Upper Extremity Somatic Dysfunction

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Objectives

- Define and describe the somatic dysfunctions that occur at each joint region of the UE.
- Describe the functional anatomy that predisposes the different types of UE somatic dysfunctions.
- Demonstrate screening and physical assessment for somatic dysfunction for each of the UE joint regions.
- Discuss how anatomic disruptions differ from somatic dysfunction and how assessment differs.
- Describe common mechanisms for inducing somatic dysfunction of the UE.

Upper Extremity Joint Regions

- Shoulder
- Elbow
- Wrist and Forearm
- Hand

Somatic Dysfunction

- Tenderness
- Asymmetry
- Restricted range of motion
- Tissue texture abnormalities

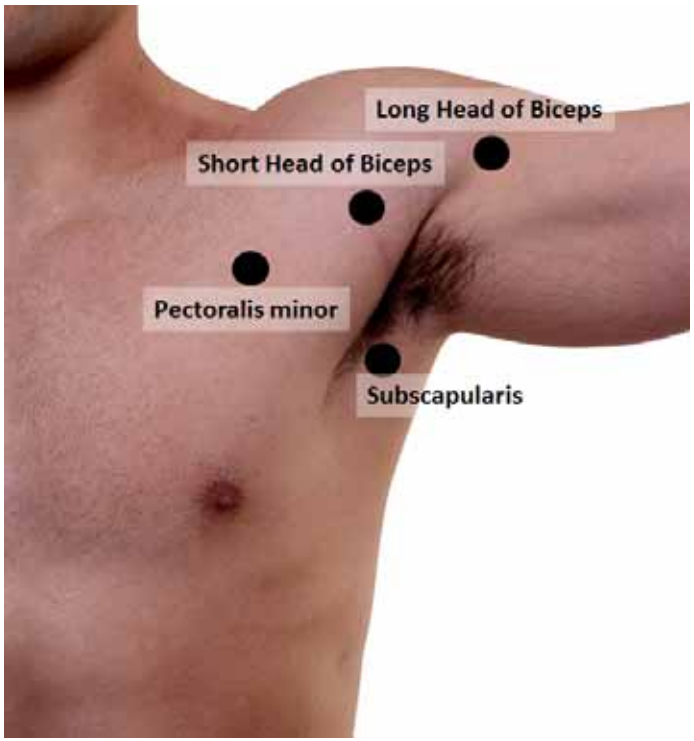
Types of somatic dysfunction

- Myofascial
  - Screen for TART findings
    - Most commonly tenderness, TTA, ROM
- Articular
  - Screen for TART findings
    - Most commonly asymmetry (static and ROM) and reduced ROM

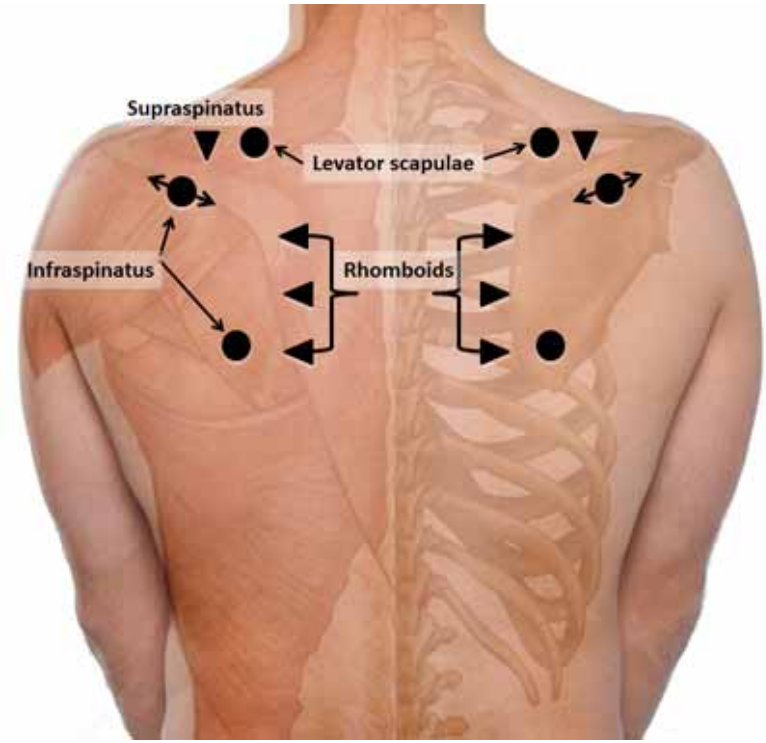
Shoulder Tender Points

Anterior Shoulder
- Pectoralis minor
- Biceps – Long Head
- Biceps - Short Head
- Subscapularis

Posterior Shoulder
- Supraspinatus
- Infraspinatus
- Levator scapulae
- Rhomboids



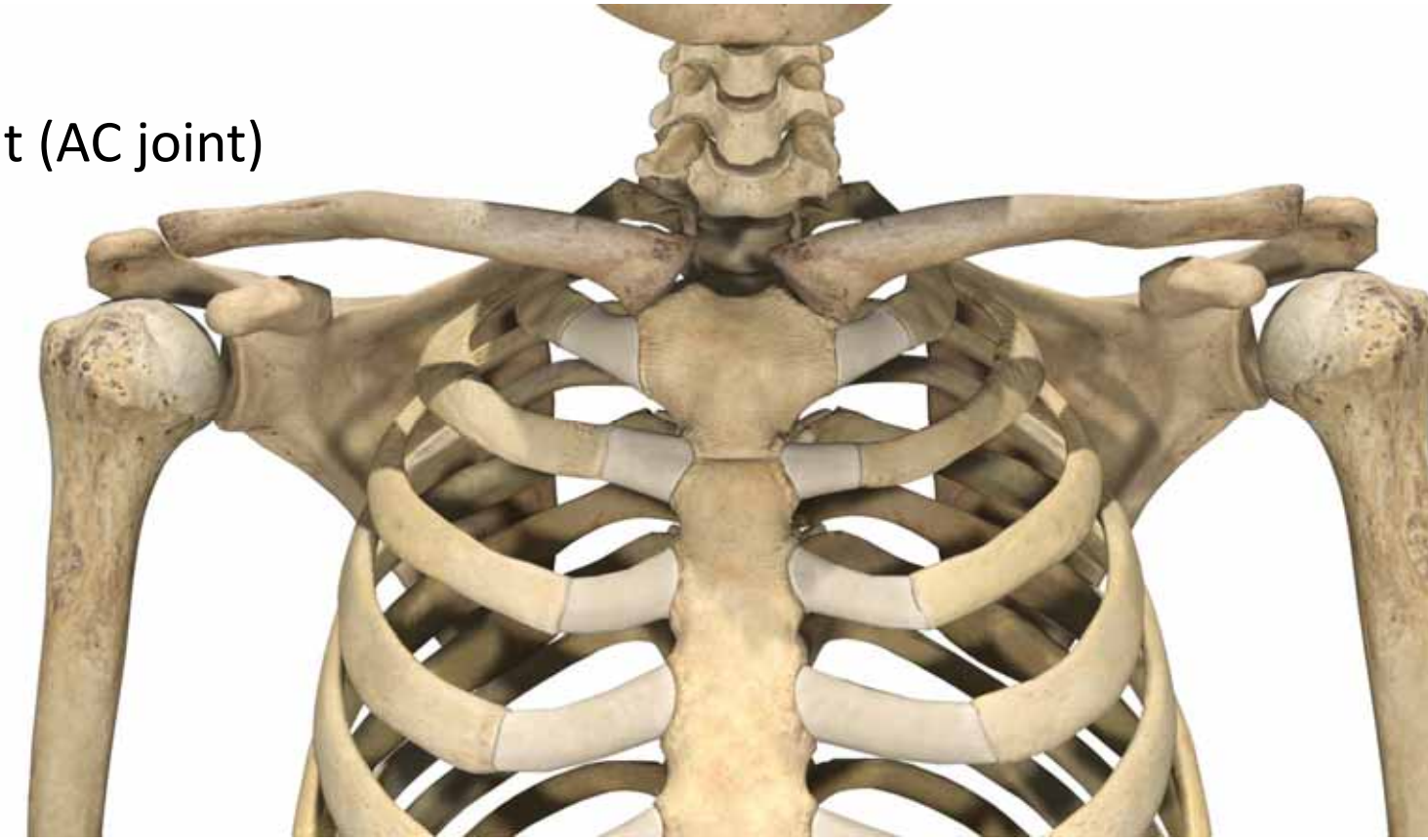
Common anterior shoulder tender points



Common posterior shoulder tender points

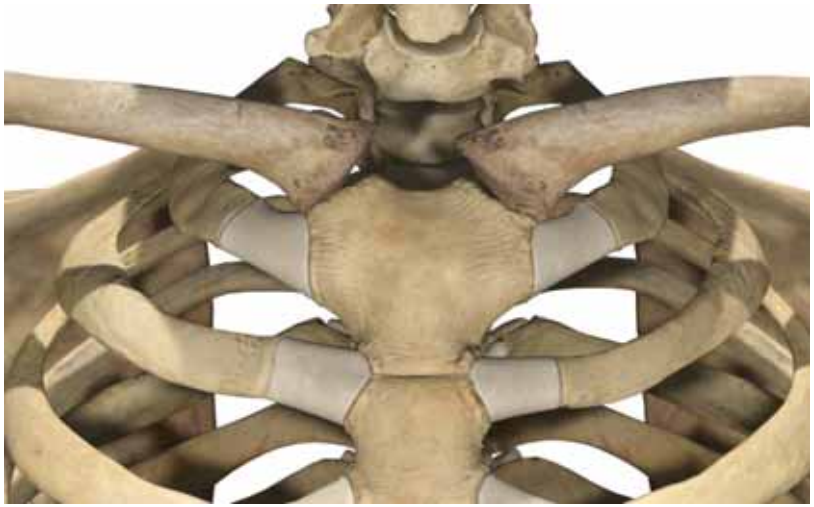
Shoulder

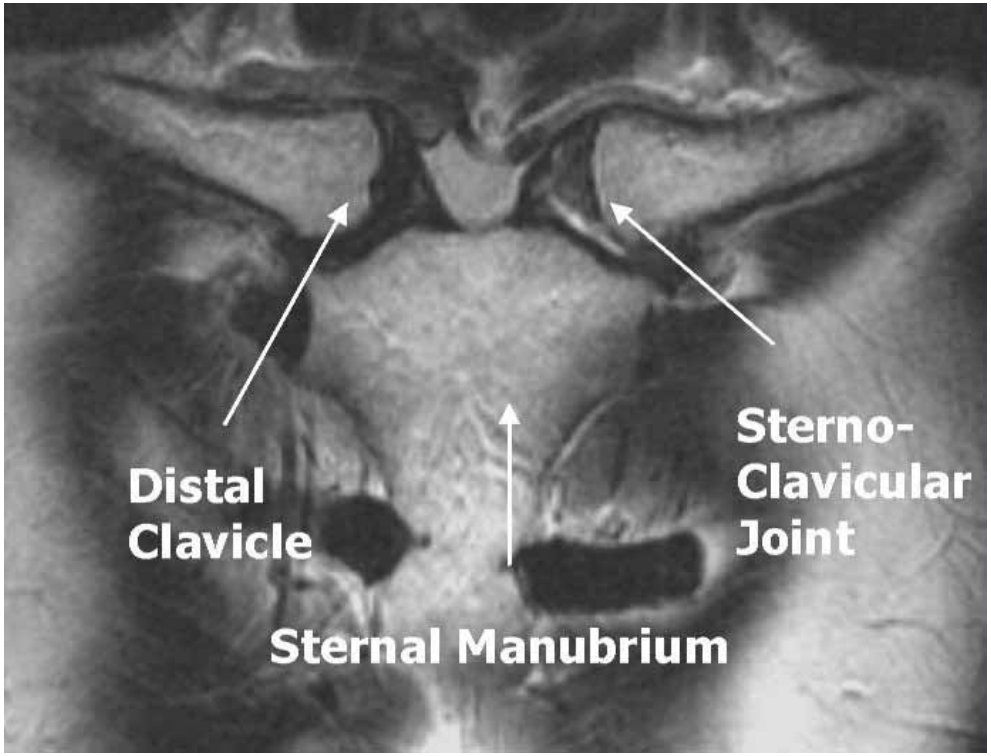
- Sternoclavicular joint
- Acromioclavicular joint (AC joint)
- Glenohumeral joint
- Scapulothoracic joint



Sternoclavicular Joint

- Complex synovial joint with meniscus
- Proximal(medial) clavicle articulates at clavicular notch of manubrium
- Stabilized by ligaments





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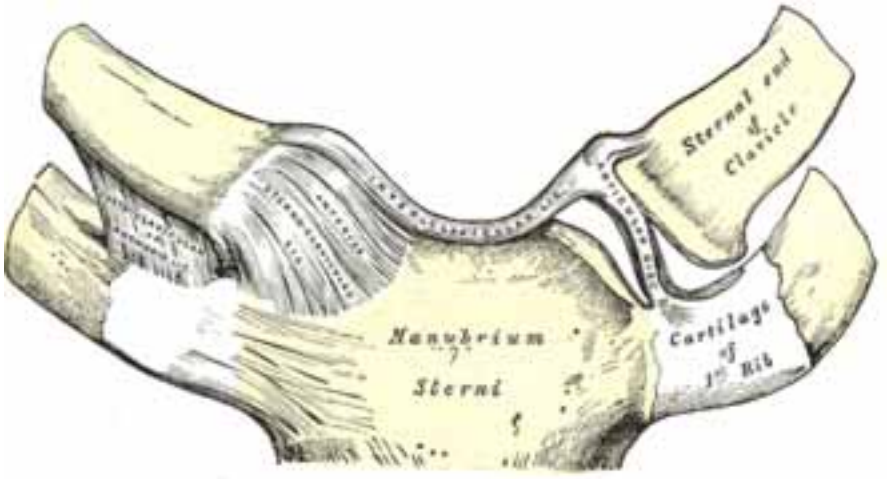
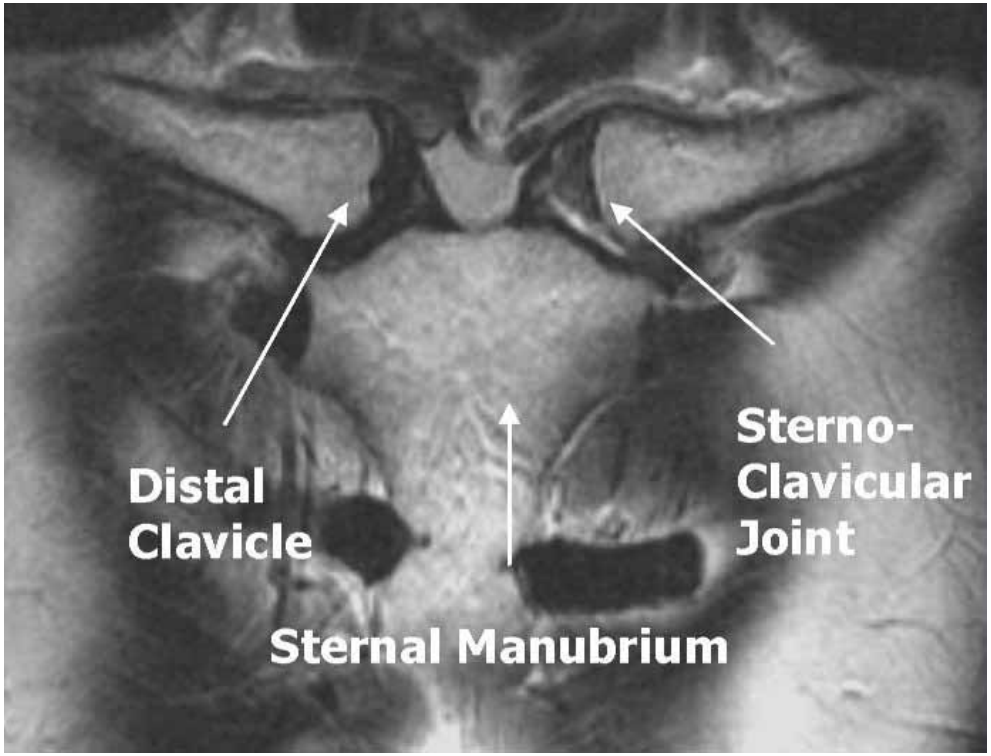
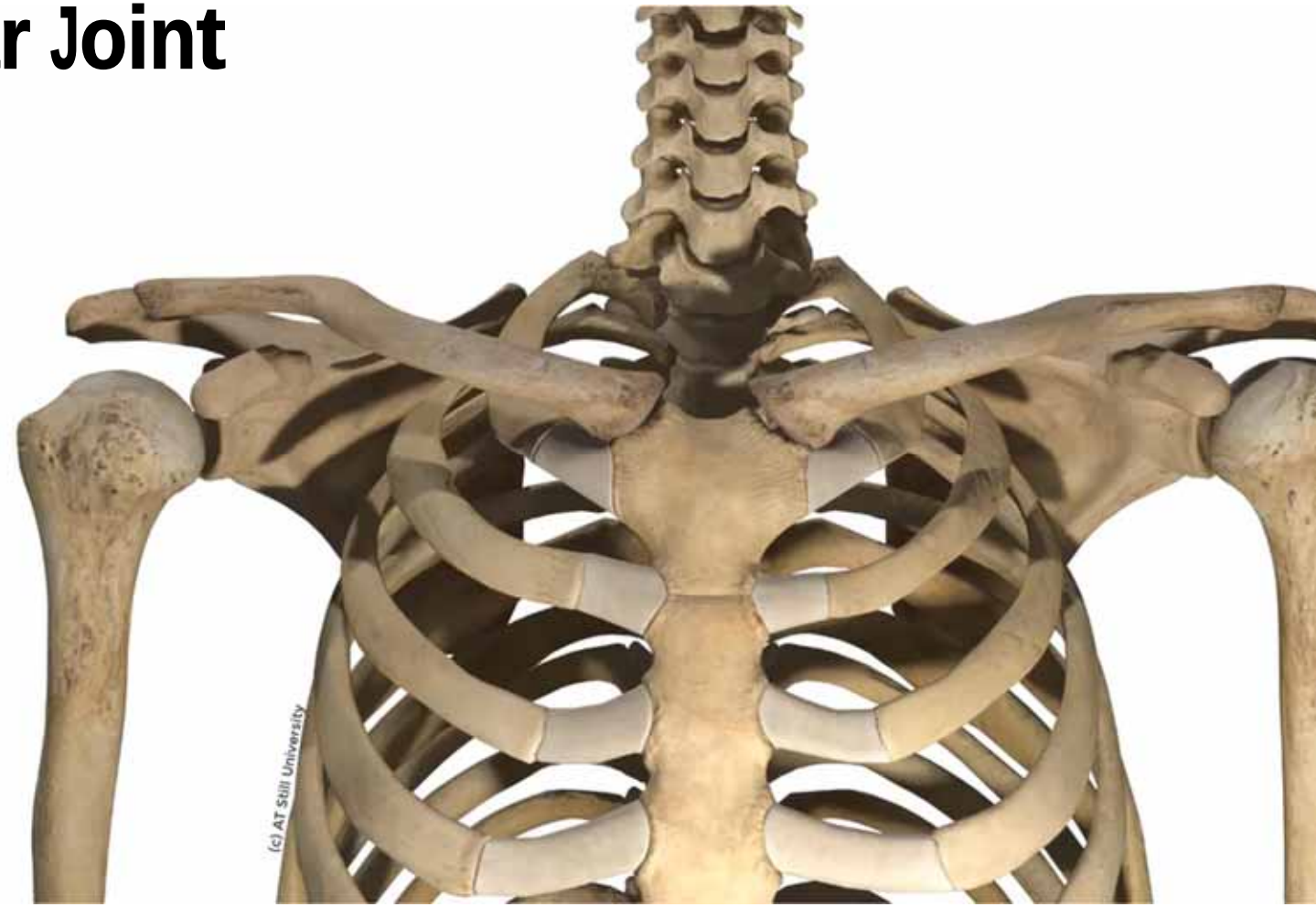




Sternoclavicular Joint

Glides of medial clavicle with SC motion

- Inferior glide with shoulder elevation (shrug)
- Superior glide with shoulder depression
- Anterior glide with shoulder retraction
- Posterior glide with shoulder protraction



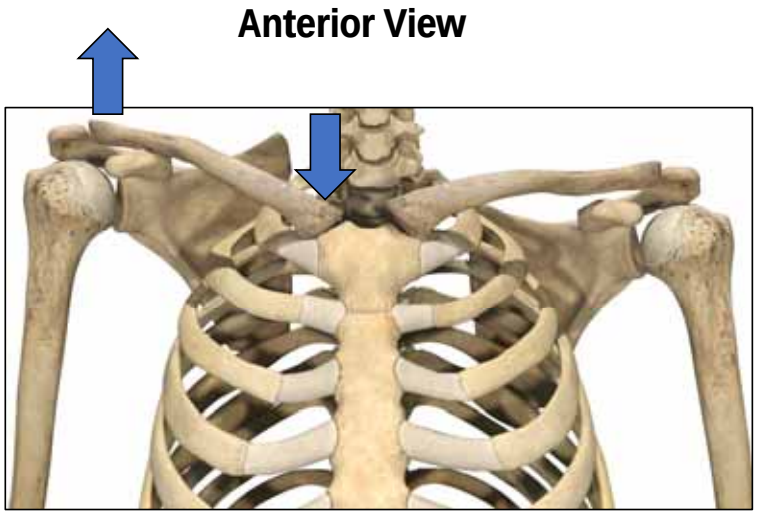
Glides of right proximal clavicle at the SC with motion

Sternoclavicular Joint

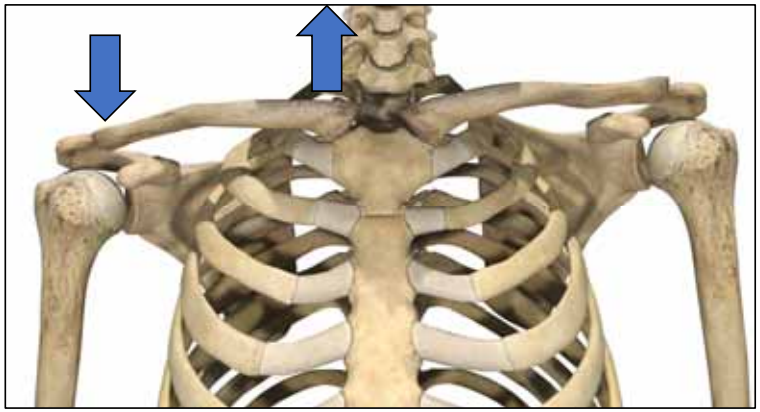
Reciprocal motion of the clavicle

Proximal clavicle moves in opposite direction of the distal clavicle

Distal Clavicle		Proximal Clavicle
Superior	→	Inferior
Inferior	→	Superior
Posterior	→	Anterior
Anterior	→	Posterior



