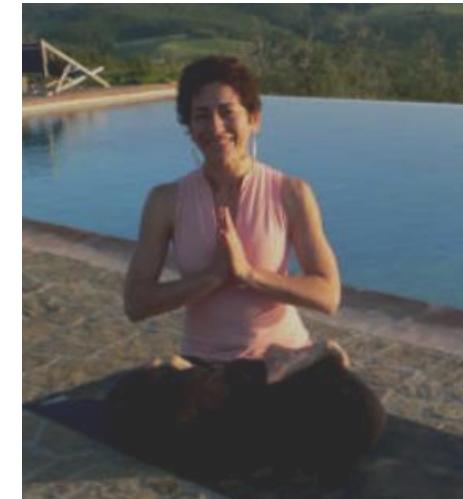


# Anatomy for 8 Limbs Yoga Center Teacher Training 2012-2013

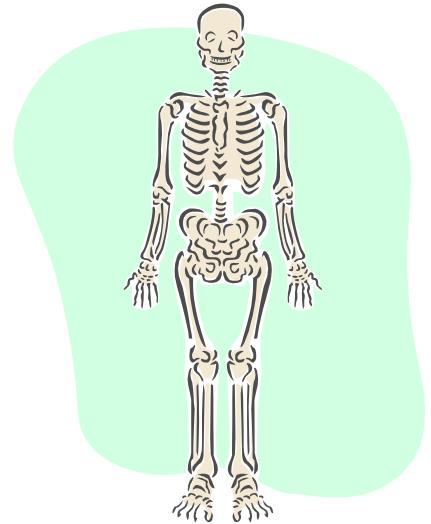
## Spine and Core

Chiara Guerrieri, LMT

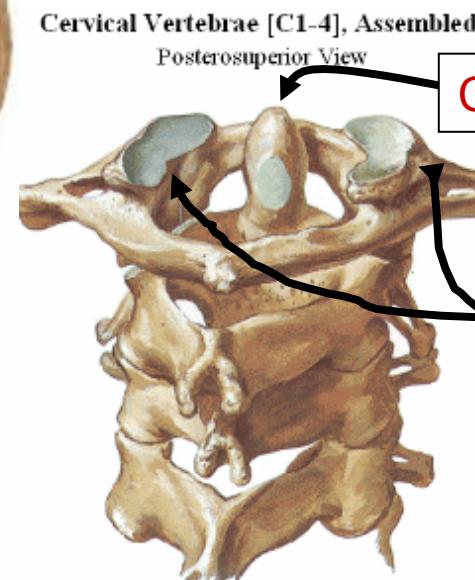
[Chiarayoga@hotmail.com](mailto:Chiarayoga@hotmail.com)



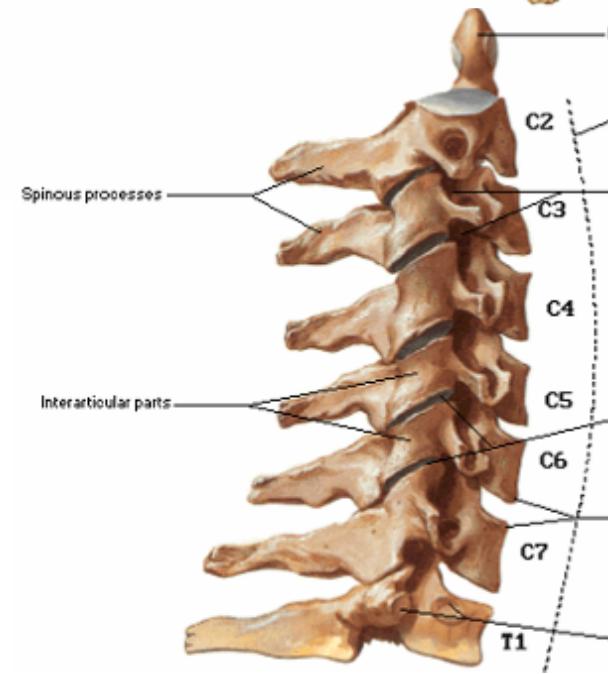
# Bones



# Cranium and Cervical Spine

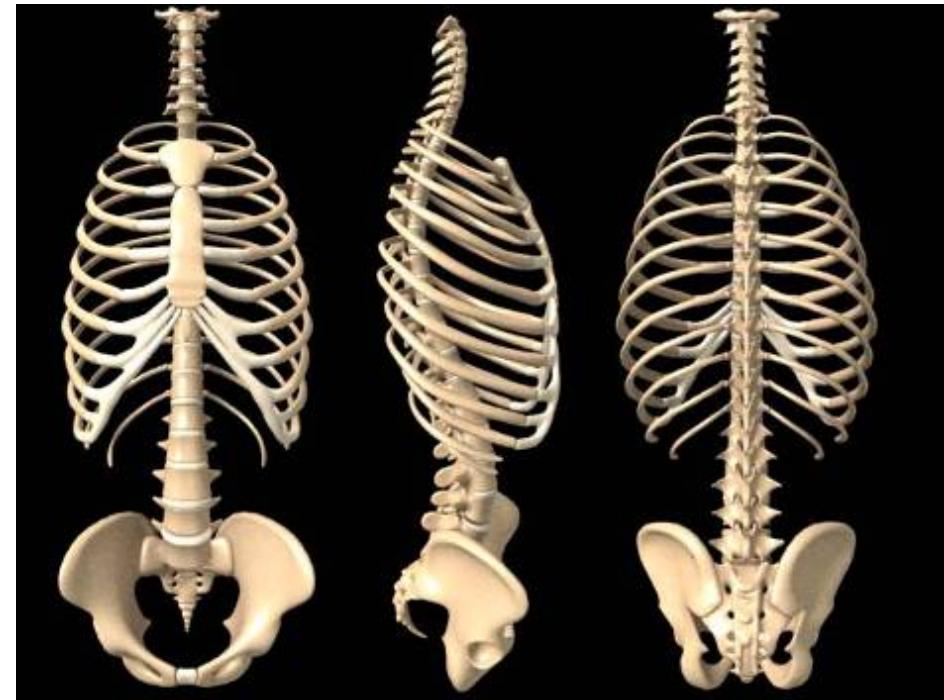


Cervical Vertebrae [C4 and C7]  
Superior Views



- Cranium, cervical spine
- Movement of atlas, axis
- Movement of occiput over atlas

# Thorax



- Thorax: sternum, manubrium, xiphoid process
- Ribs: true 7, false 5, floating 2
- Pelvis: aiis, asis, iliac crest, iliac fossa, ramus of pubis

# Muscles



<http://www.jmu.edu/arhistory/images/david2.jpg>

# Review of Muscle Terminology

**Agonist or prime mover:** the muscle that contracts to produce a certain action about a joint. For example, the hamstrings are agonist when you flex your knee.

- **Antagonist:** A muscle that relaxes while the agonist contracts. The antagonist produces the opposite action about a joint. For example, the quadriceps (at the front of the thigh) are the antagonists to the hamstrings when you flex your knee. When you extend your knee, the quadriceps are the agonist and the hamstrings are the antagonists.
- **Synergist:** A muscle that assists and fine-tunes the action of the agonist and can be used to produce the same action, although generally not as efficiently.

# Review of Superficial Hip Flexors

## Rectus femoris

O: AIIS  
I: tibial tuberosity  
A: extension of lower leg and flexion of thigh

## Sartorius

O: ASIS  
I: medial superior tibia  
A: flexion, lateral rotation and abduction of femur

S: Lunges, one knee up & the other knee down at the wall

## Tensor fasciae latae (TFL)

O: anterior iliac crest  
I: Iliotibial tract to fibula  
A: abduction, flexion and medial rotation of femur  
S: Supine with feet 3 feet apart & 2 feet away from the sit bones, drop the right knee to the right with right foot on top of the left knee



O: Origin, I: Insertion, A: Action, S: to Stretch

# Review of Hip Extensors

## **Gluteus maximus**

O: posterolateral sacrum, posterior ilium, sacrotuberous ligament  
 I: posterosuperior femur & iliotibial tract  
 A: extension & lateral rotation of femur  
 S: Supine knees to chest

## **Gluteus medius**

O: external iliac fossa  
 I: lateral aspect of greater trochanter  
 A: abduction of femur; assists in flexion & extension  
 S: Supine one knee up and over to side

## **Gluteus minimus**

O: anterior to Gluteus medius  
 I: anterior greater trochanter  
 A: assists Gluteus medius  
 S: Supine one knee up and over to side

**O:** Origin, **I:** Insertion, **A:** Action, **S:** to Stretch



## **Hamstrings**

### **Semimembranosus**

O: ischial tuberosity  
 I: posteromedial aspect of tibial condyle  
 A: flexion of lower leg, extension of femur

### **Semitendinosus**

O: ischial tuberosity  
 I: medial to above muscle  
 A: flexion of lower leg, extension of femur

### **Biceps femoris**

O: ischial tuberosity and posterior femur  
 I: head of fibula  
 A: flexion of lower leg, extension of femur

S: Supine with strap, seated forward bend standing forward bend.

# Deep Hip Flexors

## Psoas Major

O: bodies and transverse processes  
of L1-L5

I: lesser trochanter of femur

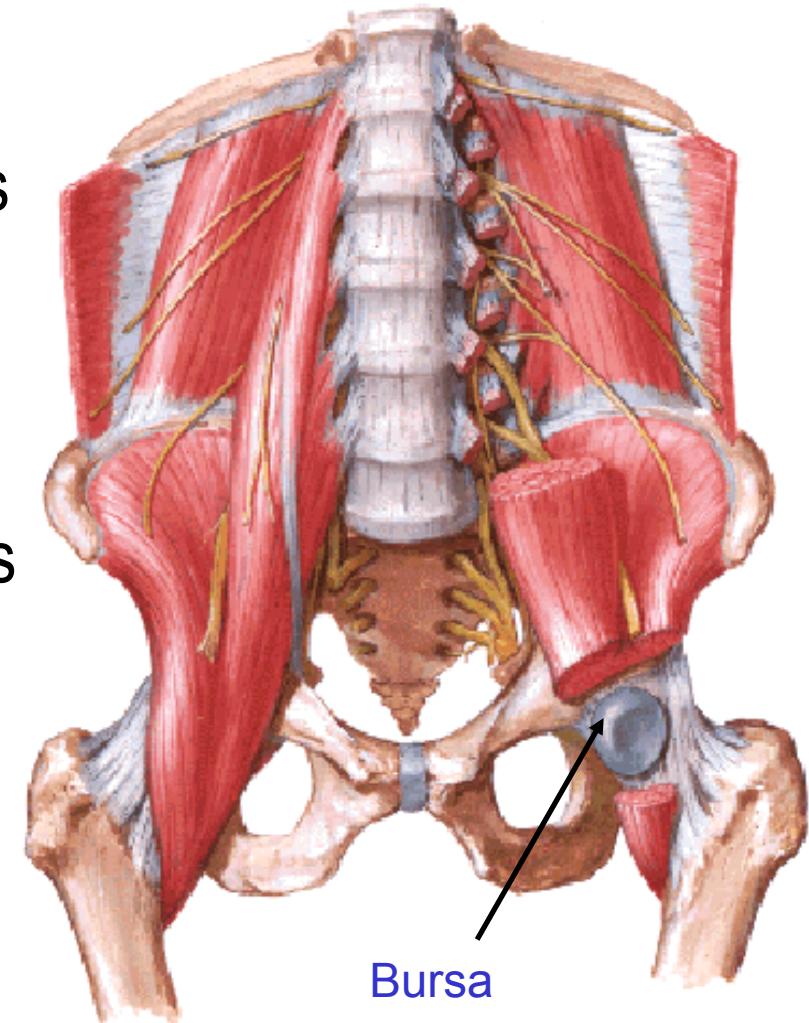
A: Flexes thigh or flexes trunk

S: Lunges with knee down and arms  
up, Warrior I (back leg)

## Iliacus

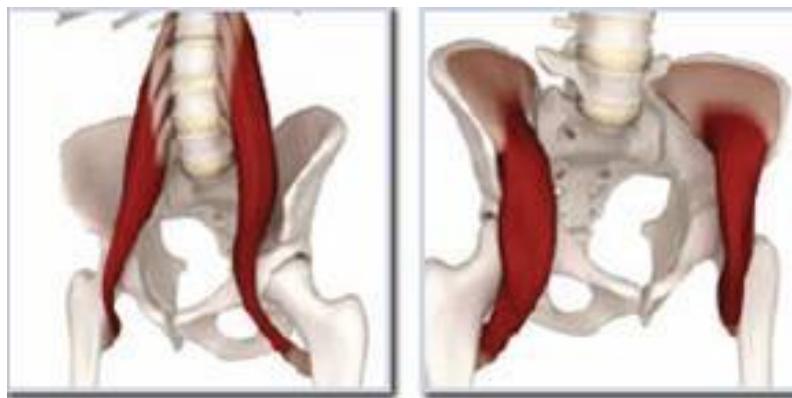
O: iliac fossa

I: lesser trochanter of femur



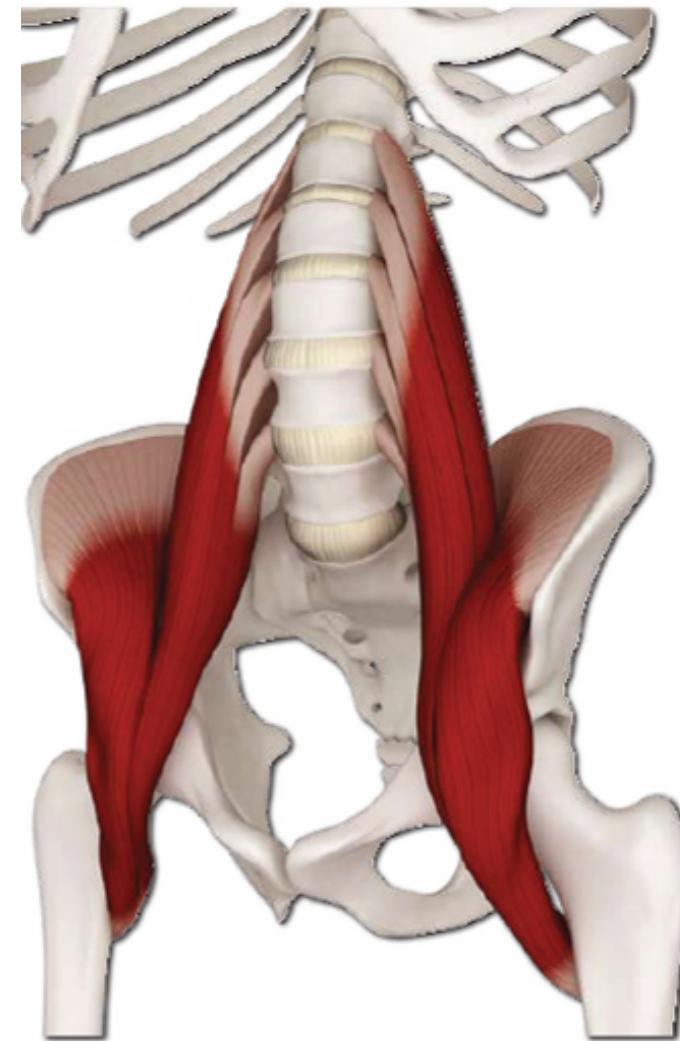
O: Origin, I: Insertion, A: Action, S: to Stretch

