The Two Roles of the Diaphragm for Chiropractic, Rehab and Sports Performance

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Postural Restoration Institute®

FAULTY POSTURAL INFLUENCES

A. Static Asymmetry
B. Dynamic Asymmetry
C. Breathing Discord
D. Abdominal Oblique Disuse
E. Parafunctional Habits

Static Asymmetries Right Hemi-Diaphragm

1) **Right hemi-diaphragm larger than left**
2) **Thicker, larger central tendon**
3) **Higher central dome**
4) **Better able to maintain dome (Liver below)**
5) **More crural fibers and fascia (attach on lumbar spine bodies 1-1/2 levels lower)**
6) **Better eccentric abdominal opposition and concentrically effective for *respiration***
7) **Right phrenic nerve more vertical, less length, faster electrical conduction (Bordini et al 2013)**

"For these reasons listed above, the right hemi-diaphragm is powerfully positioned to serve as a respiratory muscle to coordinate inhalation from a state of ZOA. This dominant respiratory activity over the right half of the diaphragm centers our core of stabilization and neurological control laterally over to the right and feeds a pattern of right dominate muscle activity that can be difficult to overcome. These muscles become chronically over worked, hypertonic and feel tight to the patient. They often lack flexibility in left lateral flexion of the thorax and right thoracic trunk rotation. The reality is that these muscles are neurologically overused and require muscle inhibition techniques rather than traditional stretches"

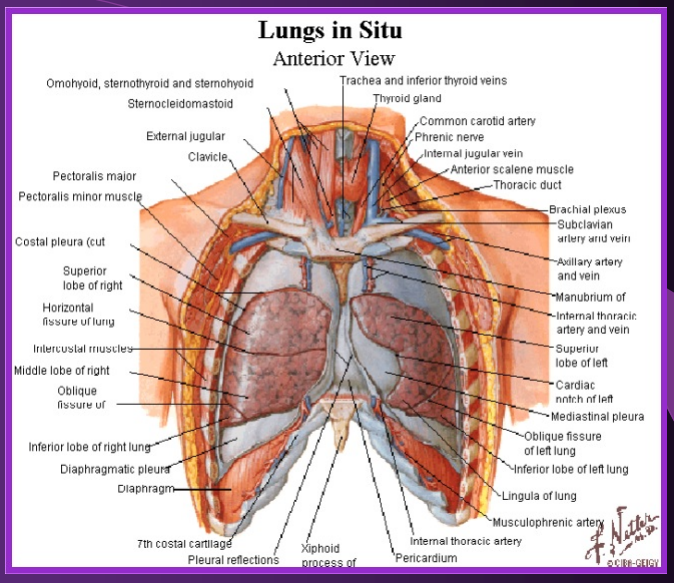
Excerpt from the Postural Respiration Course Manual