Right proximal clavicle moves inferior when distal clavicle moves superior



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Sternoclavicular Joint

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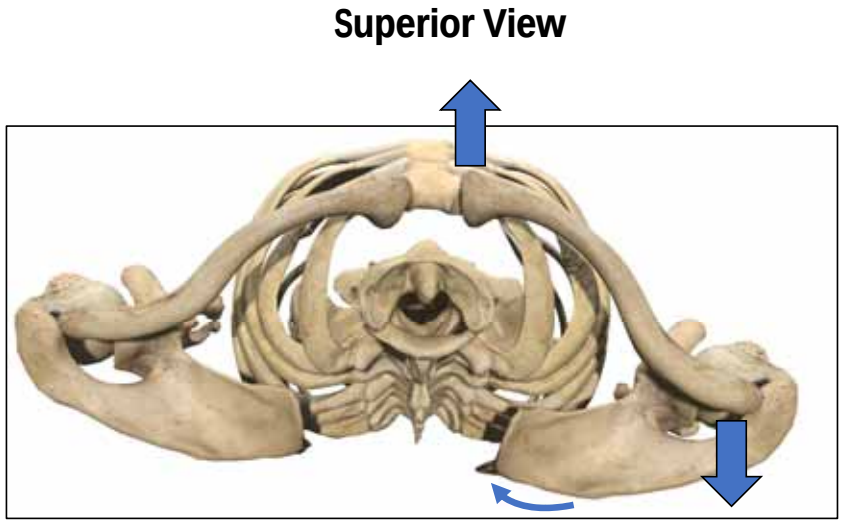
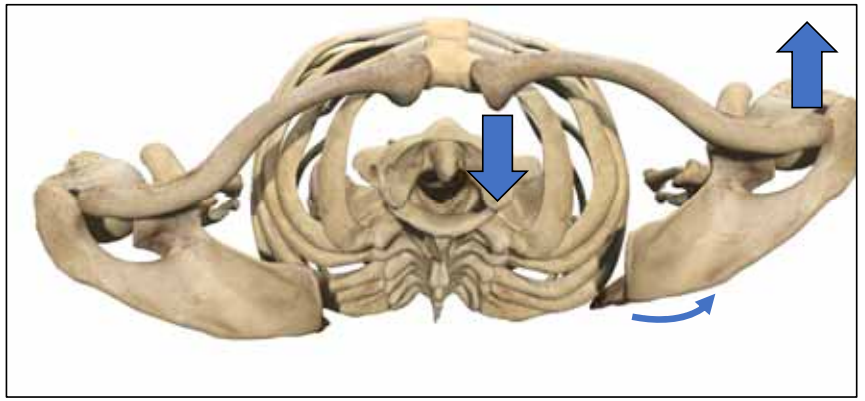


Right proximal clavicle moves anterior when distal clavicle moves posterior



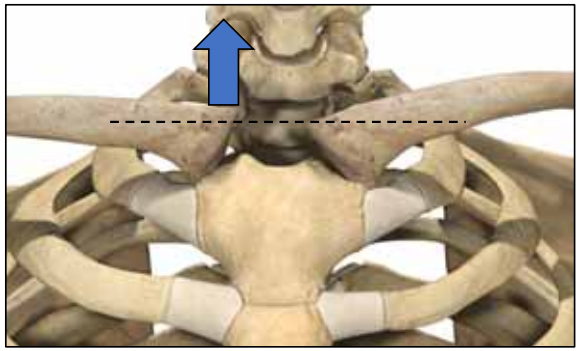
Right proximal clavicle moves posterior when distal clavicle moves anterior

Sternoclavicular Joint

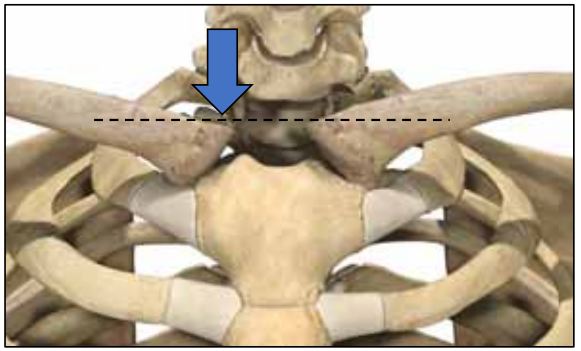
Articular Somatic Dysfunction

- Joint glide preference at clavicle
  - Inferior SC
  - Superior SC
  - Anterior SC
  - Posterior SC
- Named for motion preference of proximal clavicle relative to manubrium
- Dysfunction may occur as a combination of glide motion preferences
  - Ex Anterior and superior

Anterior View

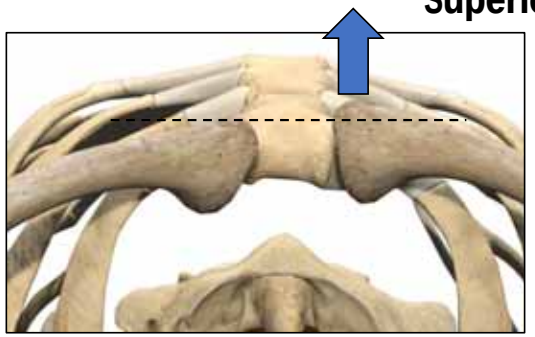


Right Superior SC

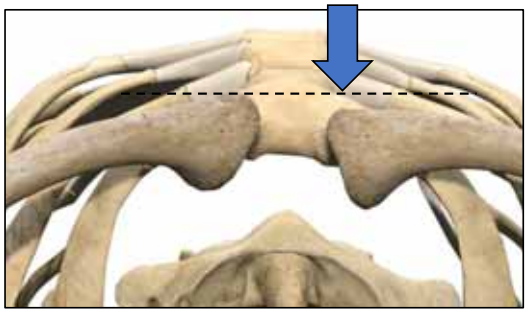


Right Inferior SC

Superior View



Right Anterior SC



Right Posterior SC

Sternoclavicular Joint

Articular Somatic Dysfunction Assessment

1. Screen for asymmetry and reduced active ROM
2. Assess for restricted motion
    1. Shoulder elevation (shrug superior)
        - Proximal clavicle should move inferior
    2. Shoulder depression (pull shoulders down)
        - Proximal clavicle should move superior
    3. Shoulder retraction (retract shoulders)
        - Proximal clavicle should move anterior
    4. Shoulder protraction (shrug forward)
        - Proximal clavicle should move posterior

Note motion restriction

Named for direction of motion preference

Proximal clavicles should move inferiorly when patient shrugs shoulders up.

Proximal clavicles should move superiorly when patient pull shoulders down.

Proximal clavicles should move anteriorly when patient squeezes shoulder blades together.

Proximal clavicles should move posteriorly when patient shrugs shoulders forward.

Sternoclavicular Joint

Articular Somatic Dysfunction Assessment

1. Screen for asymmetry and reduced active ROM
2. Assess for restricted motion
    1. Shoulder elevation (shrug superior)
        - Medial clavicle should move inferior
    2. Shoulder depression (pull shoulders down)
        - Medial clavicle should move superior
    3. Shoulder retraction (retract shoulders)
        - Medial clavicle should move anterior
    4. Shoulder protraction (shrug forward)
        - Medial clavicle should move posterior

Note motion restriction

Named for direction of motion preference

Acromioclavicular joint

- Planar joint with small meniscus
- **Variable** shape and slope of articular surfaces
- Stabilized by ligaments
- Small motions permitted at distal clavicle
  - Superior-inferior *
  - Anterior-posterior
  - Rotational motion

*Named somatic dysfunctions

Variable shape and slope of normal AC joint

Acromioclavicular joint

Right normal

Left ligamentous disruption causing complete separation (Grade III)

Excess passive range of motion = ligamentous laxity or disruption

Acromioclavicular joint

Somatic Dysfunctions (Articular)

- Joint glide preference of distal clavicle
  - Superior AC (clavicle on acromion)
  - Inferior AC (clavicle on acromion)
- Named for motion preference of distal clavicle relative to acromion

- Other somatic dysfunctions can be present
  - Internal rotation/external rotation
  - Abduction/adduction

Normal Right AC

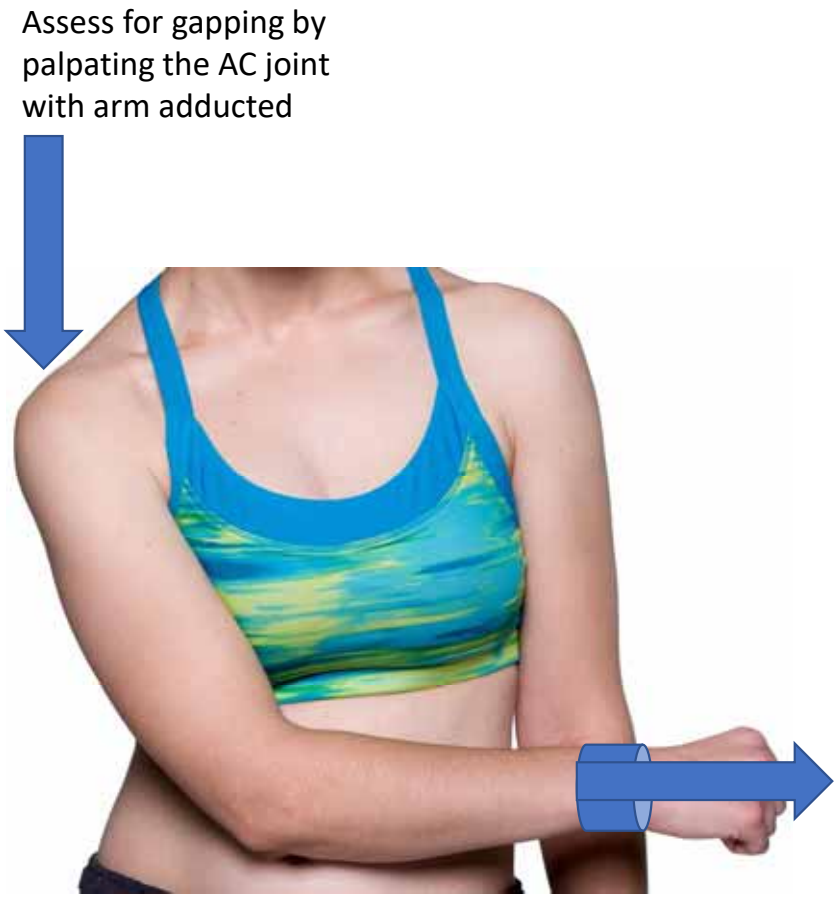
Right Superior AC – Clavicle superior to acromion

Right Inferior AC – Clavicle inferior to acromion

Acromioclavicular joint

Articular Somatic Dysfunction Diagnosis

1. Screen for static asymmetry
2. Screen for joint gapping
   - With shoulder adducted across body, note excess space that occurs between acromion and distal clavicle at AC joint
   - Excess space indicates ligamentous laxity
3. Passive motion assessment



Acromioclavicular joint

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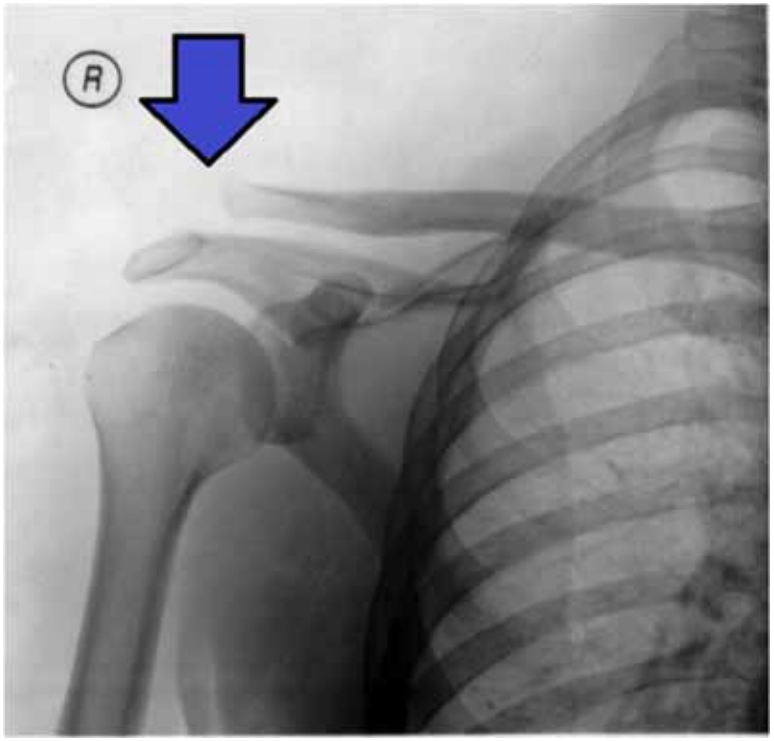


Joint gapping will be appreciated if AC separation is present

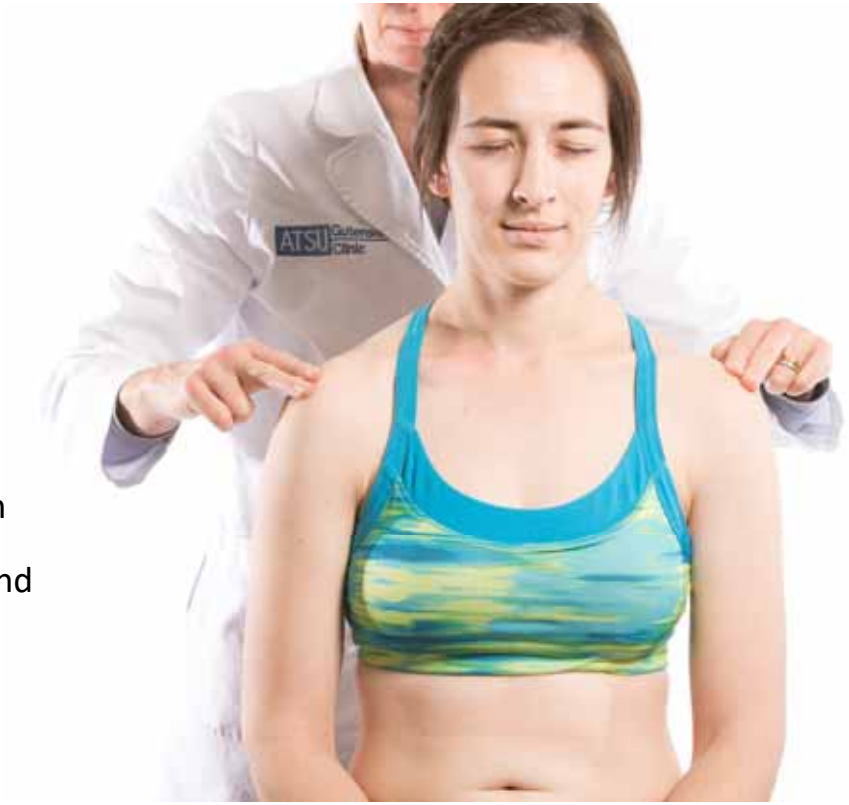
Acromioclavicular joint

Articular Somatic Dysfunction Diagnosis

1. Screen for Static asymmetry
   - Distal clavicle superior to acromion
     - Superior clavicle at AC (step off to acromion)
   - Distal clavicle inferior to acromion
     - Inferior clavicle at AC (step up to acromion)
2. Screen for joint gapping
3. Passive motion assessment
   - Spring caudad on distal clavicle, then acromion
     - Superior clavicle at AC – distal clavicle superior to acromion and resists caudad pressure
     - Inferior clavicle at AC - distal clavicle inferior to acromion and acromion resists caudad pressure

Note motion restriction

Named for direction of motion preference



Acromioclavicular joint

Articular Somatic Dysfunction Diagnosis

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2. Screen for joint gapping
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   - Spring caudad on distal clavicle, then acromion
     - Superior clavicle at AC – distal clavicle superior to acromion and resists caudad pressure
     - Inferior clavicle at AC - distal clavicle inferior to acromion and acromion resists caudad pressure

Note motion restriction

Named for direction of motion preference

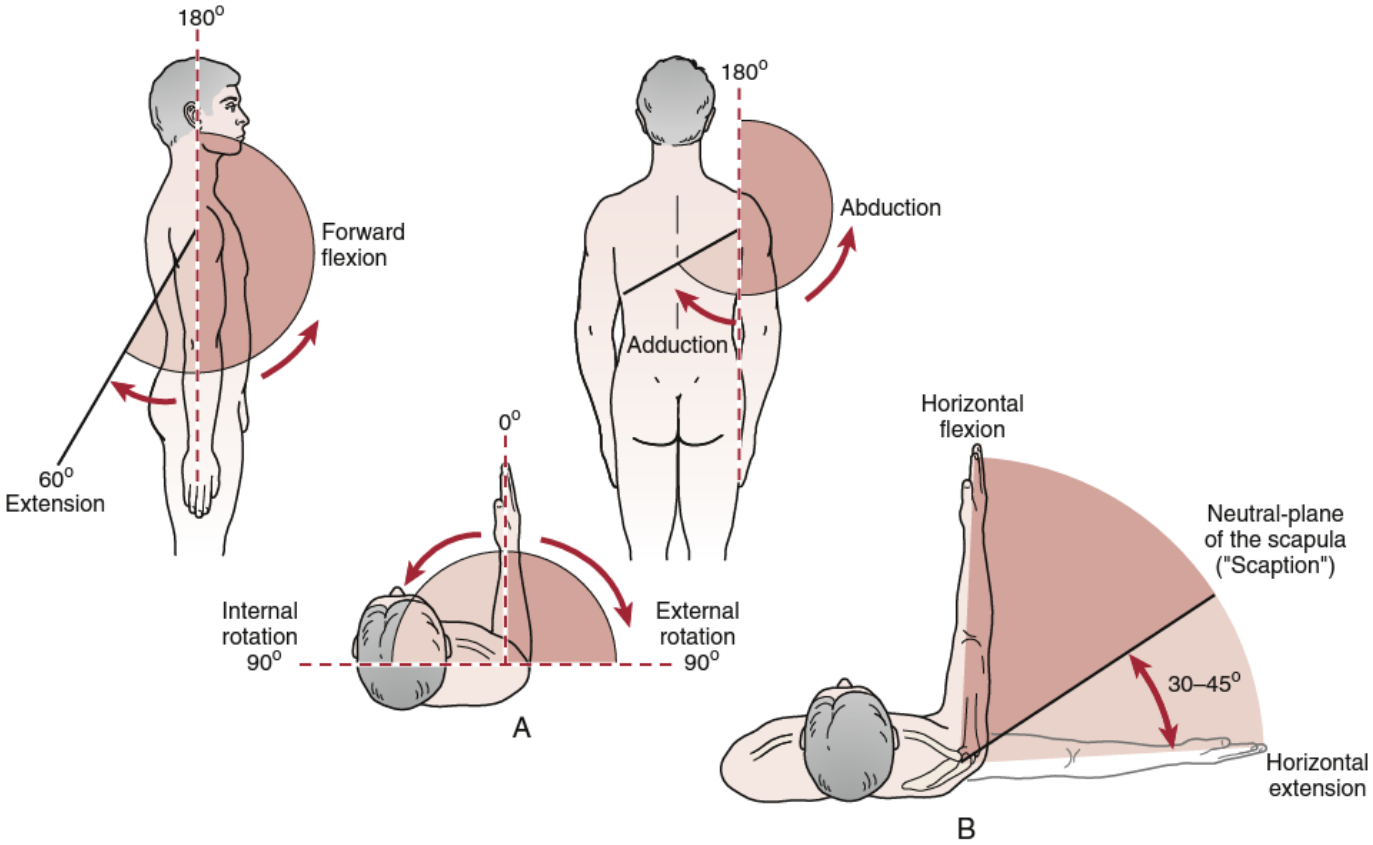
Glenohumeral joint

- Complicated ball in socket
- Synovial joint
- Stabilized by muscles and ligaments
- Humeral head rests against the fibrocartilage labrum within the glenoid concavity of the scapula

Glenohumeral joint

Normal Range of Motion

- Forward flexion – 160-180°
- Extension – 50-60°
- Internal (medial) rotation – 60-100°
- External (lateral) rotation– 80-90°
- Abduction– 170-180°
- Adduction – 50-75°
- With shoulder abducted to 90°
  - Horizontal (cross) flexion (horizontal adduction) – 130°
  - Horizontal (cross) extension (horizontal abduction) – 30-45°



*Normal range of motion will vary with shoulder position

Myofascial Somatic Dysfunction

- Reduced ROM
  - Reduced flexion
    - Triceps
  - Reduced abduction
    - Subscapularis
    - Infraspinatus
    - Supraspinatus
    - Teres major
  - Reduced internal rotation
    - Teres minor
    - Infraspinatus
  - Reduced external rotation
    - Subscapularis
    - Pectoralis minor

- Commonly treated with Seven Stages of Spencer

Glenohumeral joint

Somatic Dysfunctions

- Joint glide preferences of humerus
  - Anterior
    - Extension
    - External rotation
  - Posterior
    - Flexion
    - Internal rotation
  - Superior
    - Adduction
  - Inferior
    - Abduction
- May occur in combination
  - Ex. Anterior and superior glide preference

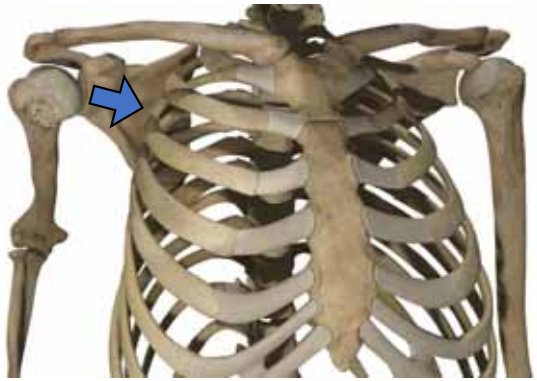
Postures associated with glenohumeral somatic dysfunction

Glenohumeral joint

Somatic Dysfunctions

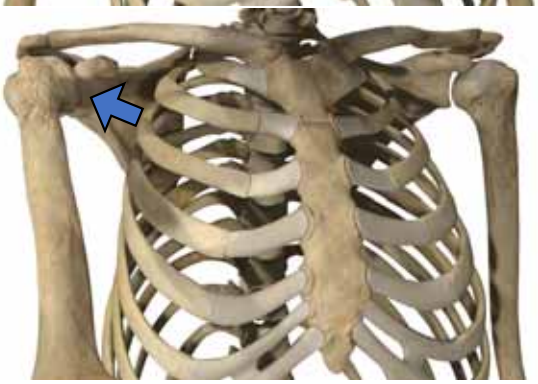
- Joint glide preferences of humerus
  - Anterior
    - Extension
    - External rotation
  - Posterior
    - Flexion
    - Internal rotation
  - Superior
    - Adduction
  - Inferior
    - Abduction
- May occur in combination
  - Ex. Anterior and superior glide preference

Extension occurs with anterior glide of humeral head in glenoid fossa



Neutral position

Flexion occurs with posterior glide of humeral head in glenoid fossa

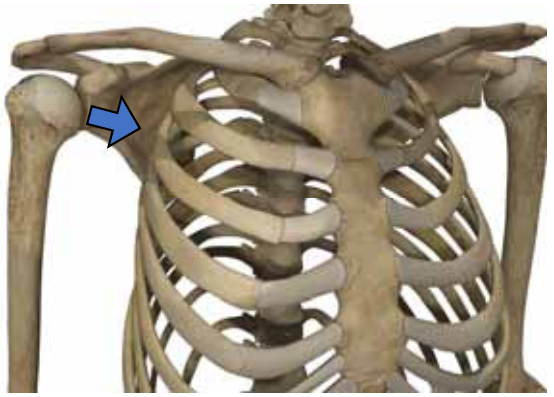


Glenohumeral joint

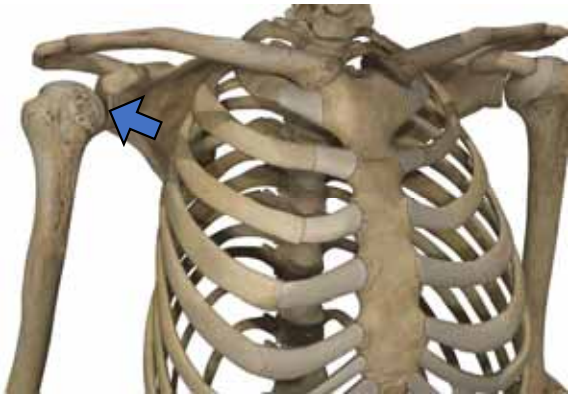
Somatic Dysfunctions

- Joint glide preferences of humerus
  - Anterior
    - Flexion
    - External rotation
  - Posterior
    - Extension
    - Internal rotation
  - Superior
    - Adduction
  - Inferior
    - Abduction
- May occur in combination
  - Ex. Anterior and superior glide preference

