

# INNOVATIVE OSTEOPATHIC MANIPULATIVE MEDICINE TECHNIQUES FOR RIB PAIN IN THE ATHLETE

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# DISCLOSURES

- I have no personal or financial disclosures.

# OBJECTIVES

- Review anatomy and mechanics of ribs and thoracic spine
- Discuss facets of rib dysfunction in the athlete
- Review basic manipulation techniques to increase rib mobilization and improve mild dysfunction

## CASE 1

- 17 yo cross country runner comes to the athletic training room in the morning complaining she “slept wrong” and is having pain in her right upper traps. Pain is exacerbated with turning and bending her neck, moving her right arm and breathing. She has a meet this afternoon and is worried she can’t run.

## CASE 2

- A 21yo baseball pitcher complains of severe right sided chest pain after throwing a 96mph fastball during a game. He has no pain if he is still but says if he tries to breathe he has a severe sharp pain. He can't continue the game.

## CASE 3

- A 15 yo female gymnast comes in complaining of bilateral lower thoracic/rib pain. She notes it is worsened when she is practicing and is unable to vault or do her passes during her floor routine due to pain. She recently was diagnosed with pertussis 1 month prior.

# FUNCTION- SPINE

- Functional pillar of the body
- Protects the spinal cord
- Provides attachments for ribs