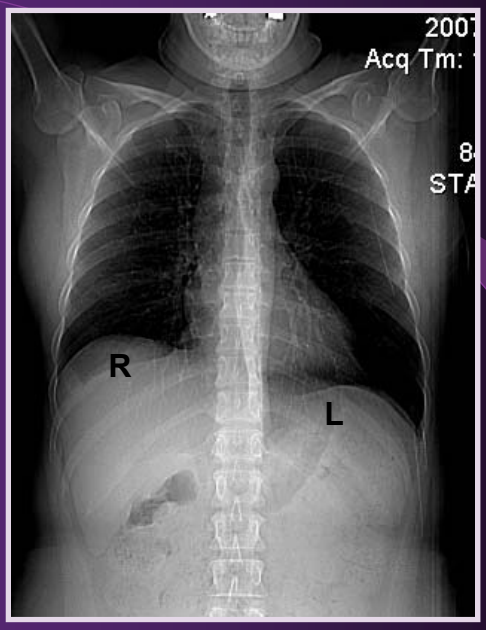
Static Asymmetries Left-Hemi Diaphragm

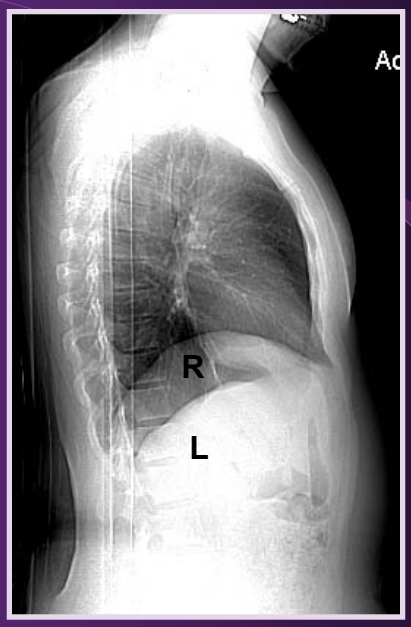
1) **Smaller diameter**
2) **Smaller, thinner central tendon**
3) **Lower, flatter central dome, placement under heart**
4) **Less able to obtain/maintain domed shape**
5) **Less crural fibers and fascia with attachments 1-1/2 lumbar levels higher**
6) **Poorer abdominal eccentric opposition**
7) **Concentrically effective for *left thoracic extension, rotation and stabilization***

"For these reasons, the left hemi-diaphragm is not as well positioned to serve as a respiratory muscle to coordinate normal inhalation because the left hemi-diaphragm is more challenged in attaining ZOA activity. Thus, the flatter left "D" becomes more of a postural stabilizer to the spine and core axial skeleton as it assists the back extensors and moves the lumbar spine into more of a state of extension (Hodges et al 2001) This flatter position causes it to be overactive (tonic). This over activity is ineffectual because it is not properly supported and opposed by the unilateral, ipsilateral abdominal muscles and therefore cannot maintain the ZOA required for proper respiration. The muscles across the left side of the body need neuromuscular repositioning and retraining to properly position the left "D", left hip and pelvis"

Excerpt from the Postural Respiration Course Manual







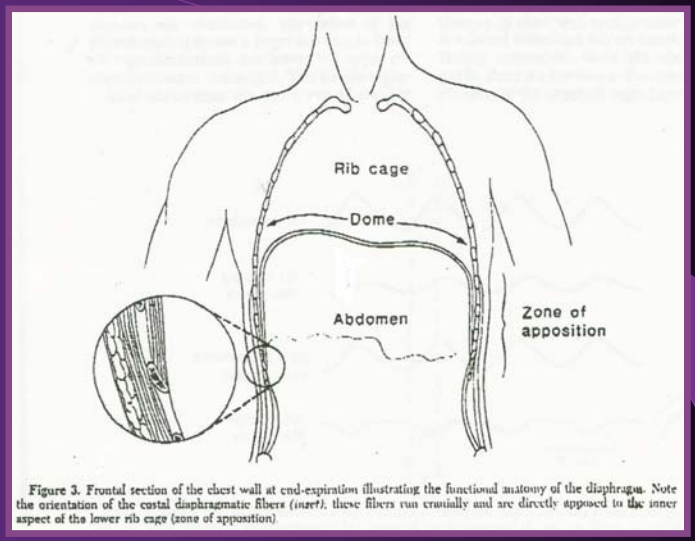
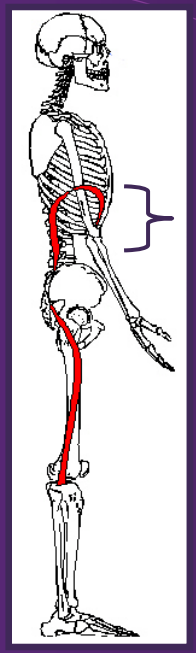


Figure 3. Frontal section of the chest wall at end-expiration illustrating the functional anatomy of the diaphragm. Note the orientation of the costal diaphragmatic fibers (*inset*), these fibers run cranially and are directly apposed to the inner aspect of the lower rib cage (zone of apposition).

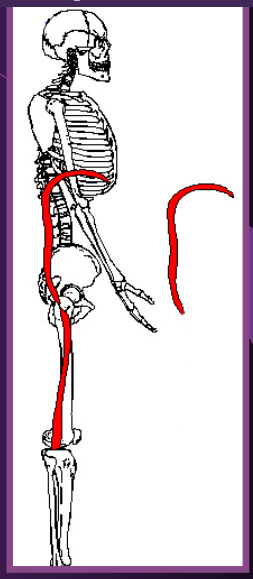
DeTroyer A, Estenne M: Functional anatomy of the respiratory muscles. Clin Chest Med 9:2, 1988 with permission from Elsevier.