External rotation occurs with anterior glide of humeral head in glenoid fossa



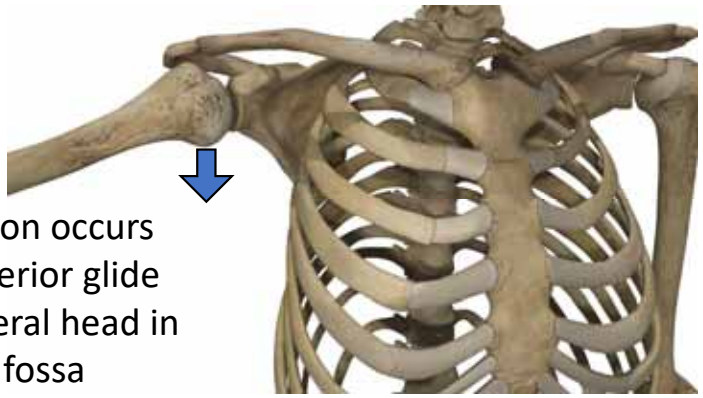
Internal rotation occurs with posterior glide of humeral head in glenoid fossa



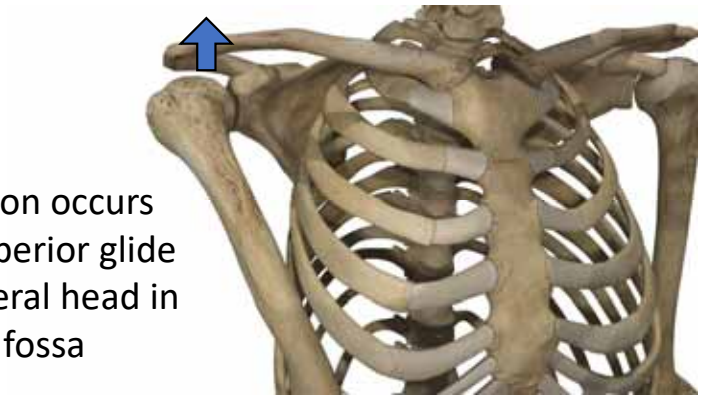
Glenohumeral joint

Somatic Dysfunctions

- Joint glide preferences of humerus
  - Anterior
    - Extension
    - External rotation
  - Posterior
    - Flexion
    - Internal rotation
  - Superior
    - Adduction
  - Inferior
    - Abduction
- May occur in combination
  - Ex. Anterior and superior glide preference



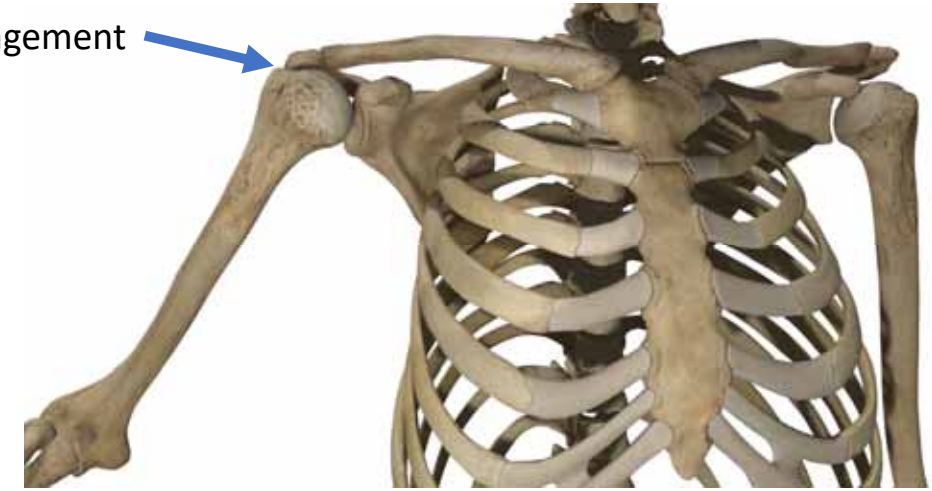
Abduction occurs with inferior glide of humeral head in glenoid fossa



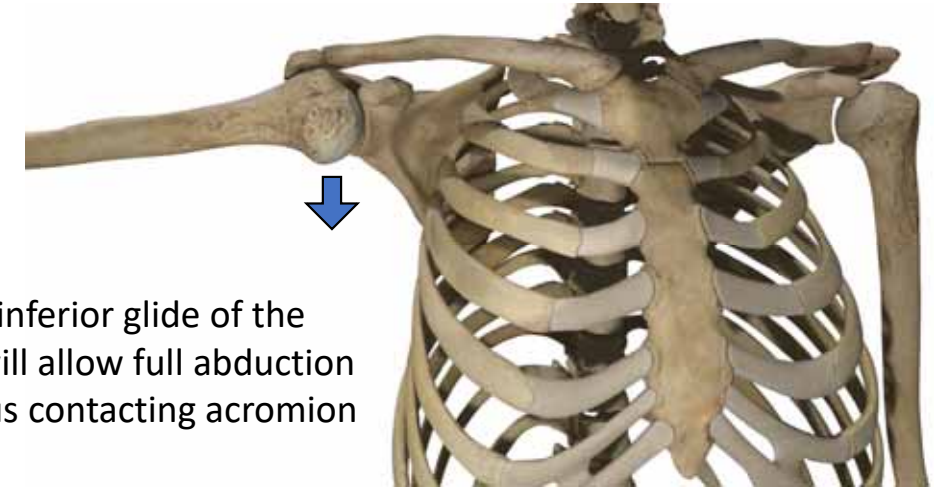
Adduction occurs with superior glide of humeral head in glenoid fossa

Joint Glides

- Sliding or translatory motion between articular surface without rotational motion
- Joint glides must occur to allow normal motion within a joint
- Loss of normal gliding motion occurs with somatic dysfunction and occurs in *impingement syndrome*



Abduction without inferior glide of the humeral head will cause humerus to contact acromion and allowable motion will be reduced



Abduction with inferior glide of the humeral head will allow full abduction without humerus contacting acromion

Joint Glides

- Sliding or translatory motion between articular surface without rotational motion
- Joint glides must occur to allow normal motion within a joint
- Loss of normal gliding motion occurs with somatic dysfunction and occurs in *impingement syndrome*

Abduction without inferior glide of the humeral head will cause humerus to contact acromion and allowable motion will be reduced

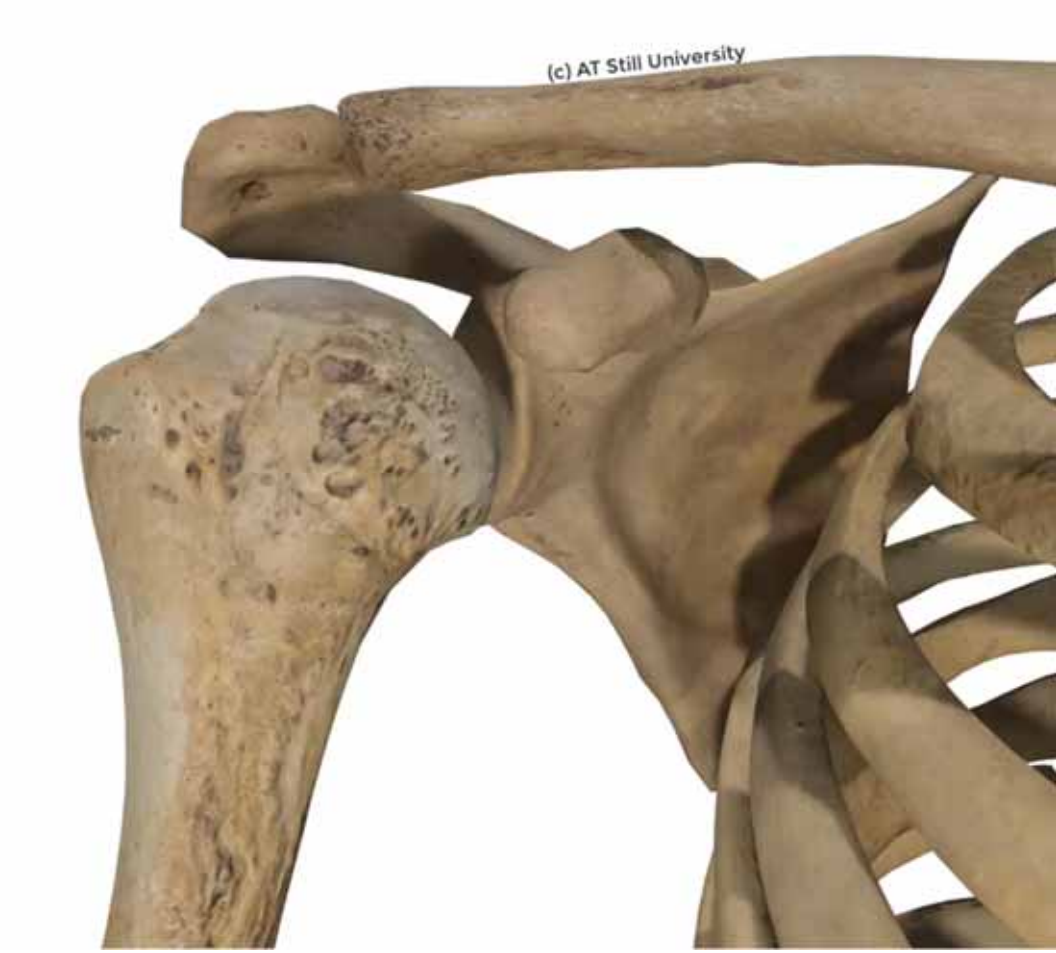
Glenohumeral joint

Articular Somatic Dysfunction Diagnosis

1. Screen for asymmetry and reduced active ROM
2. Passive motion assessment
    1. Anterior glide with anterior translation
    2. Posterior glide with posterior translation
    3. Superior glide with superior translation
    4. Inferior glide with inferior translation

Note motion restriction

Named for direction of motion preference



Assessment of glenohumeral somatic dysfunction

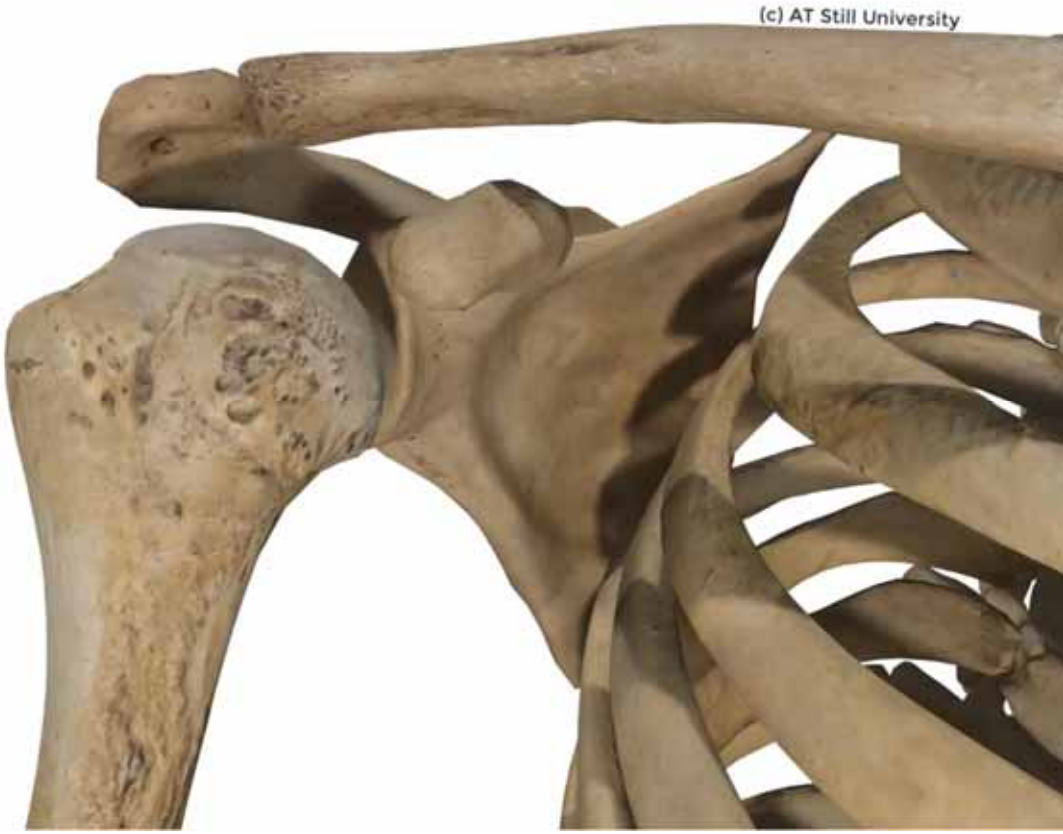
Glenohumeral joint

Articular Somatic Dysfunction Diagnosis

1. Screen for asymmetry and reduced active ROM
2. Passive motion assessment
    1. Anterior glide with extension
    2. Posterior glide with flexion
    3. Anterior glide with external rotation
    4. Posterior glide with internal rotation
    5. Superior glide with adduction
    6. Inferior glide with abduction

Note motion restriction

Named for direction of motion preference



Assessment of glenohumeral somatic dysfunction

Glenohumeral joint

Articular Somatic Dysfunction Diagnosis

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    3. Superior glide with superior translation
    4. Inferior glide with inferior translation
    5. Anterior glide with extension
    6. Posterior glide with flexion
    7. Anterior glide with external rotation
    8. Posterior glide with internal rotation
    9. Superior glide with adduction
    10. Inferior glide with abduction

Note motion restriction

Named for direction of motion preference

Assessing anterior translation of humeral head

Assessing anterior glide with extension

Glenohumeral joint

Articular Somatic Dysfunction Diagnosis

1. Screen for asymmetry and reduced active ROM
2. Passive motion assessment
    1. Anterior glide with anterior translation
    2. Posterior glide with posterior translation
    3. Superior glide with superior translation
    4. Inferior glide with inferior translation
    5. Anterior glide with extension
    6. Posterior glide with flexion
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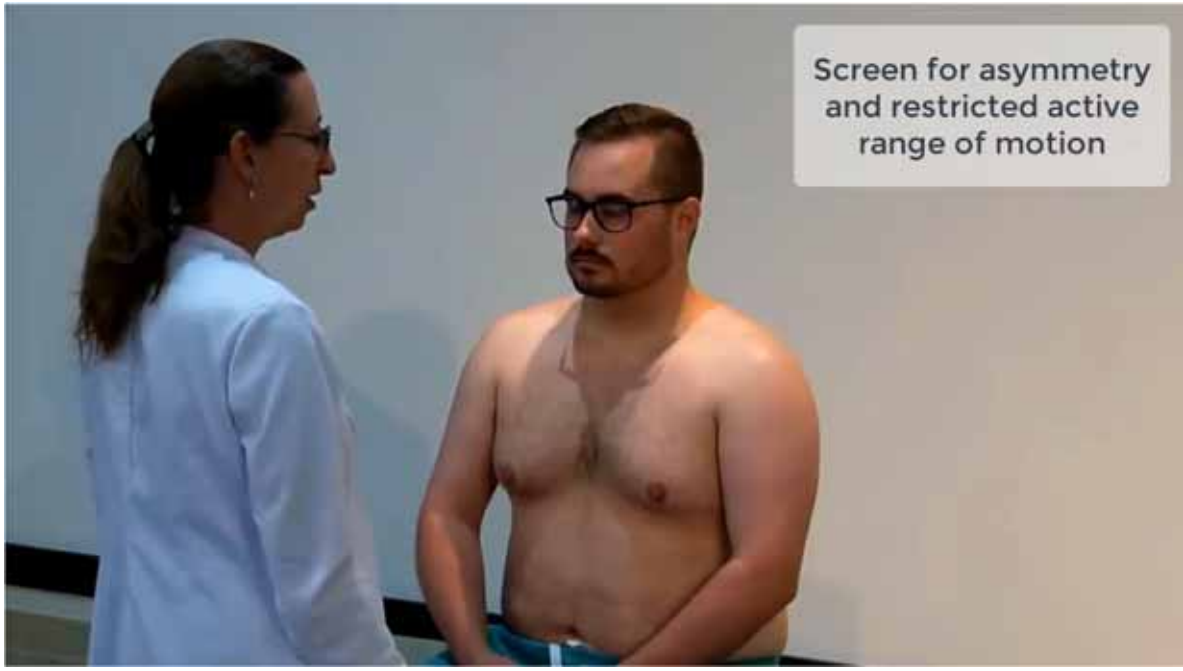
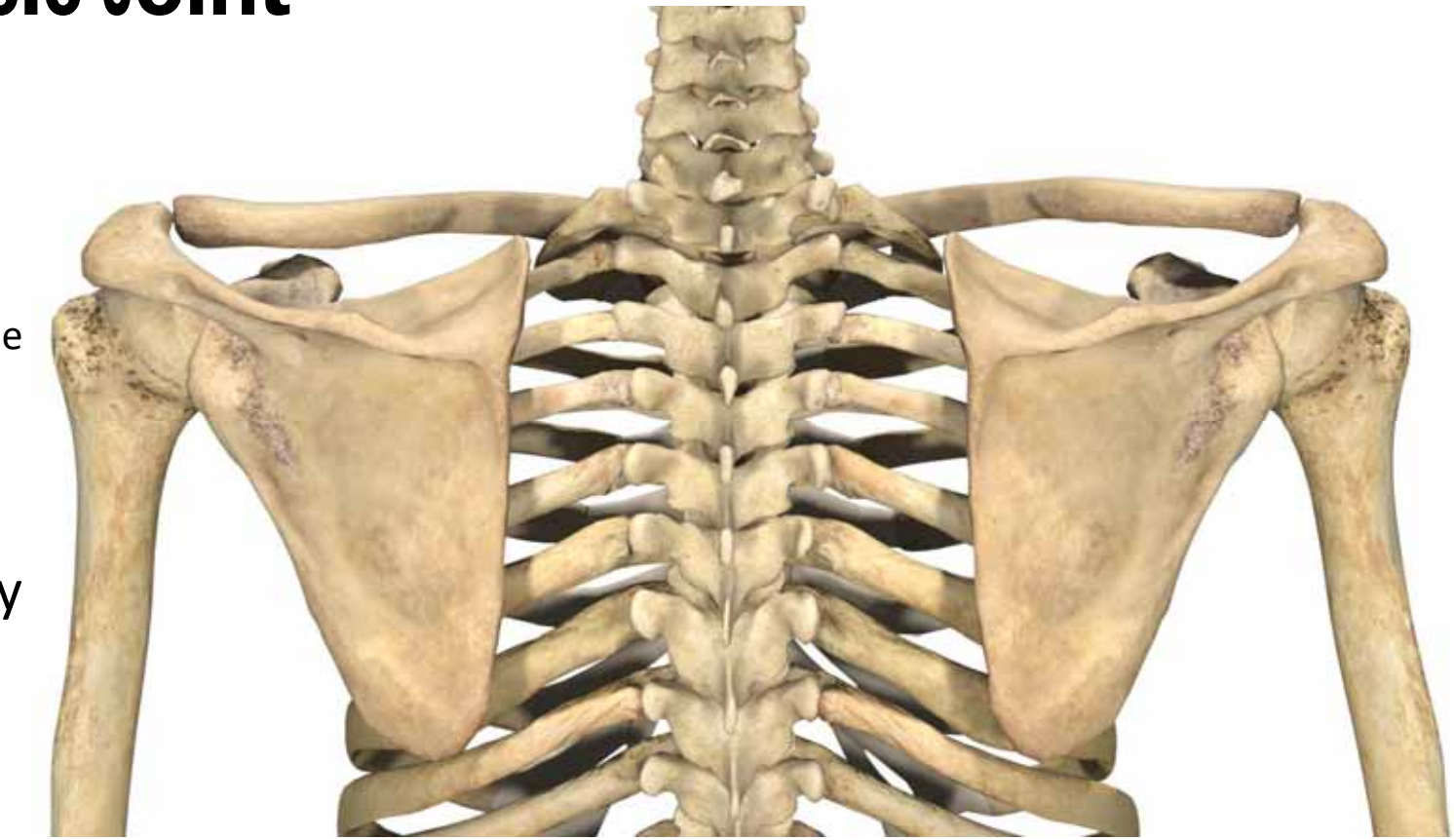


Assessment of glenohumeral somatic dysfunction

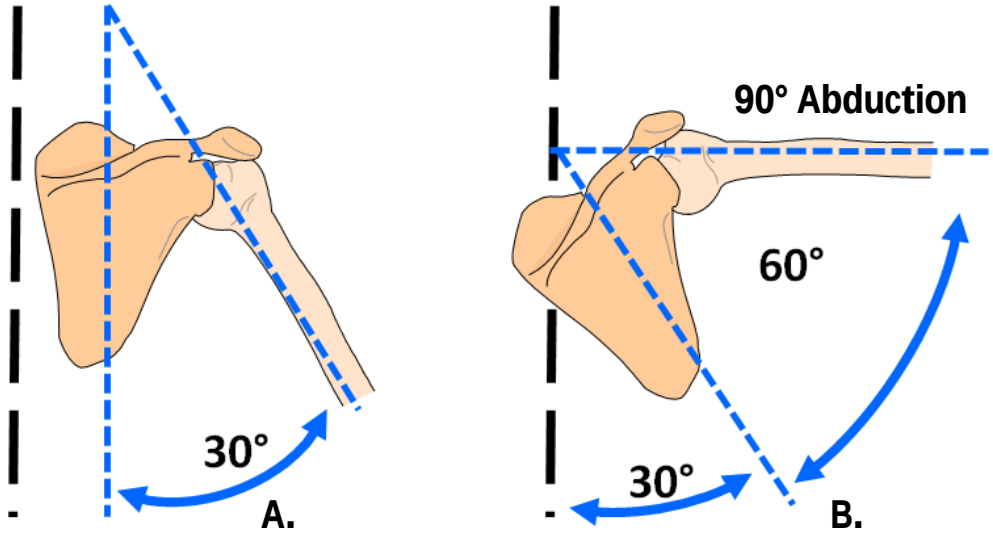
Scapulothoracic Joint

- Not a “true joint”
  - Composed of
    - Body of the scapula
    - Muscles covering the posterior chest wall
- Motion influenced by ribs



Scapulohumeral Rhythm

- Scapulohumeral rhythm
  - During the 180° of shoulder abduction, scapula rotates approximately 1° for every 2° of glenohumeral abduction
    - 120° occurs at glenohumeral joint
    - 60° occurs at scapulothoracic joint
  - 0-30°Abduction
    - Scapula moves minimally
  - 30-180° Abduction
    - Scapula rotates 60° at 2:1 ratio with humerus
- Dysfunction alters rhythm



Scapulohumeral Rhythm

A. During first 30° of shoulder abduction, scapula rotates minimally

B. From 30-180° of shoulder abduction, the scapula rotates approximately 1° for every 2° of glenohumeral abduction

Scapulohumeral Rhythm

- Scapulohumeral rhythm
  - During the 180° of shoulder abduction, scapula rotates approximately 1° for every 2° of glenohumeral abduction
    - 120° occurs at glenohumeral joint
    - 60° occurs at scapulothoracic joint
  - 0-30°Abduction
    - Scapula moves minimally
  - 30-180° Abduction
    - Scapula rotates 60° at 2:1 ratio with humerus
- Dysfunction alters rhythm

Scapulothoracic Joint

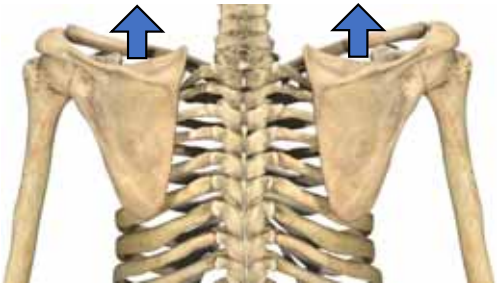
Somatic Dysfunction Diagnosis

1. Screen for asymmetry and reduced active ROM
2. Passive motion assessment
    1. Superior glide
    2. Inferior glide
    3. Medial glide
    4. Lateral glide
    5. Rotation
        - Clockwise and counterclockwise
        - Upward and downward rotation