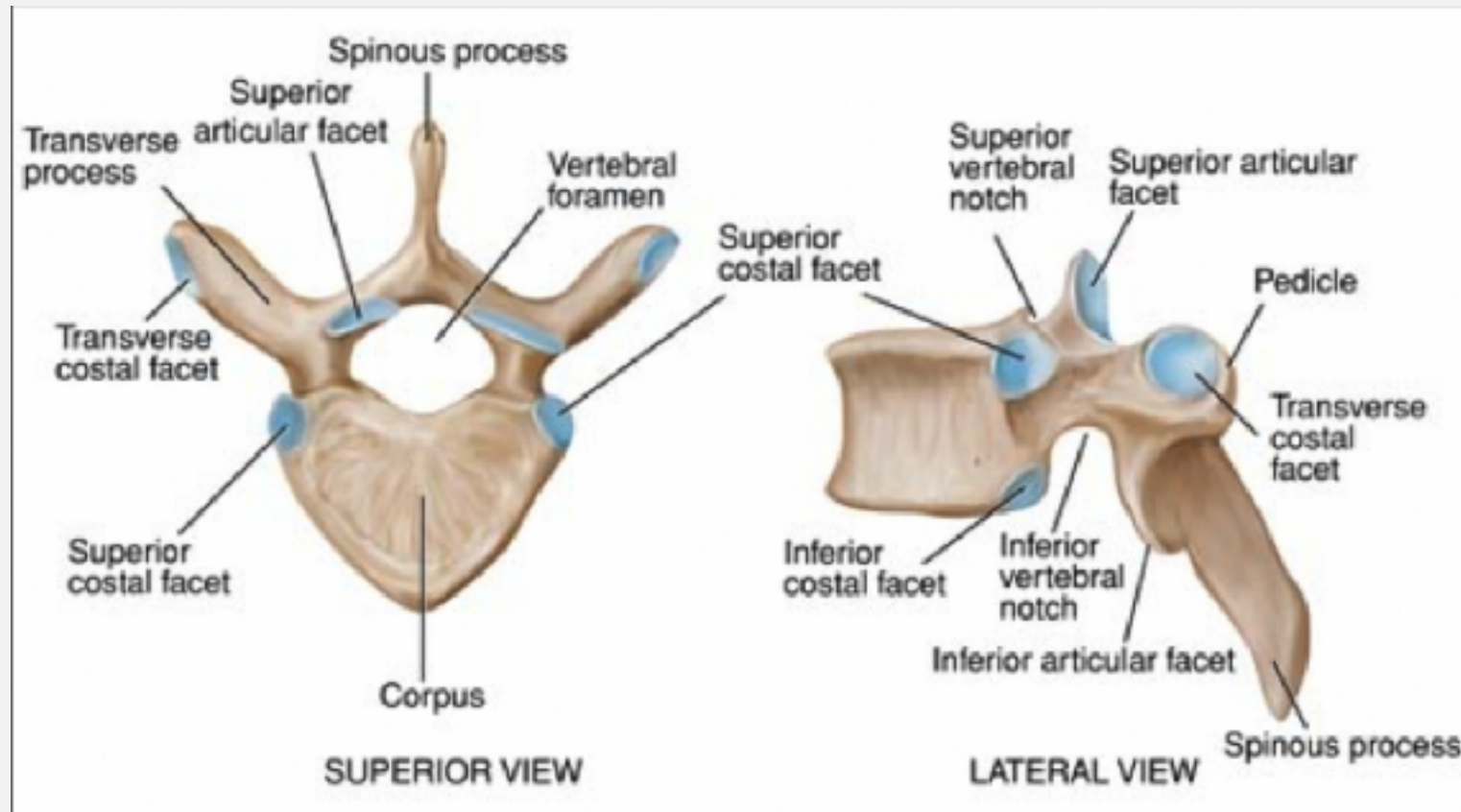
# ANATOMY- SPINE

- Cervical
- Thoracic
- Lumbar
- Sacrum





# ANATOMY- VERTEBRAE

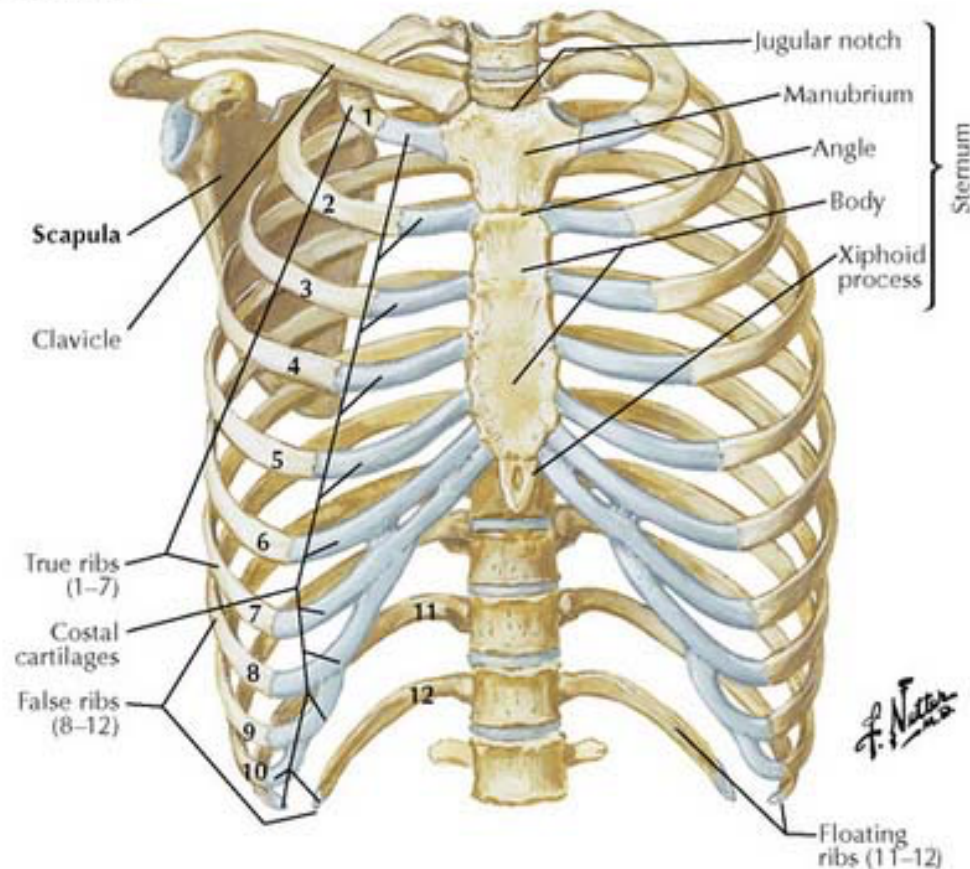


## FUNCTION- RIBS

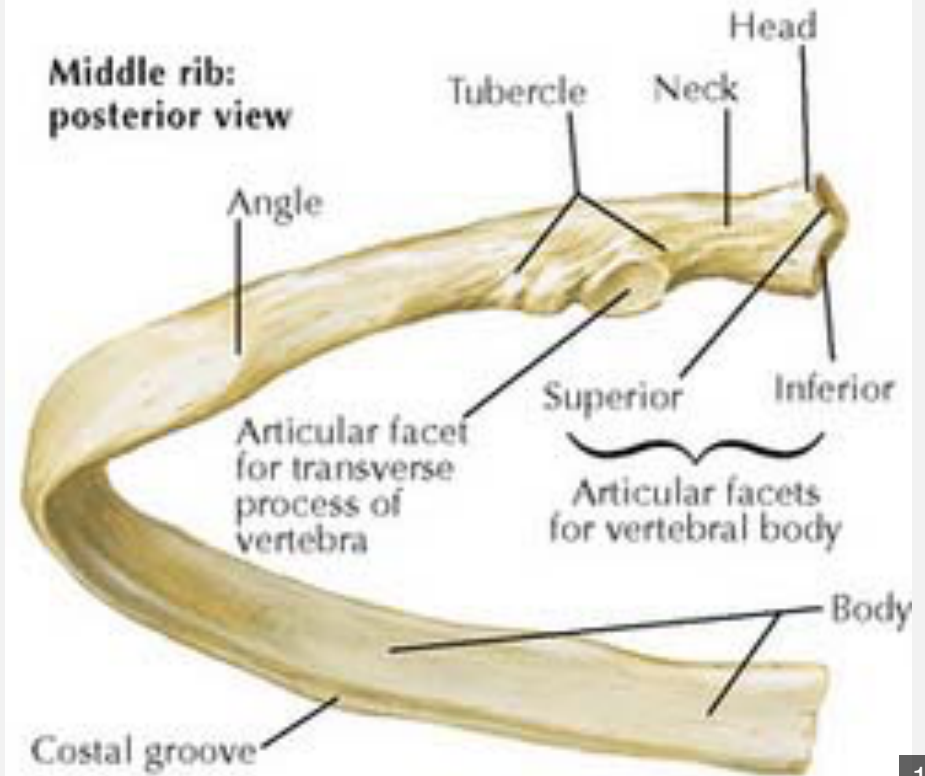
- Protects the lungs, heart, kidneys, liver, spleen, stomach
- Provides support for being upright
- Aides in respiration

