska<sup>1</sup> has described an opinion that there is an underlying postural pattern of asymmetry existing in all humans to some measure in spite of hand dominance, known as the left Anterior Interior Chain pattern (left AIC)
- This is accompanied with an opposing right Brachial Chain pattern

1. Hruska, R.J. Myokinematic Restoration-An Integrated Approach to Treatment of Lower Half Musculoskeletal Dysfunction. Postural Restoration Institute Course Manual, 2007.

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### Brachial Chain (BC)

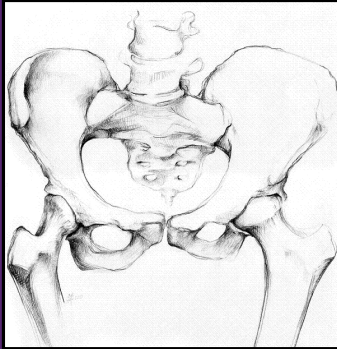
Anterior-Lateral Intercostals, Deltoid-Pectoral Muscle, Sibson's Fascia, Triangularis Sterni, Sternocleidomastoid, Scaleni, Diaphragm

### Anterior Interior Chain (AIC)

Diaphragm, Iliacus, Psoas, TFL, Vastus Lateralis, Biceps Femoris

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## Left AIC



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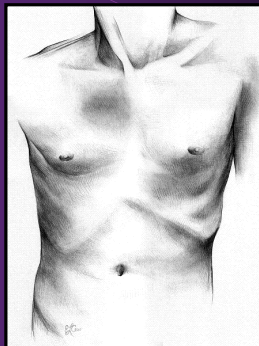
## Left AIC

- The left hemi-pelvis is anteriorly tilted and forwardly rotated comparatively to the right hemi-pelvis. This predominate position orientates the sacrum and lumbar spine to the right.



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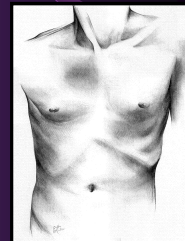
## Left AIC / Right BC



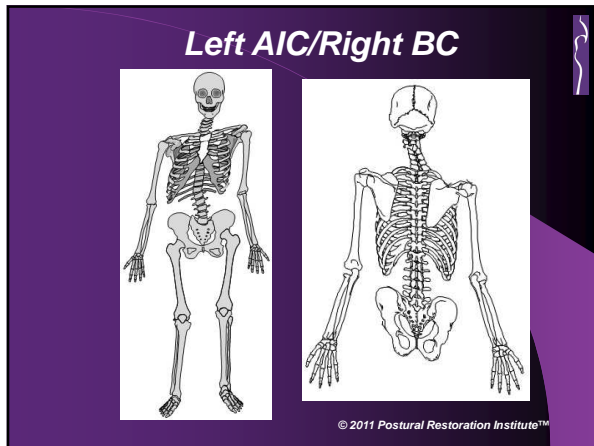
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## Right BC

- The trunk/thorax demonstrates compensatory rotation to the left, resulting in:
  - Left rib flare
  - Right depressed shoulder
  - Poor scapular-thoracic/thoracic-scapular mechanics



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### Zone of Apposition (ZOA)

- The diaphragm's mechanical action and respiratory advantage depends on its relationships and anatomic arrangement with the rib cage<sup>2,3</sup>
- The cylindrical aspect of the diaphragm that apposes the inner aspect of the lower mediastinal (chest) wall, constitutes the zone of apposition.

2. Goldman M, Mead J. Mechanical interaction between the diaphragm and the rib cage. J Appl Physiol 35:2, 1973.  
3. Mead J. Functional significance of the area of apposition of diaphragm to rib cage. Am Rev Respir Dis 11:31, 1979.

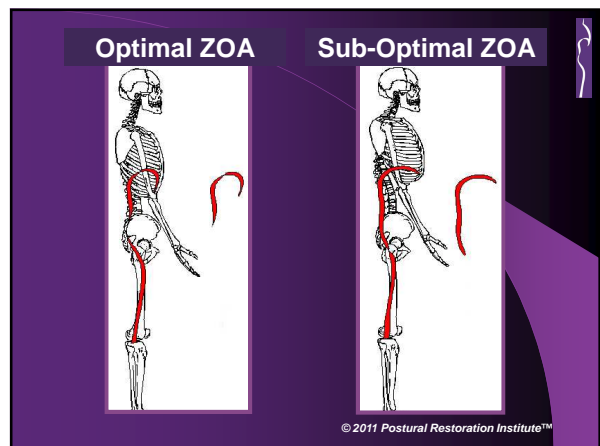
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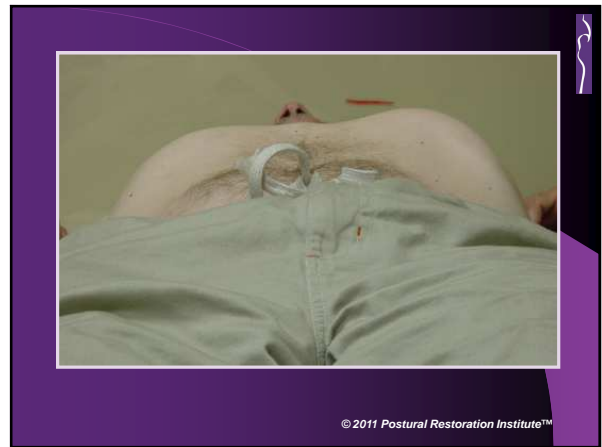
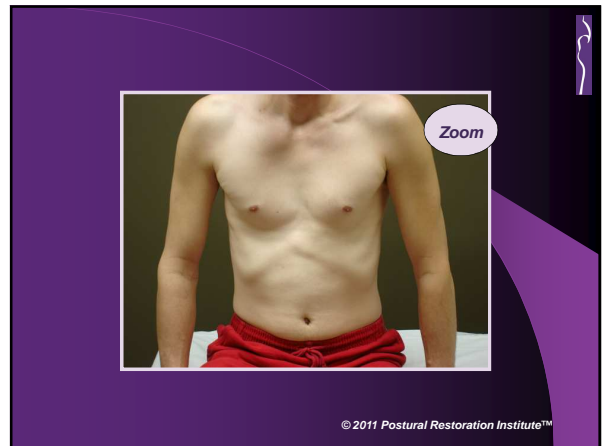
### Zone of Apposition (ZOA)

