

## *living anatome: The Thorax & Abdomen*

### I. INTRODUCTION

### II. WARM-UP

### II. THE ABDOMINAL WALL

#### *Talking points:*

- Layers of Abdominal Muscles (Superficial to Deep): Rectus abdominis, External obliques, Internal obliques, Transversus abdominis
- All innervated by ventral rami intercostal nerves

#### **Exercise** (Pilates): *Ab Prep*

- Featured muscle: Rectus abdominis (vertical fibers)
- Origin: Pubic symphysis and crest
- Insertion: Costal cartilage of ribs 5,6,7
- Function: Flexion of trunk
- Note: What makes your six-pack?
  - Linea alba (sister of Jessica ☺), a fibrous band in the ventral midline that is the combined aponeurosis of the 4 ab muscles
  - Tendinous insertions (horizontal) of the rectus abdominis that cut it into 3 or 4 bellies (giving you a 6- or an 8-pack)

#### **Exercise** (Pilates): *Obliques with Rotation/Spinal Twist/Side Bends*

- Featured muscle: External Oblique (“hands-in-pocket” fibers)
- Origin: Lower 8 ribs
- Insertion: Linea alba, pubis, anterior iliac crest
- Function: a) Unilaterally rotate you to contralateral side, i.e. right obliques rotate you left; b) Unilateral lateral flexion to ipsilateral (same) side; c) bilaterally flex the trunk

- Featured muscle: Internal Oblique (“hugging myself” fibers)
- Origin: Lower 8 ribs (5-12)
- Insertion: Linea alba, pubis, anterior iliac crest
- Function: a) Unilaterally rotate you to ipsilateral side, i.e. right obliques rotate you right; b) Unilateral lateral flexion to ipsilateral (same) side; c) bilaterally flex the trunk

#### **Exercise** (Pilates): *Transverse Engagement*

- Featured muscle: Transversus abdominis (horizontal fibers)
- Origin: Inguinal ligament, iliac crest, thoracolumbar aponeurosis, internal surface of costal cartilage 7-12
- Insertion: Linea alba, pubis

- Function: Compression of abdominal contents
- *Clinical Correlate:* Hernias: Protrusion of parietal peritoneum and viscera through a normal or abnormal opening in the abdominal cavity
  - Direct: medial to inferior epigastric artery (inside Triangle of Hesselbach (first cousin of David Hasselhoff ☺)); rarely enters scrotum
  - Indirect: lateral to inferior epigastric artery (outside the Triangle); passes through inguinal canal and commonly enters scrotum; more common; due to patent processus vaginalis

### III. THE THORAX

#### *Talking points:*

- Bony anatomy (palpate):
  - Manubrium (level T2-T4ish)
  - Sternal angle, a.k.a. angle of Louis (level T4-T5; where trachea bifurcates)
  - Sternum (level T5-T9)
  - Xiphoid process (level T10)
  - Ribs: 12 total- 7 true, 3 false, 2 floating. Posterior joints: all costovertebral joints are synovial. Anterior joints: first ribs are cartilaginous joint; ribs 2-7 articulate with sternum via sternocostal synovial joints; ribs 8-10 cartilaginous joints

#### Thoracoappendicular muscles

**Exercise** (yoga): *Sun salutation series, composed of the following movements highlighting featured muscles (described, below):*

- *Chataranga*
    - Engage serratus (and pec minor) to stabilize/prevent retraction of the scapula
    - Engage pec major to adduct arms from bent position, when transferring into upward dog
  - *Upward Dog*
    - Engage pec minor to depress the scapula (have shoulders move up first) (and- as a refresher- trapezius!)
  - *Downward Dog*
    - Engage serratus to stabilize scapula
    - Engage pec minor to depress scapula (ultimately maintaining neutral position on back; have students elevate shoulders before depressing)
- Featured muscle: Pectoralis major (palpate anterior axilla)
  - Origin: Two heads: 1) Clavicular head: medial half of clavicle, 2) Sternal head: sternum, cartilages of upper 6 ribs
  - Insertion: Bicipital groove of humerus

- Innervation: Lateral (C5-7) and medial pectoral nerves (C8-T1)\*
- Function: Adduction, medial rotation, and flexion of humerus
  
- Featured muscle: Pectoralis minor (palpate coracoid)
- Origin: Anterior surface of ribs 3,4,5
- Insertion: Coracoid process of scapula
- Innervation: Lateral (C5-7) and medial pectoral nerves (C8-T1)\*
- Function: Protraction, depression, downward rotation of scapula
  
- Featured muscle: Serratus anterior (palpate anterolateral ribs below axilla during scapula protraction)
- Origin: Outer surface of upper 8 ribs
- Insertion: Vertebral border of scapula
- Innervation: Long thoracic nerve (C5-7)
- Function: Protraction, upward rotation, and stabilization of scapula
- *Clinical correlate*: Winged scapula

\*Note: Visually, the lateral nerve is oriented more medially; “lateral” and “medial” refer to the origination of the nerves of the “lateral” and “medial” cords, respectively, of the brachial plexus.

### Intercostal Muscles

**Exercise:** *Cleaning (Kapalabhati) breath (yoga)*

- Featured muscle: External, internal, innermost; fibers parallel ab wall layers (ex obliques, internal ob, transversus ab)
- Function: Primary respiration; elevation and depression of ribs
- Note: The diaphragm is the body’s primary respiratory muscle. The intercostals are the secondary respiratory muscles. The pectoral muscles, amongst others, are accessory respiratory muscles
- *Clinical correlate*: Vein, artery, nerve (thoracic ventral rami from spinal nerves) (“VAN”) run between internal and innermost muscles in the costal groove on the inferior portion of rib. This is why pleural taps are performed on superior portion of ribs.
  
- Featured muscle: Diaphragm
- Function: Primary muscle of respiration
- Innervation: Phrenic Nerve (C 3,4,5, mainly GSE fibers~ “keeps the diaphragm alive”)

## IV. SAVASANA

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