# ANATOMY- RIBS

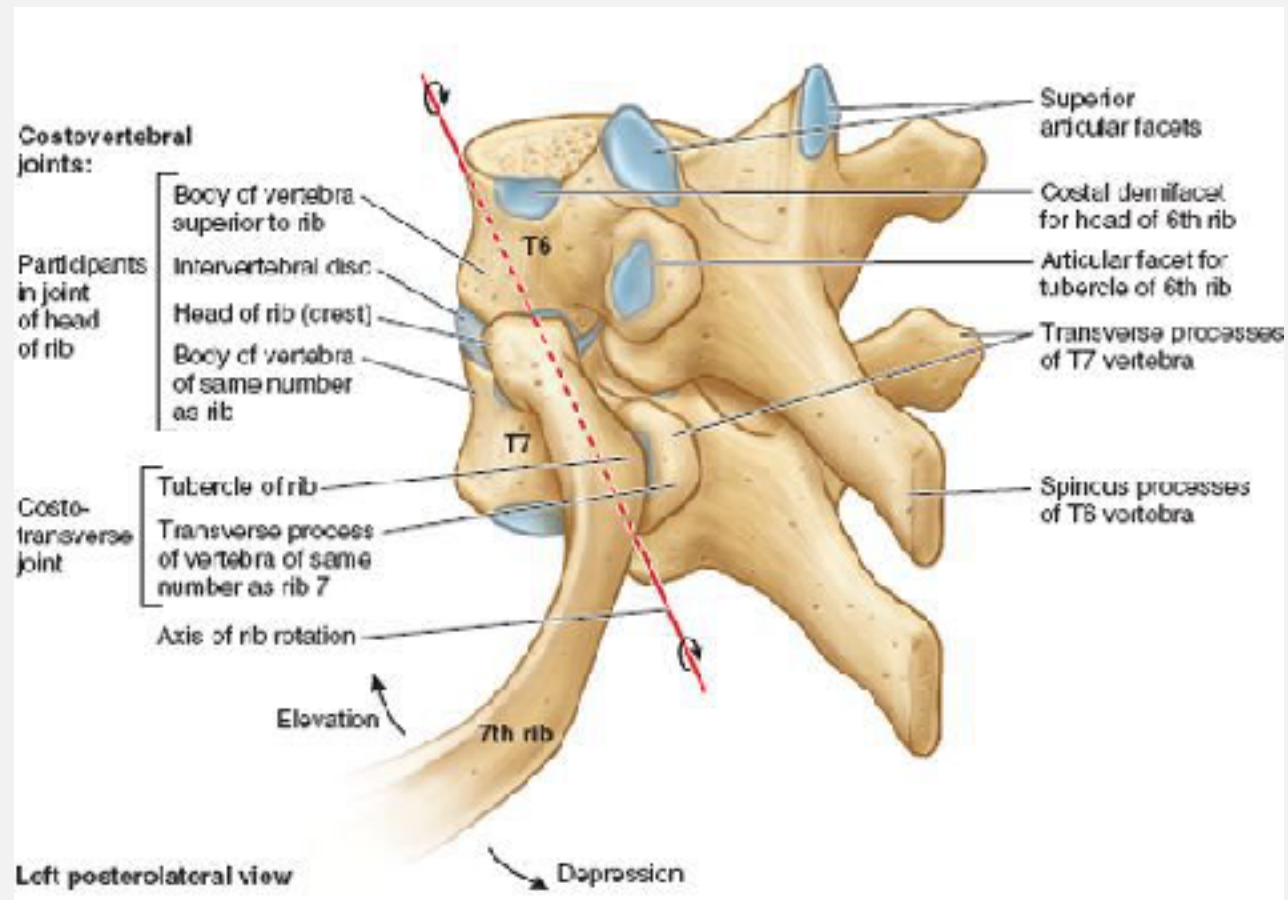
Anterior view



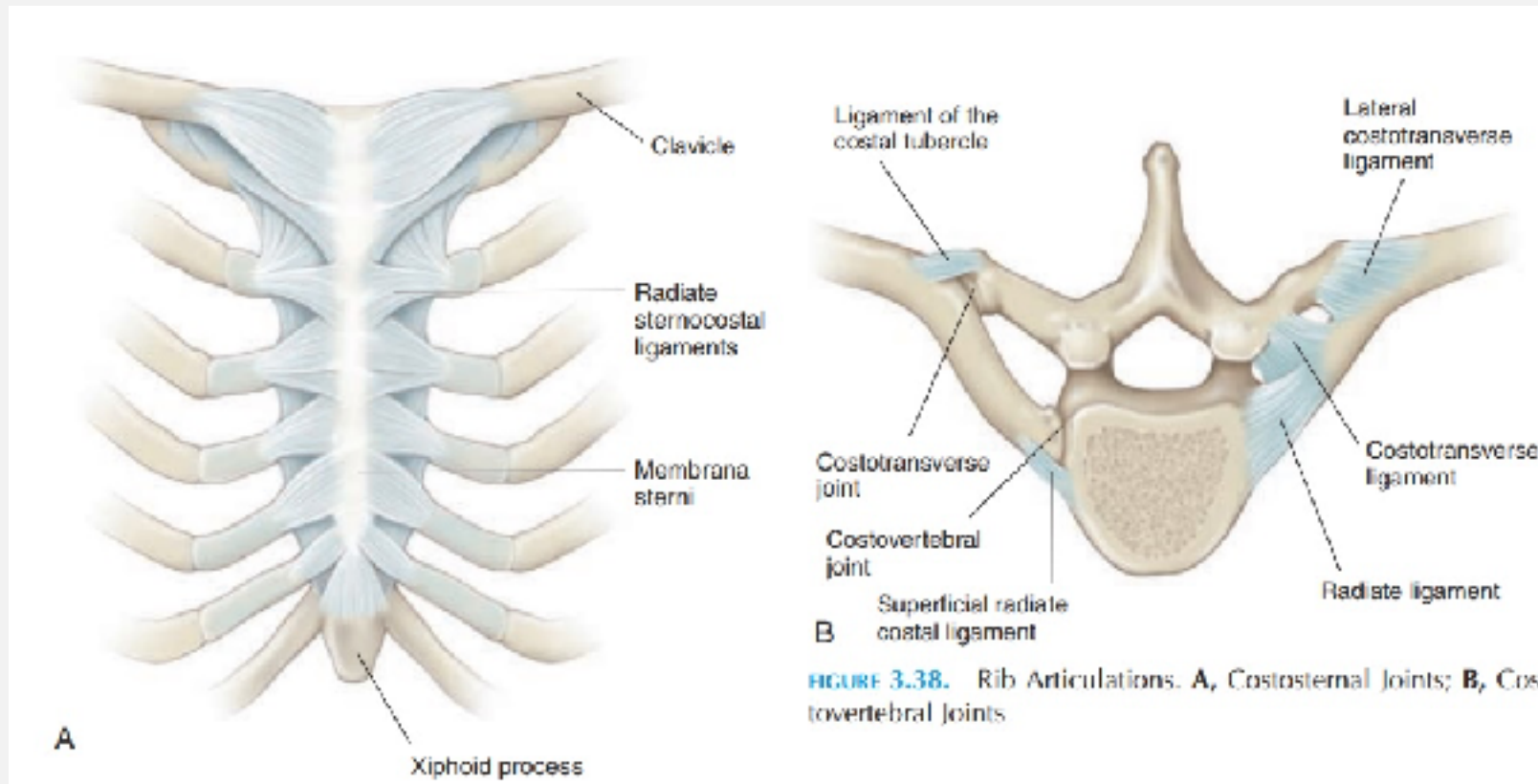
Middle rib:  
posterior view



# ANATOMY- RIBS



# ANATOMY- RIBS



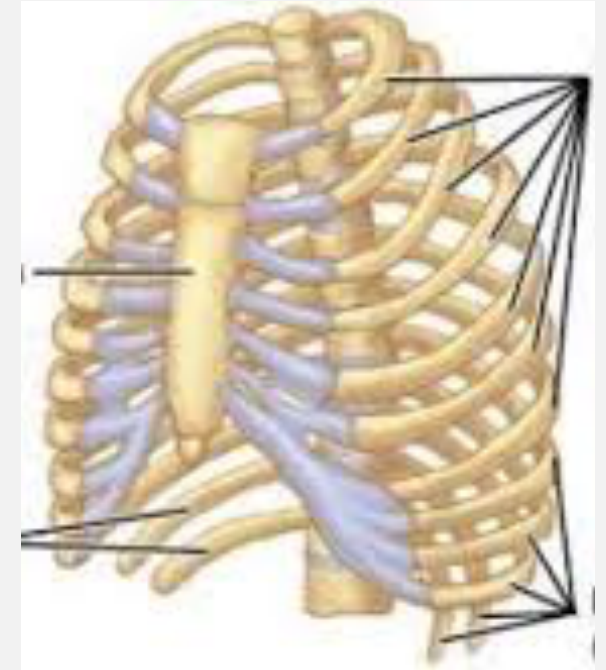
# ANATOMY- RIBS

- Typical vs Atypical Ribs
  - Typical Ribs
    - Have a tubercle, head, neck, angle and body
    - Ribs 3-9, +/- 10
  - Atypical Ribs
    - Rib 1- only articulates with T1 and no angle
    - Rib 2- large tuberosity on the shaft for serratus anterior
    - Rib 11 and 12- no tubercles and only articulate with corresponding vertebrae
    - Rib 10- articulates only with T10



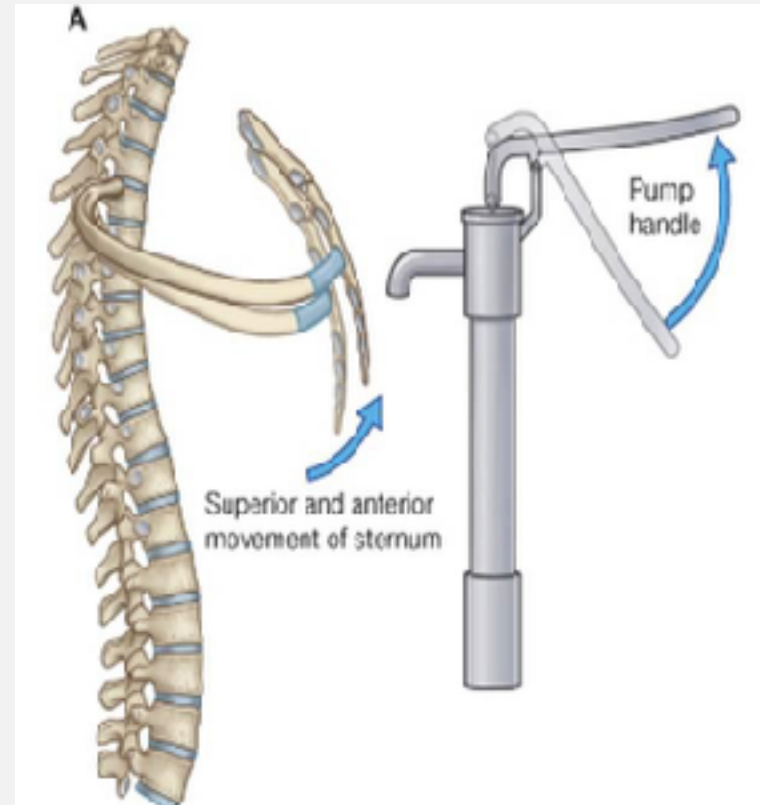
# ANATOMY- RIBS

- True vs False vs Floating Ribs
  - True ribs attach to the sternum through costal cartilage
    - Ribs 1-7
  - False ribs do not attach directly to the sternum
    - Ribs 8-10
  - Floating ribs are unattached anteriorly
    - Ribs 11-12



# RIBS- MOTION

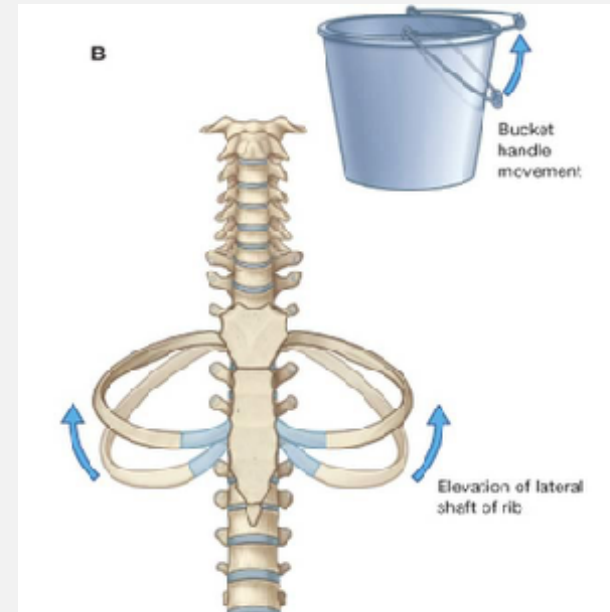
- Pump- handle motion
  - Ribs 1-5
  - Goal to increase AP diameter of thorax during inspiration





# RIBS- MOTION

- Bucket handle motion
  - Ribs 6-10
  - Goal to increase transverse diameter of thorax during inspiration



# RIBS- MOTION

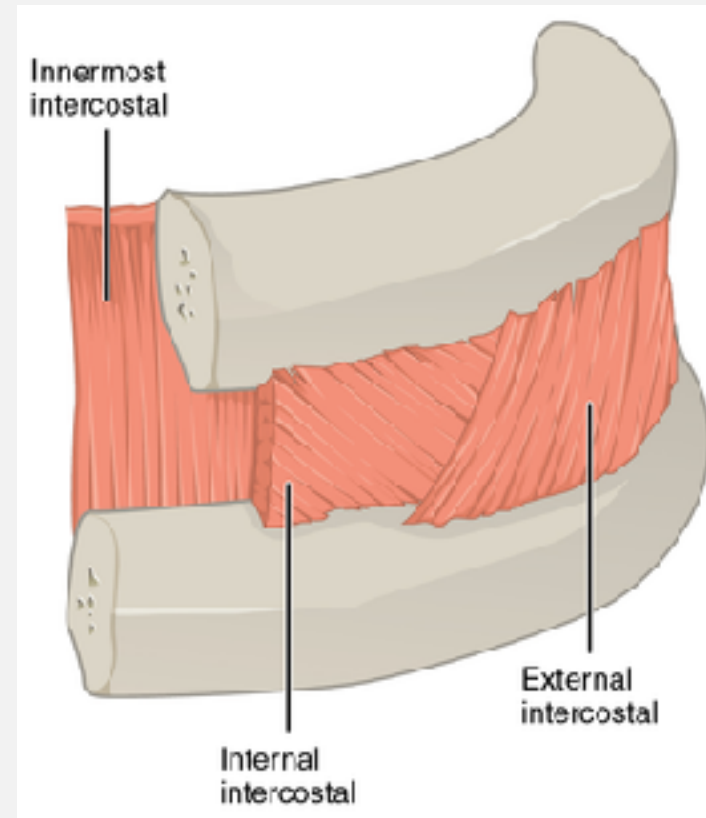
- Caliper motion
  - Ribs 11-12
  - No anterior attachment



FIGURE 5.12 – Caliper motion of ribs 11 and 12.