# Iliopsoas



Psoas: anterior flexion of the spine

Iliacus: anteversion of the pelvis



# Get up and *FEEL!*



# STILL Feeling...

## Contracted

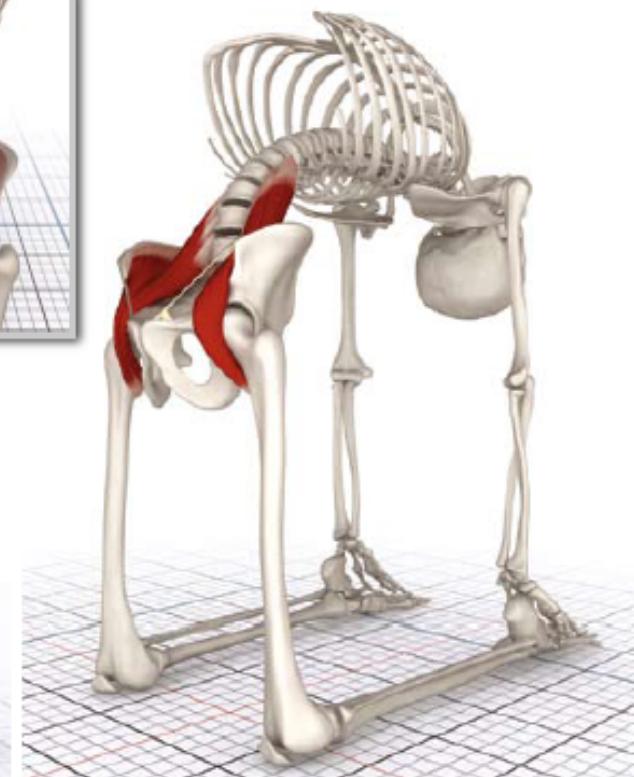
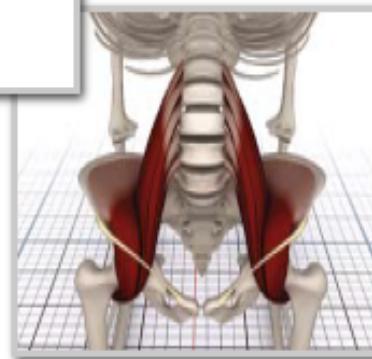
*Uttita Trikonasana* optimally contracts the psoas major portion of the iliopsoas muscle. Contraction in this posture anteverts the pelvis. This action draws the hamstring origin (ischial tuberosity) away from their insertion (lower leg), and accentuates their stretch.

Twisted variations of *utthita trikonasana* preferentially contract the iliacus portion of the iliopsoas and complete its awakening.

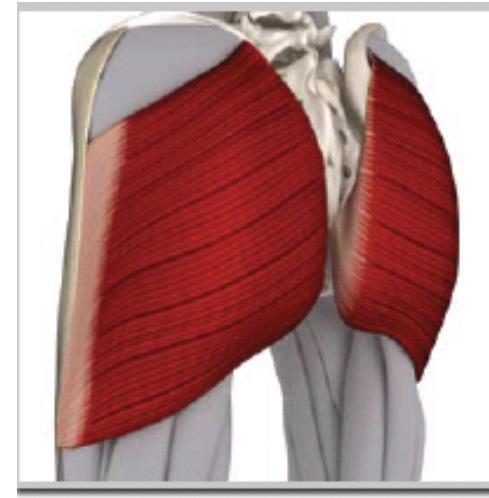
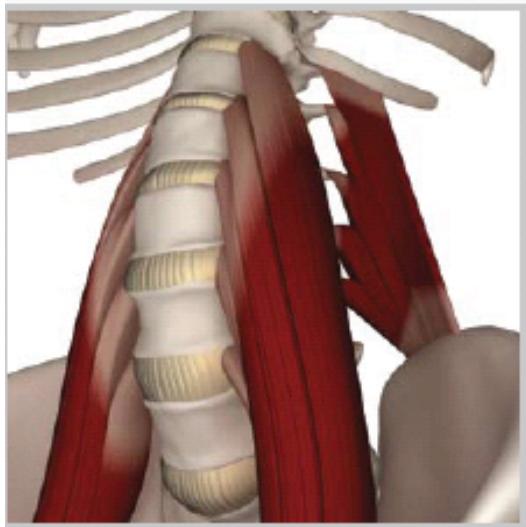


## Stretched

*Ushtrasana* stretches the iliopsoas through contraction of the hip and trunk extensors, including the gluteus maximus. Stretch is accentuated by contraction of the quadriceps (including the rectus femoris, which is eccentrically contracted).

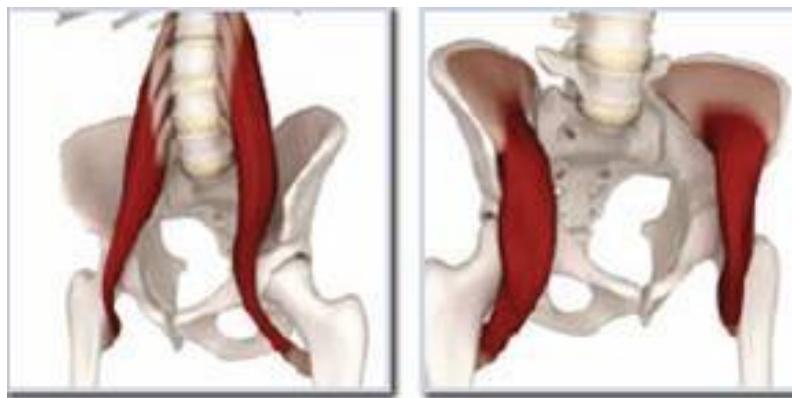


# Antagonists to Iliopsoas



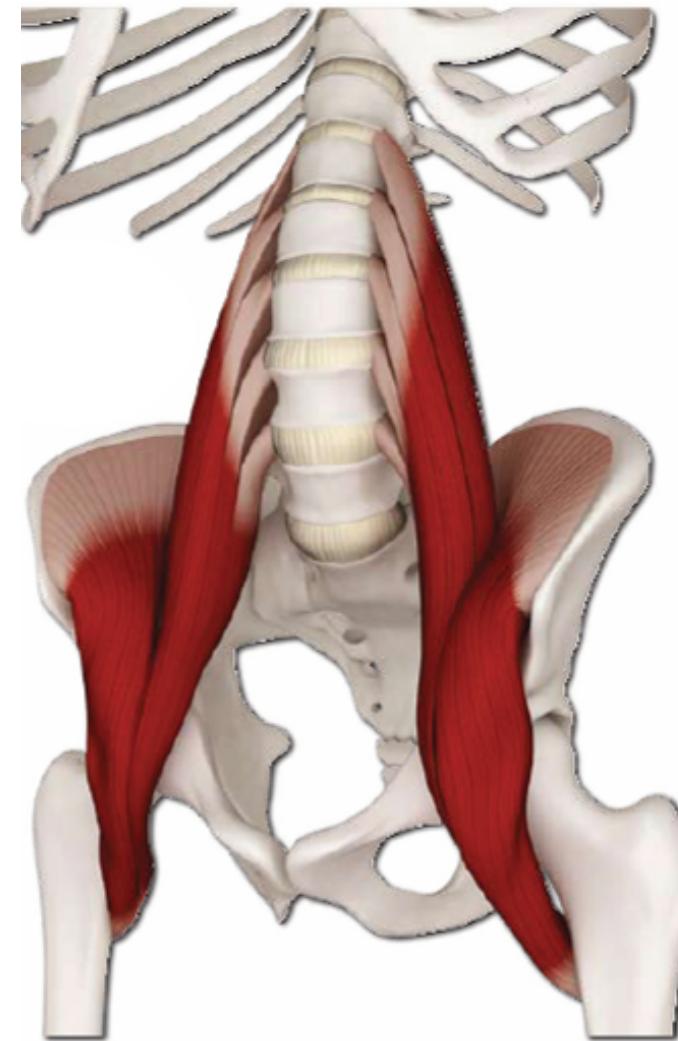
- **Quadratus lumborum**
  - Opposes spinal anterior flexion
- **Gluteus maximus & Hamstrings**
  - Oppose hip flexion

# Iliopsoas



Psoas: anterior flexion of the spine

Iliacus: anteversion of the pelvis



# Abdominals I

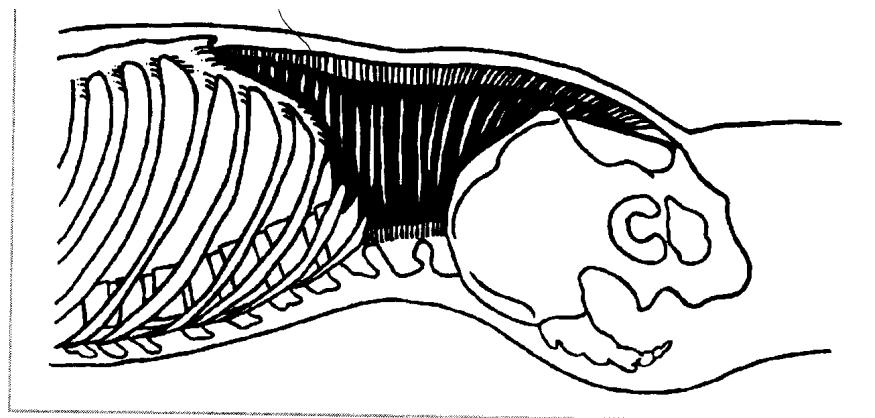
## Transversus abdominis (TVA or TrA)

O: inguinal ligament, thoracolumbar fascia,  
inner surface of ribs 7-12

I: linea alba

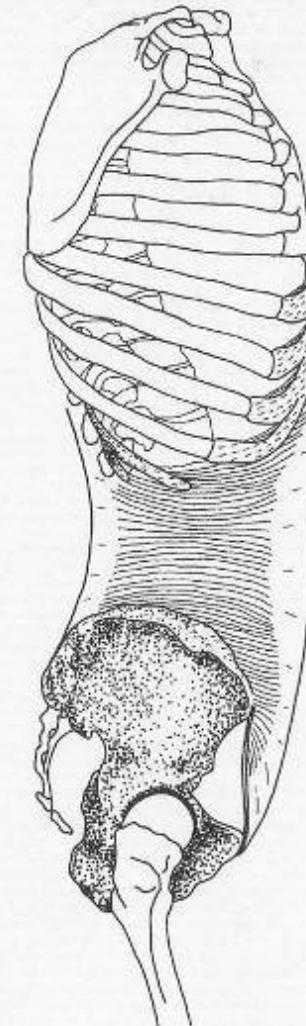
A: Pulls abdomen in.  
Expels contents in abdomen.

S: deep abdominal breathing



**Transversus Abdominus (TrA)** - the only abdominal muscle which attaches directly to our spinal joints

### TRANSVERSUS ABDOMINIS



# Abdominals II



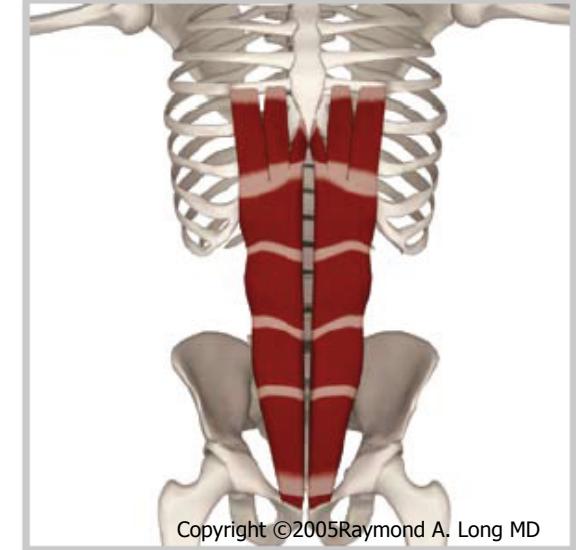
## Internal obliques

O: inguinal ligament, iliac crest, thoracolumbar fascia, lower ribs  
I: aponeurosis  
A: Side bending, flexion of trunk  
S: Side-bend



## External obliques

O: outer surfaces of ribs 5-12  
I: aponeurosis  
A: Sidebending, flexion of trunk  
S: Same as internal obliques



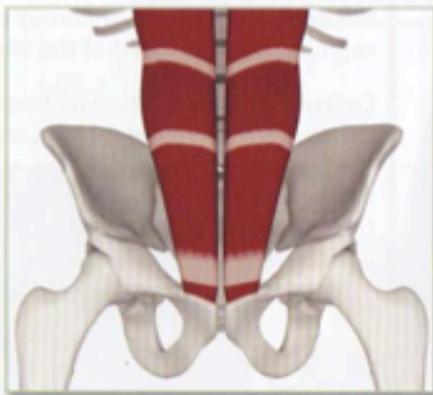
## Rectus abdominis

O: encased by aponeurosis of previous three muscles, pubis  
I: xiphoid process and ribs 5-7  
A: Flexion of trunk, approximation of pubis to xiphoid process  
S: *Urdva Danurasana*,  
Copyright ©2005Raymond A. Long MD

## Abdominals

### *Origin-Rectus Abdominus*

Symphysis pubis and pubic crest.

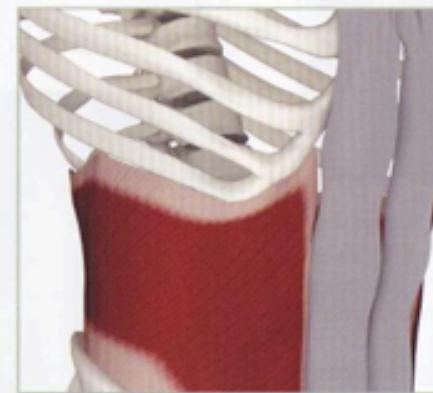


### *Insertion-Rectus Abdominus*

Zyphoid process, costal cartilages 5, 6 and 7.

### *Origin-Internal Oblique*

Lower borders of the lateral 1/3 of the inguinal ligament, iliac crest, thoracolumbar fascia and linea alba.

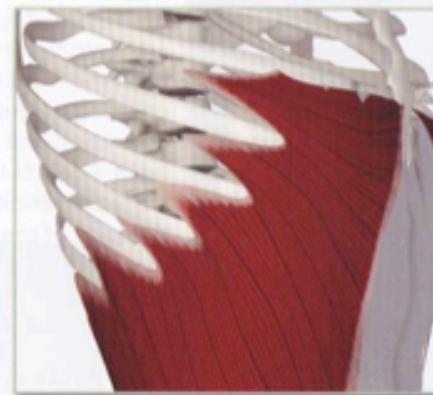


### *Insertion-Internal Oblique*

Linea alba and ribs 9 through 12.