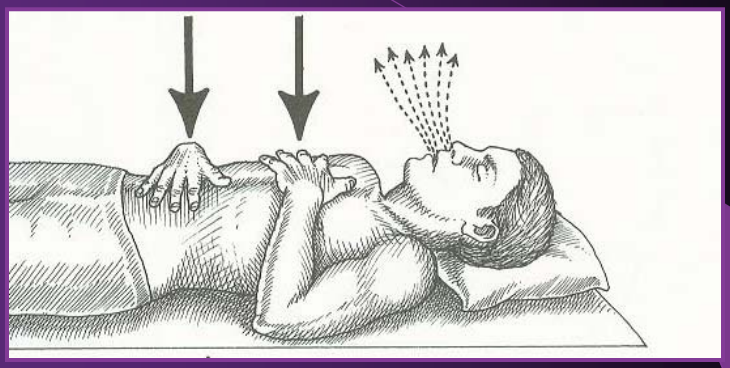
Zone of Apposition

Optimal ZOA

Sub-Optimal ZOA



NORMAL EXHALATION



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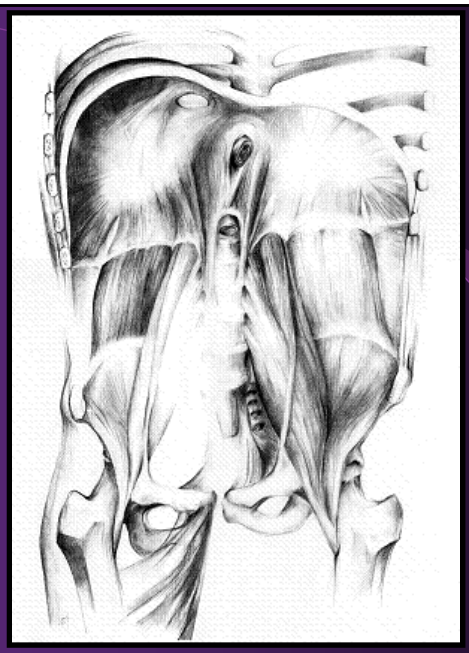
Zone of Apposition References

- **DeTroyer A, Estenne M: Functional anatomy of the respiratory muscles. Clin Chest Med 9:2, 1988. Dynamic Asymmetry**
- **Hruska RJ: Influences of dysfunctional respiratory mechanics on orofacial pain. Dent Clin North Am 41:2, 1997. Breathing Discord**
- **Mead J: Functional significance of the area of apposition of diaphragm to rib cage. Am Rev Respir Dis 11:31, 1979. Rotation Dysfunction**
- **Reid WD, Dechman G: Considerations when testing and training the respiratory muscles. Phys Ther 75:11, 1995.**
- **Lando Y et al: Effect of lung volume reduction surgery on diaphragm length in severe chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 1999 Mar;159(3):796-805.**



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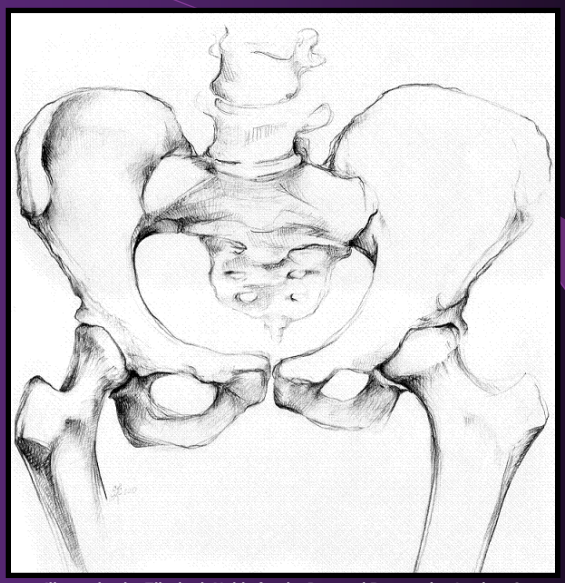
Left AIC