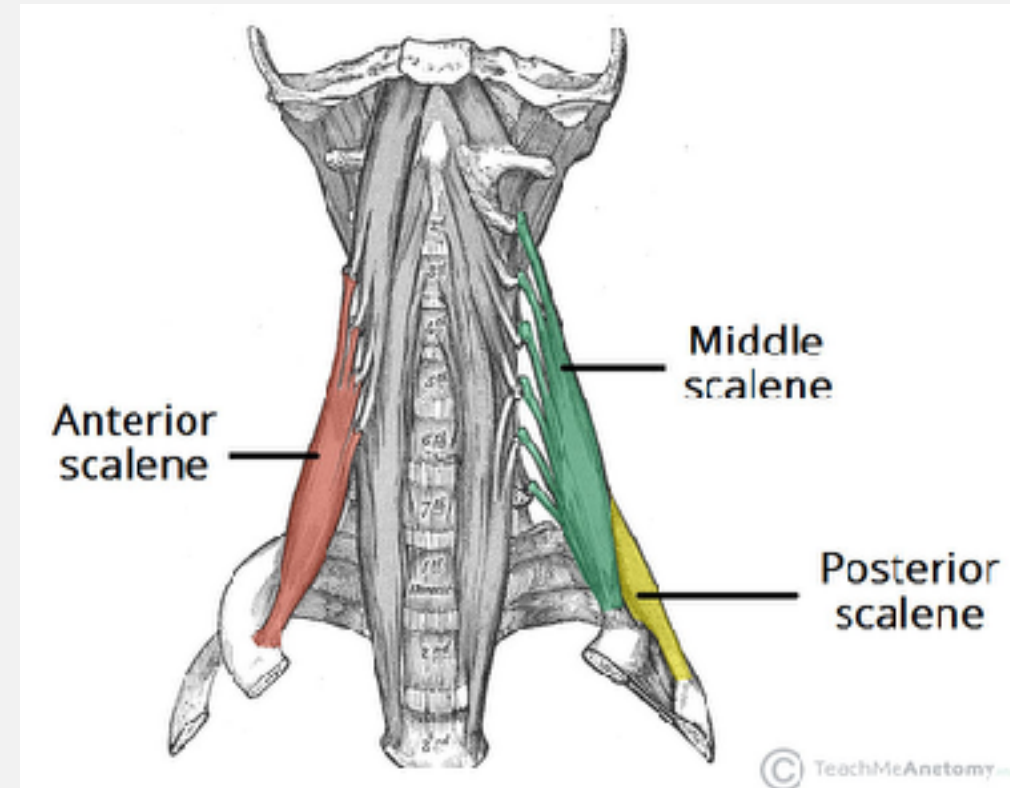
# ANATOMY- MUSCLES

- Intercostals
  - Attach to ribs 2-12
  - Aid in respiration



# ANATOMY- MUSCLES

- Scalenes
  - Anterior and middle attach to first rib
  - Posterior attaches to second rib
  - Accessory respiratory muscles
  - Sidebends neck



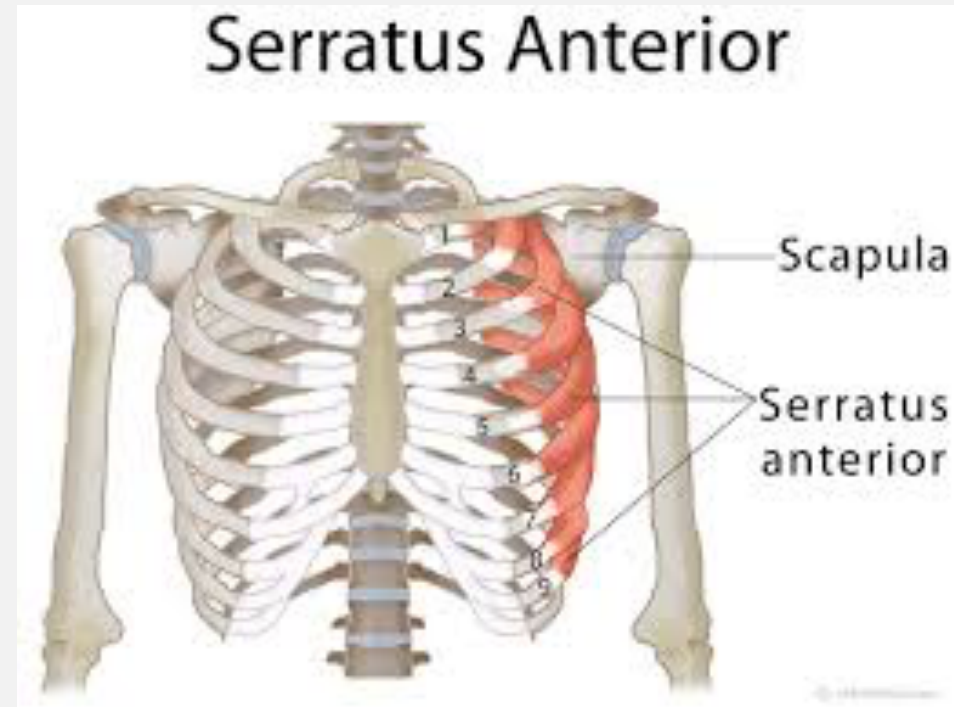
# ANATOMY- MUSCLES

- Pectoralis Minor
  - Originates from third, fourth and fifth ribs
  - Draws scapula forward
  - Aids in respiration



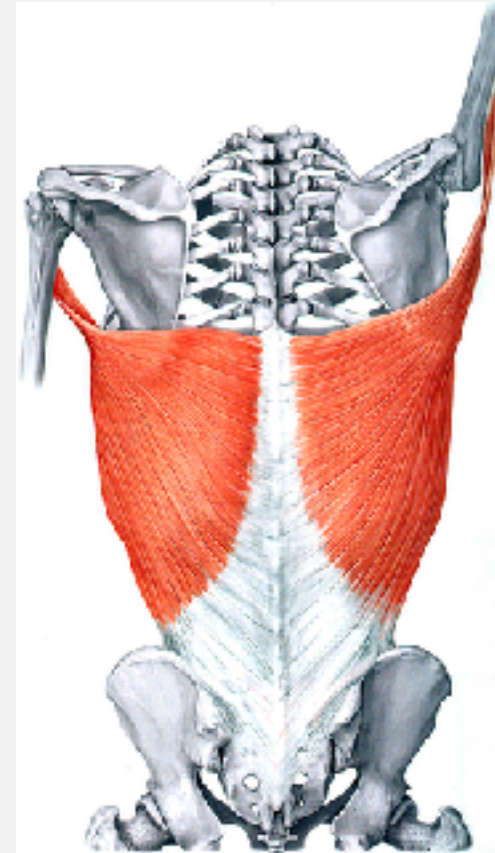
# ANATOMY- MUSCLES

- Serratus Anterior
  - Originates from ribs 1-8
  - Protracts and stabilizes scapula
  - Aids in respiration



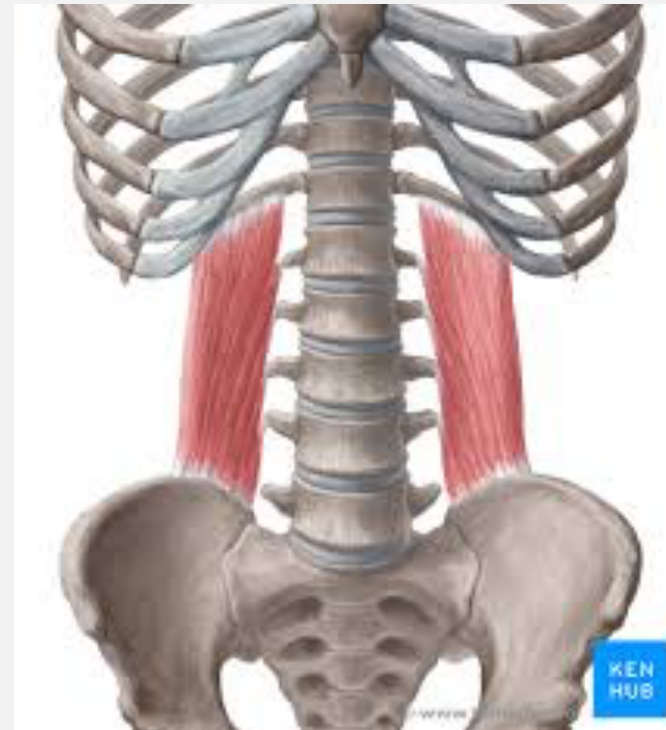
# ANATOMY- MUSCLES

- Latissimus Dorsi
  - Originates from ribs 8-12
    - Also T7-L5, thoracolumbar fascia, inferior angle of scapula, and iliac crest
  - Adducts, extends, internally rotates the arm
  - Trunk rotator
  - Accessory muscle of respiration



# ANATOMY- MUSCLES

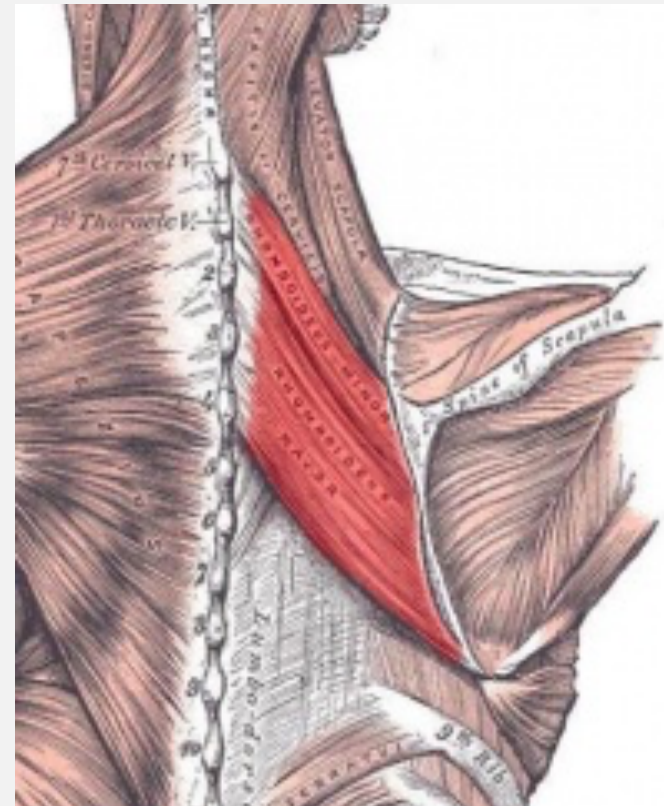
- Quadratus Lumborum
  - Inserts on inferior 12<sup>th</sup> rib
  - Depresses thoracic rib cage
  - Lateral trunk flexion





