Thoracic Mobility: The Missing Link to Core Stability

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Thoracic Anatomy

Vertebrae

The Rib

Rib Mobility During Breathing
Osteokinematics

- Flexion/Extension
- Rotation
  - About 2 degrees per segment
  - 12 segments total = 24 degrees of total rotation
    - Lumbar spine is 10-12 degrees of rotation
- Side bending
  - Limited by the ribs

Associated Osteokinematics

- Bilateral shoulder flexion and extension
  - Requires thoracic extension
- Unilateral shoulder flexion/ER
  - Requires thoracic extension and ipsilateral rotation
- Unilateral shoulder extension/IR
  - Requires thoracic flexion and contralateral rotation

Ideal Alignment

- Upright posture
  - Co-activation of flexors and extensors
  - Co-activation of adductors/abductors
  - Co-activation of internal/external rotators

Posture

- Balance is disturbed in the body
- “Old system” takes over
- Occurs with injury, central nervous dysfunction, fatigue, and even fear

Brugger’s Cogwheel Diagram

- Favoring of the older system in static posture
- Can affect breathing
- Creates a nociceptive chain

Posture

“Posture follows movement like a shadow”
- Sherrington 1906

Thought becomes strategy
- Strategy becomes habit
- Habit becomes posture
- Posture becomes structure

*Adapted from Tom Myers, What is Fascia? Webinar with The Benjamin Institute 5/10/11*
Respiration vs. Breathing

- We must differentiate between the spontaneous act of oxygenation, and the act of breathing for other purposes outside of respiration
  - *Respiration* is the exchange of gases, as oxygen cannot be stored in the body
  - *Respiration* depends on the oxygen needs of the body
  - *Breathing* influences our actions and emotions and is influenced by our actions and emotions

*Respiration is automatic, breathing is conscious*

Calis-Germain, 2006

Respiration vs. Breathing

- Two principle types of breathing
  - Costal
  - Diaphragmatic
  - Both have variations

- Neither one is right or wrong
  - Simply adapt for the purpose or task at hand
  - Important to practice a variety of techniques, especially if you use one variation more than others

Diaphragm

**Sternal Part**
- Attached at the posterior aspect of the xiphoid

**Costal Part**
- Arises from anterior surfaces of inferior 6 ribs and costal cartilage
- Muscular slips intertwine with fibers of the TA

Diaphragm

**Lumbar Part**
- Med and Lat Arcuate LL forms a fibrous arch (read DIRECT ATTACHMENT) between TL fascia, psoas, crus, and QL

**** Gives cause for direct anatomical connection between breath, rib position and lumbar spine ****
**Relationships**
- Breath facilitates movement
- Movement facilitates breath
- Breath facilitates stability
- Stability facilitates mobility

**Breath Facilitates Movement**
- Inhalation
  - Thoracic extension
  - Shoulder flexion, scapular elevation, humeral internal rotation
- Exhalation
  - Thoracic flexion
  - Shoulder extension, scapular depression, humeral external rotation
- Combination
  - Lateral flexion/side bend (unilateral breathing)
  - Rotation

**Movement Facilitates Breath**
- Thoracic Extension
  - Anterior inhalation
- Spine Flexion
  - Posteriolateral breathing
- Lateral Flexion
  - Unilateral breathing

**Breath Facilitates Stability**
- Maintenance of optimal spinal position (axial elongation) during movement
  - Inhalation when hips flex or shoulder extend
  - Exhalation when hips extend or shoulders flex
- Diaphragmatic breath provides connection to spine and facilitation of force couple between pelvic floor, abdominal region, and spinal intrinsics
- Forced exhalation increases oblique activation and force couple increasing intra-abdominal pressures

**Scalenes**

**SCM**
- Sternocleidomastoid
**COMPENSATORY POSTURES & MOVEMENTS**

**Normal tidal volume**
- Generally uses diaphragm
- Low use of inspiratory mm during inhalation
- Relaxation of inspiratory mm during exhalation

**Inspiratory Reserve Volume**
- Inspiratory muscles work more concentrically and eccentrically
- Expiratory muscles relax

**Expiratory Reserve Volume**
- Concentric work of expiratory mm
- Relaxation of inspiratory mm

8 weeks of training
Apical Breathing

Hypertonus of the Paraspinals

Kolar, 2008

Static Posture

Inspiratory Position of the Chest

Kolar, 2008

Rainbow Breathing

Lateral Side Breathing
Interventions

- General mobility
- Jt specific mobility

PA Mobs with Wedge

Sitting Thoracic Mobilizations

TLRR1

TLRR2

Tennis Ball T/S Mobility
Pec Minor Release: Floor

Pec Minor Release: Wall

Floor Slide

Wall Sit

Supine Lat Stretch with Expiration

Mid Thoracic Stretch- Heel Sit
Thoracic Flexion
- You will see a “flat spot” in the t-spine, where you no longer see or see less prominent thoracic spinous processes
- Restore with:
  - Pec Minor Release
  - Diaphragm Release
  - Abdominal Release

Summary
- Remember Specific Breathing Patterns
  - 3D breath
- Restore Thoracic Mobility
  - Esp. extension and rotation
- Lumbar stability and hip mobility for comprehensive program

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