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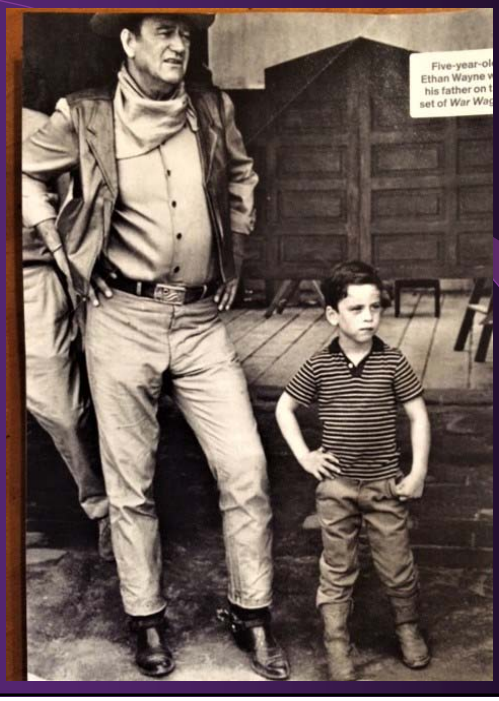
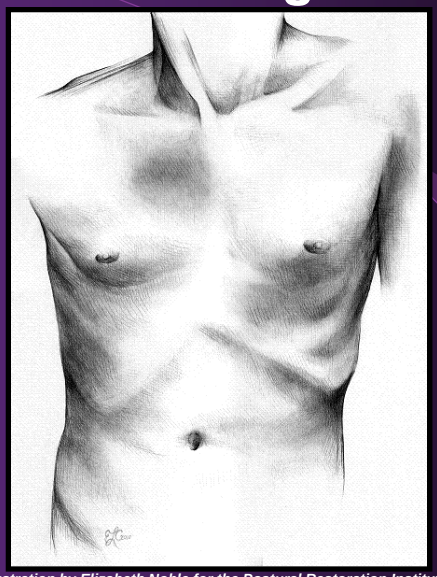


Right, unilateral, body on head posture

Left AIC / Right BC



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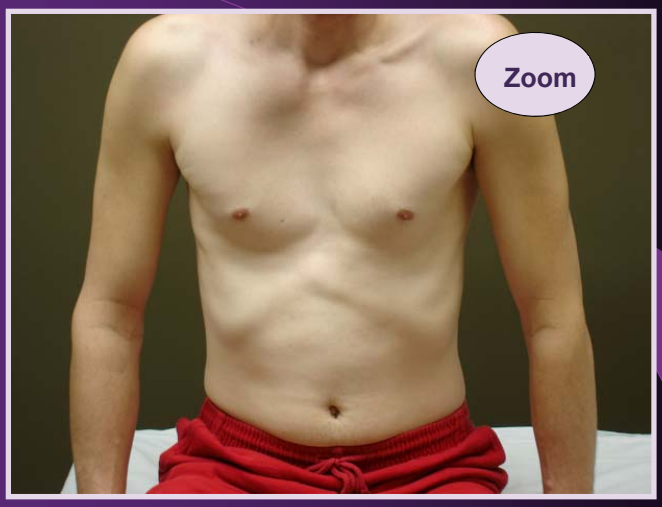

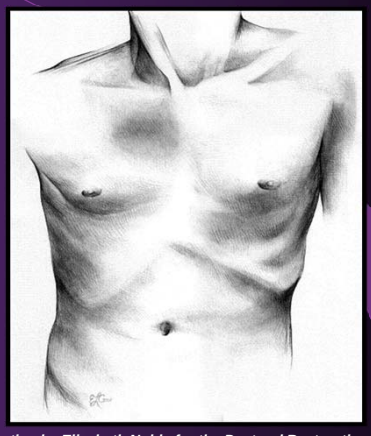

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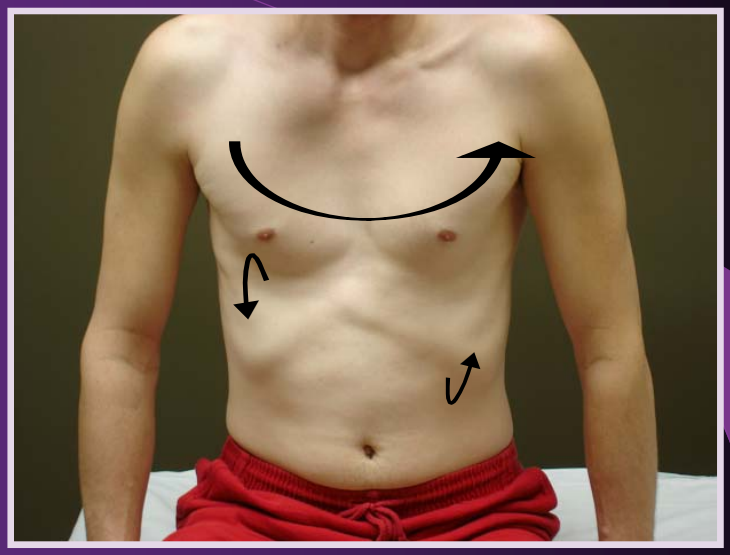
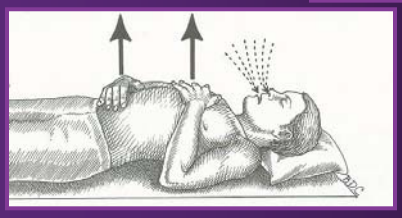


Breathing Discord

1) Shallow & asymmetrical
2) Limited hemi-diaphragmatic respiratory function (often left)
3) Decreased mobility of upper chest wall & cavity (often right)
4) "Belly breather"

INHALATION

Inhalation by using the diaphragm only, protruding the abdomen and keeping the chest collapsed.