### *Origin-External Oblique*

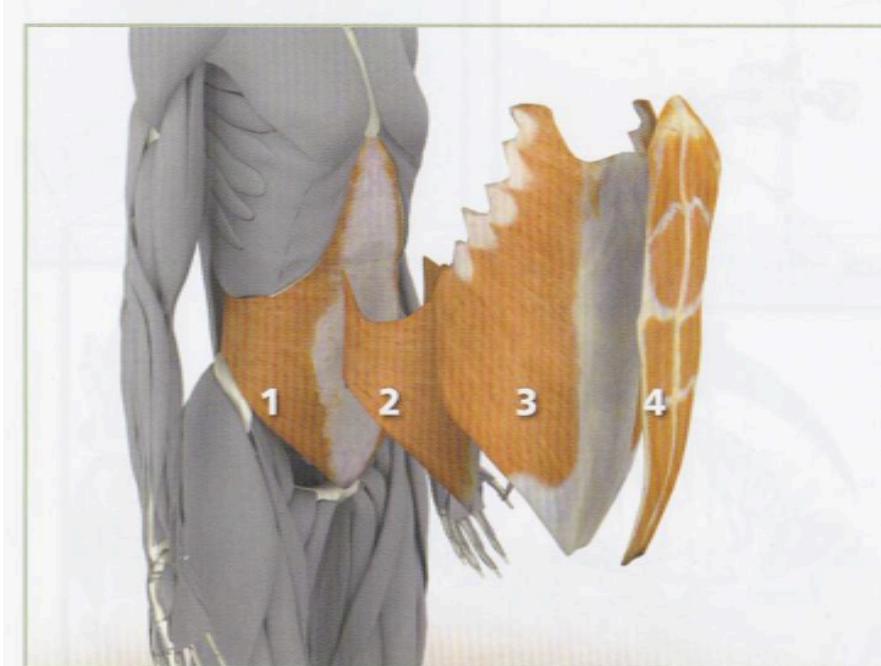
Ribs 5 through 12 and lower section of latissimus dorsi.



### *Insertion-External Oblique*

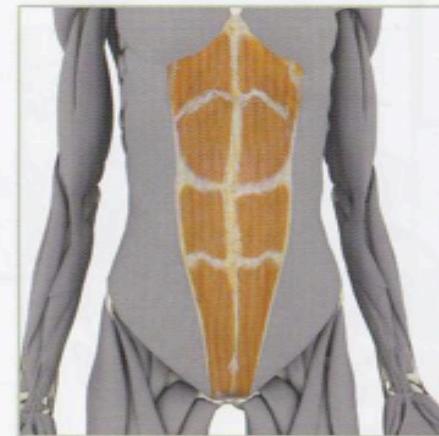
Linea alba, inguinal ligament and anterior half of iliac crest.

# Abdominals



- 1** Transversus Abdominis
- 2** Internal Oblique
- 3** External Oblique
- 4** Rectus Abdominus

## *Rectus Abdominus*



This is a long flat muscle that is divided into four bellies by horizontal fibrous bands, giving it a "washboard" appearance. It originates bilaterally from the pubic symphysis and pubic crest, inserting on the xiphoid process (at the bottom of the sternum) and, more laterally, the cartilage of the fifth, sixth and seventh ribs.

Contracting the rectus abdominus flexes the trunk forward, or, if the insertion is fixed, lifts the pelvis. This is demonstrated in utthanasana and tolasana respectively. Tightness in this muscle limits the depth of backbends such as urdhvadhanurasana and purvottonasana.

Contracting the rectus abdominus also compresses the abdominal contents, producing an "air bag" effect, which is thought to prevent hyperextension of the lumbar spine, protecting it when extended (as in backbends).

## *External Oblique*

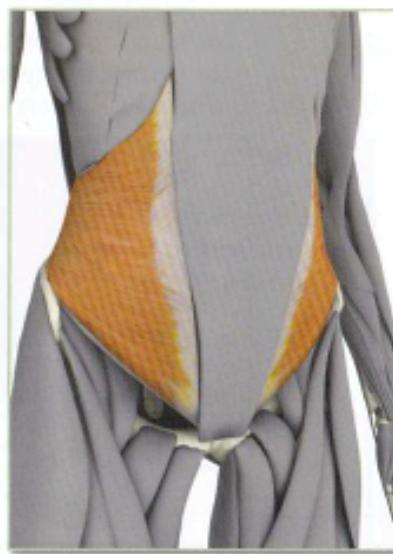


This is also a sheet-like muscle with fibers running opposite to the internal oblique. It is the larger of the two obliques and lies superficial. Its anterior fibers are more superior, originating from the front of the ribs, crossing diagonally forward and downward and inserting on the linea alba. Its lateral fibers are more posterior, originating from the back of the ribs, crossing downward and forward and inserting on the structures at the front of the pelvis.

Contraction of the external oblique draws the same side shoulder forward. This action combines with contraction of the

contralateral (other side) internal oblique, accentuating twisting poses. Tightness in this muscle limits these postures. Contraction assists in compressing the abdominal contents and contributes to the "air bag" effect, protecting the lumbar spine.

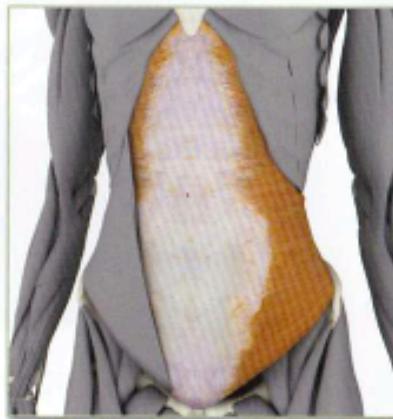
## *Internal Oblique*



This is a thin sheet-like muscle located on the side of the trunk. Its fibers cross diagonally upward and forward from the iliac crest, inserting on the lower ribs and the linea alba (a band of fibrous tissue running down the front of the abdomen).

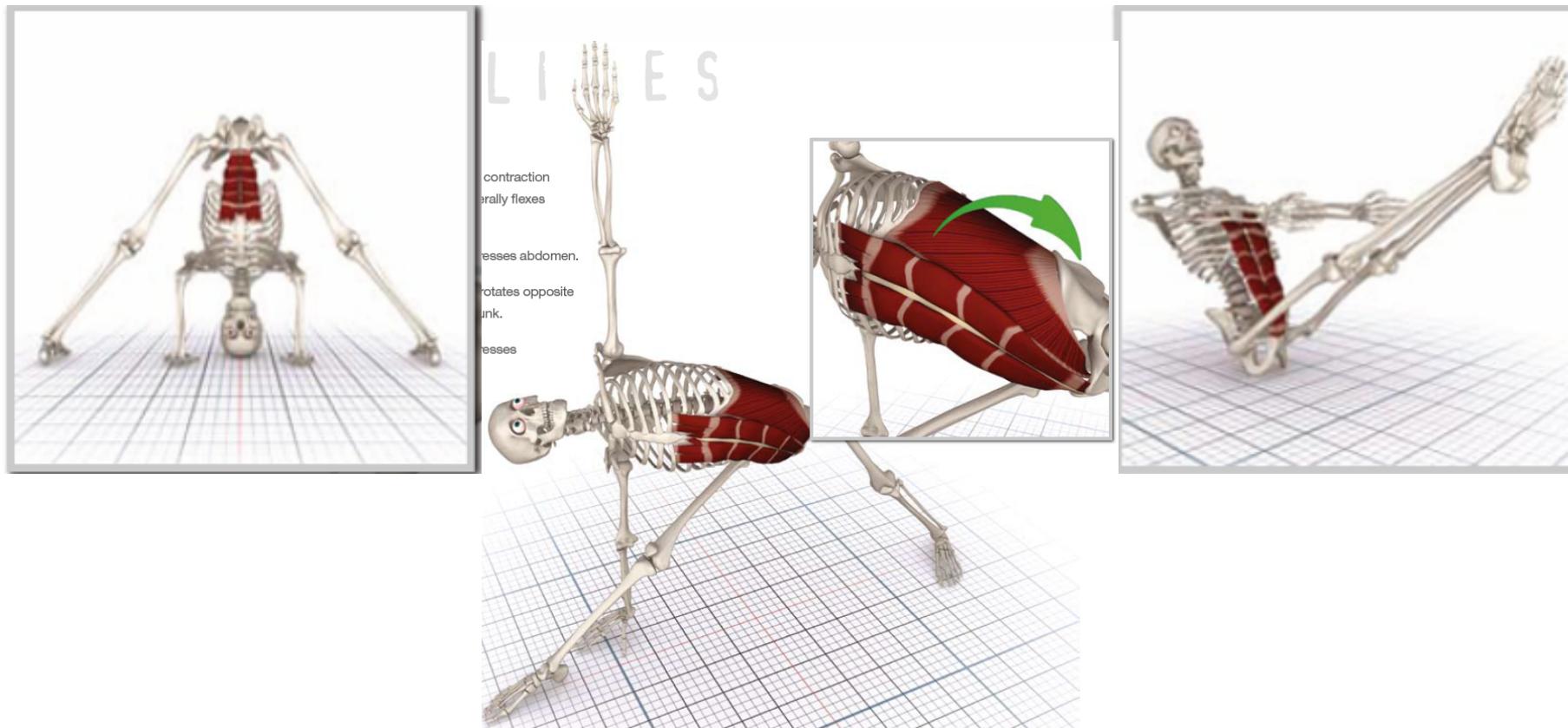
Contraction of the internal oblique draws the opposite shoulder forward and bends the trunk laterally. This action accentuates twisting postures such as parivrtta trikonasana. Contracting the internal oblique also contributes to the "air bag" effect described for the rectus abdominus.

## *Transversus Abdominus*

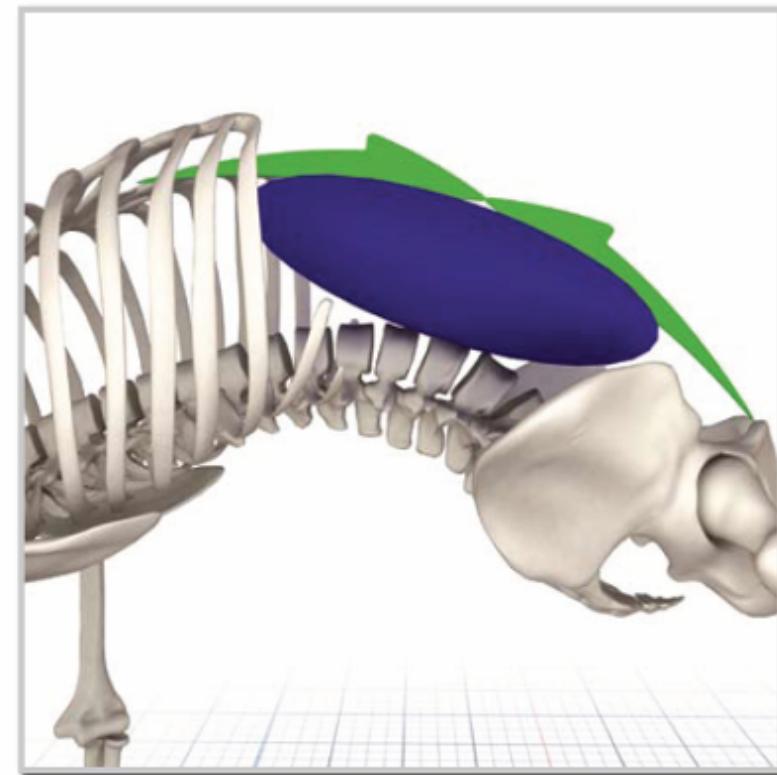
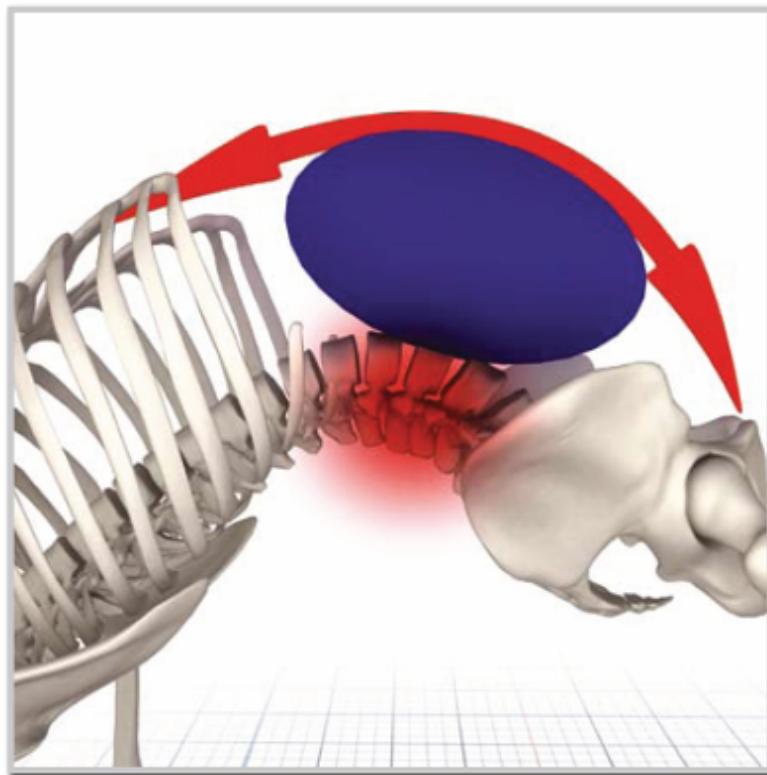


The transversus abdominus is the deepest of the abdominal muscles. Its fibers run horizontally, originating from the iliac crest, the inguinal ligament and the thoracolumbar fascia and inserting on the lower costal cartilages. Contracting the transversus abdominus compresses the abdomen and tones the abdominal organs. This muscle is important for udyana bandha and nali. Awaken and strengthen it in navasana.