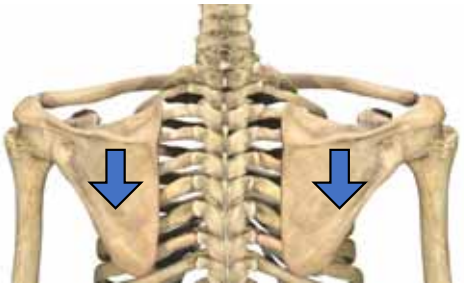
Note motion restriction

Named for direction of motion preference

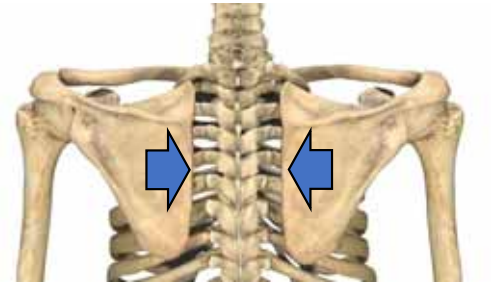
Active Range Of Scapular Motion



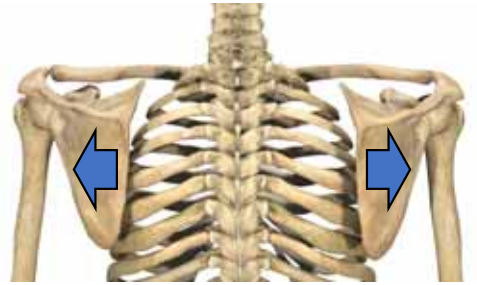
Elevate shoulders (shrug up) to glide scapula superiorly



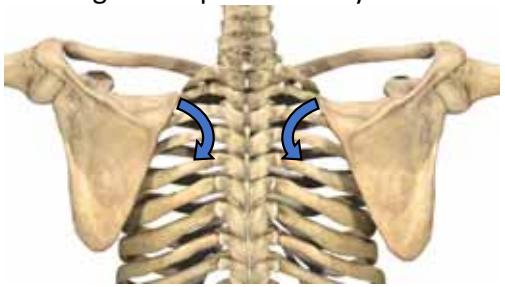
Depress shoulders (shrug down) to glide scapula inferiorly



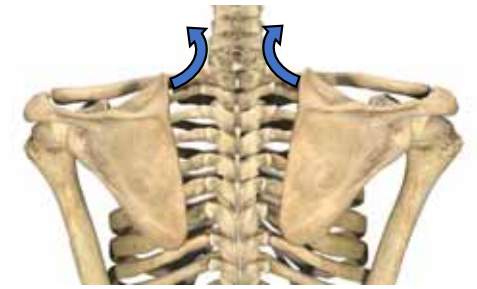
Retract scapula (shrug backward) to glide scapula medially



Protract (shrug forward) scapula to glide scapula laterally



Shoulder abduction to rotate medial angle inferomedially



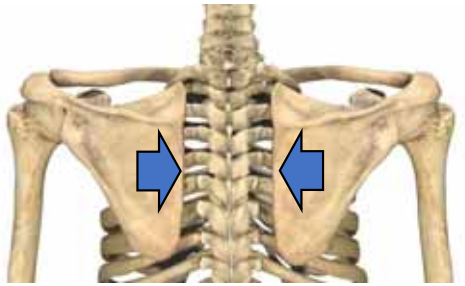
Shoulder adduction to rotate medial angle superolaterally

Scapulothoracic Joint

Terminology variations for scapular motion

Scapular Retraction = Scapular Adduction (scapula moves toward midline)

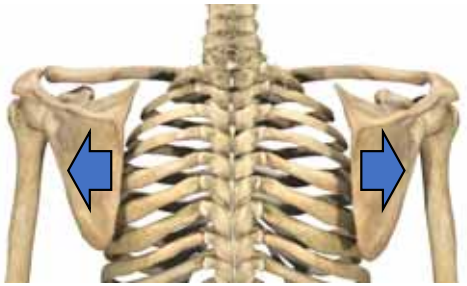
- Occurs with external rotation of the shoulders and causes medial glide of the scapula



Retract scapula (shrug backward) to glide scapula medially

Scapular Protraction = Scapular Abduction (scapula moves away from midline)

- Occurs with internal rotation of the shoulders and causes lateral glide of the scapula

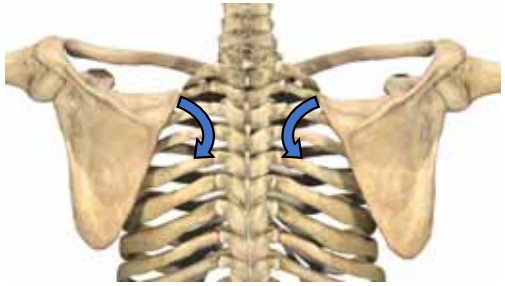


Protract (shrug forward) scapula to glide scapula laterally

Scapulothoracic Joint

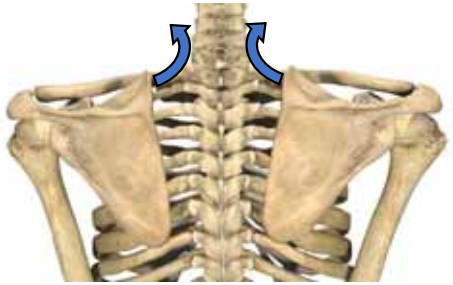
Terminology variations for scapular motion

Upward rotation -
Occurs with reaching arms up



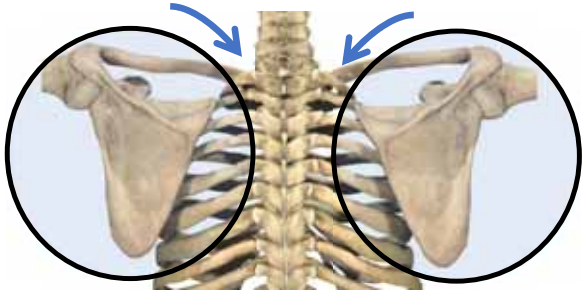
Medial angle moves inferomedially
Inferior angle moves superolaterally

Downward rotation –
Occurs with reaching arms down



Medial angle moves superolaterally
Inferior angle moves inferomedially

Clockwise and **Counterclockwise** –
named if viewing a clock on the scapula



Clockwise Counterclockwise

Scapulothoracic Joint

Triplanar Somatic Dysfunction Diagnosis

1. Screen for asymmetry and reduced active ROM
2. Passive motion assessment
    1. Superior glide
    2. Inferior glide
    3. Medial glide
    4. Lateral glide
    5. Rotation
        - Clockwise and counterclockwise
        - Upward and downward rotation

Note motion restriction

Named for direction of motion preference

Assessing glide motion of scapulothoracic joint

Scapulothoracic Joint

Triplanar Somatic Dysfunction Diagnosis

1. Screen for asymmetry and reduced active ROM
2. Passive motion assessment
    1. Superior glide
    2. Inferior glide
    3. Medial glide
    4. Lateral glide
    5. Rotation
        - Clockwise and counterclockwise
        - Upward and downward rotation

Note motion restriction

Named for direction of motion preference

Shoulder Somatic Dysfunction

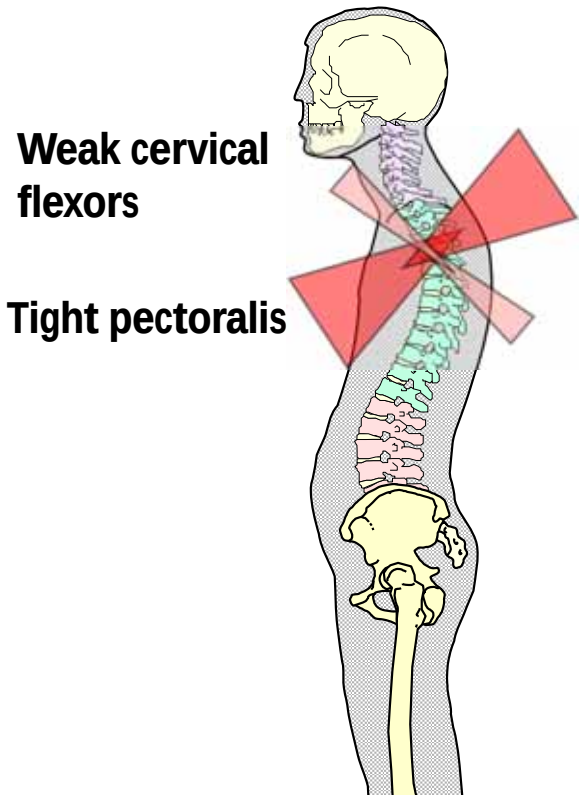
- Body unity
  - Joints of the shoulder work as unit
  - Dysfunction in one joint can affect function of multiple joints
- Asymmetry and active range of motion is useful regional screen
- Both sides can be have somatic dysfunction
- Individual joint somatic dysfunction is assessed at individual joint

Individual joint somatic dysfunction is assessed at individual joint

Shoulder Somatic Dysfunction

Causes

- Sudden injuries
  - Falls, sprains, and strains
- Overuse, repetitive strain
- Postural Dysfunction
  - Upper Cross Syndrome



Shoulder Somatic Dysfunction

- Sudden injuries
- Overuse, repetitive strain
- Postural Dysfunction
  - Upper Cross Syndrome
  - Alters muscular balance and loading in the shoulders

- Try this exercise
  - Stand with head held forward (upper cross)
  - Raise arms and note shoulder tension
  - Stand up straight
  - Raise arms again, note freer shoulder motion

Shoulder Somatic Dysfunction

- Sudden injuries
- Overuse, repetitive strain
- Postural Dysfunction
  - Upper Cross Syndrome
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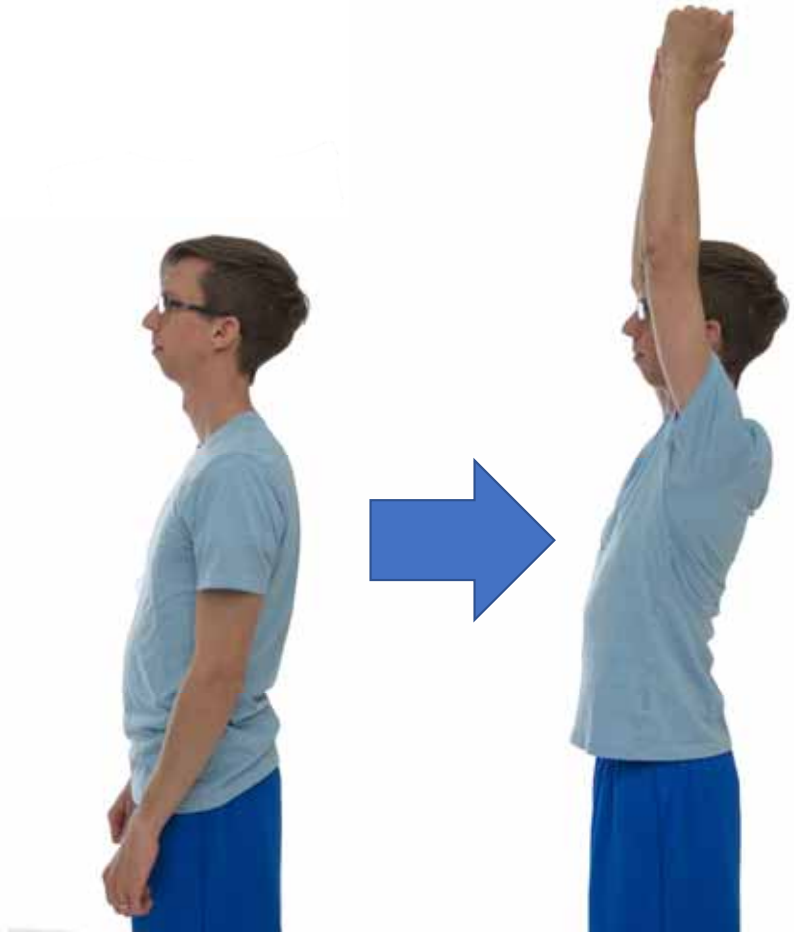


Screening for Shoulder Dysfunction

- Tissue texture Abnormalities
  - Muscular hypertonicity
  - Edema or joint swelling
- Tenderness
  - Muscular, joint, bursal tenderness
  - Trigger points
- Asymmetry
- Restricted Range of Motion
  - Active range of motion
  - Passive range of motion
- Shoulder Special Tests - instability

Apley Scratch test is a good screen for assessing should range of motion and shoulder dysfunction

Anatomic Disruption VS Somatic Dysfunction

- Ligamentous tears
  - Joint laxity
- Tendon pathology
  - Tendonitis
  - Tendinosis
  - Tendon tears
- Joint pathology
  - Joint swelling
  - Arthritic changes
  - Adhesive capsulitis
  - Cartilage tears

- Disruption of the anatomic barrier = **ANATOMIC DISRUPTION**
- Somatic dysfunction may be present

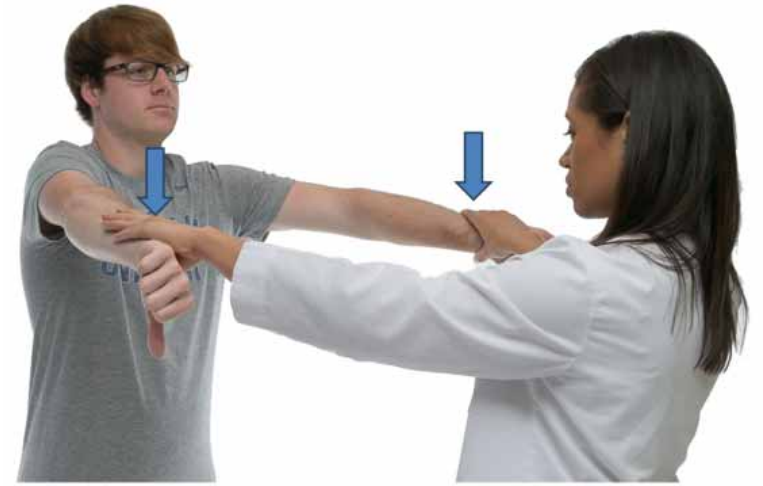
Somatic dysfunction

- Tenderness
- Asymmetry
- Restricted Range of Motion
- Tissue Texture Abnormality

Popeye muscle deformity associated with biceps tendon rupture

Special Tests for Shoulder Dysfunction

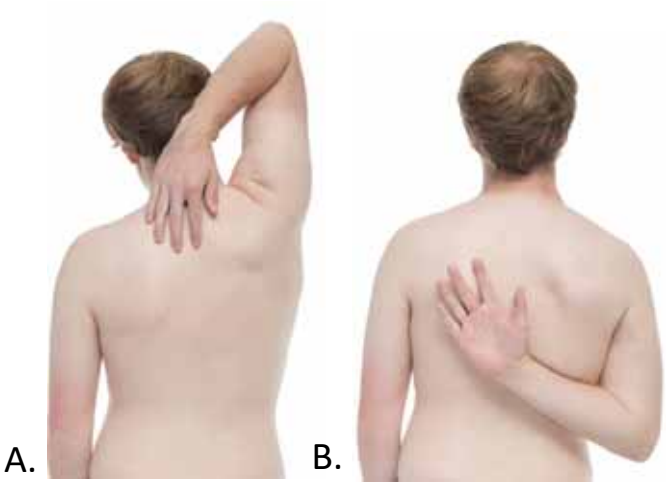
Drop Arm Test – Patient's arm is abducted to 90° with the elbow extended. Patient slowly lowers it to their side. Test is positive if the patient cannot lower their arm slowly, causing it to drop, or if the patient has severe pain while attempting the maneuver. This may indicate **rotator cuff tear**.



Empty Can Test (Supraspinatus Test) – Patient abducts both arms to 90° and then pronates the forearms so that the thumbs are pointing down as if emptying a can. Physician grasps the arms and the patient attempts to lift the arms upward against resistance. Test is positive if there is pain or weakness with the maneuver. This may indicate **supraspinatus pathology** or **rotator cuff tear**.

Special Tests for Shoulder Dysfunction

Impingement Sign (Neer's Sign) – Patient's arm is flexed at the shoulder to 180° while the physician stabilizes the scapula posteriorly. Test is positive if there is pain with the maneuver and may indicate **supraspinatus impingement**.



Apley "Scratch" Test – A. Patient abducts and externally rotates the arm with palm on back, trying to scratch the lowest vertebrae. B. Patient adducts and internally rotates the arm with the dorsum of hand on back trying to reach thumb to highest vertebrae. Test is used to assess shoulder range of motion. Test is positive if there is restriction or pain during the maneuver. This may indicate **rotator cuff disorder**.

Special Tests for Shoulder Dysfunction

Hawkin's Test – Patient's shoulder and forearm are flexed to 90°. The physician grasps the arm with one hand and the forearm with the other. The physician then forcibly internally rotates the shoulder. Test is positive if there is pain during the maneuver. This may indicate possible **supraspinatus impingement**.

Yocum's Test – Patient places hand on opposite shoulder and lifts elbow against physician resistance without raising the shoulder. Test is positive if there is pain during the maneuver. This may indicate **supraspinatus impingement**.

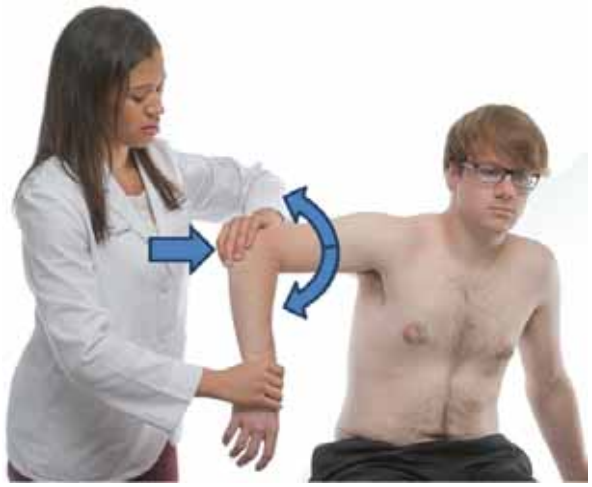
Special Tests for Shoulder Dysfunction

Speed's Test – Patient's arm is flexed to 60° with the forearm supinated. Patient attempts to flex at the shoulder with resistance from the physician. Test is positive if there is pain at the bicipital groove and may be used to indicate **bicipital tendonitis**.

Yergason's Test – Patient's arm is at their side with the elbow flexed to 90° and forearm pronated. Physician grasps the elbow with one hand and the forearm with the other hand. Patient supinates against physician resistance. Test is positive if there is pain within the bicipital groove. This may indicate **instability or inflammation of the long head of the biceps tendon**.

Special Tests for Shoulder Dysfunction

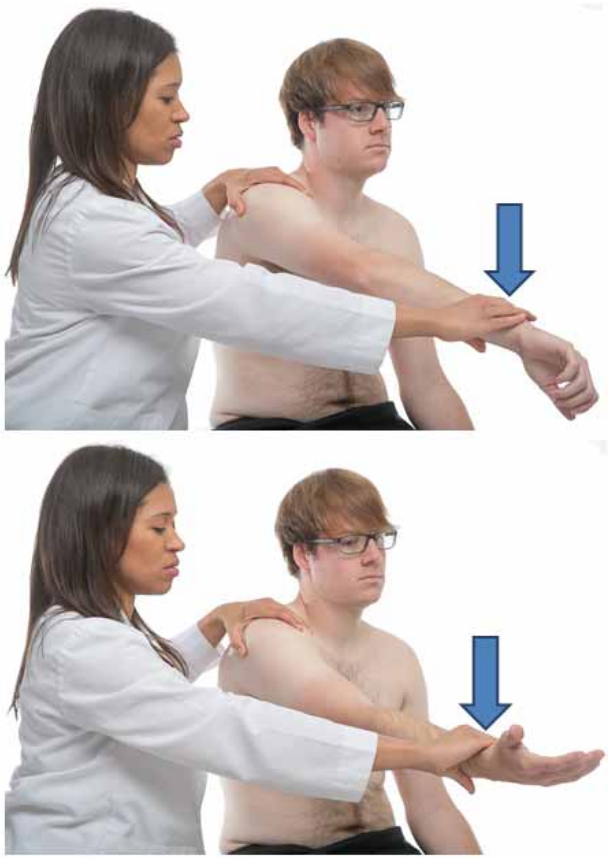
Apprehension Test – Patient's arm is abducted to 90°, elbow flexed to 90°, and progressively externally rotated while the physician stabilizes the scapula posteriorly. Test is positive if the patient has the sensation that the shoulder will slip out of joint. This is associated with **chronic anterior glenohumeral instability**.



Crank Test – Abduct arm to 160° and apply a compressive force through the elbow into the glenohumeral joint while passively internally and externally rotating the shoulder. Test is positive with pain, catching, or clicking in the shoulder. Pain inside the glenohumeral joint indicates **labral tear or abnormality**

Special Tests for Shoulder Dysfunction

O'Brien Test (Active Compression Test) – Patient's arm is flexed at the shoulder to 90°, adducted 10°-15°, and pronated. Patient resists downward pressure from the physician. The arm is then supinated and downward pressure is applied in the same way. Test is positive if there is pain with the first maneuver that is relieved or alleviated with the second maneuver. Pain inside the glenohumeral joint indicates **labral tear or abnormality**.