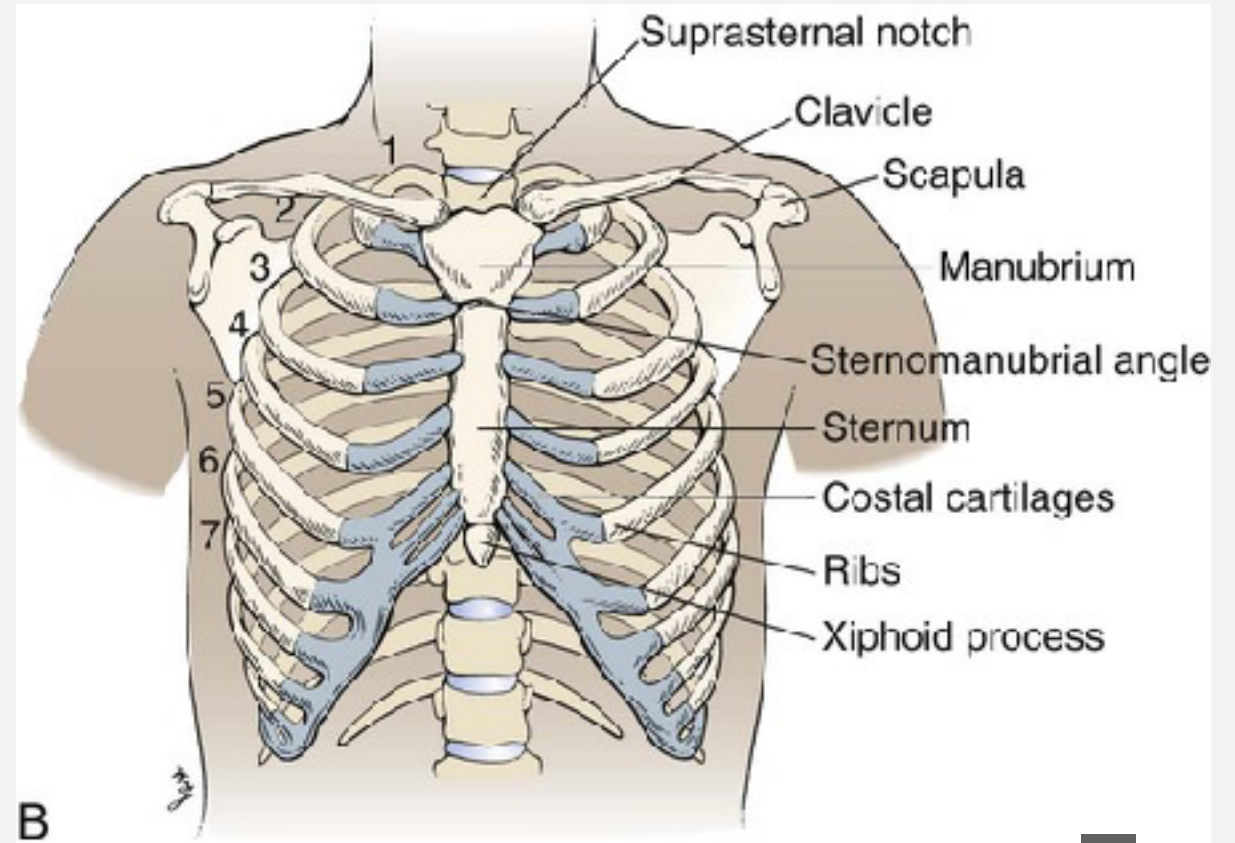
# ANATOMY- MUSCLES

- Rhomboids
  - No rib attachment
  - Scapular stabilizer



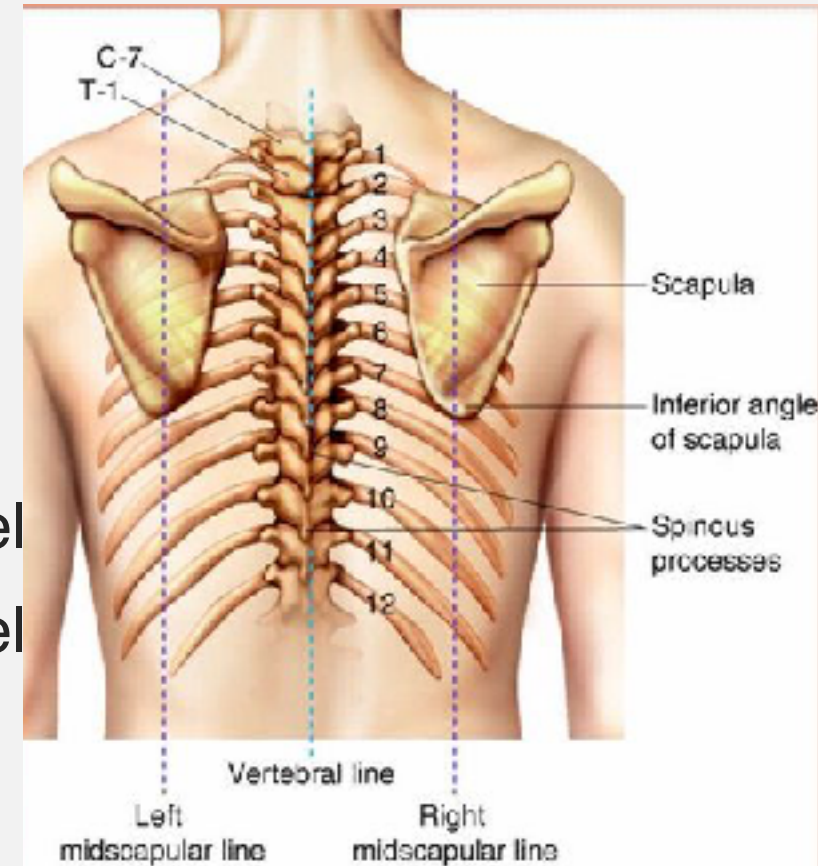
# LANDMARKS- ANTERIOR

- Anterior
  - Sternoclavicular joint
  - Suprasternal notch
  - Angle of Louis
  - Costomanubrial joint
  - Costochondral joint



# LANDMARKS- POSTERIOR

- Posterior
  - Costovertebral joint
  - Rib angles
  - Paraspinal muscles
  - Spine of scapula- Rib 3 level
  - Angle of scapula- Rib 7 level



# RIB DYSFUNCTION- WHAT IS IT?

- TART
  - Tissue texture change
  - Asymmetry
  - **Restriction of movement**
  - Tenderness



## RIB DYSFUNCTION

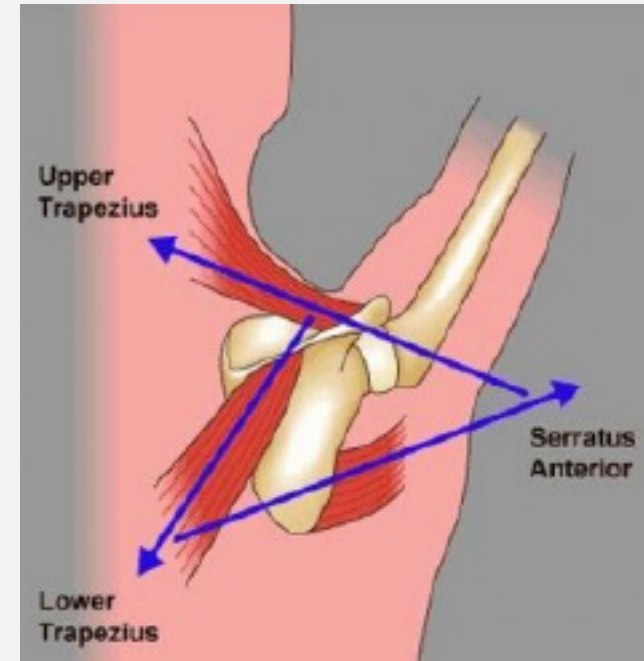
- Rib “subluxation”
  - Tissue texture change
  - Asymmetry compared to contralateral side
  - Restriction of movement
  - +/- tenderness

## RIB DYSFUNCTION- WHY DOES IT OCCUR?

- Acute trauma
  - Direct blow
  - Rotational strain
- Poor Posture
- Asymmetrical muscle mechanics/muscle fatigue