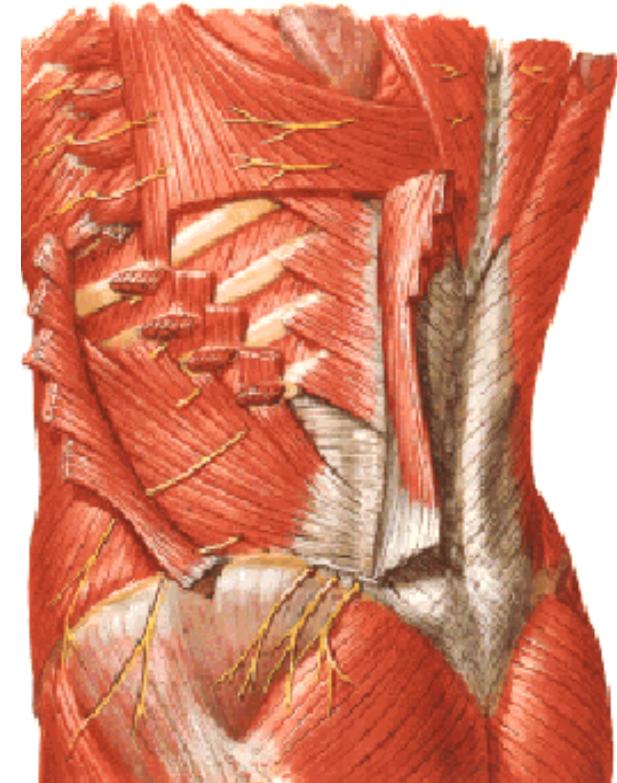
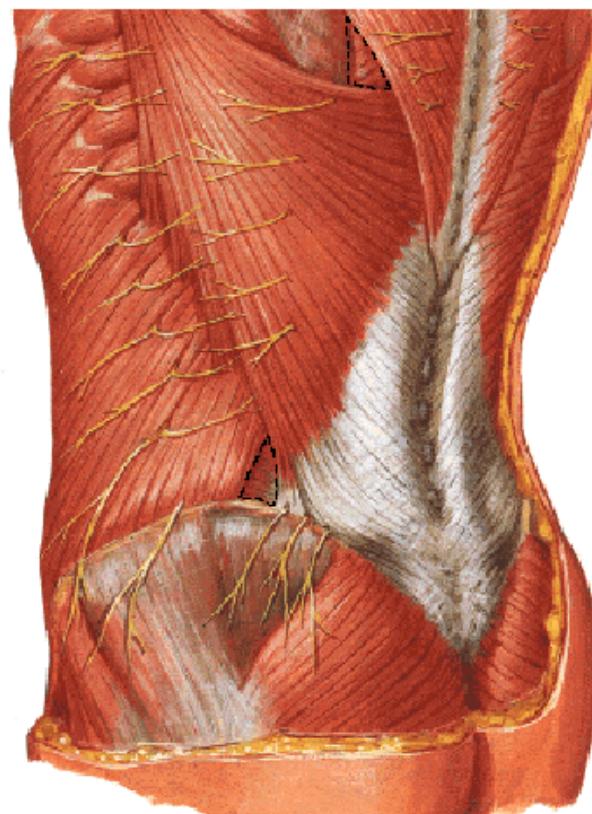
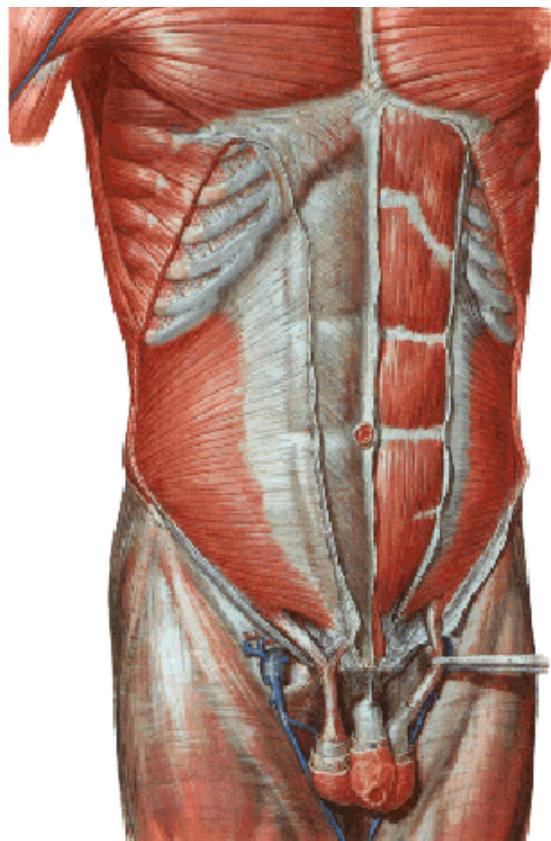
# Get up and Feel!



# Feel this!



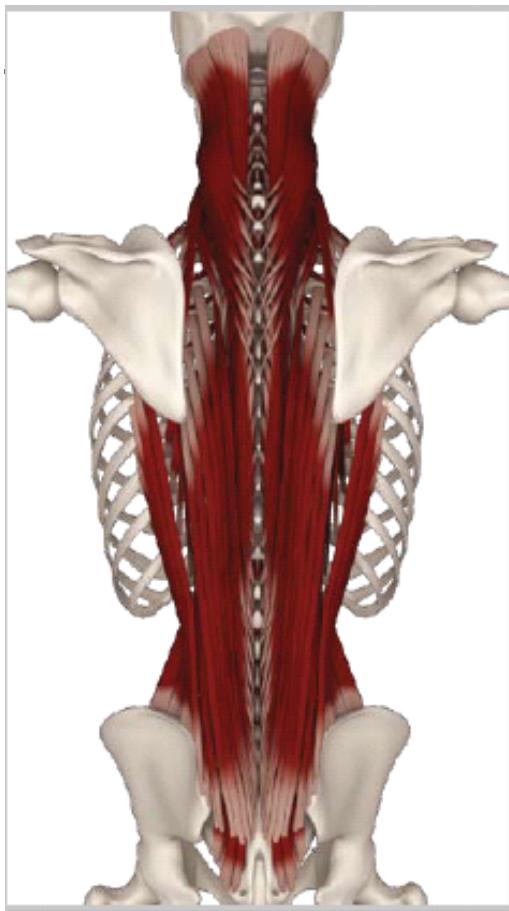
# Abdominals



# Antagonists

Erector spinae & QI

mul



Latissimum dorsi,  
Trapezius,



# Muscles of Respiration

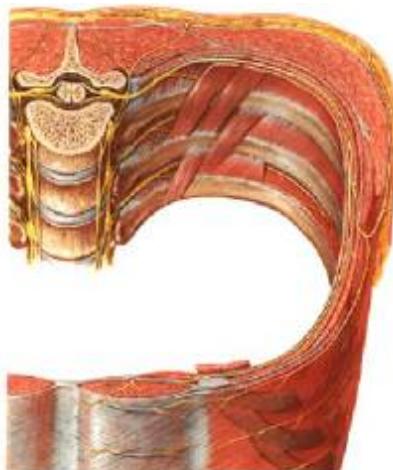
## Diaphragm

O: xiphoid process, deep surfaces of ribs 7-12, bodies of L1, L2

I: central tendon

A: Diaphragm moves inferiorly when contracting to increase thoracic space, so air is drawn into lungs; diaphragm moves superiorly when relaxing and aids in expelling air out of lungs.