Elbow and Wrist

Elbow

- Ulnohumeral joint
- Radiohumeral joint
- Proximal radioulnar joint
  - Radial head
  - Sometimes called a joint of the wrist because it moves with wrist motion

Cubital Articulations

Wrist

- Distal radioulnar joint
- Ulnocarpal joint
- Radiocarpal joints

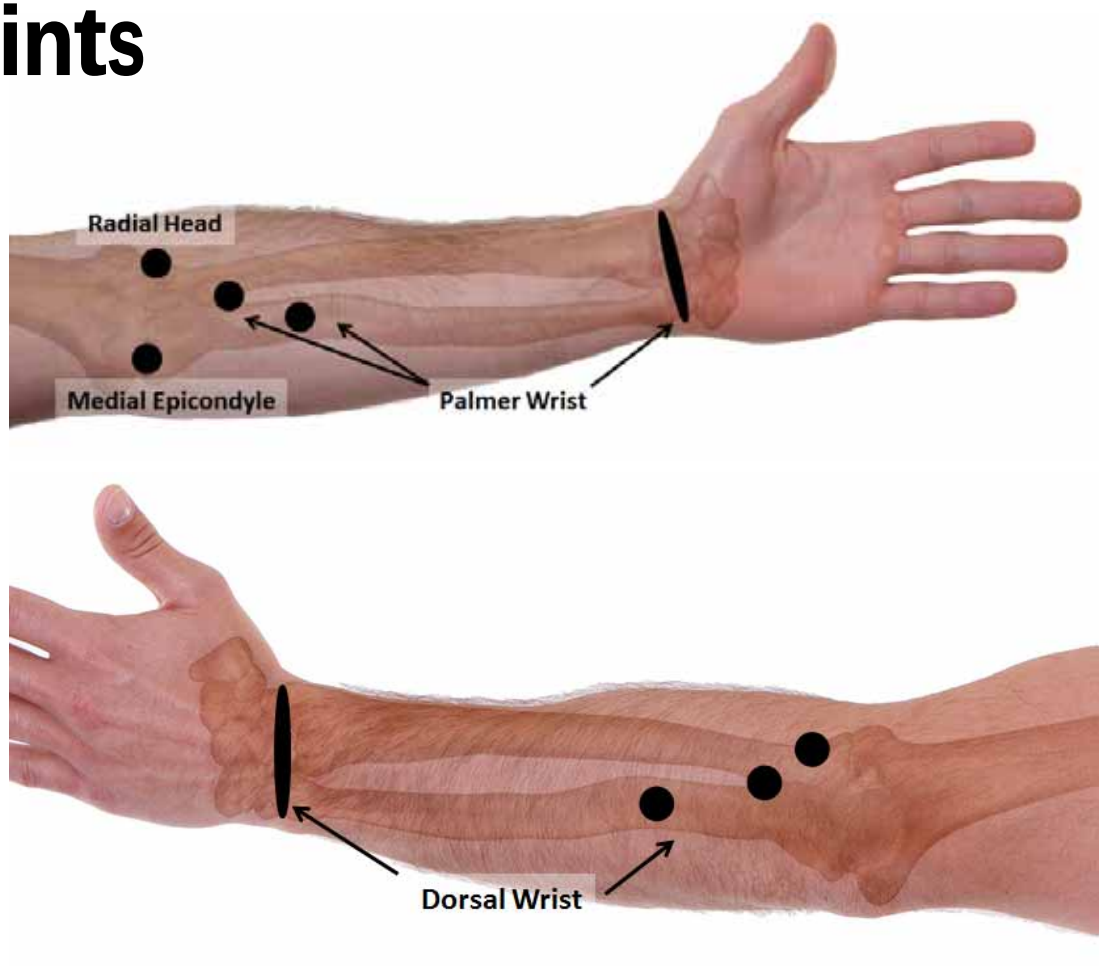
Forearm Tender Points

Anterior Forearm

- Radial Head
- Medial Epicondyle
- Palmer wrist

Posterior Forearm

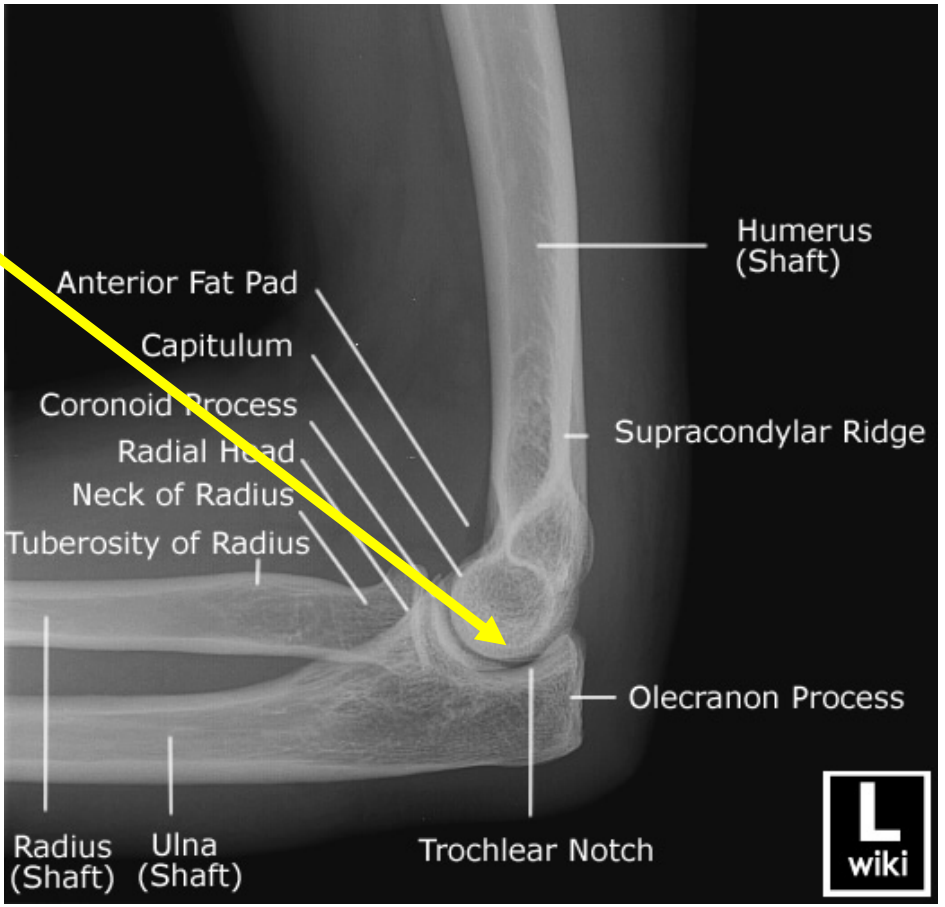
- Dorsal Wrist



Common tender points of elbow, forearm, and wrist

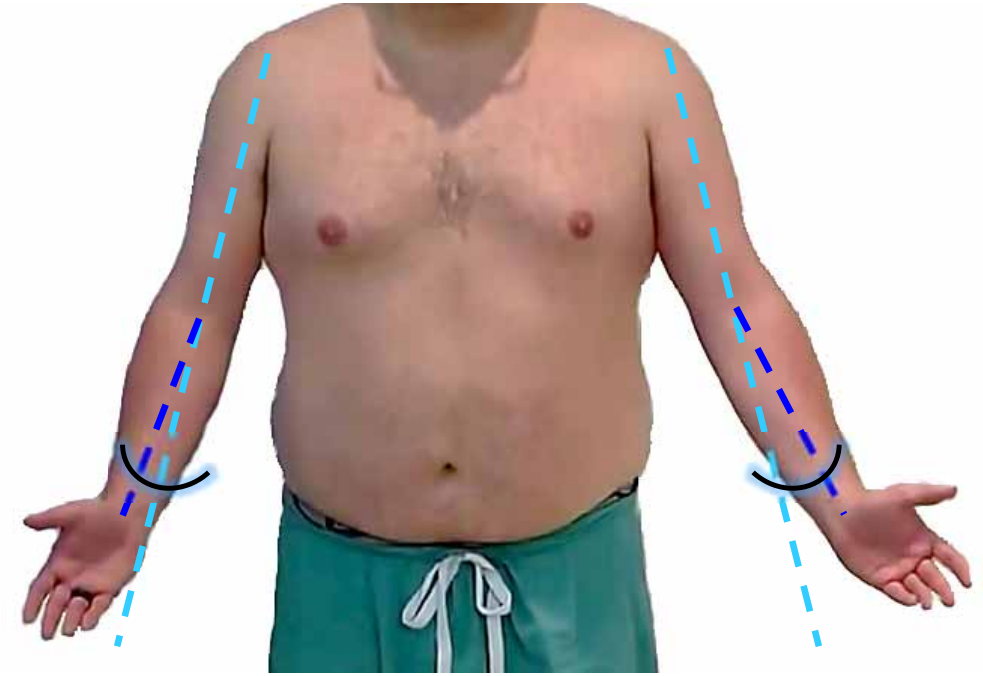
Ulnohumeral joint

- AKA - Trochlear joint
- Primary location of elbow stability
- Normal Active Range of Motion
  - Flexion 140-150°
  - Extension 0°
    - Hyperextension 10-15°
- Carrying angle (Resting position)
  - 70° Elbow flexion
  - 10° Supination



Ulnohumeral joint

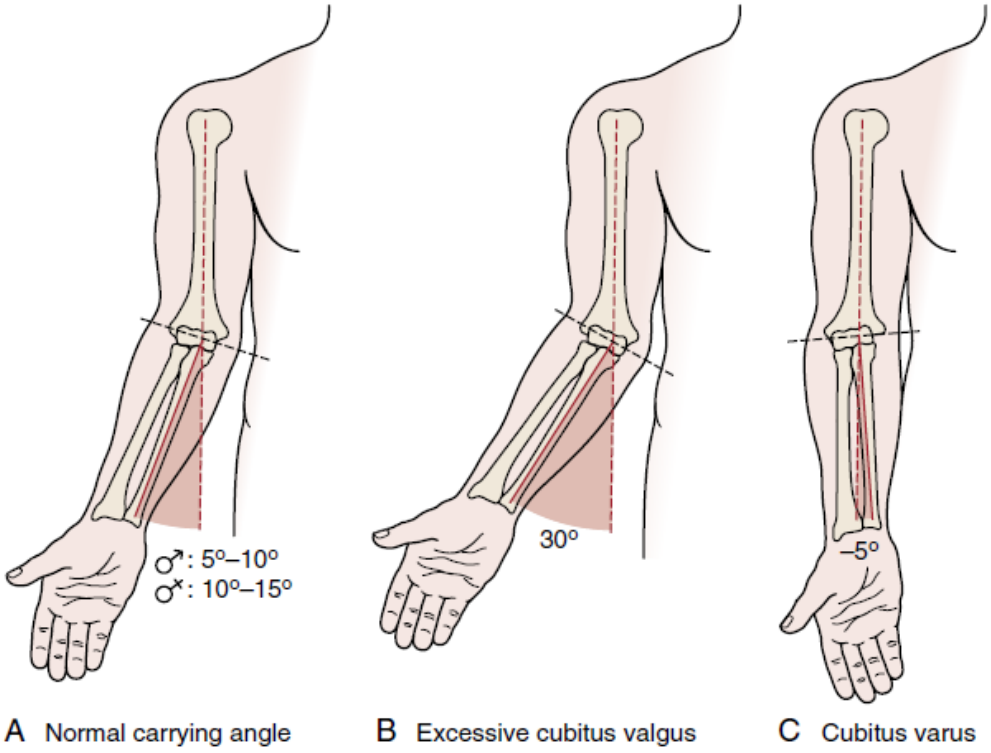
- AKA - Trochlear joint
- Primary location of elbow stability
- Normal Active Range of Motion
  - Flexion 140-150°
  - Extension 0°
    - Hyperextension 10-15°
- Carrying angle (Resting position)
  - Measure at resting position:
    - 70° Elbow flexion
    - 10° Supination
  - Men – 5-10°
  - Women – 10-15°



Carrying angle is measured as the angle between the long axis of the humerus and the long axis of the forearm

Ulnohumeral joint

- AKA - Trochlear joint
- Primary location of elbow stability
- Normal Active Range of Motion
  - Flexion 140-150°
  - Extension 0°
    - Hyperextension 10-15°
- Carrying angle (Resting position)
  - 70° Elbow flexion
  - 10° Supination
- Increased carrying angle associated with *tardy ulnar nerve palsy*



Carrying angle = angle between lines connecting midpoints in the distal humerus and midpoints in the proximal ulna.

Ulnohumeral joint

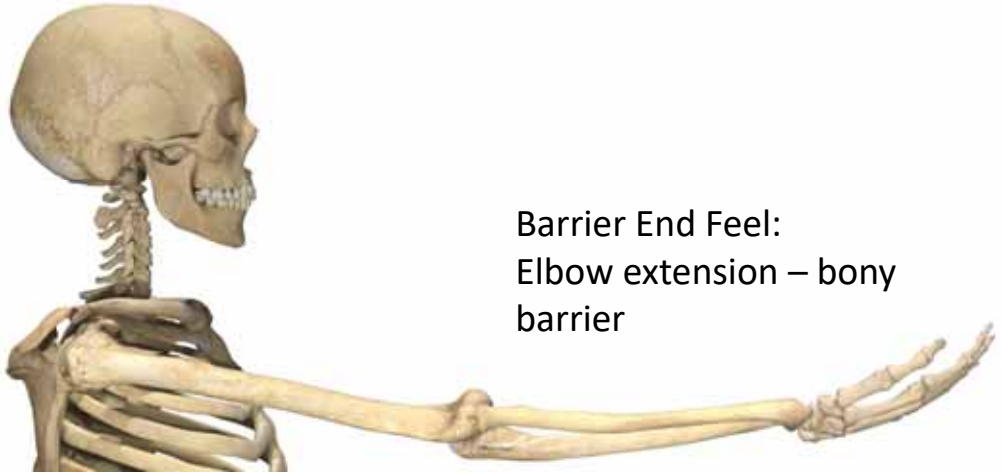
Articular Somatic Dysfunction Assessment

1. Screen for carrying angle (asymmetry)
2. Screen active range of motion
    1. Flexion and extension
    2. Supination and pronation
        - causes ulnar adduction and abduction, respectively
3. Passive motion assessment
    1. Flexion
    2. Extension
    3. Abduction with medial glide
    4. Adduction with lateral glide

Note motion restriction

Named for direction of motion preference

Barrier End Feel:
Elbow flexion - tissue approximation



Barrier End Feel:
Elbow extension – bony barrier

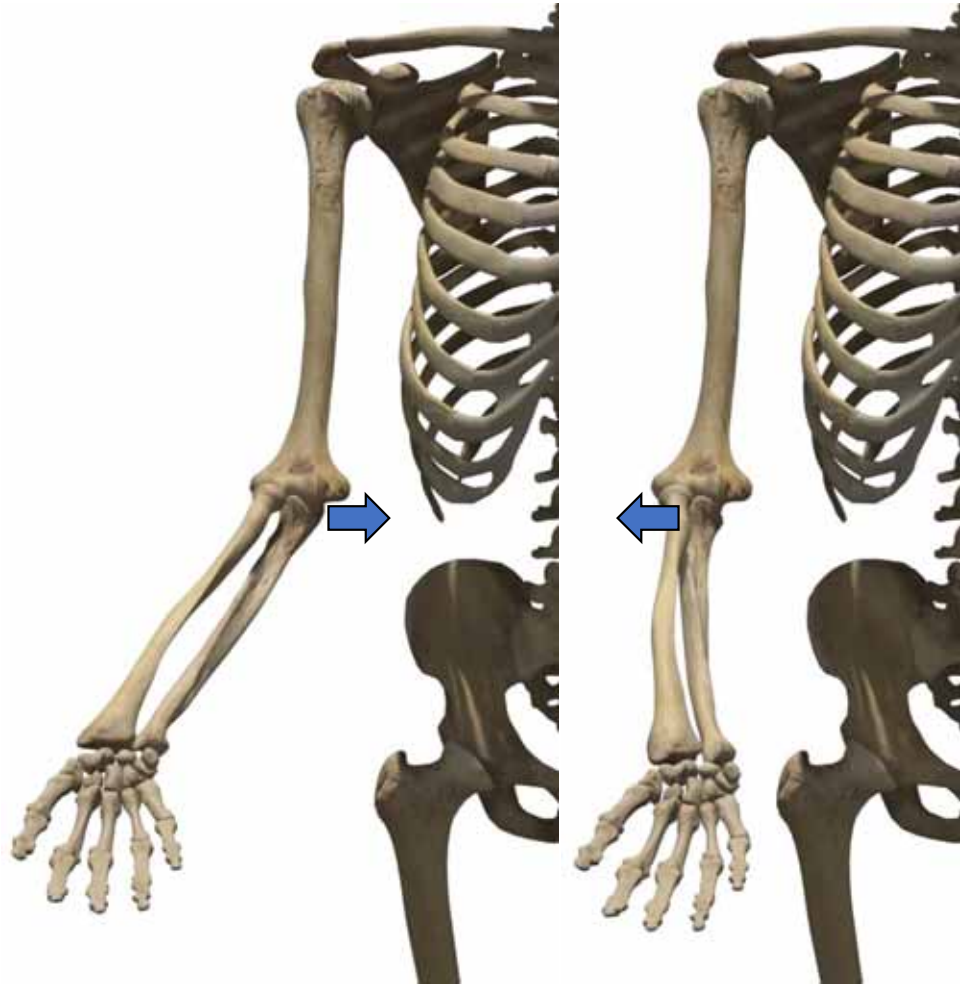
Ulnohumeral joint

Articular Somatic Dysfunction Assessment

1. Screen for carrying angle (asymmetry)
2. Screen active range of motion
3. Passive motion assessment
    1. Flexion
    2. Extension
    3. Abduction with medial glide
    4. Adduction with lateral glide

Note motion restriction

Named for direction of motion preference



Abduction - Proximal ulna glides medially

Adduction - Proximal ulna glides laterally

Ulnohumeral joint

Articular Somatic Dysfunction Assessment

1. Screen for carrying angle (asymmetry)
2. Screen active range of motion
3. Passive motion assessment
    1. Flexion
    2. Extension
    3. Abduction with medial glide
    4. Adduction with lateral glide

Note motion restriction

Named for direction of motion preference

Passive motion assessment of ulnohumeral abduction and adduction with ligamentous barrier end feel

Ulnohumeral joint

Articular Somatic Dysfunction Assessment

1. Screen for carrying angle (asymmetry)
2. Screen active range of motion
3. Passive motion assessment
    1. Flexion
    2. Extension
    3. Abduction with medial glide
    4. Adduction with lateral glide

Note motion restriction

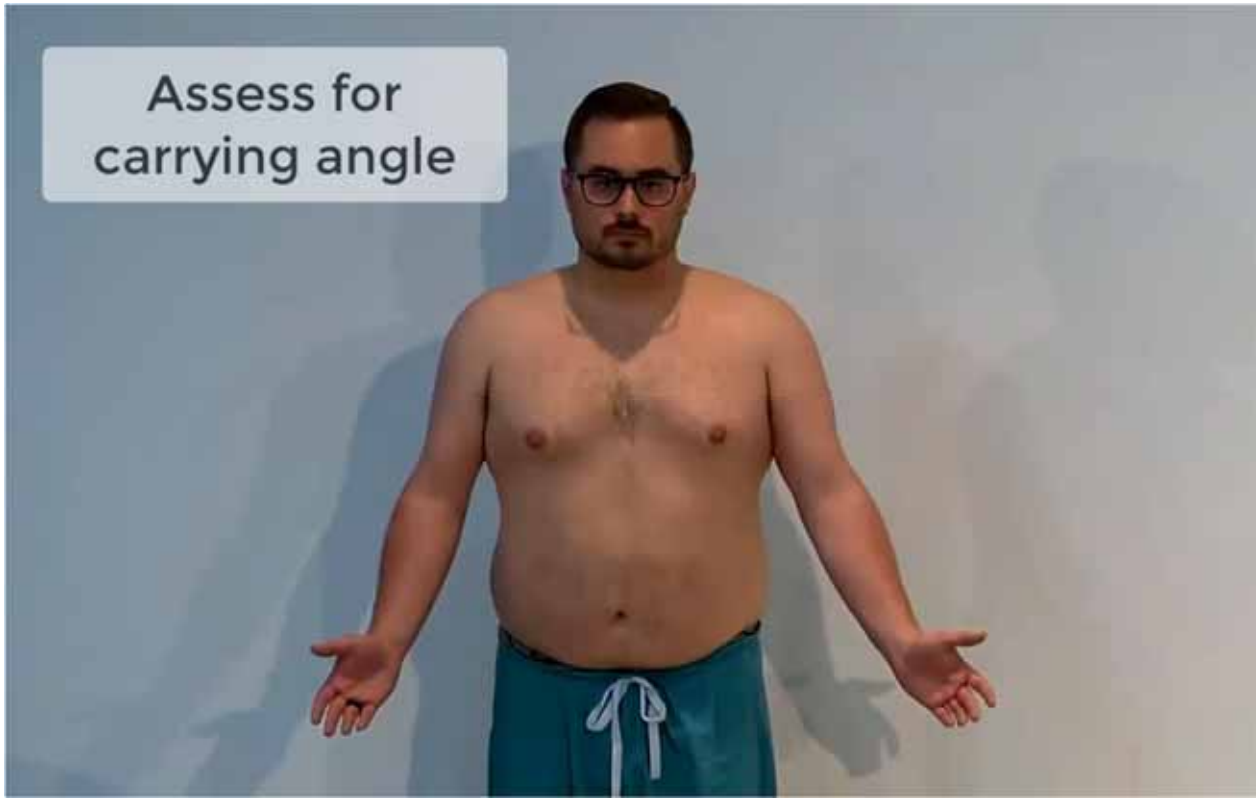
Named for direction of motion preference

Assessing UH abduction with medial glide

Ulnohumeral joint

Articular Somatic Dysfunction Assessment

1. Screen for carrying angle (asymmetry)
2. Screen active range of motion
3. Passive motion assessment
    1. Flexion
    2. Extension
    3. Abduction with medial glide
    4. Adduction with lateral glide

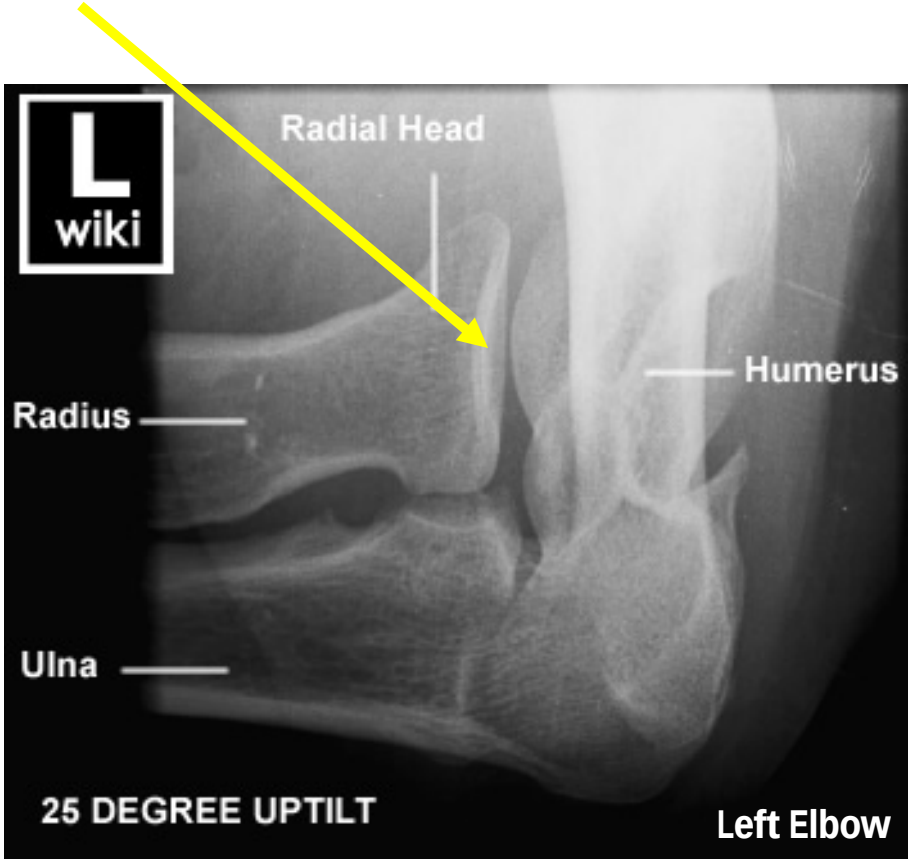


Note motion restriction

Named for direction of motion preference

Radiohumeral Joint

- Uniaxial hinge joint
- Radial head glides on the capitulum of the humerus
- Stabilized by collateral ligaments
- Motion occurs with
  - Flexion
  - Extension
  - Supination
  - Pronation

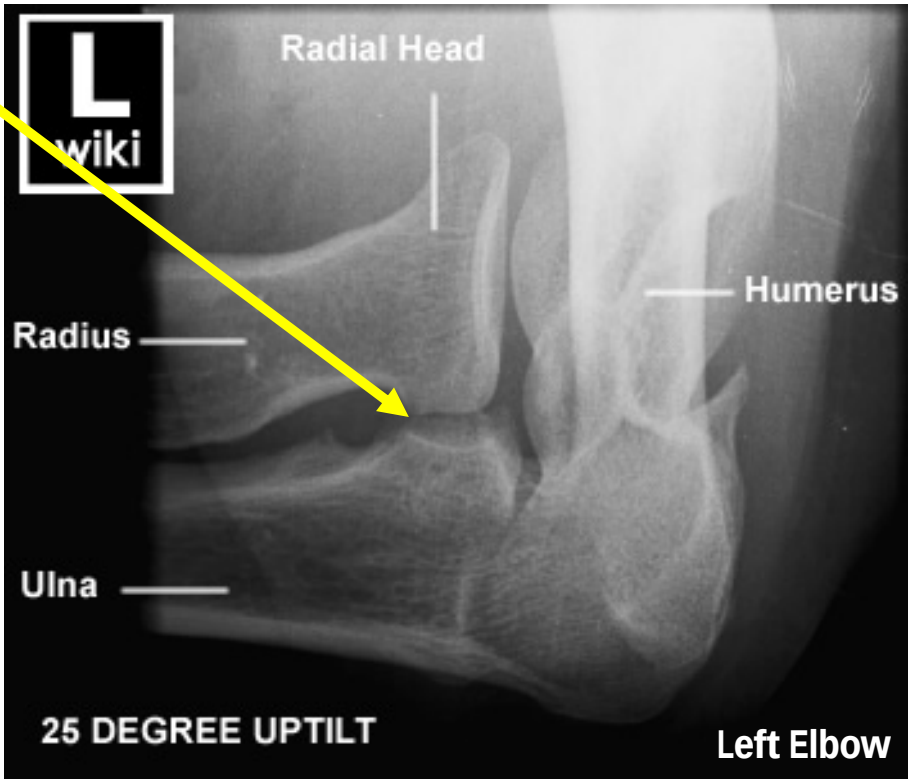


Superior Radioulnar Joint

Superior/Proximal Radioulnar Joint

- Uniaxial pivot joint
- Radial head is held in place to ulna and next to humerus by the annular ligament