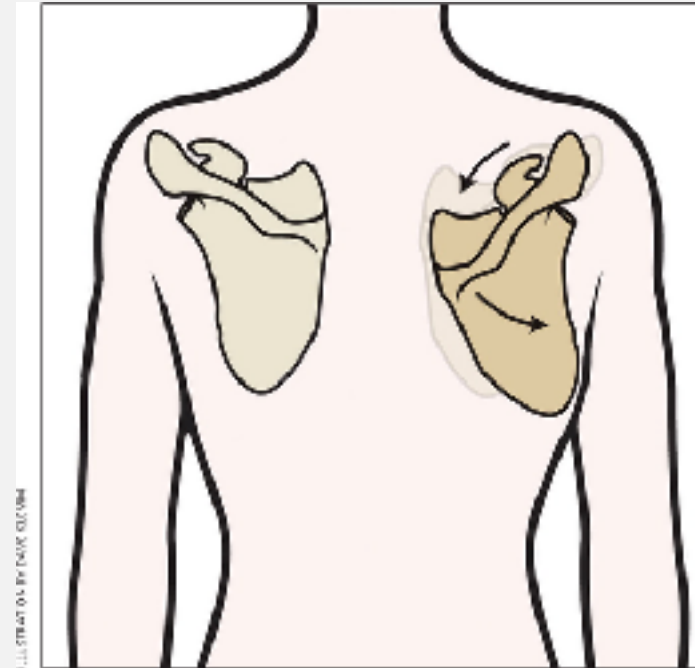
# RIB DYSFUNCTION

- Why does it occur in our athletes, and more commonly in overhead athletes?
  - Related to scapular function
    - Scapular stabilizers
      - **Serratus anterior, rhomboids, levators, trapezius**



# RIB DYSFUNCTION

- One weak link in the chain disrupt normal mechanics
- Muscle can pull on rib and create dysfunction
  - Due to strain or imbalanced forces





## RIB DYSFUNCTION- SIGNS AND SYMPTOMS

- Unilateral
- Anterior or posterior
- Pain with (deep) respiration
  - Coughing, sneezing
- Pain with rotation of the spine
- Tenderness over costovertebral joint
  - Pain may radiate anteriorly when corresponding costovertebral joint is palpated posteriorly

# CASE 1

- 17 yo cross country runner comes to the athletic training room in the morning complaining she “slept wrong” and is having pain in her right upper traps. Pain is exacerbated with turning and bending her neck, moving her right arm and breathing. She has a meet this afternoon and is worried she can’t run.
- On exam she has limited neck ROM 2/2 pain. Her right trapezius and scalene muscles are spasmed. You also notice her first rib on the right is exquisitely tender and more prominent than her left.

## CASE 2

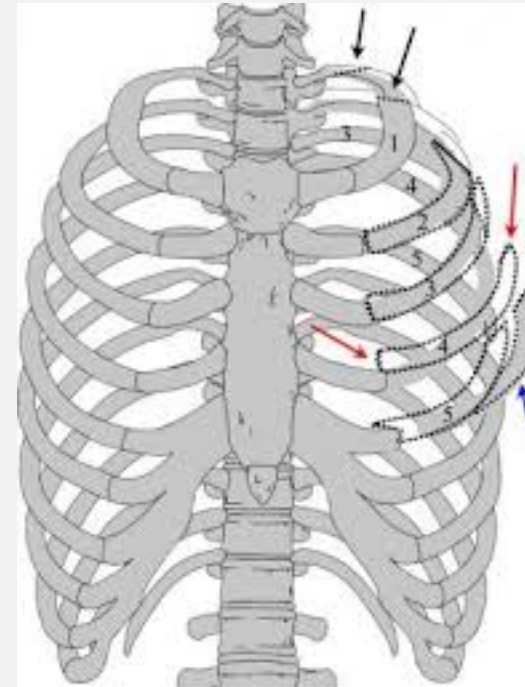
- A 21yo baseball pitcher complains of severe right sided chest pain after throwing a 96mph fastball during a game. He has no pain if he is still but says if he tries to breathe he has a severe sharp pain. He can't continue the game.
- On exam pt is visibly in pain. He is taking shallow breaths. He is point tender over his 4<sup>th</sup> rib anteriorly over the costal cartilage. When you palpate his 4<sup>th</sup> rib posteriorly his pain is reproduced in the front.

## CASE 3

- A 15 yo female gymnast comes in complaining of bilateral lower thoracic/rib pain. She notes it is worsened when she is practicing and is unable to vault or do her passes during her floor routine due to pain. She recently was diagnosed with pertussis 1 month prior.
- On exam patient's rib cage motion with respirations are severely restricted when your hands are placed on her lower rib cage. She notes pain on the left over CVJs of ribs 8-10.

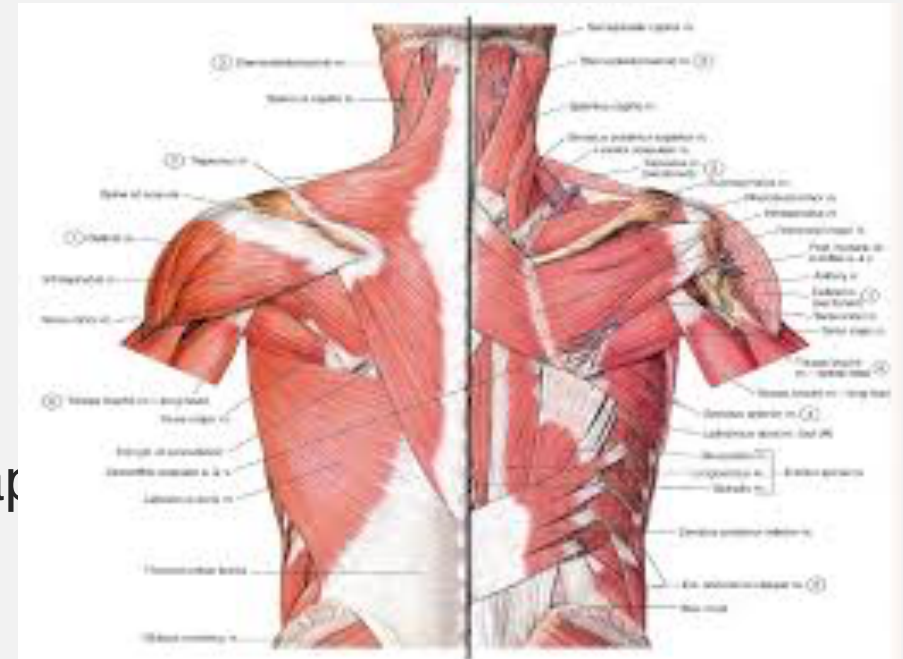
# WHAT DO THESE ATHLETES HAVE IN COMMON?

- RIB DYSFUNCTION
  - Easily treatable
  - Goal is to restore normal biomechanics
  - Rehab for strengthening and prevention



# APPROACH

- Where to treat???
- Fascia
- Superficial paraspinals
- Deep paraspinals
- Costovertebral joint
- Other major muscles- scalenes, trap, rhomboids, lats, pecs, quadratus lumborum
- Facet joints



# TECHNIQUES

- Direct or Indirect
  - Soft Tissue
  - Articulation\*
  - Myofascial release\*
  - Still's technique
  - FPR
  - Balanced ligamentous tension
  - Counterstrain
  - Muscle Energy\*
  - LVLA

• HVLA  
Direct- into the restriction  
Indirect- away from the restriction

# RIB DYSFUNCTION

- **The Use of Nonthrust Manipulation in an Adolescent for the Treatment of Thoracic Pain and Rib Dysfunction**
  - **Jason Kelley, DPT and Susan Whitney, PT, PhD, NCS, ATC**
  - **JOAPT 2006**
- Immediate pain relief and improvement of chest expansion
- Follow-up at 1 and 9 months- no return of pain



# RIB DYSFUNCTION

- Think of rib dysfunction if athlete comes in with unilateral thoracic pain
  - More pain with deep breathing
  - More likely in overhead athlete
- Use hands on techniques to relax muscles and improve rib motion
- Focus on scapular stabilization

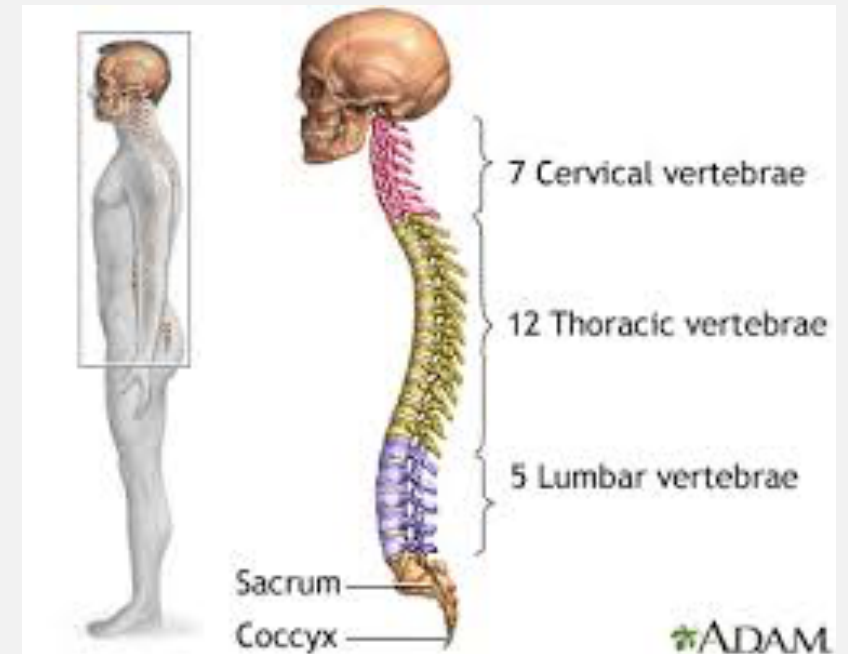
# RIB DYSFUNCTION

- Questions?