S: *Uddjana Bandha*



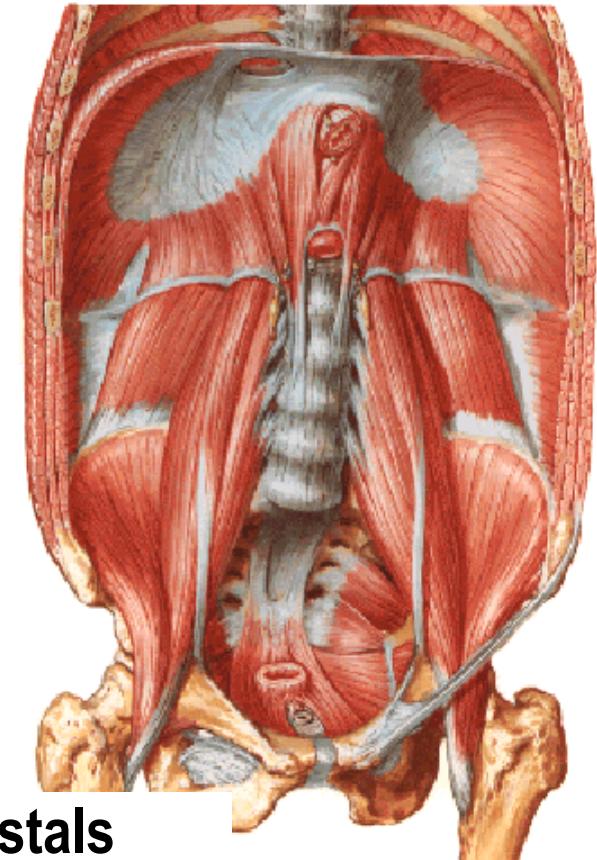
## Internal and external intercostals

O: ribs

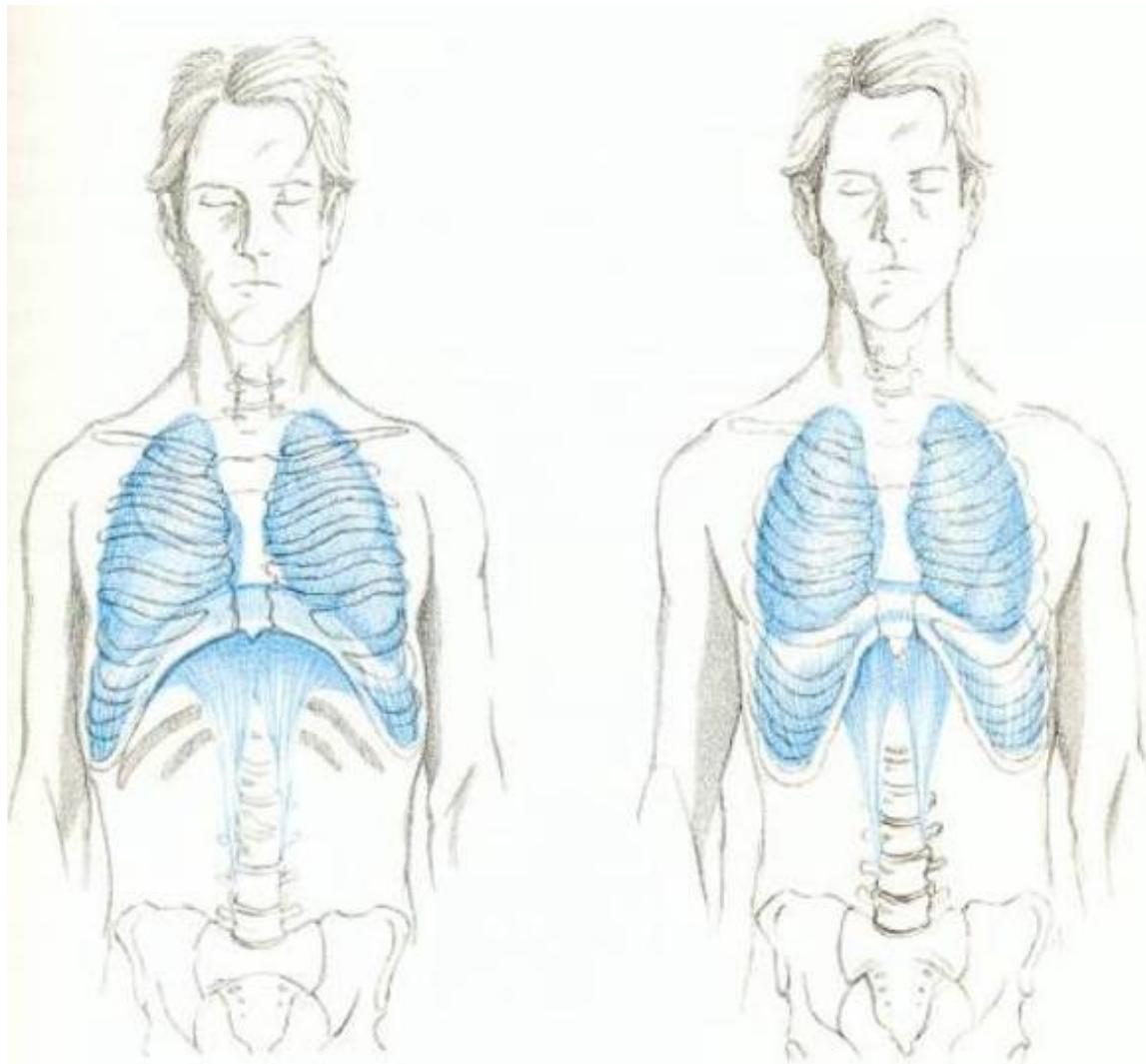
I: ribs

A: Elevation and depression of ribs

S: Deep breathing

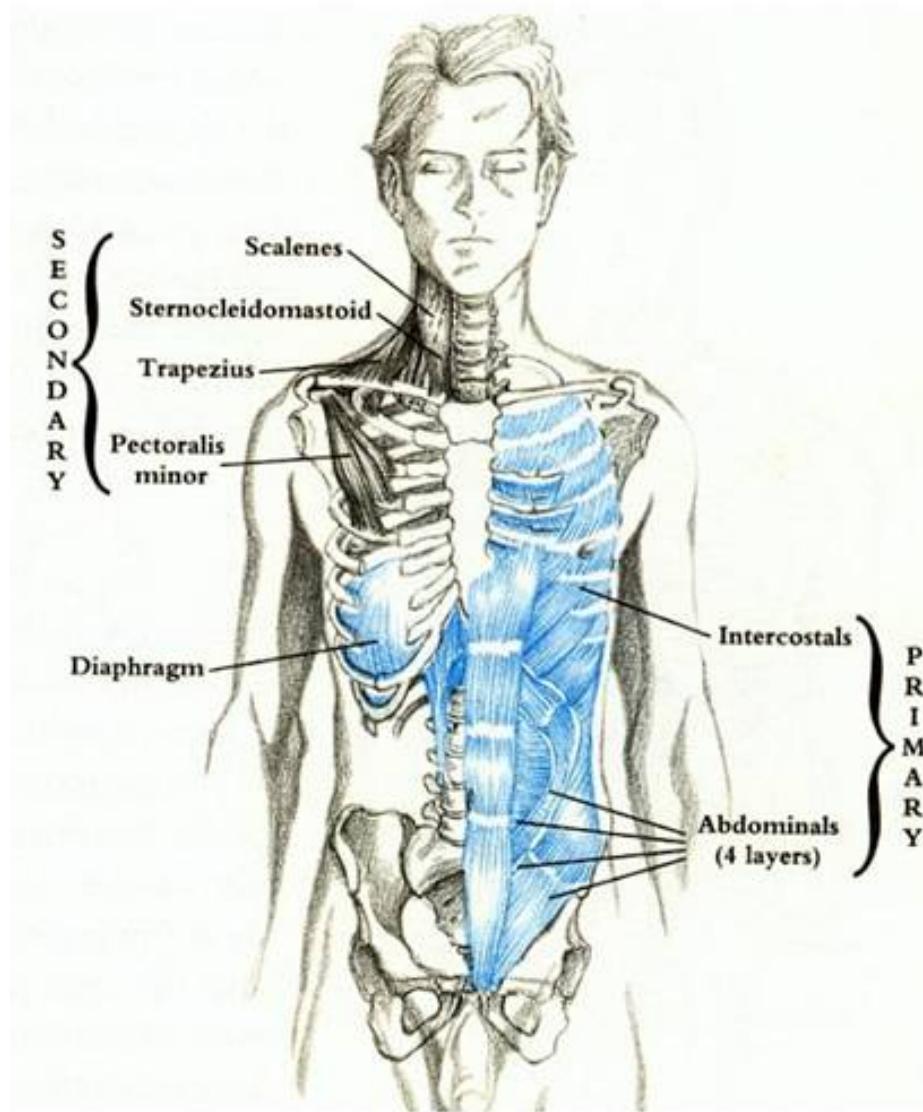


# Diaphragm Movement



Donna Fahri, *Breathing Book*

# Muscles of Respiration by D. Fahri



Donna Fahri, *Breathing Book* p51

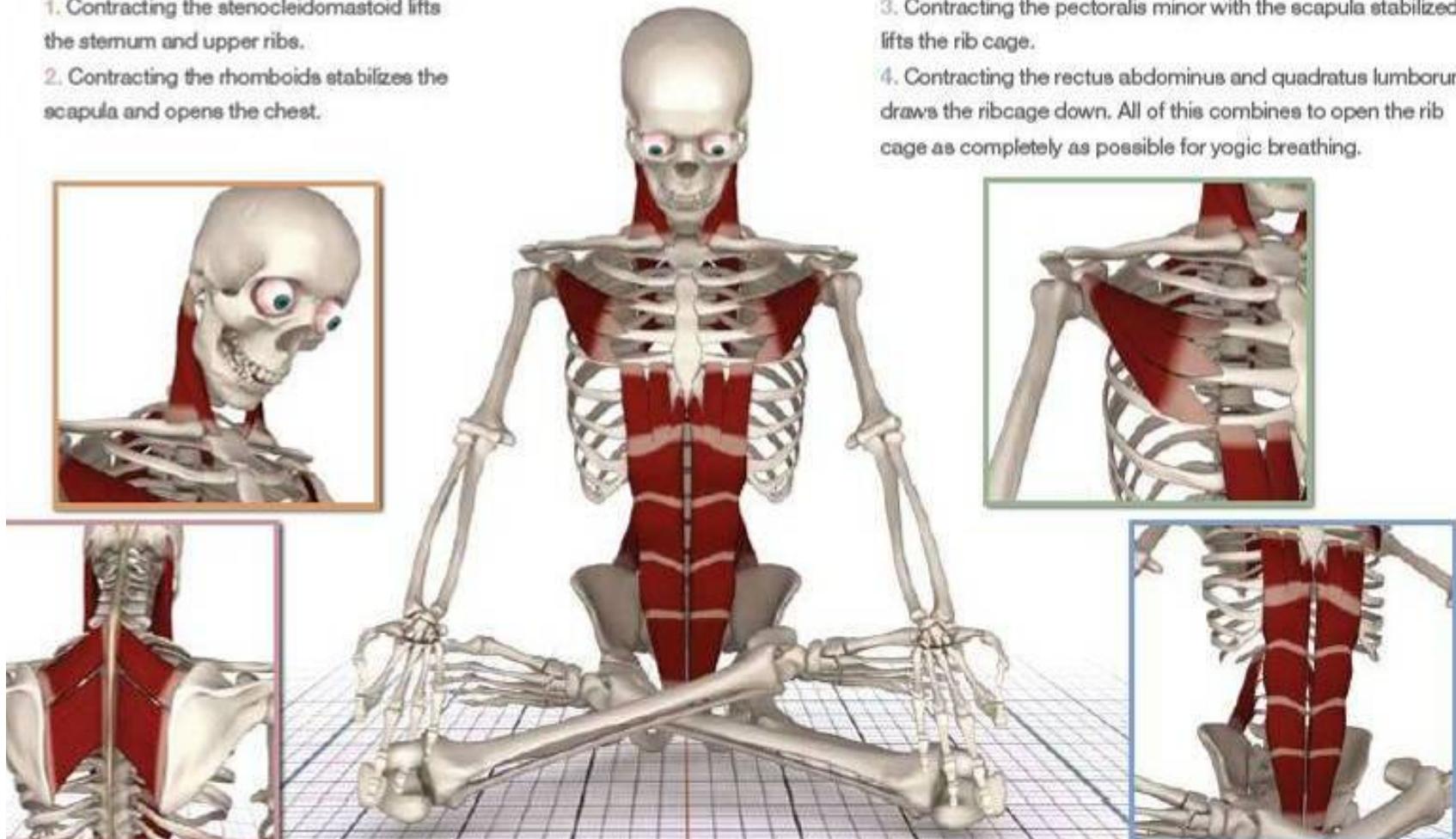
# Muscles of Respiration by R. Long

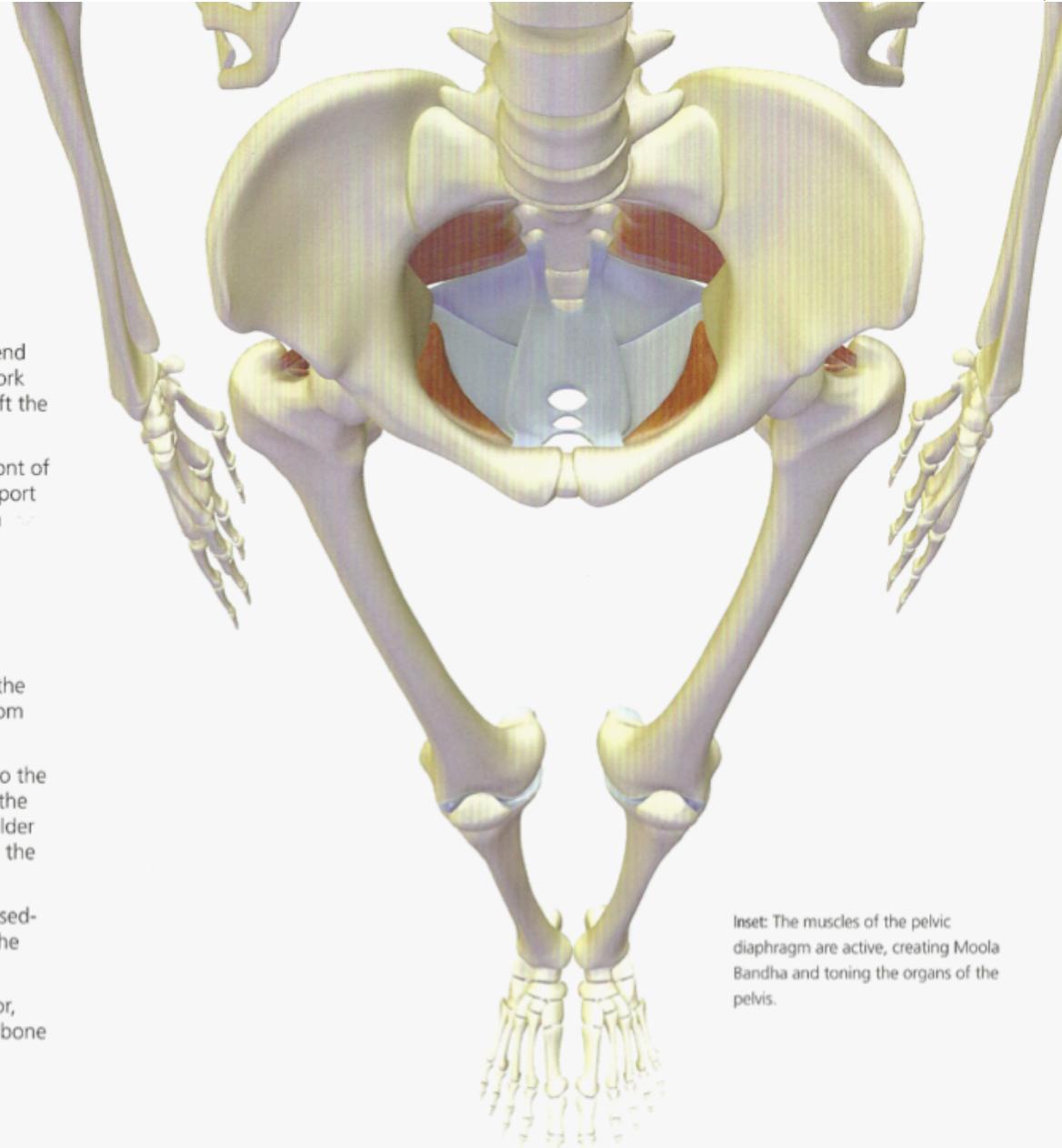
The muscles of breathing are the diaphragm, the intercostals and the accessory muscles illustrated below.

Conscious use of these accessory muscles optimizes expansion of the rib cage for breathing.

1. Contracting the stenocleidomastoid lifts the sternum and upper ribs.
2. Contracting the rhomboids stabilizes the scapula and opens the chest.

3. Contracting the pectoralis minor with the scapula stabilized lifts the rib cage.
4. Contracting the rectus abdominus and quadratus lumborum draws the ribcage down. All of this combines to open the rib cage as completely as possible for yogic breathing.





Inset: The muscles of the pelvic diaphragm are active, creating Moola Bandha and toning the organs of the pelvis.

### Trunk

1. The erector spinae (deeper back muscles) extend from the skull to the base of the spine and work with the muscles in the small of the back to lift the spine and hold you upright.
2. The abdominal muscles (running down the front of the trunk) work with the back muscles to support and balance the torso. Together, they create a tube around the torso and draw the rib cage downward.

### Shoulders and Arms

1. The lower part of the trapezius, which spans the back, draws the shoulders down and away from the ears, lifting the chest.
2. The muscles connecting the shoulder blades to the spinal column, the rhomboids, combine with the middle part of the trapezius to draw the shoulder blades towards the midline. This action opens the front of the chest.
3. The pectoralis minor muscle contracts in a closed-chain fashion to lift the lower ribs and open the chest.
4. Two muscles, the infraspinatus and teres minor, connect the shoulder blade to the upper arm bone and roll the arms outward.
5. The triceps straighten the elbows.

# Pelvic floor (as a diaphragm)

Pelvic Diaphragm of Female

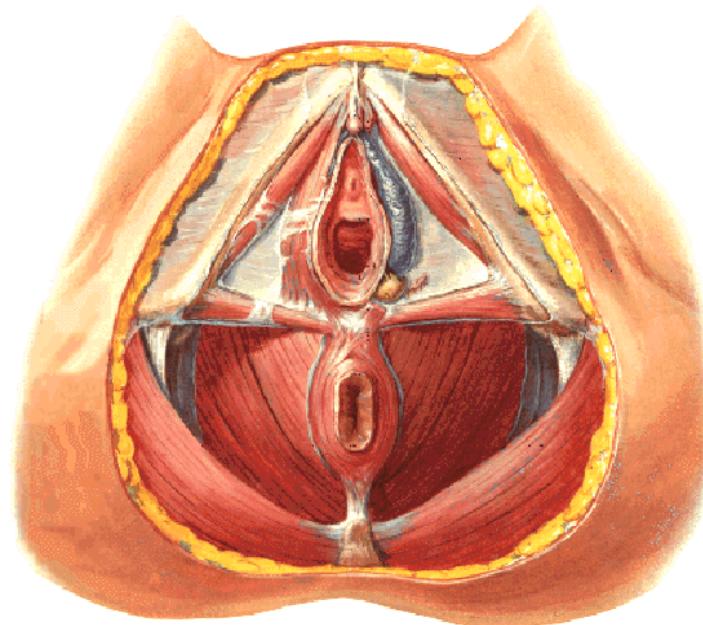
Lateral View



- Muscles need elastic quality
- Increased toning → vascularization,
- Nutritional state of muscle tissue

# Pelvic Floor (superficial layer)

Perineum and Urogenital Diaphragm of Female



## Urogenital diaphragm (Perineum) –superficial layer

O: pubis

I: Ischium (superficial to pelvic diaphragm)

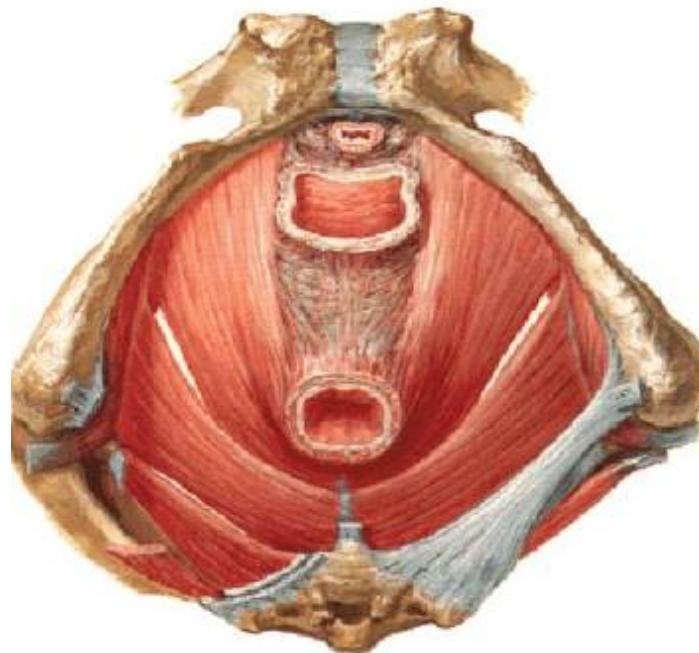
A: Contains and supports sphincter urethrae and genital canal