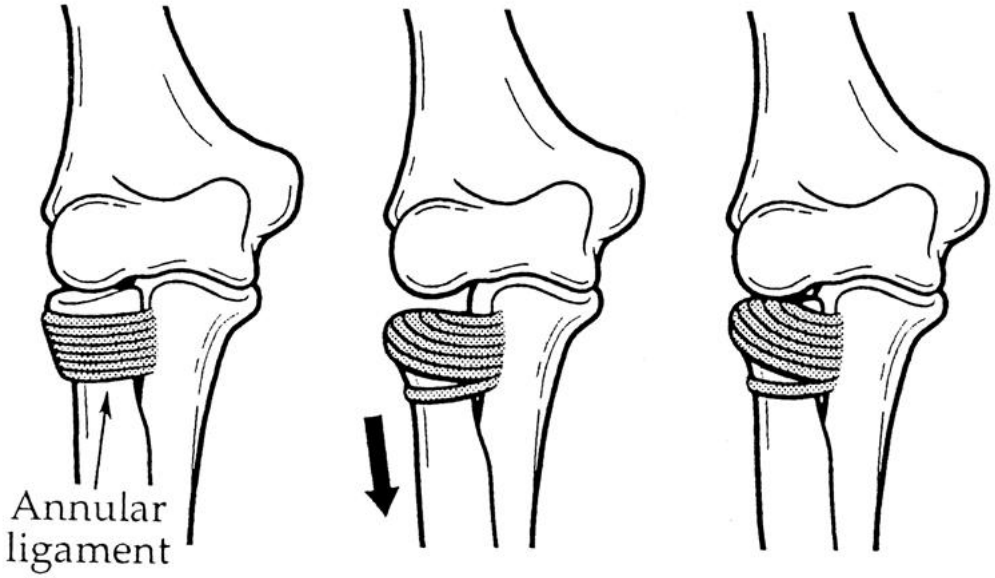
- *Nurse Maid's elbow*
  - Subluxation of the radial head into the annular ligament
  - Usually spontaneously (or easily) reduces with elbow extension and supination
  - Rarely demonstrates abnormal radiographic features



Superior Radioulnar Joint

- Uniaxial pivot joint
- Held in place next to ulna and humerus by the annular ligament

- *Nurse Maid's elbow*
  - Subluxation of the radial head into the annular ligament
  - Usually reduces spontaneously (or easily) with elbow extension and supination
  - Rarely demonstrates abnormal radiographic features



Nursemaid's elbow with subluxation of the radial head into the annular ligament

Superior Radioulnar Joint

- Normal Active Range of Motion
  - Forearm supination 80-90°
  - Forearm pronation 75-90°

- Supination and Pronation
  - 75° Occurs at elbow and forearm
  - 15° Occurs at wrist

Superior Radioulnar Joint

- Normal Active Range of Motion
  - Forearm supination 80-90°
  - Forearm pronation 75-90°

- Supination and Pronation (90°)
  - 75° Occurs at elbow and forearm
  - 15° Occurs at wrist

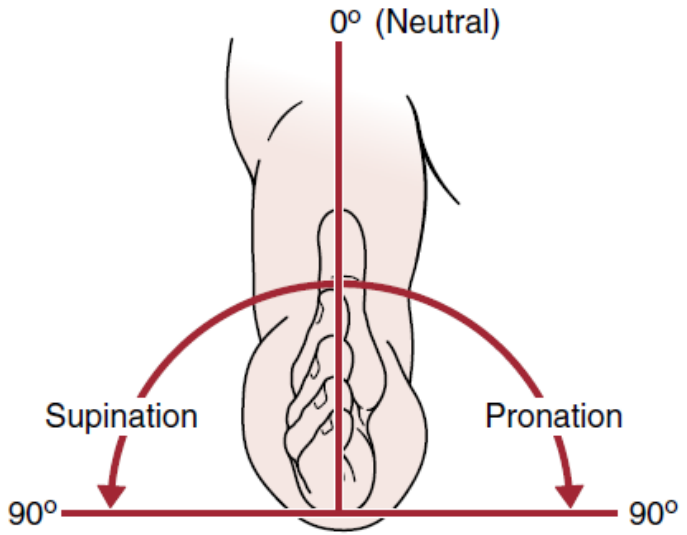


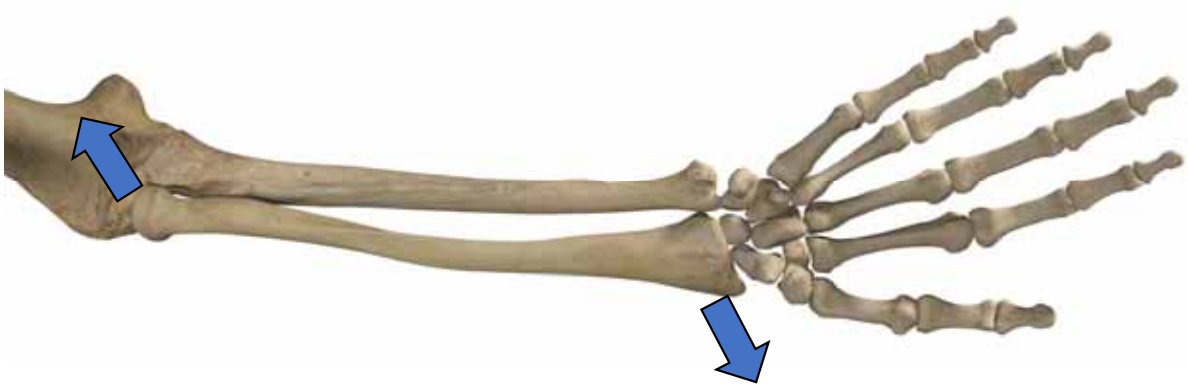
Fig. 6.3 "Thumb-up" or neutral (zero) position between supination and pronation.

- **Radial Head Somatic Dysfunction** refers to dysfunction affecting position and motion of the proximal radial head. It can involve dysfunction at both the radioulnar joint and radiohumeral joint.

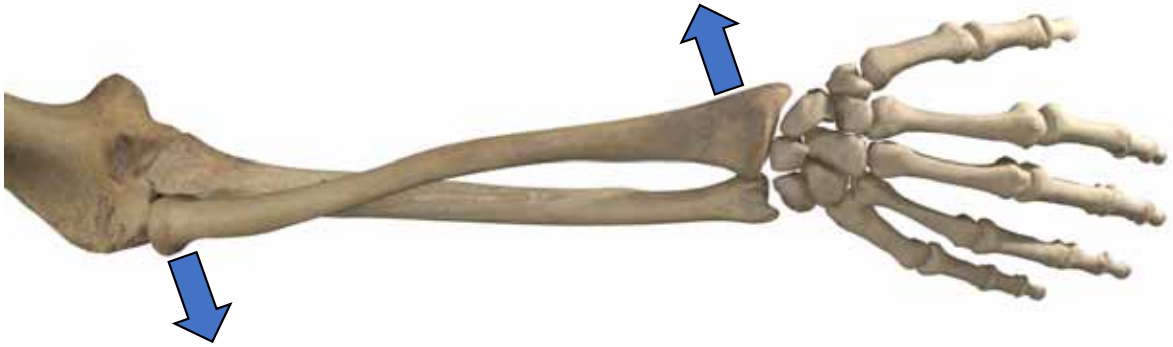
Radial Head

- Reciprocal motion between the proximal and distal radius

Superior View Of Right Forearm



Supination – proximal radius glides anteriorly while distal radius moves posteriorly around the distal ulna



Pronation – proximal radius glides posteriorly (PP) while distal radius moves anteriorly around the distal ulna

Radial Head

Reciprocal motion occurs between the proximal and distal radius

Right Forearm

Radial Head

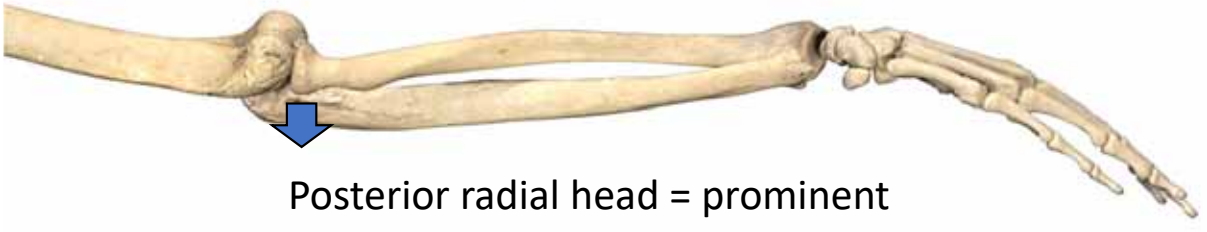
Articular Somatic Dysfunction Assessment

1. Screen for asymmetry, active range of forearm pronation and supination, and tenderness
2. Passive motion assessment
   - Radial head position and motion
     - Supination with anterior glide
     - Pronation with posterior glide (PP)

Note motion restriction

Named for direction of motion preference

Anterior radial head = prominent anteriorly, resists posterior gliding motion, and preference for forearm supination



Posterior radial head = prominent posteriorly, resists anterior gliding motion, and preference for forearm pronation

Radial Head

Articular Somatic Dysfunction Assessment

1. Screen for asymmetry, active range of forearm pronation and supination, and tenderness
2. Passive motion assessment
   - Radial head position and motion
     - Supination with anterior glide
     - Pronation with posterior glide (PP)

Note motion restriction

Named for direction of motion preference

Assessing radial head motion with pronation

Radial Head

Articular Somatic Dysfunction Assessment

1. Screen for asymmetry, active range of forearm pronation and supination, and tenderness
2. Passive motion assessment
   - Radial head position and motion
     - Supination with anterior glide
     - Pronation with posterior glide (PP)

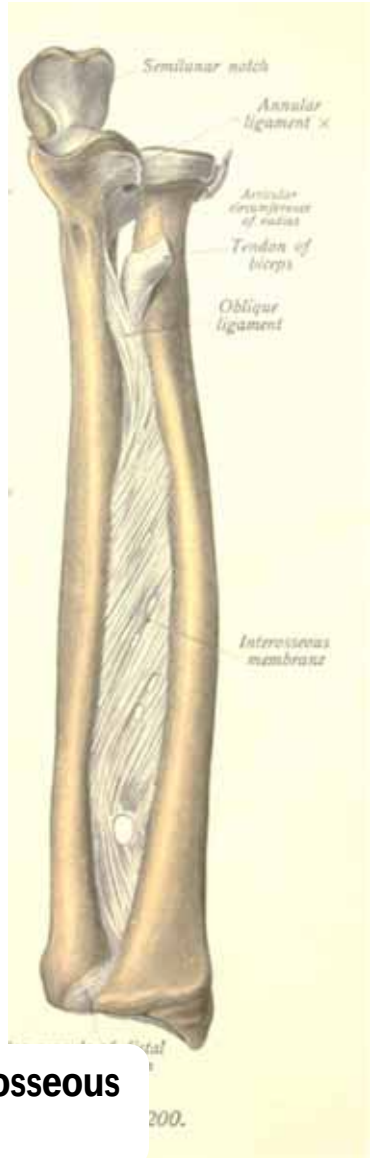
Note motion restriction

Named for direction of motion preference

Interosseous Membrane

- Maintains functional symmetry and stability of ulnar and radius
- Somatic dysfunction
  - Tissue texture abnormalities
  - Tenderness

- Diagnosis of Somatic Dysfunction
  - Palpate deep between radius and ulna throughout the length of the forearm
  - Identify localized or regional areas of tenderness and tissue texture abnormalities
  - Named as “myofascial restriction” with location



Right forearm interosseous membrane

Interosseous Membrane

- Maintains functional symmetry and stability of ulnar and radius
- Somatic dysfunction
  - Tissue texture abnormalities
  - Tenderness

- Diagnosis of Somatic Dysfunction
  - Palpate deep between radius and ulna throughout the length of the forearm
  - Identify localized or regional areas of tenderness and tissue texture abnormalities
  - Named as “myofascial restriction” with location

Assessing for tissue texture abnormalities and tenderness of the interosseus membrane

Interosseous Membrane

- Maintains functional symmetry and stability of ulnar and radius
- Somatic dysfunction
  - Tissue texture abnormalities
  - Tenderness

- Diagnosis of Somatic Dysfunction
  - Palpate deep between radius and ulna throughout the length of the forearm
  - Identify localized or regional areas of tenderness and tissue texture abnormalities
  - Named as “myofascial restriction” with location

Wrist

- Distal Radioulnar Joint
- Ulnocarpal joint
- Radiocarpal joints (largest)

Wrist - Distal Radioulnar Joint

- Uniaxial pivot joint

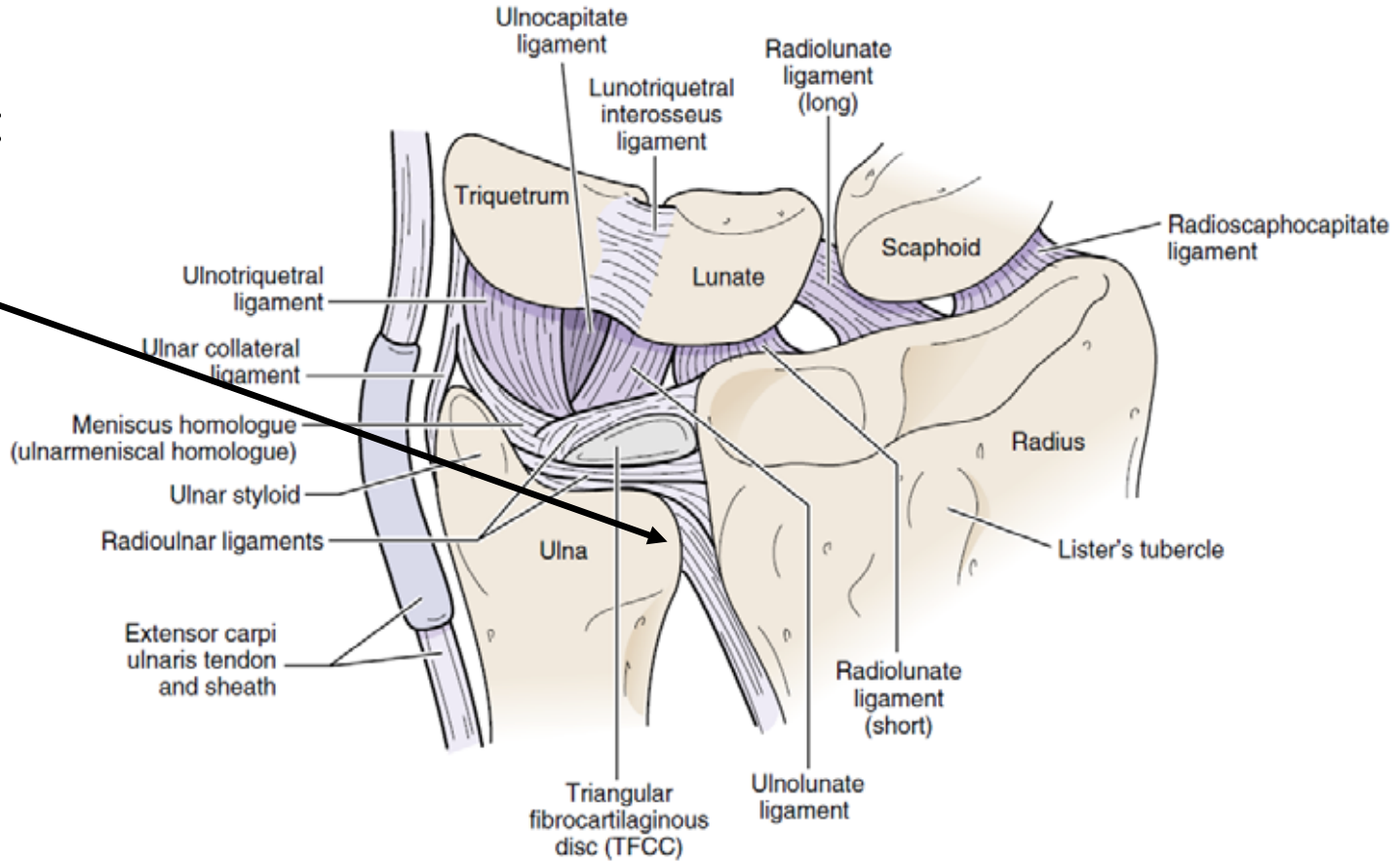
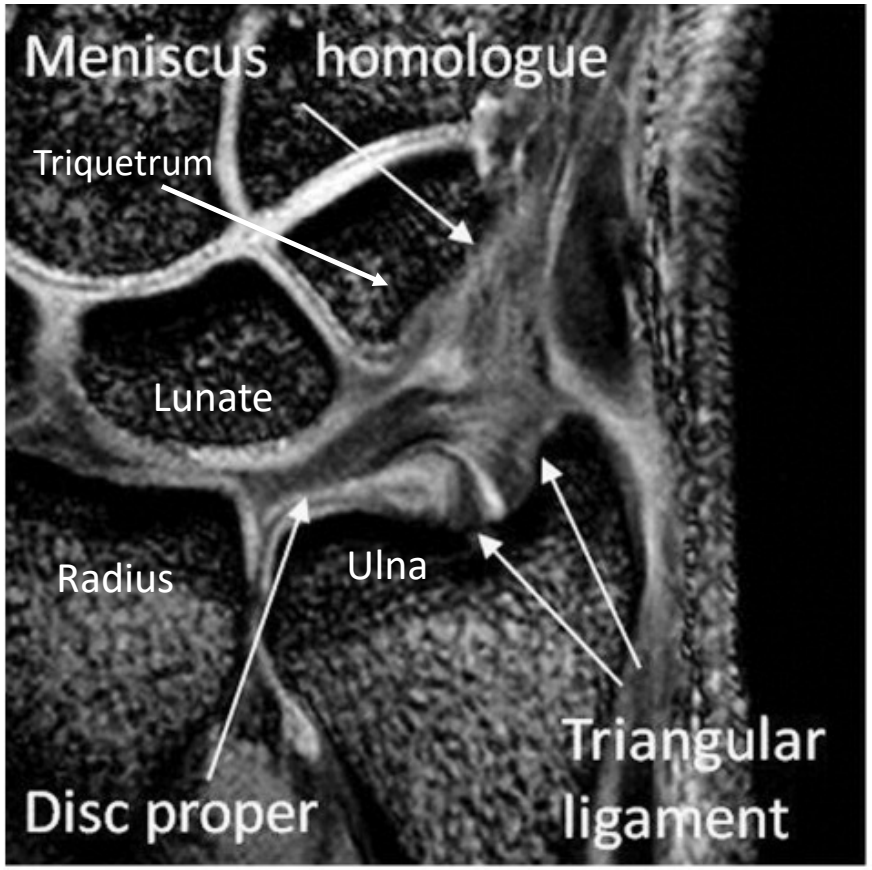


Fig. 7.3 Distal radioulnar joint anatomy. The triangular fibrocartilage complex *(TFCC)* is made up of the ulnar collateral ligament, meniscus homologue, triangular disc, and the radioulnar ligaments formed of the triangular ligament styloid band and the triangular ligament foveal band.

Wrist - Ulnocarpal joint

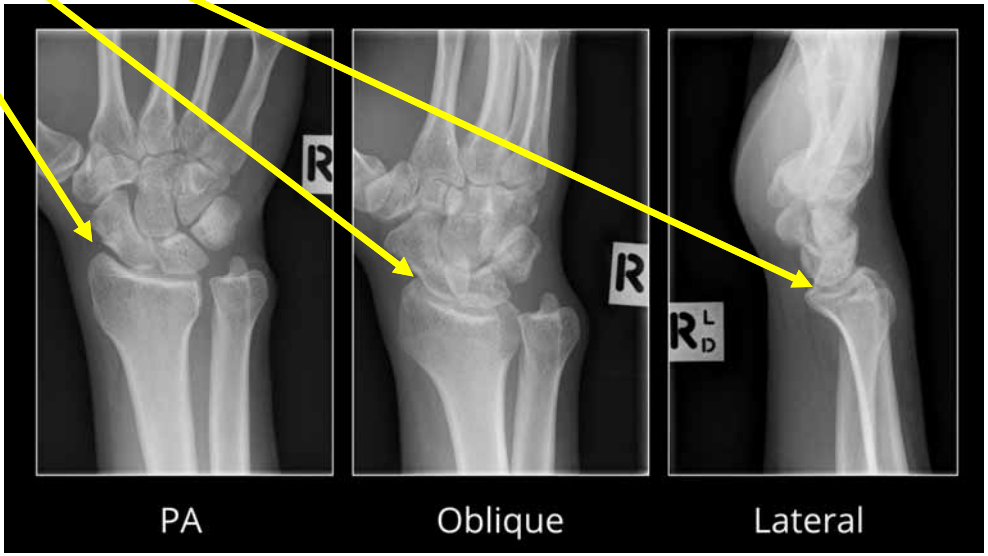
- Articulates with lunate and triquetrum via TFCC
- Triangular fibrocartilage complex (TFCC) includes ligaments, tendon sheath of the extensor carpi ulnaris, and disc that sits between ulna and the lunate and triquetrum
- TFCC extends from ulnar side of the radius to ulna at the ulnar styloid process
- Ulnocarpal joint stabilized by ligaments, tendons, and TFCC
- TFCC is most commonly injured with forced wrist extension and pronation



MRI showing normal TFCC disc and ligament complex

Wrist - Radiocarpal joints

- Biaxial ellipsoid joint
- Radius articulates with the scaphoid and lunate
- Stabilized by ligaments, TFCC, tendons
- Most commonly injured with pronated fall on outstretched hand (FOOSH) forcing wrist extension and ulnar deviation
  - Radial head posterior preference
  - Wrist extension and adduction preference
  - Scaphoid fracture



Wrist - Radiocarpal joints

- Biaxial ellipsoid joint
- Radius articulates with the scaphoid and lunate
- Stabilized by ligaments, TFCC, tendons
- Most commonly injured with pronated fall on outstretched hand (FOOSH) forcing wrist extension and ulnar deviation
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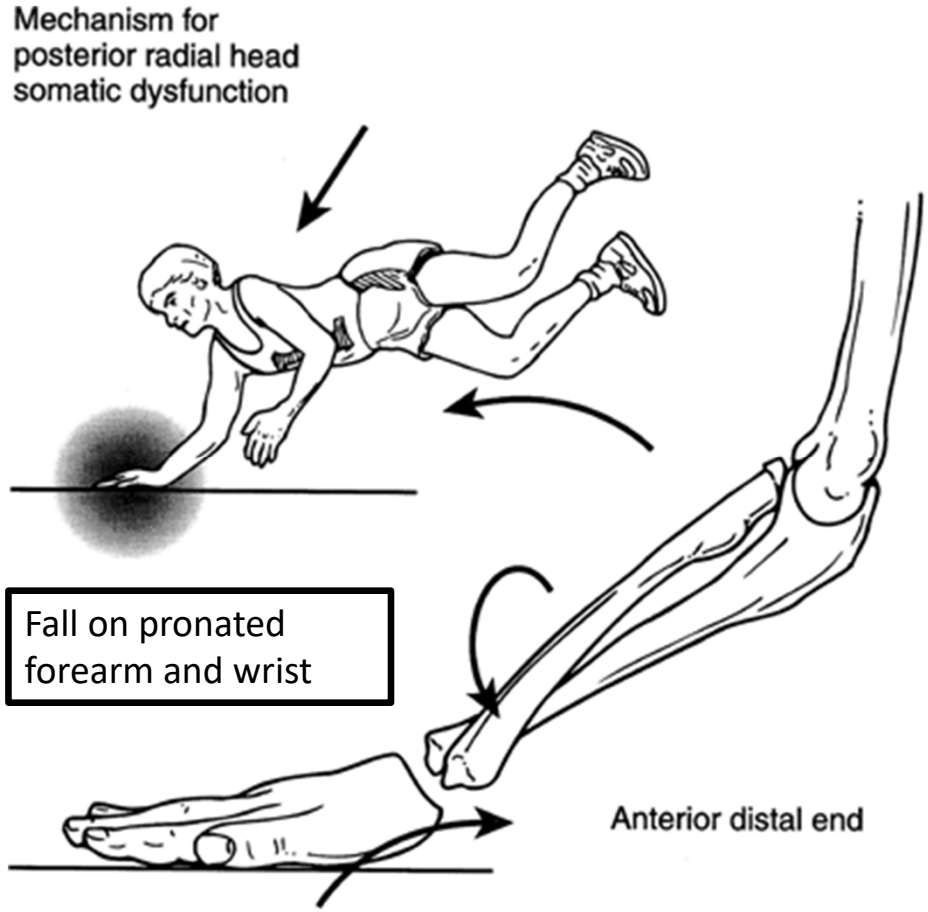
  - Scaphoid fracture