INNOVATIVE OSTEOPATHIC  
MANIPULATIVE MEDICINE  
TECHNIQUES FOR RIB PAIN IN THE  
ATHLETE  
PART 2

# EXAMINATION

- Inspection
  - Breathing
    - Depth, rate
    - Chest expansion
  - Posture
    - Protracted shoulders
    - Slumped to one side
    - Increased/decreased kyphosis or lordosis



# EXAMINATION

- Palpation
  - Screening examination sitting
    - Palpate paraspinals looking for any spasm, hypertrophy, etc
    - Palpate costovertebral joints, starting at the first rib
    - Place hands on either side of rib cage and evaluate bucket handle motion
  - Supine
    - Place hands gently on either side of spine and appreciate bucket-handle motion
    - Place hands gently on either side of mid-line over superior ribs to appreciate pump-handle motion

# DIAGNOSING RIB DYSFUNCTION



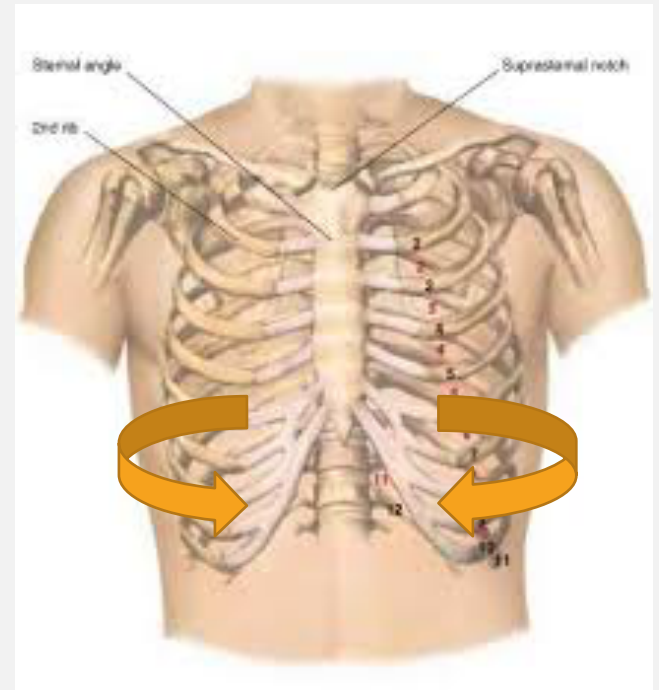
PUMP HANDLE DIAGNOSING



BUCKET HANDLE DIAGNOSING

# DIAGNOSING A RIB DYSFUNCTION

- Palpate the painful rib and corresponding rib on contralateral side
- Follow rib out and put hands in a “c” around the rib angle
- Have patient breathe in and out
- If the rib moves more freely in exhalation, the rib is exhaled
  - Inhalation dysfunction -> pain
- If the rib moves more freely in inhalation, the rib is inhaled
  - Exhalation dysfunction -> pain



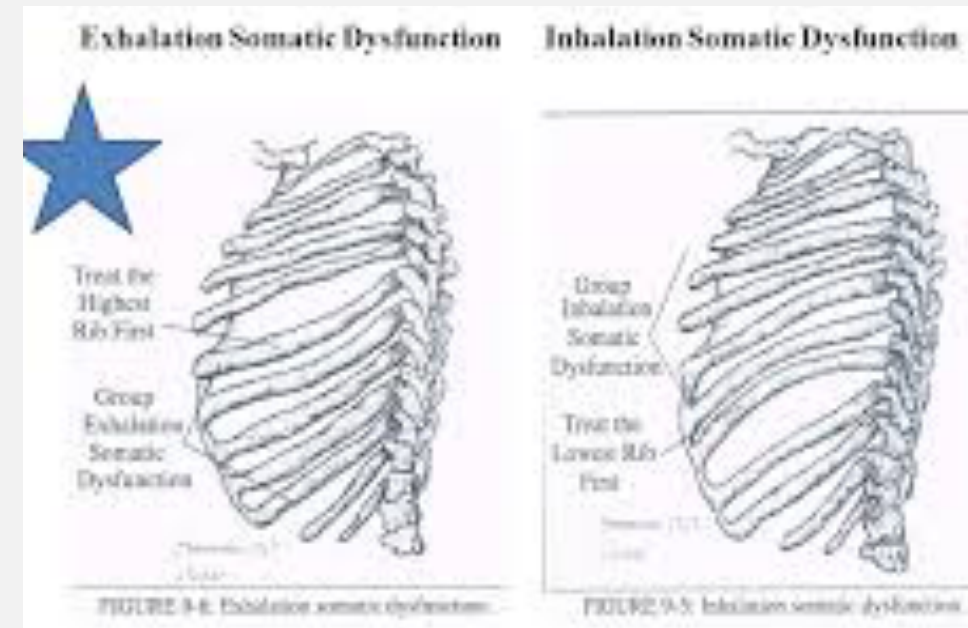
# KEY RIB

- If a group of ribs aren't moving very well -> find the key rib
- Think about rib motion through the respiratory cycle
  - Inhalation- ribs move up anteriorly, down posteriorly
  - Exhalation- ribs move down anteriorly, up posteriorly



# KEY RIB

- BITE
  - Bottom Inhalation Top Exhalation
    - Inhaled rib dysfunction
      - Treat the bottom rib
    - Exhaled rib dysfunction
      - Treat the top rib



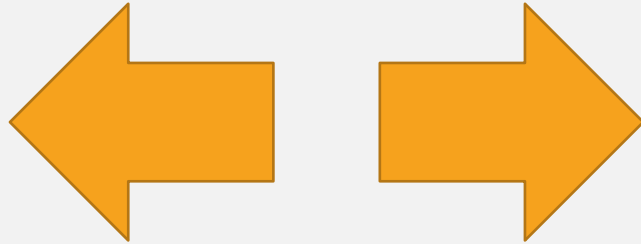
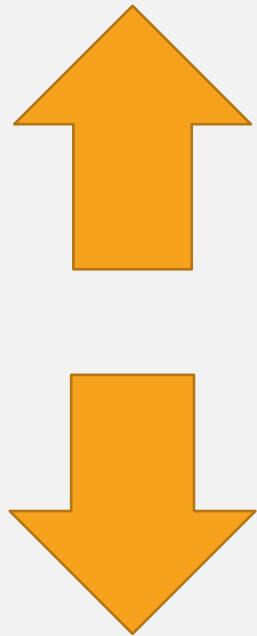
# TECHNIQUES

- Thoracic Myofascial Release
- Rib Raising
- Scapular Lift
- Rhomboid/Pec Muscle Energy

# THORACIC MYOFASCIAL RELEASE

- Direct or Indirect
  - Direct- bring the fascia where it doesn't like to go
  - Indirect- bring the fascia where it likes to go