O: Origin, I: Insertion, A: Action, S: to Stretch

# Pelvic Floor (deeper layer)

Pelvic Diaphragm of Female

Inferior View



**Pelvic diaphragm (Levator ani,Coccygeus) -deeper layer**

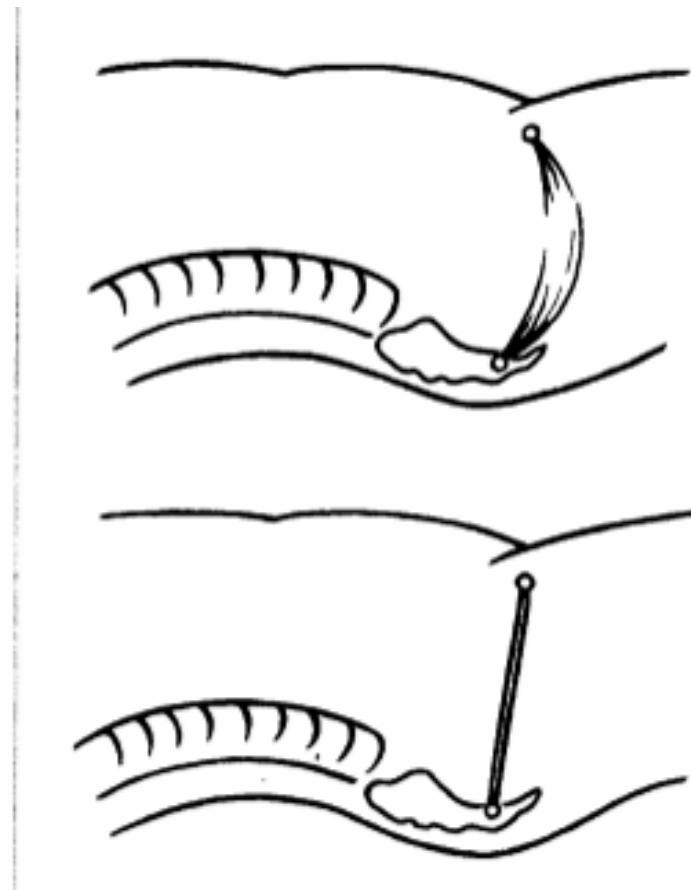
O: pubis

I: ischial spine

A: Supports weight of pelvic organs, defecation

O: Origin, I: Insertion, A: Action,

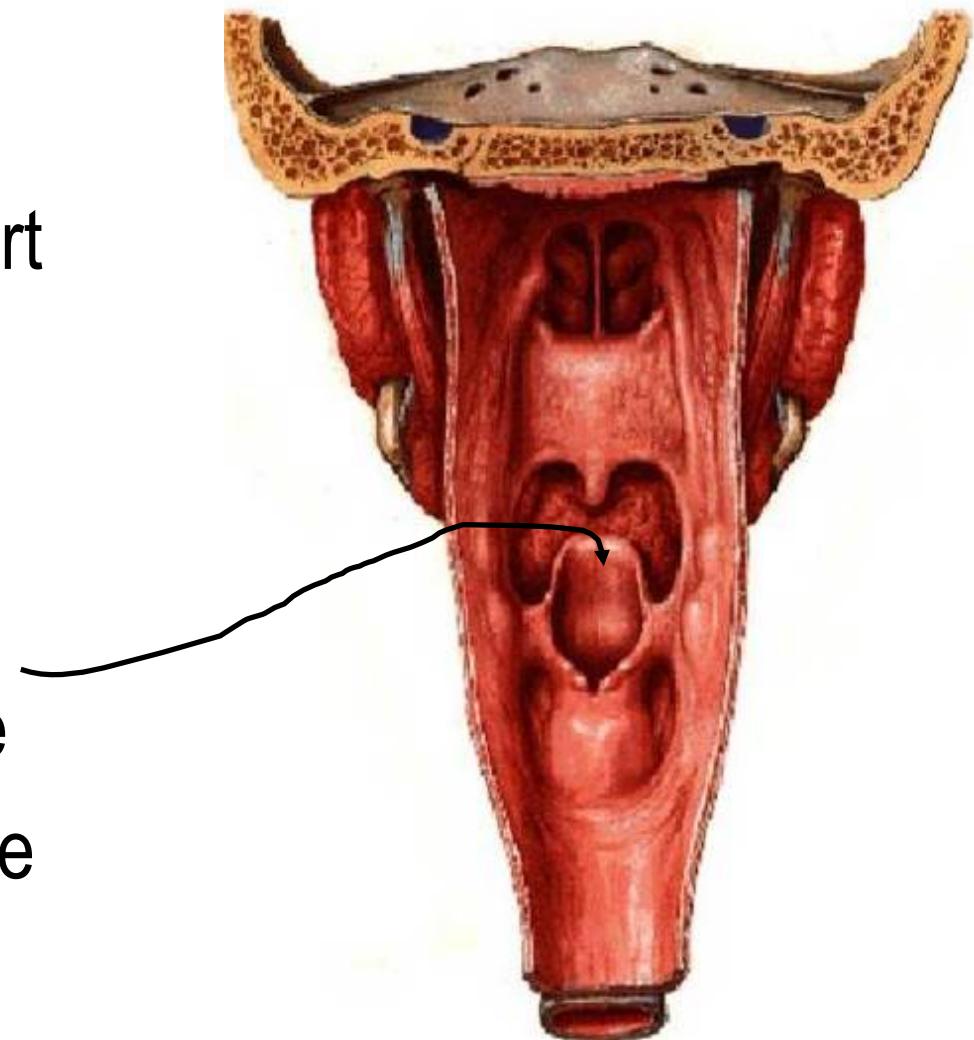
# Pelvic floor contraction



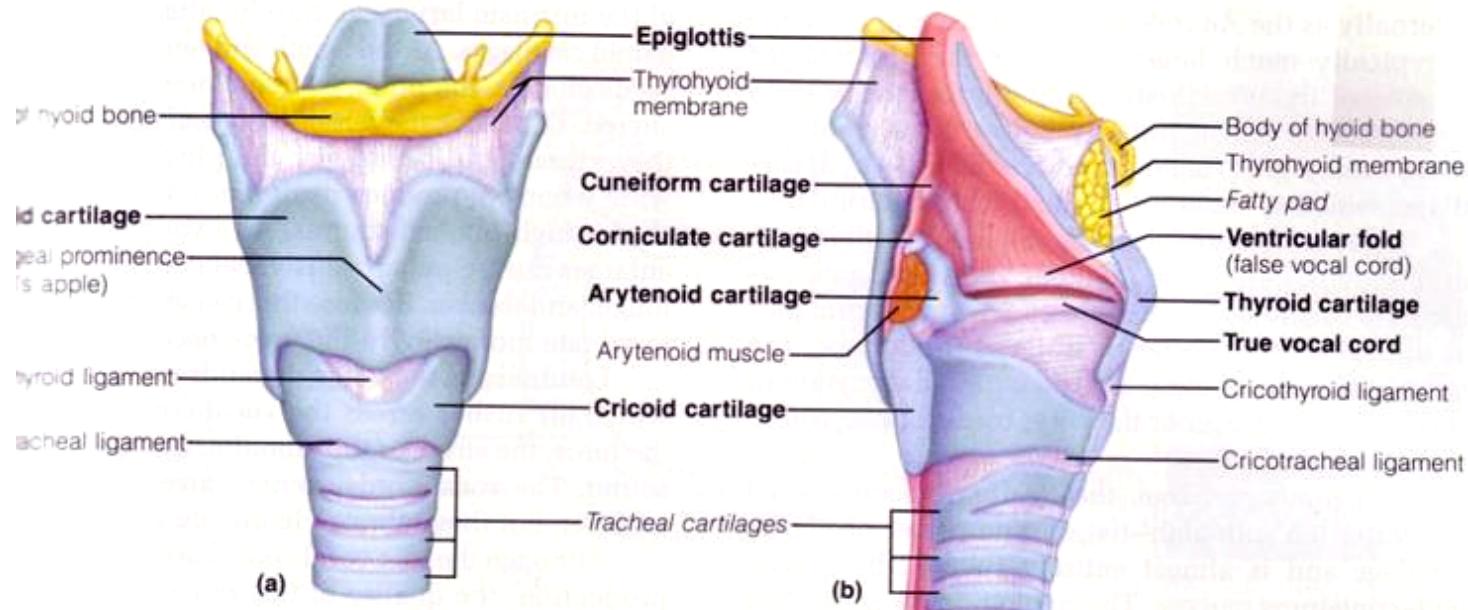
The position of the pelvic floor when laying on our back. It may be thought of as a muscular hammock between the tailbone and the front of the pelvis. The upper figure shows a relaxed pelvic floor. A gentle, inward contraction of the pelvic floor will activate the transversus abdominis muscle.

# Pharynx

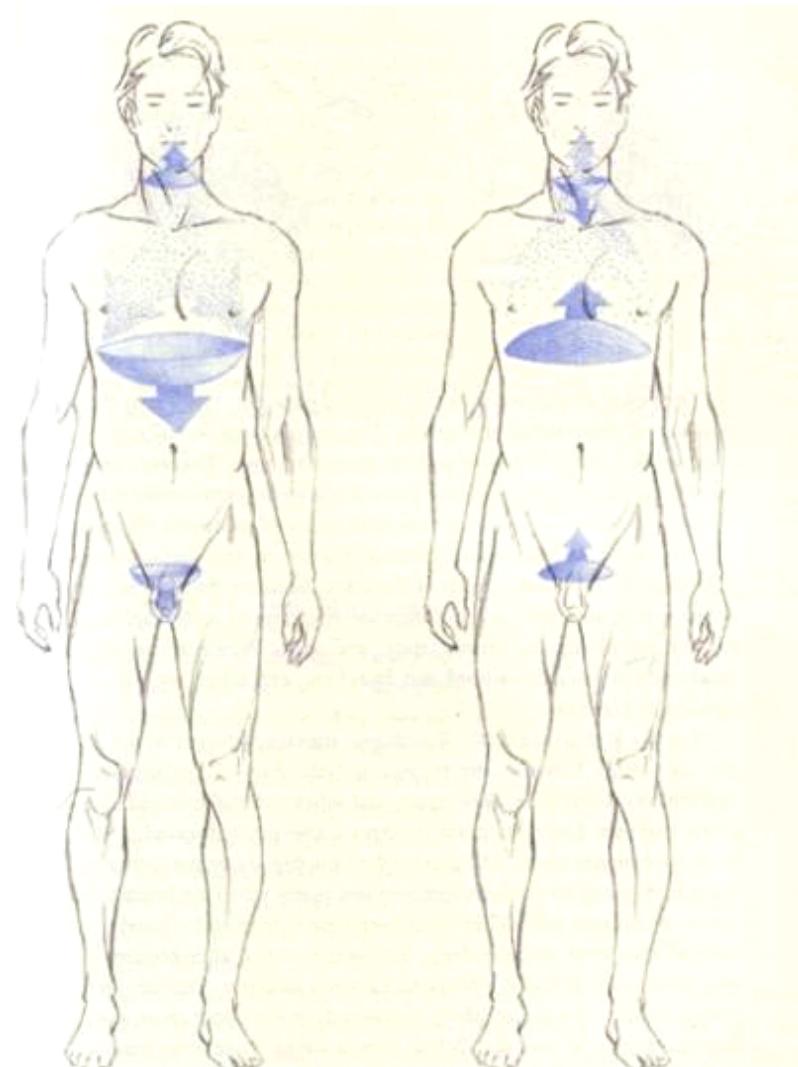
- When we breath,  
vocal folds draw a part
  - When we speak,  
vocal folds together
- 
- Epiglottis open inhale
  - Epiglottis close exhale



# Jalanhara Bandha



# Movements of Diaphragms (Bandhas)

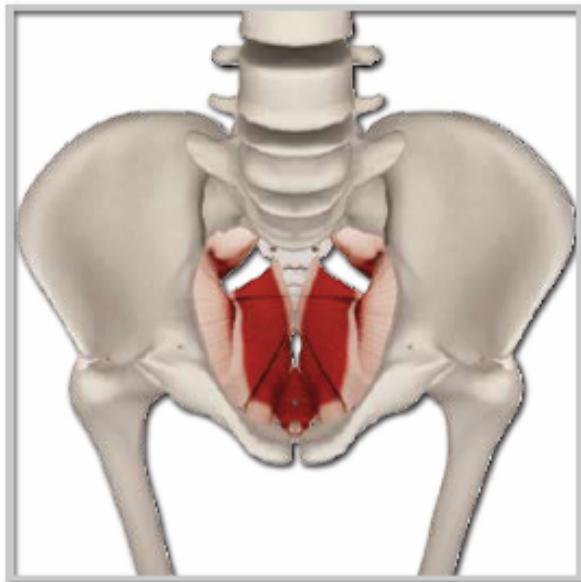


3. The three diaphragms on inhalation

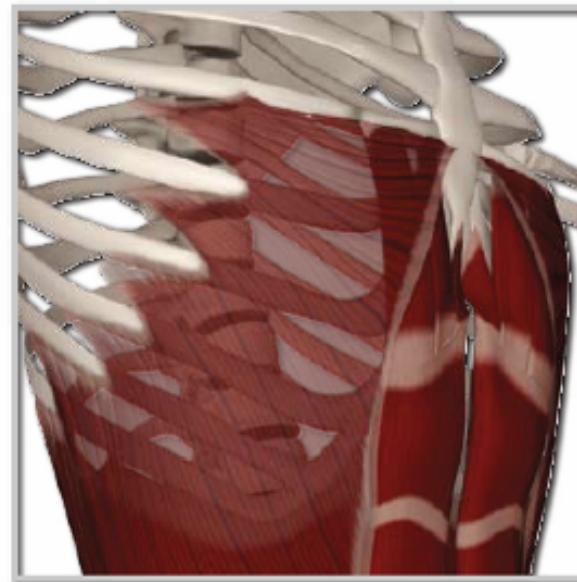
14. The three diaphragms on exhalation

Donna Fahri, *Breathing Book*

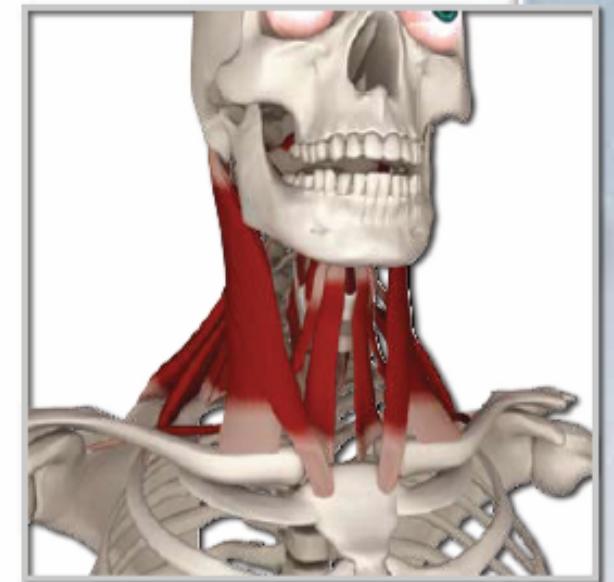
# Bandhas by R. Long



Mula Bandha



Uddiyana Bandha



Jalandhara Bandha

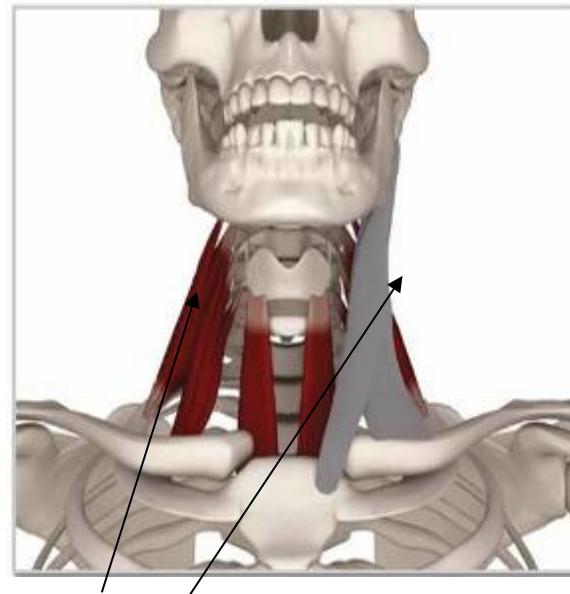
# Anterior Neck Muscles



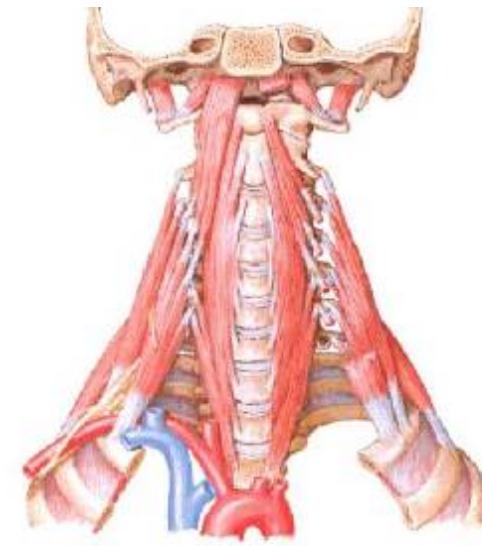
Copyright ©2005Raymond A. Long MD

## Sternocleidomastoid (SCM)

O: mastoid process  
I: clavicle & sternum  
A: Flexion of head, rotation of head  
S: rotate head (opposite side stretches)