Wrist - Radiocarpal joints

- Biaxial ellipsoid joint
- Radius articulates with the scaphoid and lunate
- Stabilized by ligaments, TFCC, tendons
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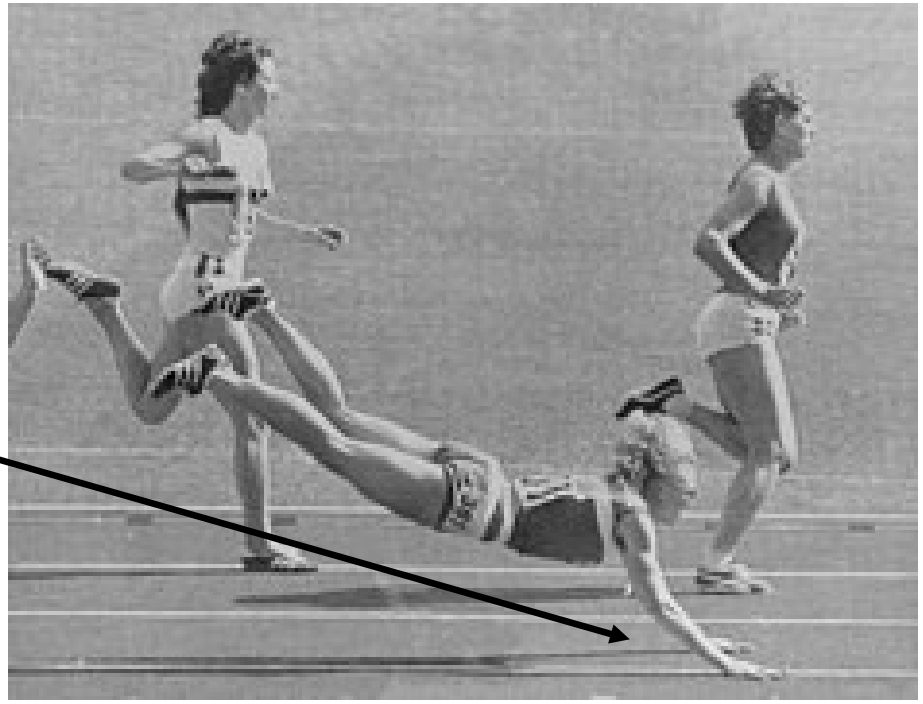
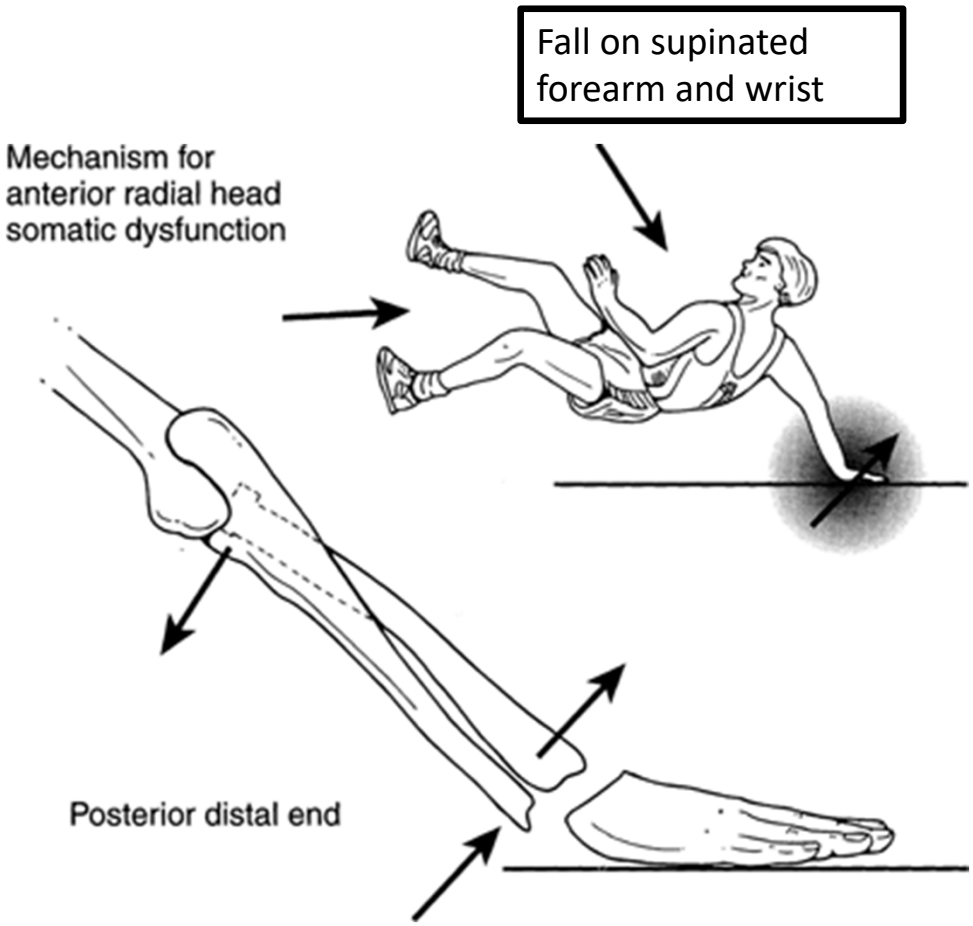
  - Radial head posterior preference
  - Wrist extension and adduction preference
  - Scaphoid fracture



Wrist - Radiocarpal joints

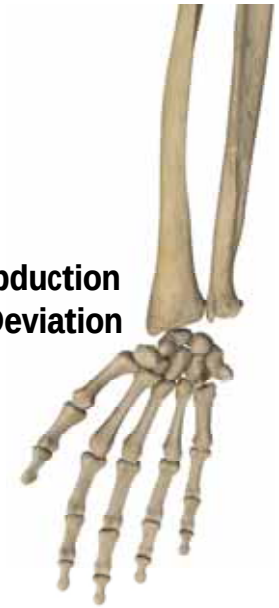
- Biaxial ellipsoid joint
- Radius articulates with the scaphoid and lunate
- Stabilized by ligaments, TFCC, tendons

- Falling backward onto supinated forearm and wrist
  - Anterior radial head somatic dysfunction



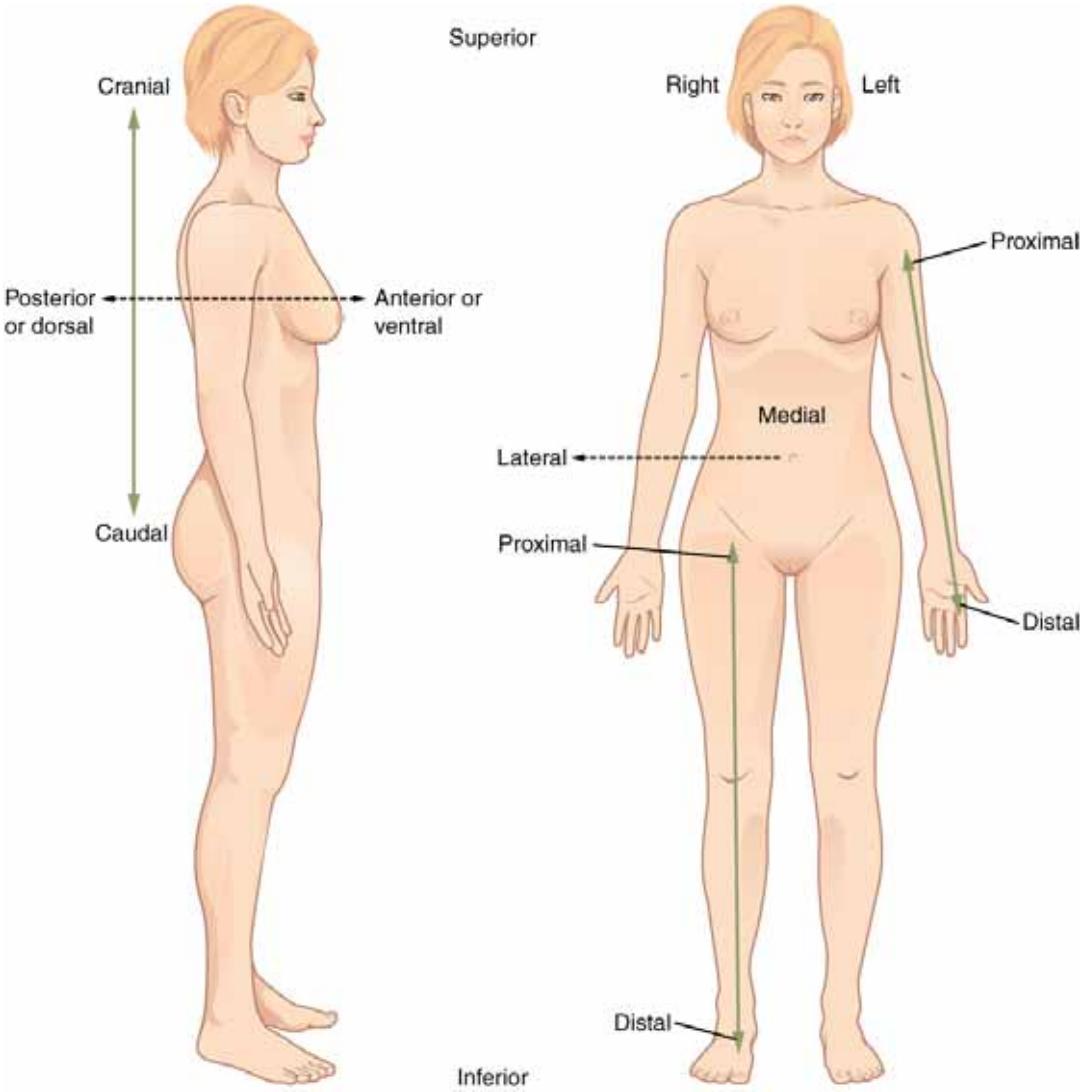
Wrist

- Normal Range of Motion
  - Flexion 40°
  - Extension 40°
  - Abduction (radial deviation) 15°
  - Adduction (ulnar deviation) 20-30°
    - ROM varies by measurement method



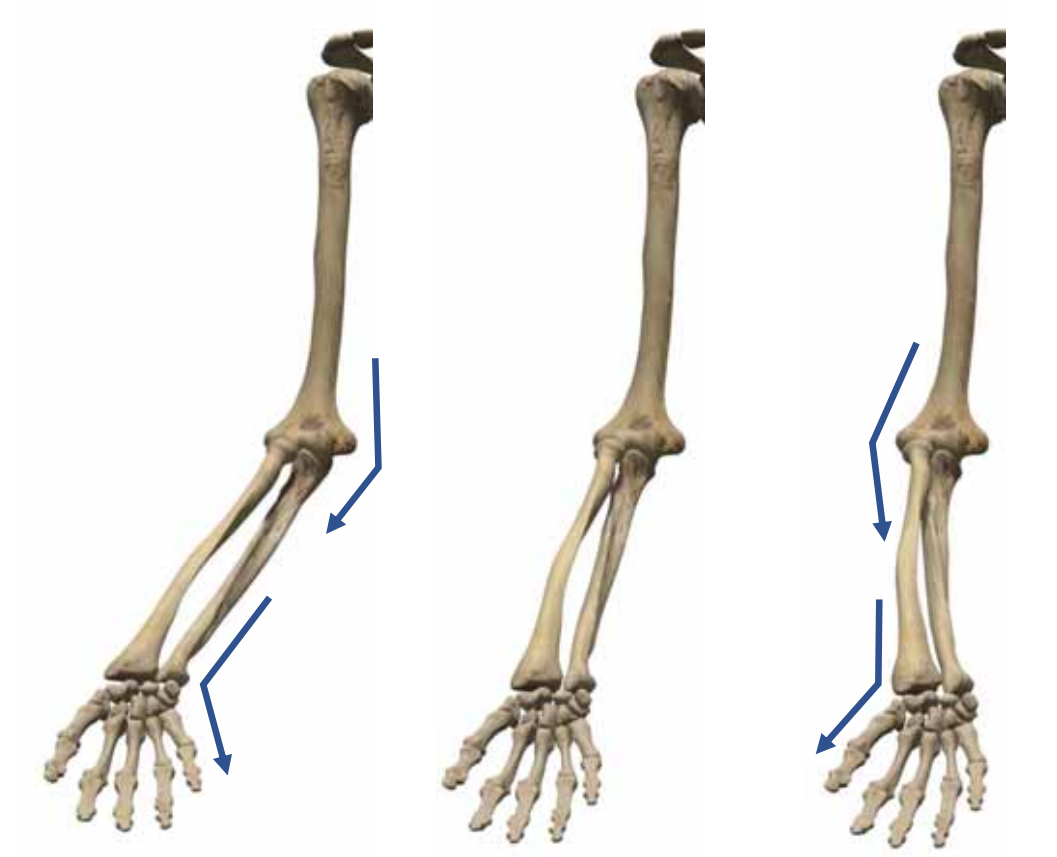
Anatomic Position

- Motions are defined in anatomic position with <u>palms facing anteriorly</u>



Wrist

- Reciprocal motion between elbow and wrist
- Parallelogram mechanics
  - wrist adduction, ulnar abduction
  - wrist abduction, ulnar adduction
- Common patterns of somatic dysfunction
  - wrist adduction, ulnar abduction
  - wrist abduction, ulnar adduction



Wrist adduction
Ulnar abduction

Neutral

Wrist abduction
Ulnar adduction

Wrist

- Reciprocal motion between elbow and wrist
- Parallelogram mechanics
  - wrist adduction, ulnar abduction
  - wrist abduction, ulnar adduction

- Common patterns of somatic dysfunction
  - wrist adduction, ulnar abduction
  - wrist abduction, ulnar adduction

Reciprocal motion between right elbow and wrist

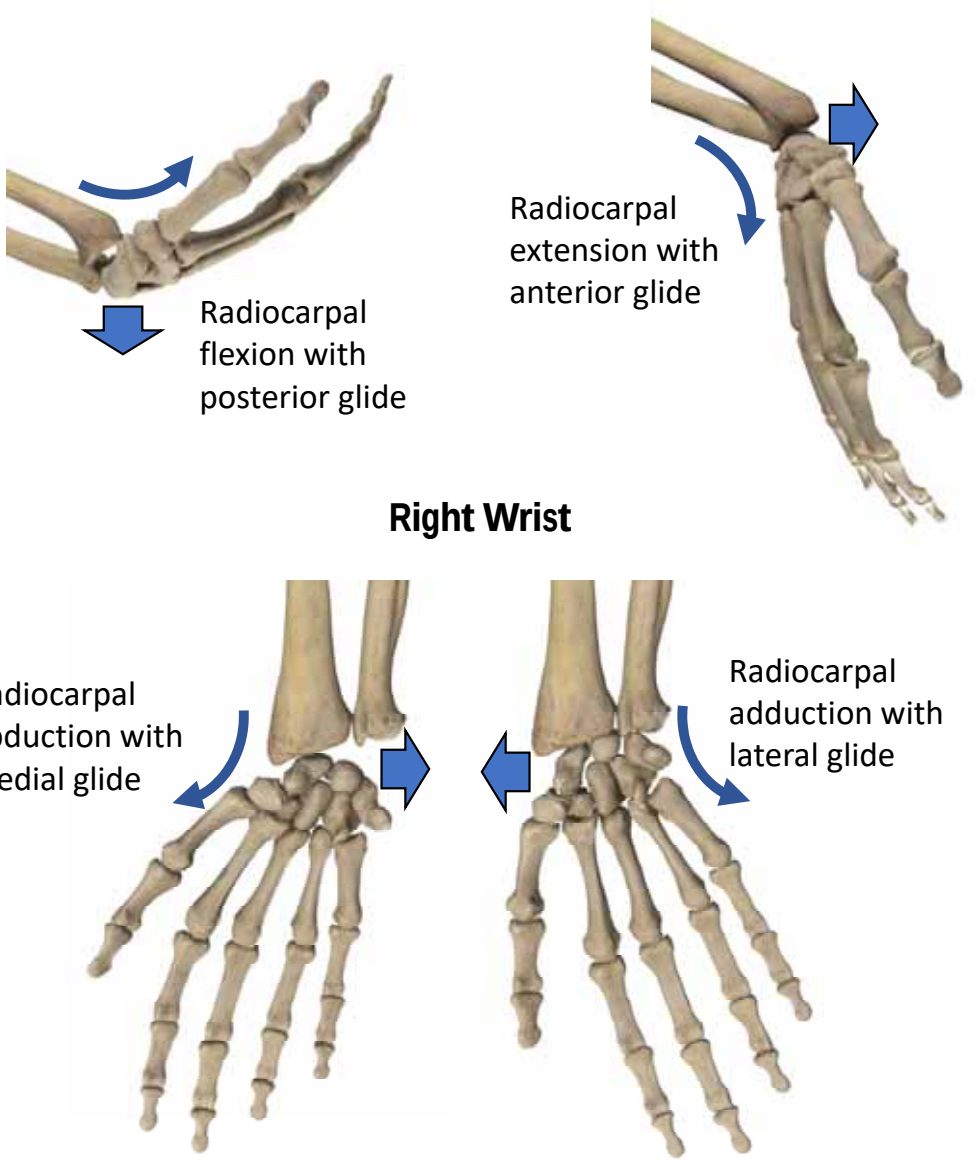
Wrist

Articular Somatic Dysfunction Assessment

1. Screen for asymmetry and reduced active range of wrist motion
2. Passive motion assessment
    1. Flexion with posterior glide
    2. Extension with anterior glide
    3. Adduction with lateral glide
    4. Abduction with medial glide

Note motion restriction

Named for direction of motion preference



Wrist

Articular Somatic Dysfunction Assessment

1. Screen for asymmetry and reduced active range of wrist motion
2. Passive motion assessment
    1. Flexion with posterior glide
    2. Extension with anterior glide
    3. Adduction with lateral glide
    4. Abduction with medial glide

Note motion restriction

Named for direction of motion preference

Glide motions of the right supinated wrist

Wrist

Articular Somatic Dysfunction Assessment

1. Screen for asymmetry and reduced active range of wrist motion
2. Passive motion assessment
    1. Flexion with posterior glide
    2. Extension with anterior glide
    3. Adduction with lateral glide
    4. Abduction with medial glide

Note motion restriction

Named for direction of motion preference

Assessing wrist extension with anterior glide

Wrist

Articular Somatic Dysfunction Assessment

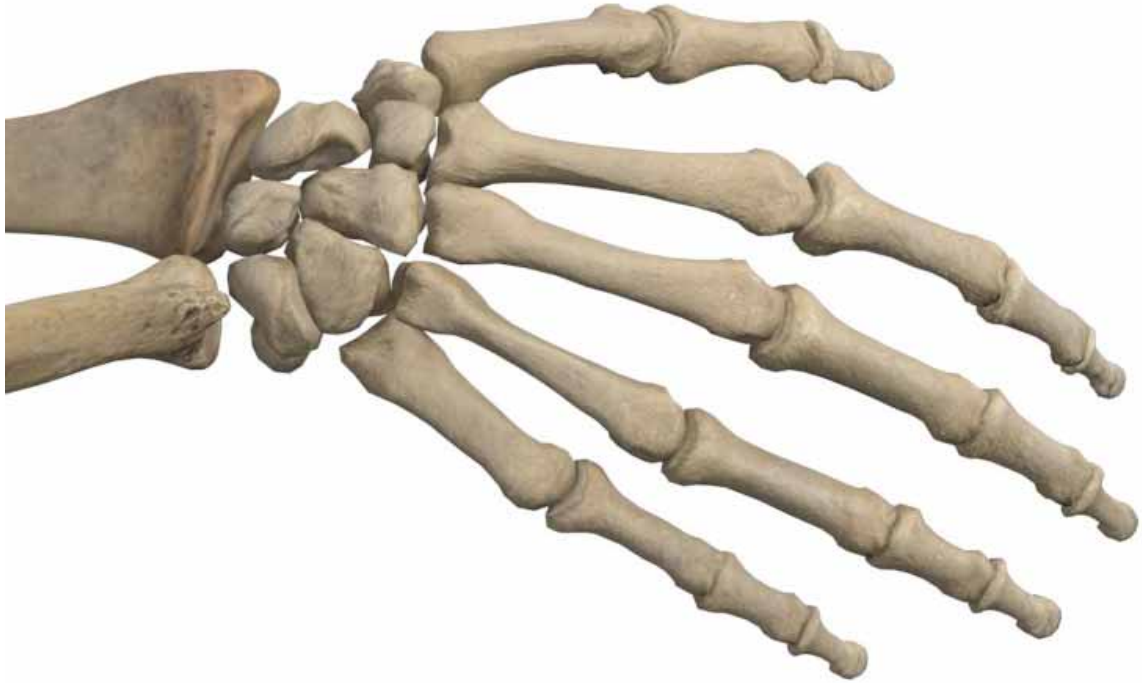
1. Screen for asymmetry and reduced active range of wrist motion
2. Passive motion assessment
    1. Flexion with posterior glide
    2. Extension with anterior glide
    3. Adduction with lateral glide
    4. Abduction with medial glide