Synchronized chest and diaphragm conjugal movement. The chest and abdomen move in and out together.

Used with permission from Barbara D. Cummings. Adapted from Simons DG, Travell JG, Simons LS: Myofascial pain and dysfunction, the trigger point manual, upper half of body. Baltimore, Williams & Wilkins, 1999.

Belly Breathing

Anterior thoracic concavity

"Reversed Cervical Spine"

Weak: abdominals, mid and lower traps glutes and dorsiflexors.

Breathing Discord (cont'd)

5) Accessory respiratory muscle becomes primary muscle of inhalation
6) Diaphragm postural oriented & acts as an "agonistic" co-contractor to thoraco-lumbar fascia & extensor muscle

Breathing Discord (cont'd)

7) Chronic habitual overuse of thoracic elevators creates "pullers" vs. "pushers"

Breathing Discord (cont'd)

8) Hemi-diaphragm contraction pulls ventral thoraco lumbar psoas fascia upward, upper vertebra forward and superiorly thus creating lordotic posturing and limited hip extension

Breathing Discord (cont'd)

9) Exhalation becomes passive and rate of inhalation increases

10) Nocturnal mouth respiration or bruxism

Breathing Discord (cont'd)

11) Hyperinflation

- Increase in intercostals & accessory muscle contraction
- The flattened diaphragm begins to have an expiratory action on the rib cage


Zoom
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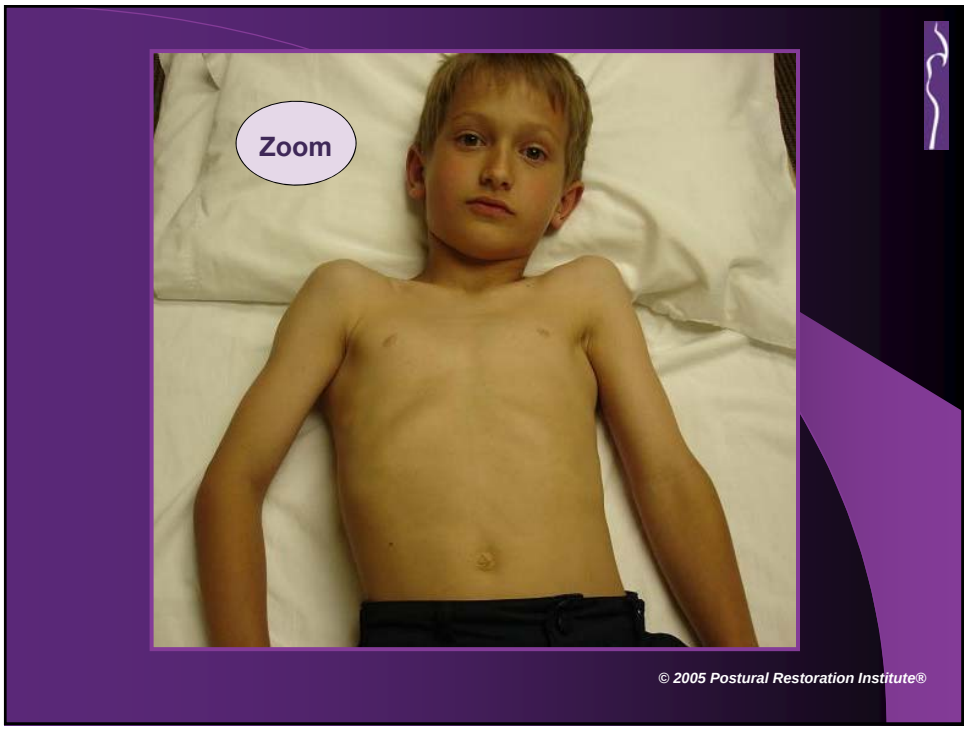
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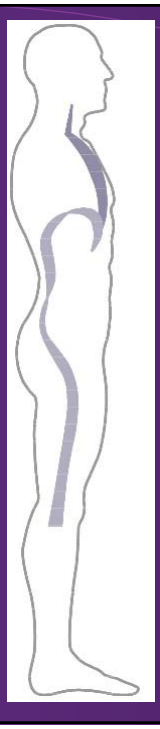