- Accessory respiratory muscle overuse, chest wall mobility and lung hyperinflation are all influenced by diaphragm and zone of apposition resting positions at the end of exhalation<sup>4</sup>
- Chest wall/rib cage mobility directly affects the scapula's resting position, thus affecting both ST/TS and GH/HG mechanics

4. Hruska RJ. Influences of dysfunctional respiratory mechanics on orofacial pain. Dent Clin North Am 41:2, 1997

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## The Value of a Balloon

- Postural Restoration exercises using a balloon are designed to help restore the ZOA, spine and thorax to its proper position

*Boyle K, Olinick J, Lewis C. The value of blowing up a balloon. North American Journal of Sports Physical Therapy. Sept 2010;5(3):179-188.*

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## Evaluation

- Visual Examination
  - Depressed right shoulder
  - Left rib flare or bilateral rib flares
  - Winging right scapula
  - Accessory muscle overuse

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## Evaluation

- Objective Testing
  - Humeral Glenoid Internal Rotation (HG IR)
  - Horizontal Abduction
  - Apical Expansion Test

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## HG IR

- With the shoulder at 90°, stabilize the GH joint by placing firm pressure on the anterior shoulder joint.
- Passively rotate the patient's arm toward the mat as far as it will go.
- Repeat the test on the opposite extremity.
- A positive test is indicated when the patient's arm will not fully rotate towards the mat or table.
- Most often positive (limited) on the right side, or bilaterally.



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## Horizontal Abduction

- Passively take the patient's arm into horizontal abduction while securing the shoulder joint with one hand.
- A positive test is indicated by limited horizontal abduction of one extremity when compared to the other.
- Less than 30° is considered limited.
- Most often positive (limited) on the left side or bilaterally.



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## Apical Expansion Test

- Patient lies in supine with knees flexed to flatten the lumbar spine. Patient inhales through nose, upon exhalation guide left rib cage down. Hold ribs down as patient attempts to fill opposite chest wall. Repeat on opposite side.
- A Positive test is indicated when the patient is unable to draw air into the right thoracic chest wall as easily as on the left, through patient report or tester observation.



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## Apical Expansion Test

- Limitation in expansion of the right thoracic-apical chest wall reflects right rib internal rotation orientation with accompanying left rib external rotation orientation secondary to possible compensation of thoracic rib cage to the left as a result of thoracic "spinal" orientation to the right.



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**Postural Restoration Institute™  
Treatment Approach**

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**RESTORE Pelvic Position & Muscular Balance**



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**RESTORE Apical Chest Wall Expansion**



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**RESTORE Diaphragmatic Breathing**



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### RESTORE Abdominal Opposition to Diaphragm

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### RESTORE Chest Wall Flexibility

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### INITIATE Right Low Trap/Right Tricep Strengthening

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### Recommendations for Achieving & Maintaining Symmetry

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### 1. Positioning for daily activities

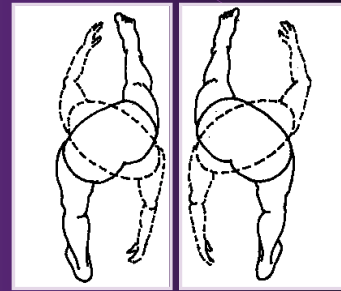
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2. Ability to shift weight over your left hip as well as your right



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3. Alternating reciprocal gait always leading with your right leg and left arm



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4. Ability to touch your toes



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5. Ability to fully squat



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Shoulder Impingement



...then Right Low Trap/Tricep →  
Right Subscap Progression Sequence

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Thoracic-Outlet Syndrome



...then Right Low Trap/Tricep →  
Right Subscap Progression Sequence

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## Cervical Strain



...then Right Low Trap/Tricep →  
Right Subscap Progression Sequence

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## Thank you!

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