Note motion restriction

Named for direction of motion preference

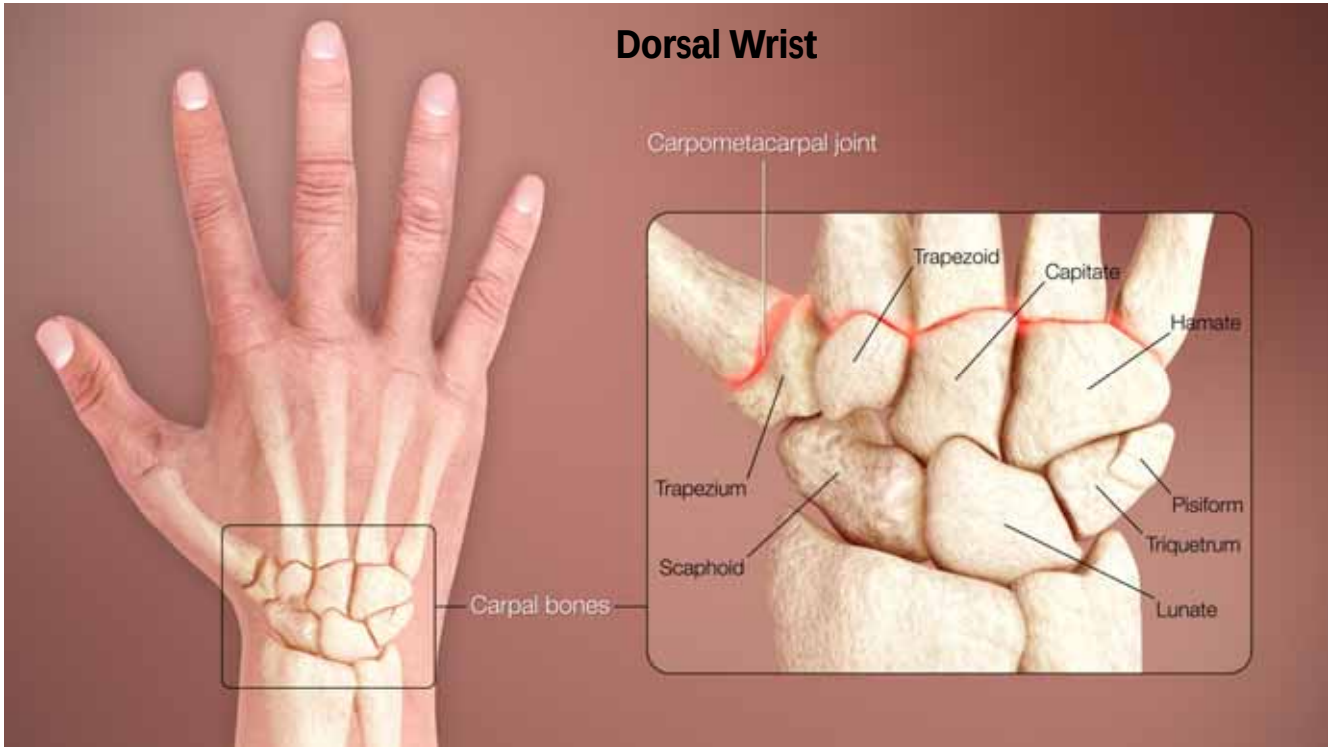
Hand, Thumb, and Fingers

- Intercarpal joint
- Carpometacarpal joints
- Metacarpal phalangeal joints
- Proximal Interphalangeal Joints
- Distal interphalangeal joints



Intercarpal joints

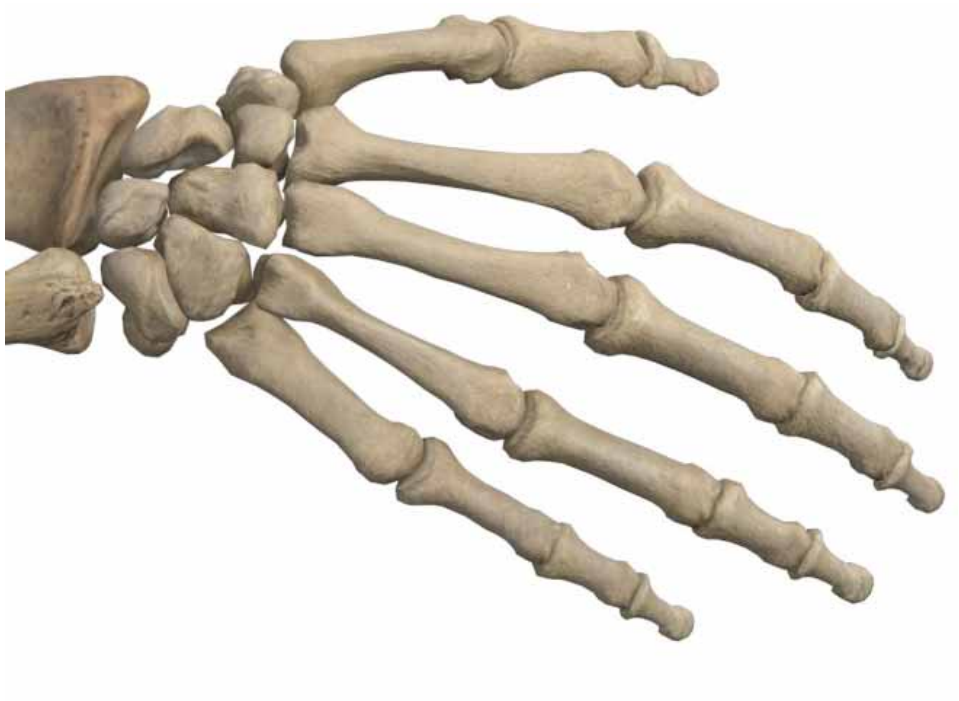
- Stabilized by complex configuration of ligaments and bones
- Proximal row -scaphoid, lunate, and triquetrum
- Distal row - trapezium, trapezoid, capitate, and hamate
- Pisiform sits on the triquetrum
- Flexor carpi ulnaris inserts on pisiform and hamate (only muscle to insert on carpals)



Intercarpal joint

- Gliding motions permitted along the joint surfaces

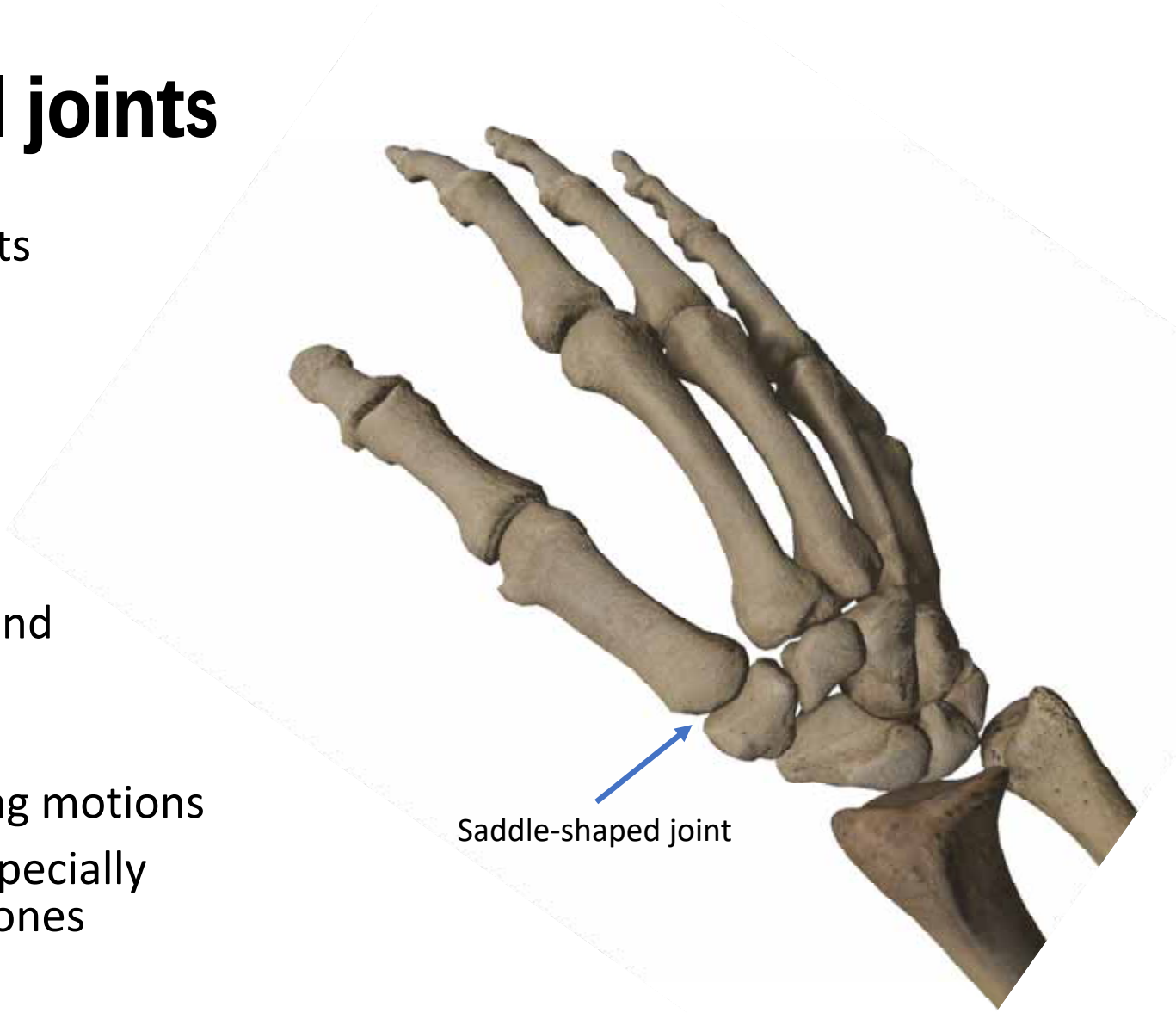
- Palpate for TART findings especially reduced motion between bones



Carpometacarpal joints

- Thumb (1st CMP) Movements permitted:
  - Flexion/extension
  - Abduction/adduction
  - IR/ER
  - Circumduction.
- Saddle shaped
- Palpated for TART findings and reduced ROM

- 2nd-5th MCPs just have gliding motions
- Palpate for TART findings especially reduced motion between bones



Metacarpophalangeal Joints

- Flexor tendons and finger annular pulleys are key anatomical structures
- Movements of MCP at thumb
  - Flexion/Extension
  - Abduction/Adduction
  - Opposition (thumb touches finger)
- Movements of MCP 2-5
  - Flexion/Extension
  - Abduction/Adduction
  - IR/ER
- Swelling of pulleys causes trigger fingers

Thumb flexion

Thumb extension

Thumb abduction

Thumb adduction

Thumb opposition

Metacarpal Phalangeal and Interphalangeal Joints

Articular Somatic Dysfunction Assessment

1. Screen for asymmetry and reduced active range of motion
2. Passive motion assessment
    1. Flexion with posterior glide
    2. Extension with anterior glide
    3. Adduction with lateral glide
    4. Abduction with medial glide
    5. Internal rotation
    6. External rotation

Note motion restriction

Named for direction of motion preference

Assessing active range of motion of MCP and IP joints 2-4

Metacarpal Phalangeal and Interphalangeal Joints

Articular Somatic Dysfunction Assessment

1. Screen for asymmetry and reduced active range of motion
2. Passive motion assessment
    1. Flexion with posterior glide
    2. Extension with anterior glide
    3. Adduction with lateral glide
    4. Abduction with medial glide
    5. Internal rotation
    6. External rotation

Note motion restriction

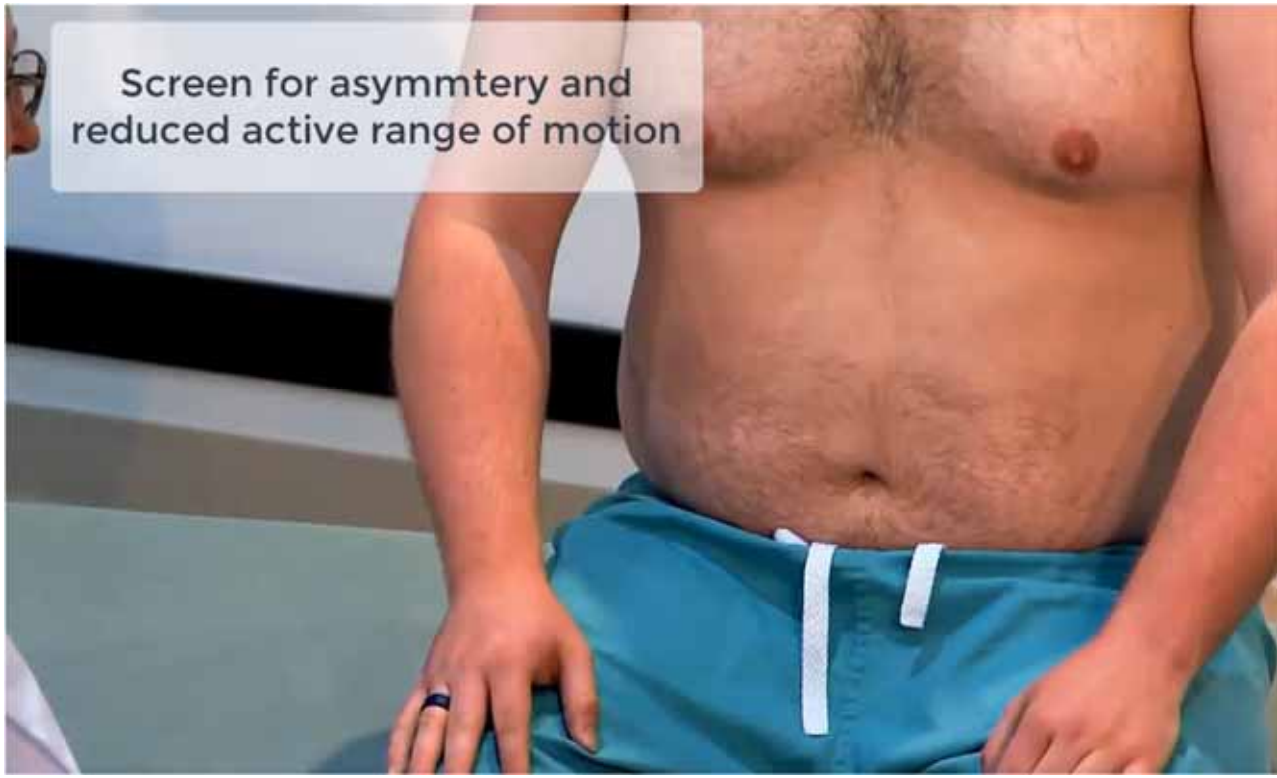
Named for direction of motion preference

Assessing flexion range of motion of 2nd PIP

Metacarpal Phalangeal and Interphalangeal Joints

Articular Somatic Dysfunction Assessment

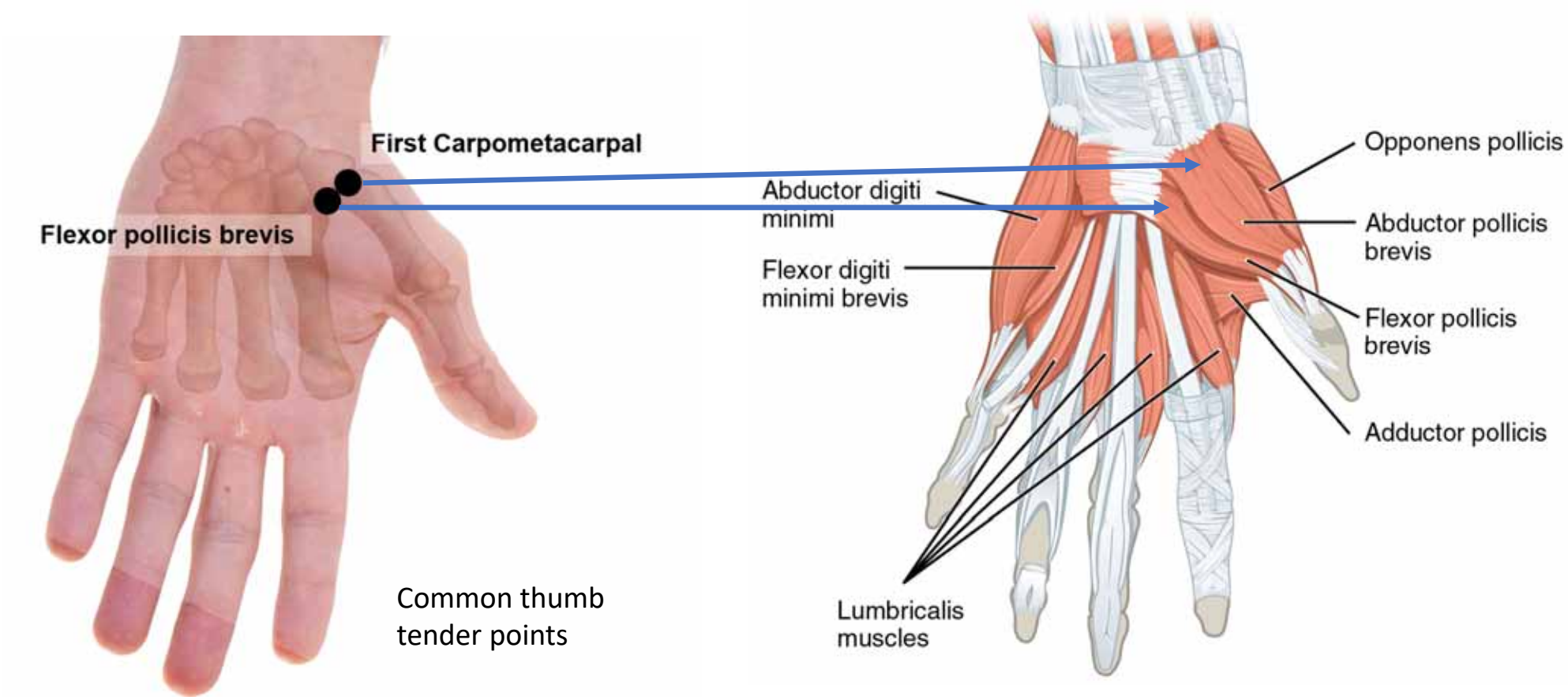
1. Screen for asymmetry and reduced active range of motion
2. Passive motion assessment
    1. Flexion with posterior glide
    2. Extension with anterior glide
    3. Adduction with lateral glide
    4. Abduction with medial glide
    5. Internal rotation
    6. External rotation



Note motion restriction

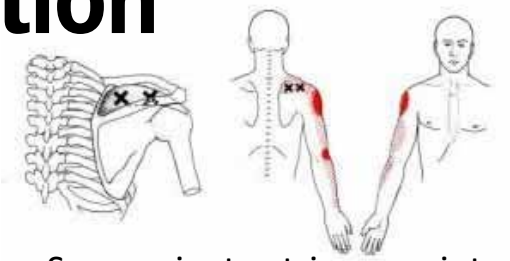
Named for direction of motion preference

Anterior Hand Tender Points



Upper Extremity Myofascial Dysfunction

- Tender points
  - Assess by palpation
    - Ligamentous attachment sites
    - Muscle attachment sites
    - Musculotendinous junctions
    - Muscle bellies
- Trigger points
  - Assess by palpation
- Muscular hypertonicity
  - Assess by palpation and range of motion



Supraspinatus trigger point

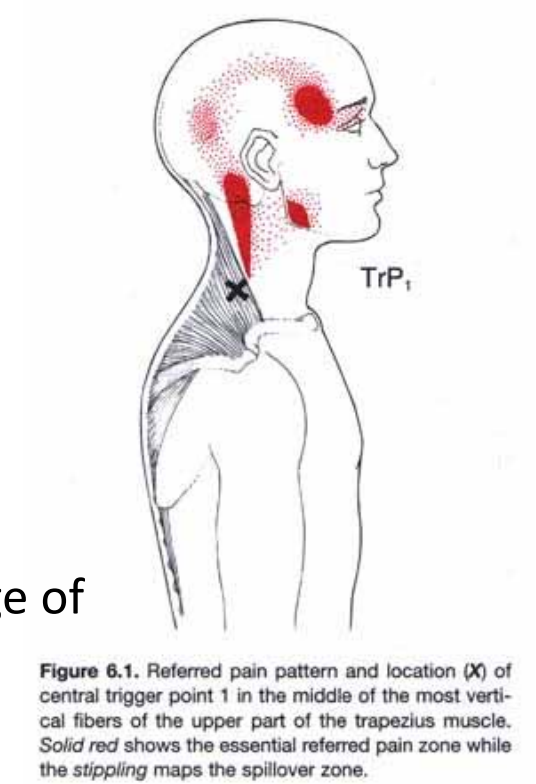
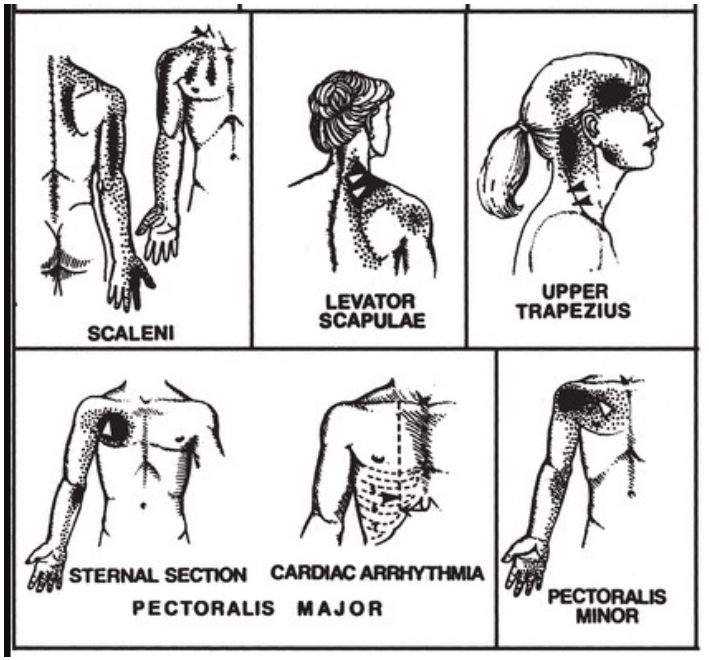


Figure 6.1. Referred pain pattern and location (*X*) of central trigger point 1 in the middle of the most vertical fibers of the upper part of the trapezius muscle. *Solid red* shows the essential referred pain zone while the *stippling* maps the spillover zone.

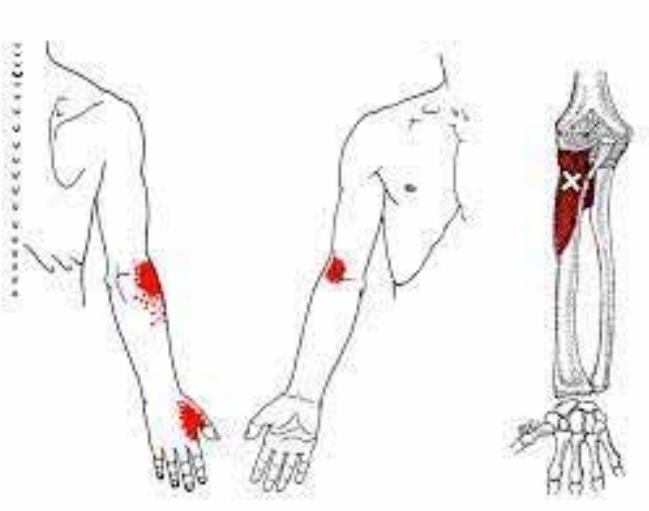
Trapezius trigger point



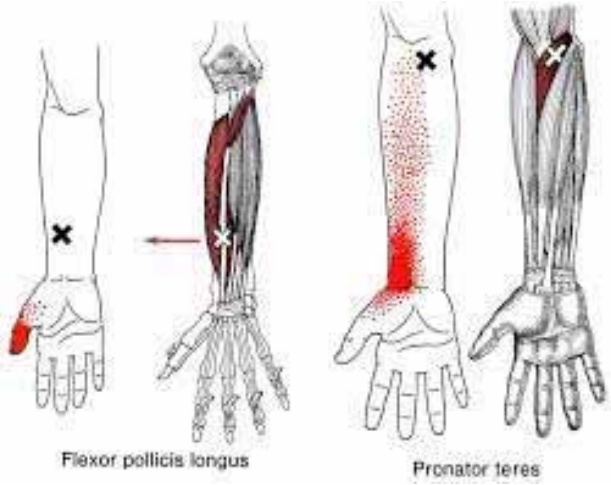
Various UE trigger points

Upper Extremity Trigger Points

- Upper Trapezius
- Levator scapulae
- Pectoralis Minor
- Pectoralis Major
  - Trigger point associated with cardiac arrythmias
- Supinator
- Pronator teres



Supinator trigger point may be present with tennis elbow (lateral epicondylitis)



Pronator teres trigger point may mimic carpal tunnel syndrome

References

- Chapter 5, 6, 7. Magee DJ, Manske RC. Orthopedic Physical Assessment. Seventh edition. Elsevier; 2021
- Chapter 27, 28G, 49C. Seffinger MA. Foundations of Osteopathic Medicine : Philosophy, Science, Clinical Applications, and Research. Fourth edition. Wolters Kluwer; 2018.
- Snider and Glover. Atlas of Common Counterstrain Tender Points. 2015
- Chapters 1-5. Kapandji AI. The physiology of the Joints. Volume 1 The Upper Limb. 6th Edition. Churchill Livingstone. 2007