Brachial Chain (BC)

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

Dynamic Asymmetry

1) Acquired dynamic dominance
   a. lumbo-pelvic-femoral core stability (usually to the right)
   a. thoraco-abdominal rotation (usually to right)
   c. thoraco-scapula-humeral reach (usually with the right)

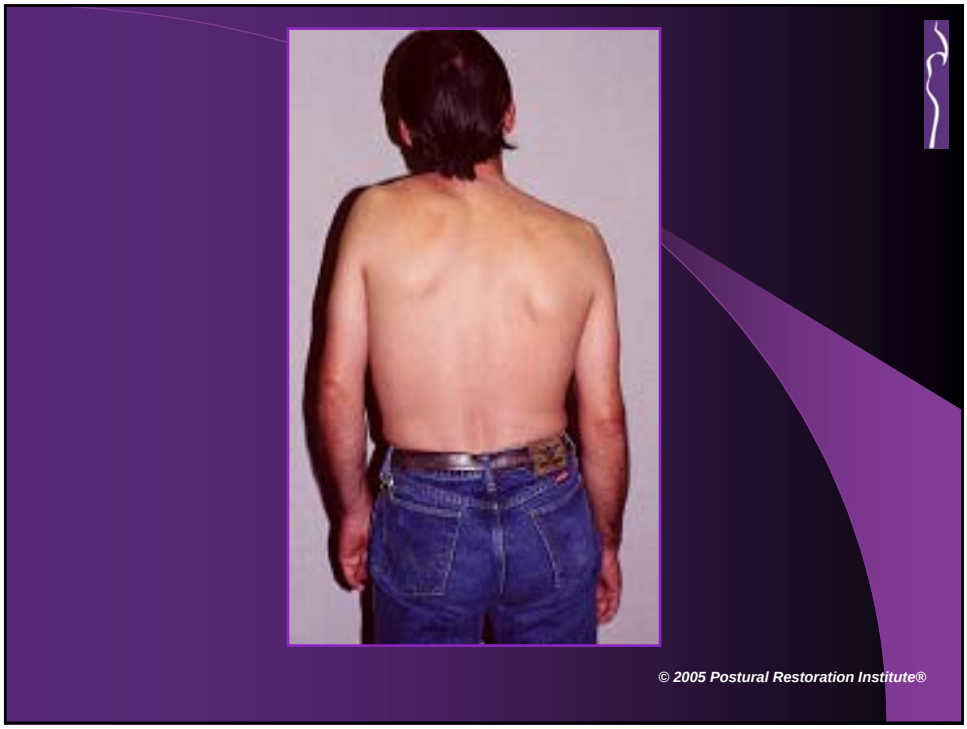
Dynamic Asymmetry (cont'd)

2) Lymphatic drainage greater on left
3) Greater zone of apposition at the right diaphragm leading to increased chest expansion on the left upon inhalation
4) Early development of strong unilateral body-on-head righting reaction skills

Dynamic Asymmetry (cont'd)

5) Motor area of left frontal lobe in the anterior wall of cerebral sulcus of cerebral cortex controls muscles on the contralateral side while the right insula area controls empathy and the left prefrontal cortex controls feelings of joy and happiness
6) Obligatory acquired AF & FA imbalance of positional sense & proprioceptive awareness
7) Trauma, repetitive overuse, obesity & surgery contribute to extremity compensatory strategy

Right arm repetitive overuse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1) "The Function of the diaphragm in not only respiratory, but also postural and can be voluntarily controlled. (*Kolar P et al 2009*)
2) Asymmetrical airflow and perfusion between the right and left lungs occurs in more than half of the children with congenital and infantile thoracic scoliosis. (*Redding G, 2008*)
3) The costal aspect of the diaphragm is responsible for rib external rotation upon diaphragm inhalation while the crural fiber is primarily responsible for dome decension and thoracic-lumbar spinal extension.
   - *Ron Hruska*

AIC Tests

*Adduction Drop Test
Extension Drop Test
*Trunk Rotation
*Apical Expansion

Opposition Muscle

Hamstrings
Glutes
IOs / TAs

Thank You!

Questions or Comments?

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