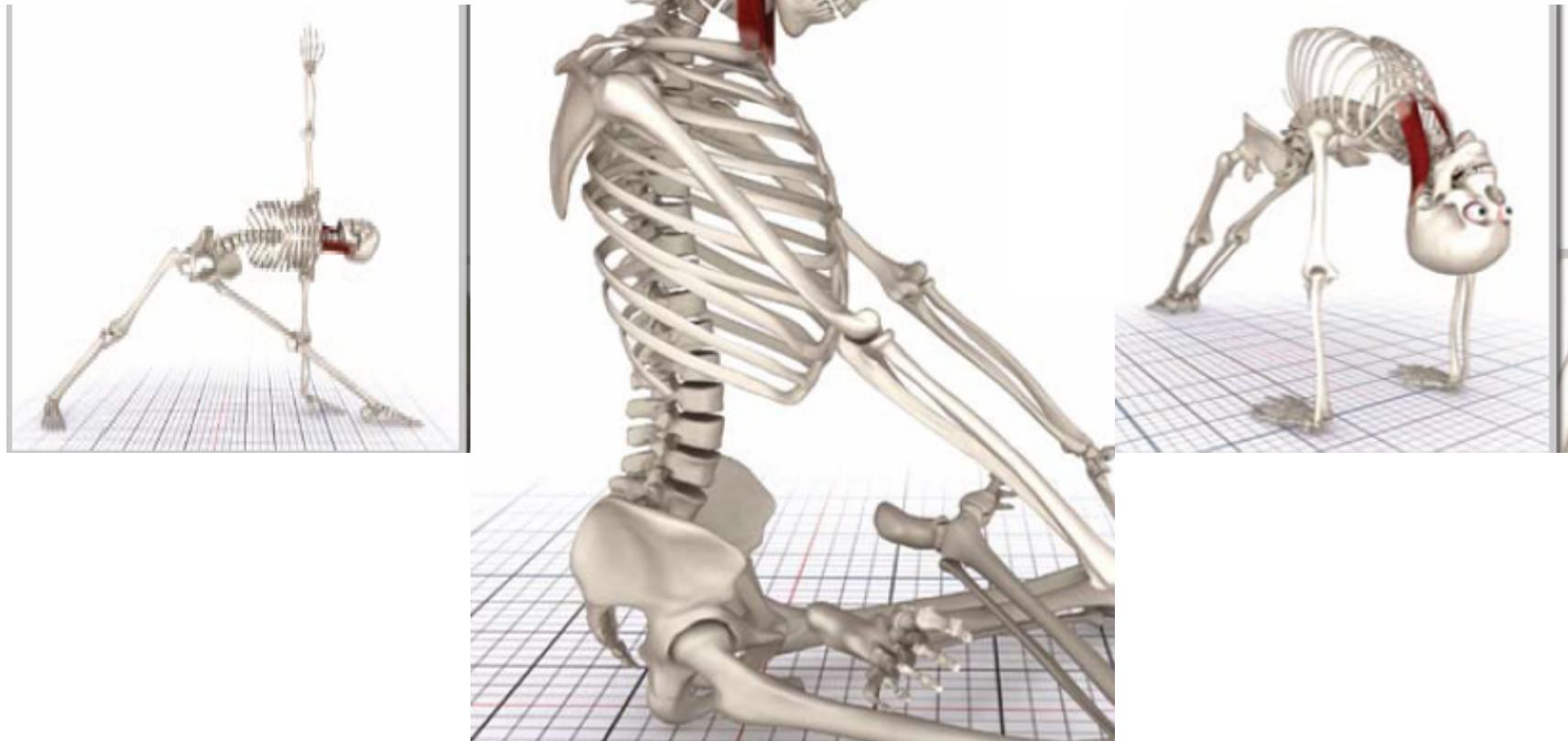
**Scalenes** (anterior, medius, posterior)  
O: C3,C7  
I: ribs 1 and 2  
A: Sidebending, accentuates antr. curvature of cer. spine, elevates rib 1,2 assist in inspiration  
S: prone or sitting neck stretch (3 ways)



## Longus colli & capitis

O: Anterior occiput, bodies of cervical and upper thoracic vertebrae  
I: transverse processes of cervical vertebrae  
A: Straightens cervical spine, flexes head  
S: Matsyasana

# Get up and Feel



Copyright ©2005Raymond A. Long MD

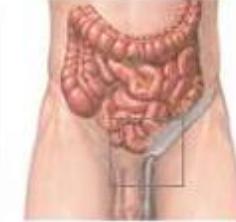
# Pathology & Contraindications

# Pathology & Contraindications I

## Hernia (inguinal)

It can be:

- A protrusion of abdominal contents through the abdominal wall and/or inguinal canal due to weakening or tear of the abdominal wall.



adam.com

### Not to Do:

- Movements that strain the abdominals.
- Movements that cause discomfort

### To Do:

- Usually this requires surgical attention; however, external support (girdle) can be helpful

# Pathology & Contraindications II

## Separation of Linea Alba

It can be:

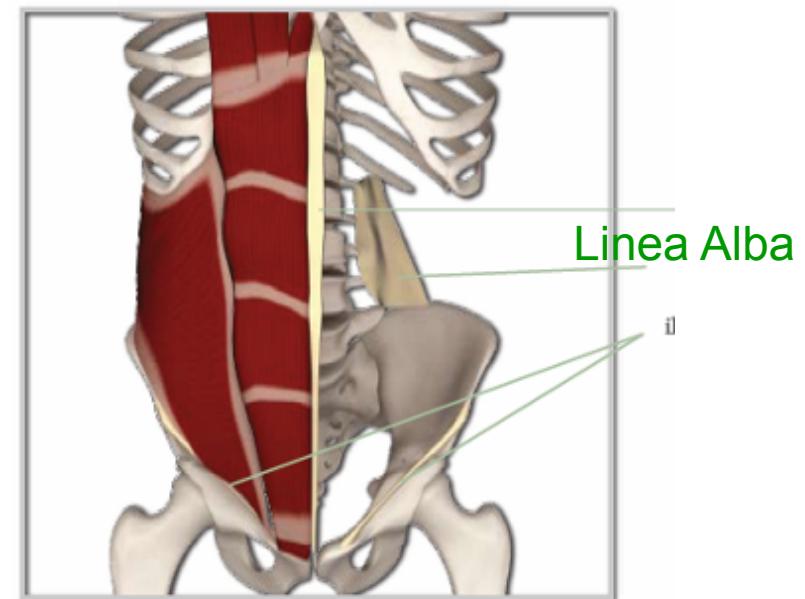
- Weakening of the midline of the abdominal wall due to using the rectus abdominis during the pregnancy.

**Not to Do:**

- Abdominals .

**To Do:**

- Avoid abdominals



# Pathology & Contraindications III

## Whiplash & Neck Pain

It can be:

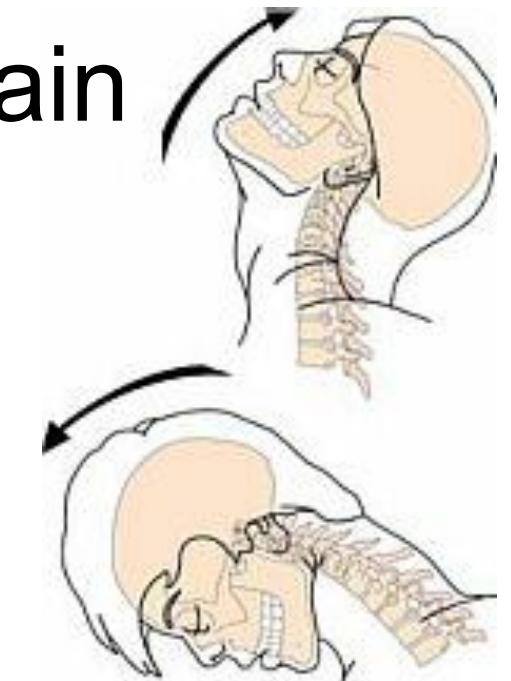
- Whiplash can be described as the movement of the cervical spine that neck does which is going forward and back and forward again. Often caused by car, biking, & skiing accidents.

### Not to Do:

- Avoid head stands and shoulder stands particularly injuries are recent.

### To Do:

- When injuries are fresh, support head in side bends: keep the chin tuck in the extreme backbends.
- When injuries are less recent, to built strength, press fontanel against the wall on all fours.



<http://www.gezondheid.be/picts/whiplash-wit.jpg>



# Pathology & Contraindications IV

## Prolapsed organs

It can be:

- A weakness of the abdomino-pelvic muscles causing abnormal downward movement of uterus or bladder

**Not to Do:**

- A weakness of the abdomino-pelvic muscles causing abnormal downward movement of uterus or bladder
- Forget your pelvic floor.

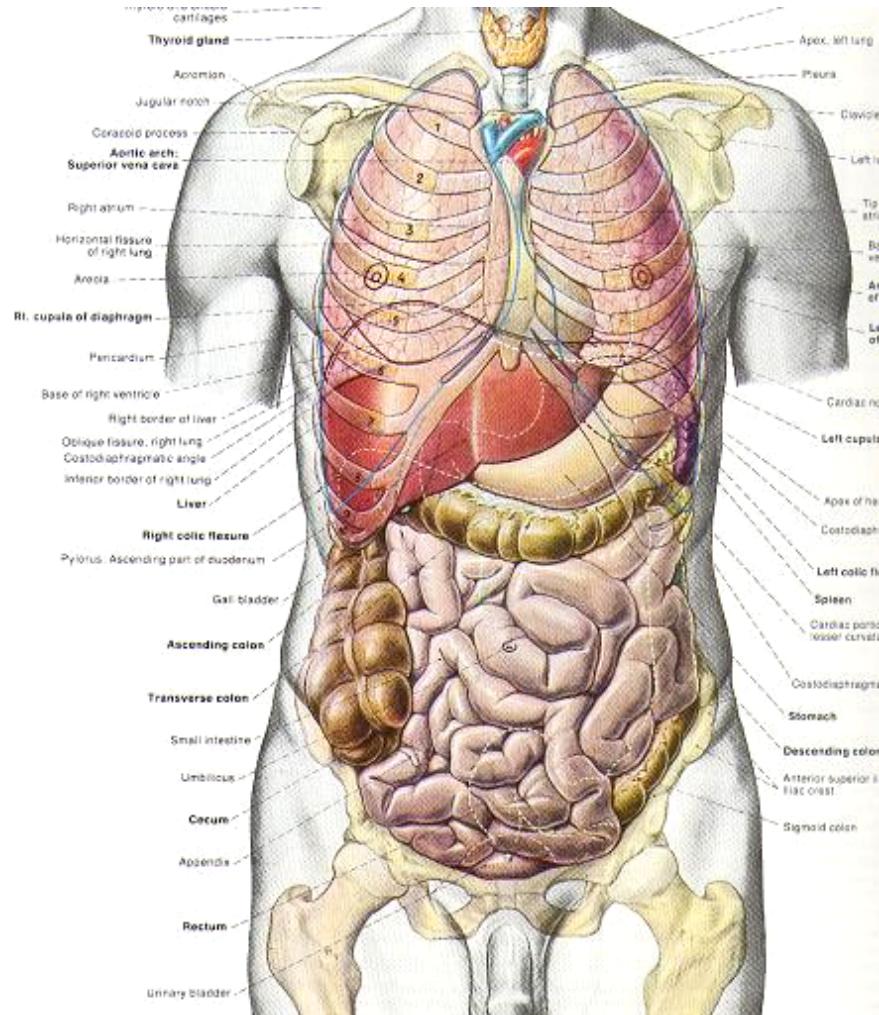
**To Do:**

- Develop connection and strength in your pelvic muscles.

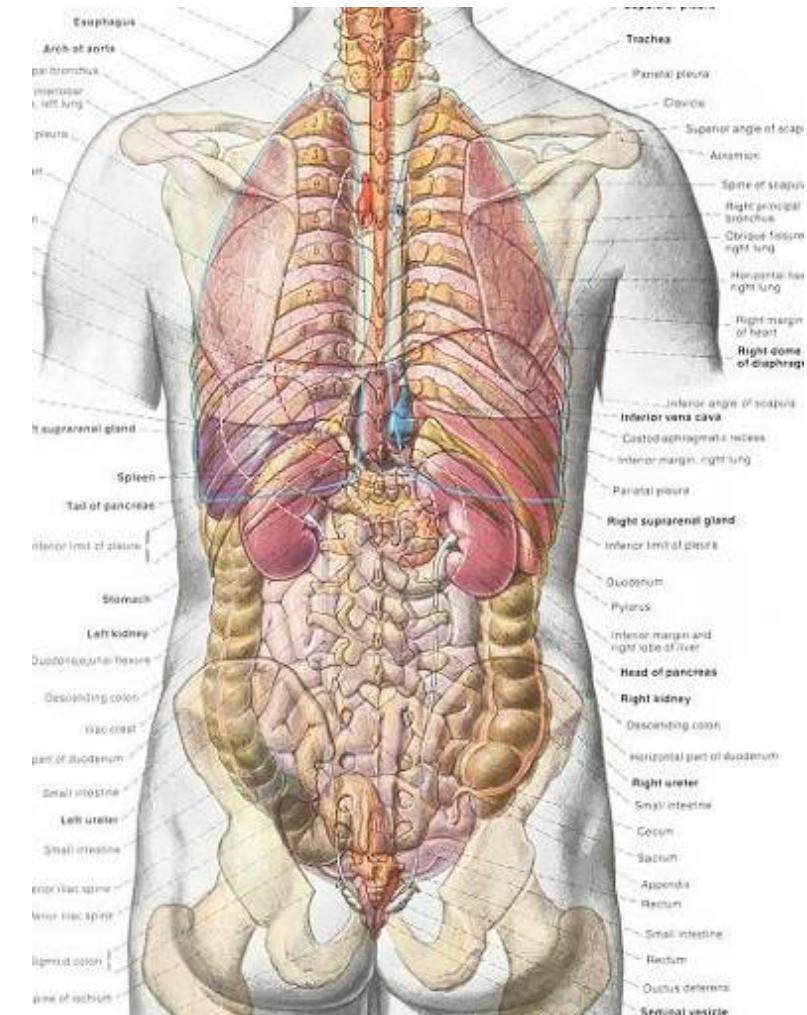
# What else is in our core?