# THORACIC MYOFASCIAL RELEASE

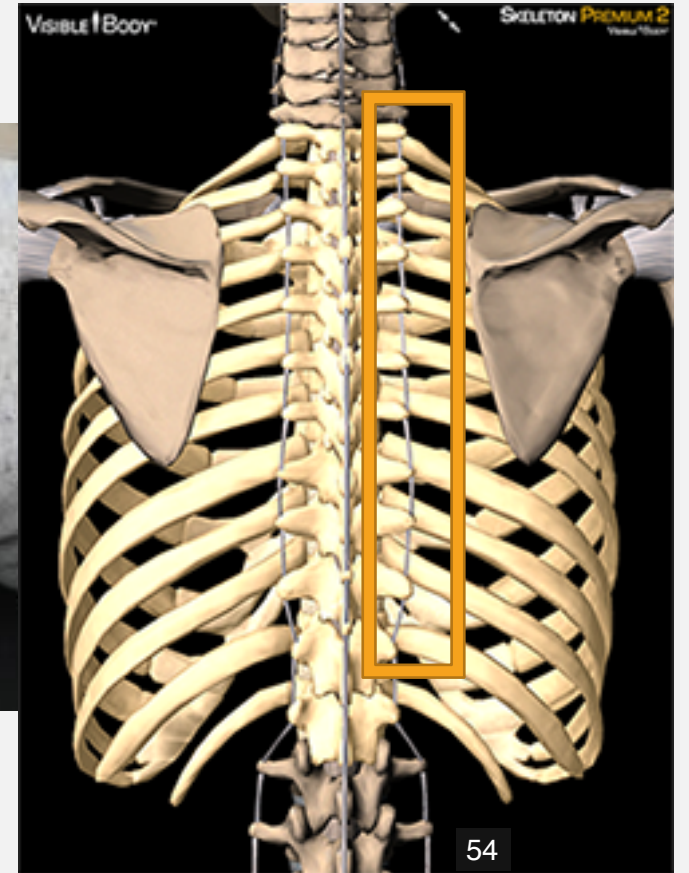


# THORACIC MYOFASCIAL RELEASE



- Patient positioned prone
- Treatment hand position on each side of spine
- If using indirect technique, take the tissue where it wants to go and hold cranially, caudally, counterclockwise and clockwise and HOLD.
  - Direct technique is the same with taking tissue where it is restricted
- Have patient take 3-4 deep breathes then treatment is complete.
- Repeat if necessary
- Goal- Free up any restriction posterior thorax and warm up tissues for treatment

# RIB RAISING-POSTIONING



# RIB RAISING TREATMENT



- Patient is supine
- Treatment hand position is on the costovertebral junction (rib angles)
- Treatment starts with anterior pressure with fingers then lateral traction
  - Best to lean back not to strain wrists.
- Option to hold this hand position or repeat it up and down the whole rib cage.
- Goal- free any rib restrictions



# SCAPULAR LIFT



POSITION ONE- UPPER SCAPULA



POSITION TWO- LOWER SCAPULA



# SCAPULAR LIFT

- POSITION ONE-

- Patient sidelying with shoulder full abduction and compress on axilla to wing the scapula
- Treatment- fingers are on ribs and scapula pull traction toward the examiners
- May hold until you feel release or repeat several times for more of a soft tissue technique
- GOAL- treatment of scapulothoracic joint and surrounding tissues.

- POSITION TWO-

- Patient sidelying with shoulder in full internal rotation, examiner pushes AC joint caudally to wing scapula
  - Modification for shoulder pain- patient shoulder at neutral
- May hold until you feel release or repeat several times for more of a soft tissue technique
- GOAL- treatment of scapulothoracic joint and surrounding tissues.

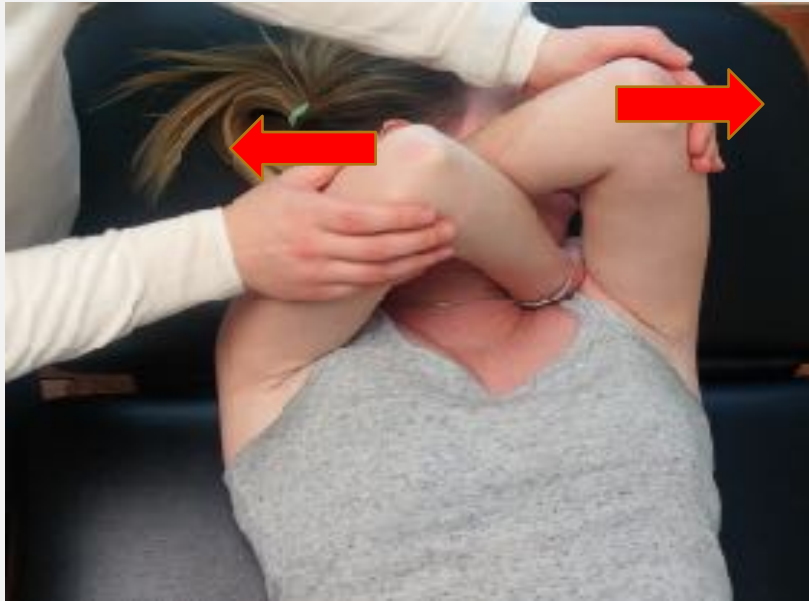
# SCAPULAR LIFT- MODIFICATION



# RHOMBOID MUSCLE ENERGY



STEP ONE



STEP TWO



STEP THREE

RED ARROWS- PATIENT MOTION  
PHYSICIAN RESISTS-ISOMETRIC

# PEC MINOR MUSCLE ENERGY



STEP ONE



STEP TWO

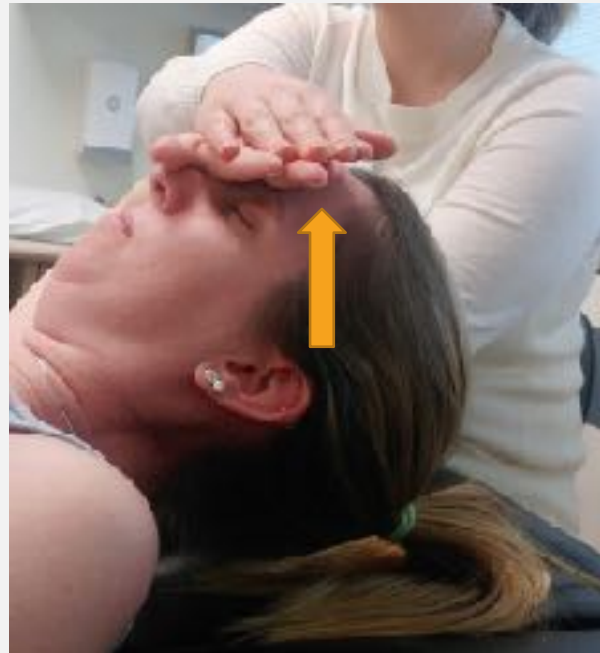


STEP THREE

RED ARROWS- PATIENT MOTION  
PHYSICIAN RESISTS- ISOMETRIC



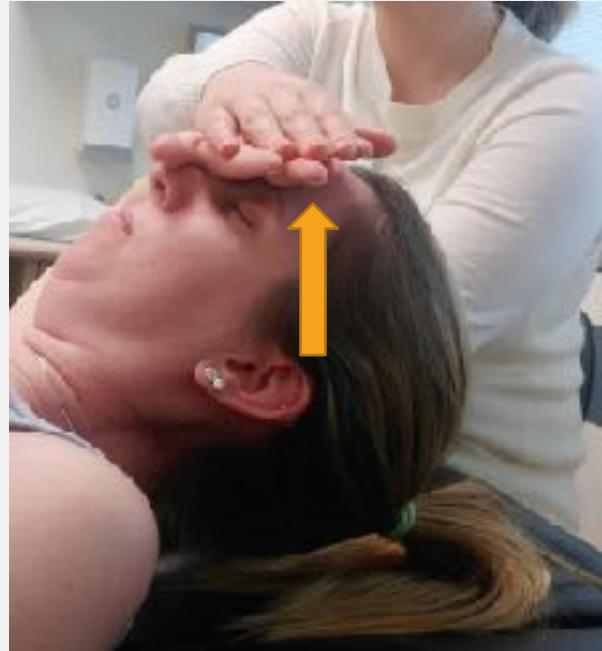
# RIB ONE TREATMENT



- Patient position is supine with hand on forehead and neck neutral
- Examiner's one hand is on the superior part of RIB 1 and other hand on patients forehead
- Patient pushes up into examiner's hand (yellow arrow) and examiner resists (isometric) for 3 secs
- Patient relaxes at the same time examiner pushes RIB ONE caudally (blue arrow) holds through whole treatment
- Repeat 2 times
- GOAL- Using anterior scalene attachment at rib one to free restrictions

# RIB TWO TREATMENT

- Patient position is supine with hand on forehead and neck rotated 30 degrees
- Examiner's one hand is on the RIB TWO and other hand on patients forehead
- Patient pushes up into examiner's hand (yellow arrow) and examiner resists (isometric) for 3 secs
- Patient relaxes at the same time examiner pushes RIB TWO anterior and holds through whole treatment.
- Repeat 2 times
- GOAL- Using middle and posterior scalenes attachment at RIB 2 to free restrictions



# RIBS 3-5 TREATMENT

- Patient position is supine with hand on forehead and neck neutral
- Examiner's one hand is on the RIBS 3-5 and other hand on patients elbow
- Patient pushes elbow into examiner's hand (yellow arrow) aiming to opposite ASIS and examiner resists (isometric) for 3 secs
- Patient relaxes at the same time examiner pushes RIB3- 5 anterior and lateral traction and holds position through whole treatment
- Repeat 2 times



# RIBS 6-9 TREATMENT



- Patient position is supine with shoulder abduction 90 degrees and external rotation with neck neutral
- Examiner's one hand is on the RIBS 6-9 and other hand on patients elbow
- Patient pushes elbow into examiner's hand (yellow arrow) caudally and examiner resists (isometric) for 3 secs
- Patient relaxes at the same time examiner pushes RIB 6-9 anterior and lateral traction and holds position through whole treatment
- Repeat 2 times