- Organs
- Blood and lymph vessels
- Nerves
- Endocrine glands
- Nadis & Chakras

# Organs

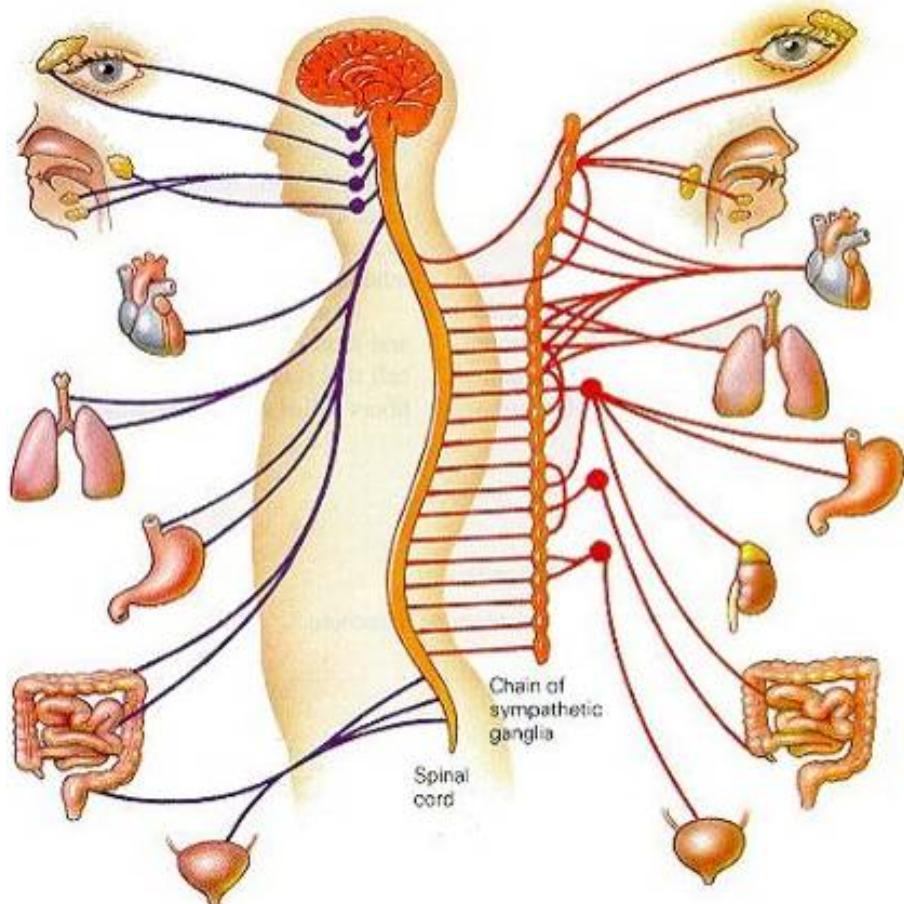
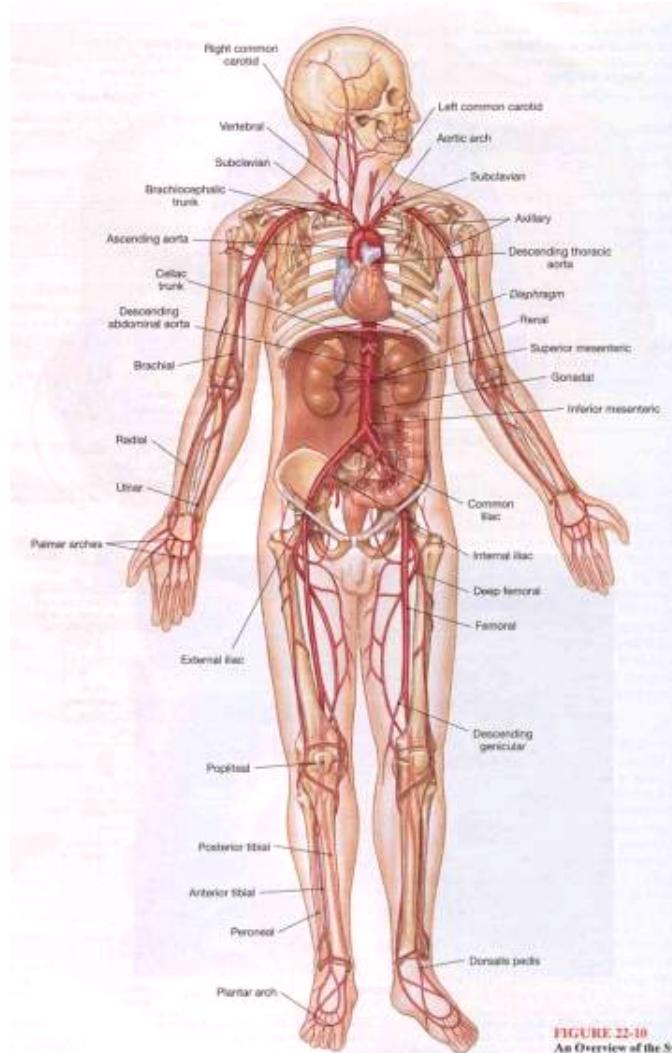


Front



Back

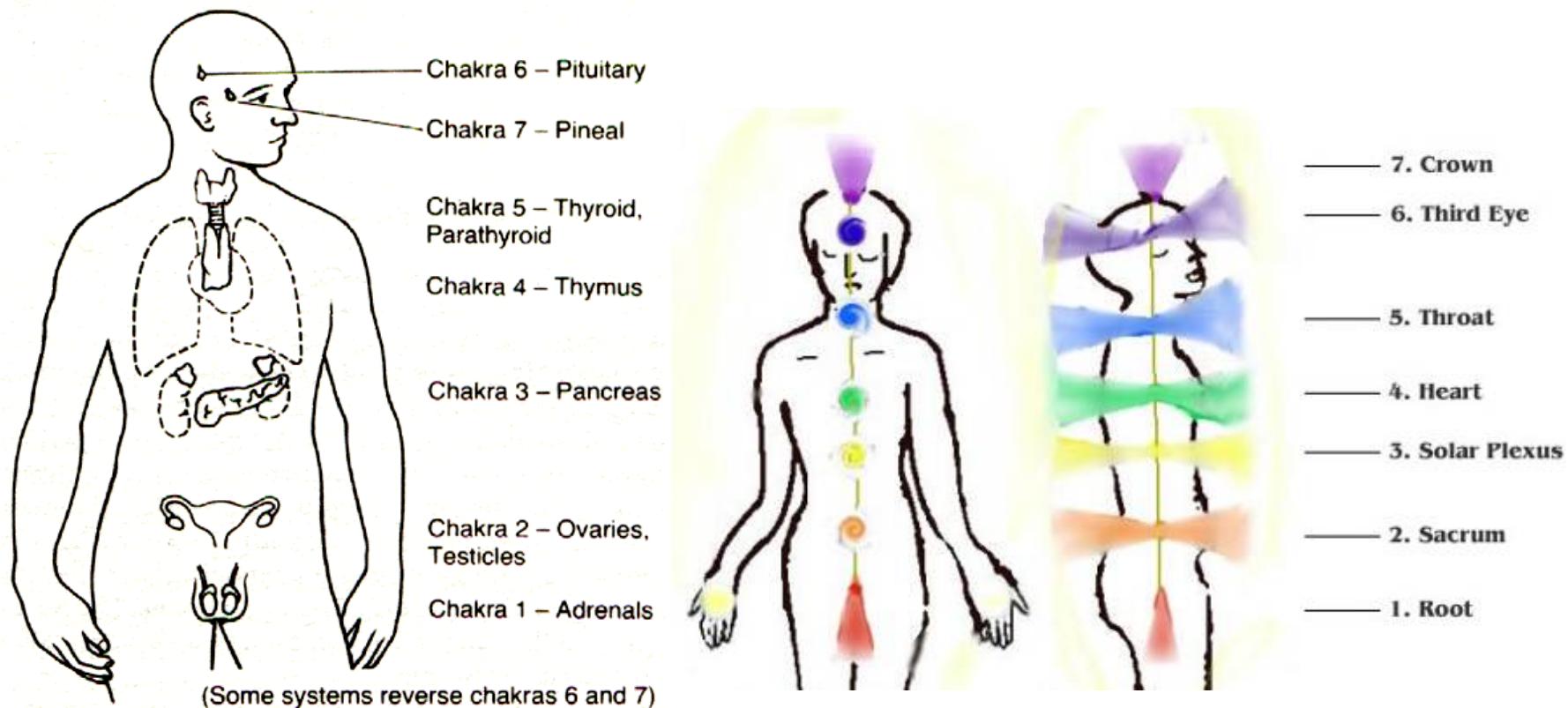
# Circulation & Autonomic Nervous system



**Parasympathetic**

**Sympathetic**

# Endocrine and Chakras systems

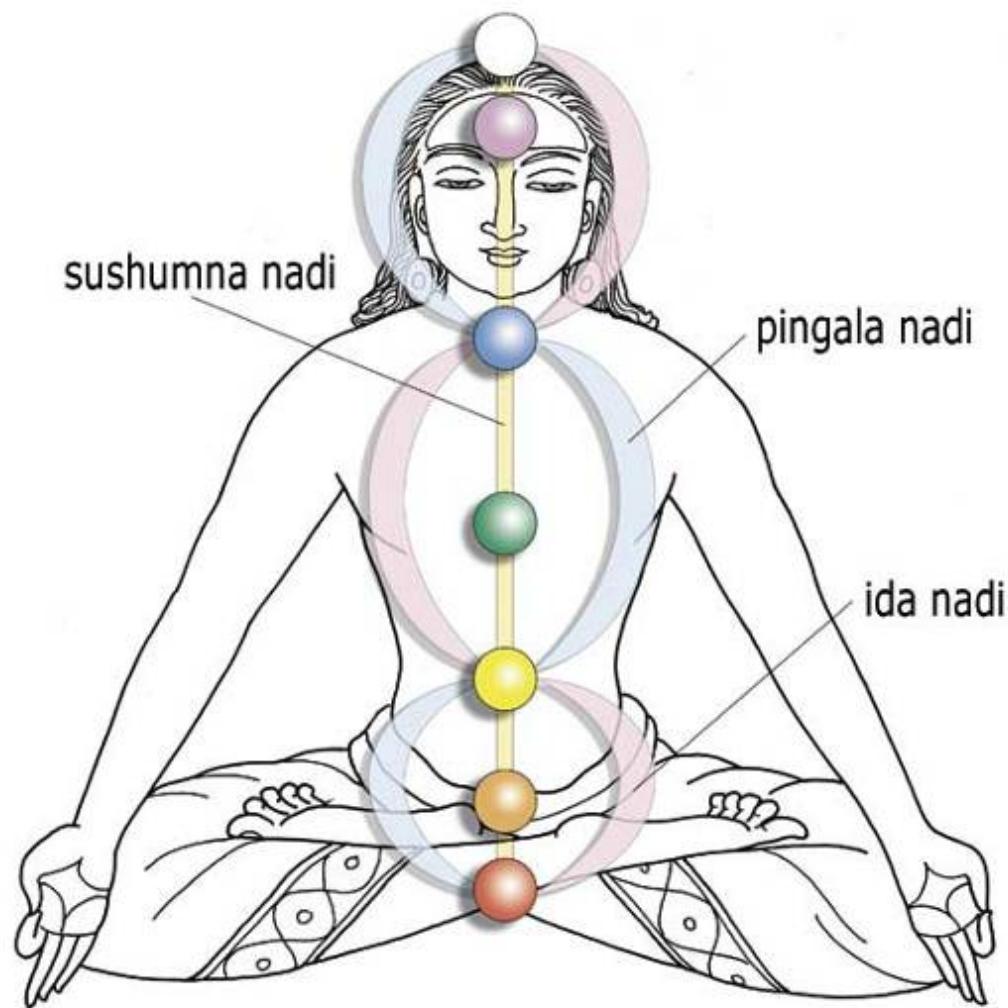


**Figure 2. The Chakras and the Endocrine System**

[http://www.energyenhancement.org/Omahamani/chakras/Chakra\\_general/elements%20of%20chakras.html](http://www.energyenhancement.org/Omahamani/chakras/Chakra_general/elements%20of%20chakras.html)

<http://www.wellspringreiki.com/wellspringchakras.htm>

# Chakras and Nadis



# Shortened Psoas

- Pelvic bowl forward
- Femurs compressed in hip socket
- Thigh muscles overdeveloped
- Organs: restricted (as nerves are)
- diaphragmatic breathing ↓
- Vitality ↓
- Connection with emotions are reduced

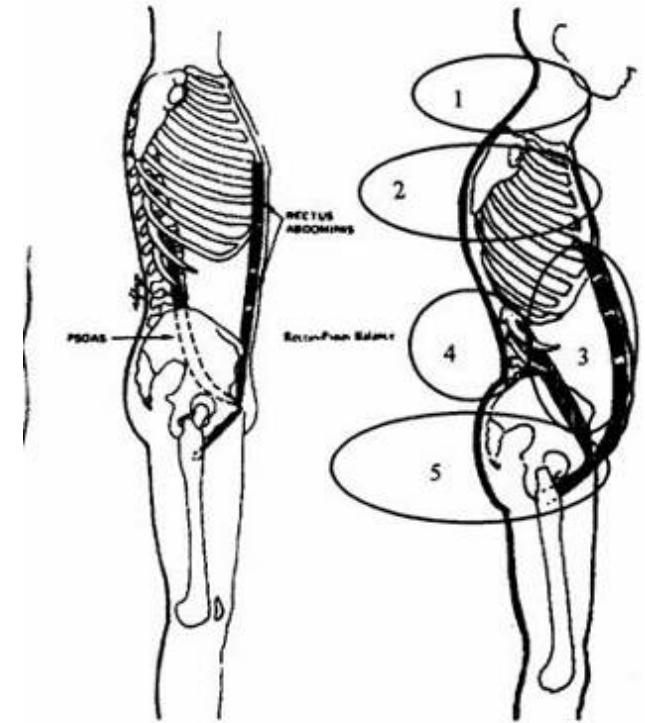


Figure 10-68

A chronically short psoas will have its greatest impact on the groin, forcing the pelvis down in front. There is a concurrent loosening of the normal tone of the rectus abdominis. One very common result is lordosis and a pot belly.

- 1 Anterior Head Carriage
- 2 Forward Shoulder Rotation
- 3 Ribcage Pulled Down, Collapsed Lung Space
4. Compression of Lumbar Spine.
5. Pelvis Tilted Forward, Weight Carried on Balls of Feet

# For NEXT Month:

- For the next lecture: read Anatomy of Movement
- Chapter 3 *The Shoulder* pg 98-120
- Chapter 4 *The Elbow* pg 132-141
- Chapter 5 *The Wrist and Hand* pg 148-164
- See you next month!