

An Introduction to the Shoulder Complex: Anatomy / Biomechanics Review

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30 slides

Structure

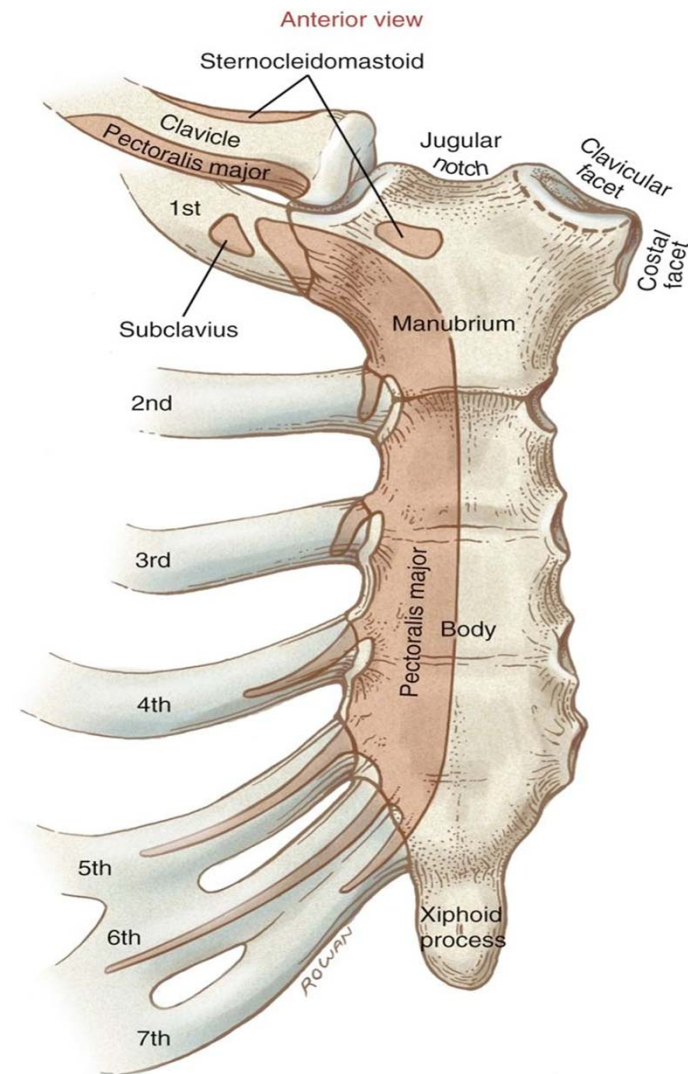
- Osteology
- Arthrology
- Muscle and Joint Interaction
- Synopsis
- Clinical Connections

Osteology

- Sternum
- Clavicle
- Scapulae
- Proximal to mid humerus

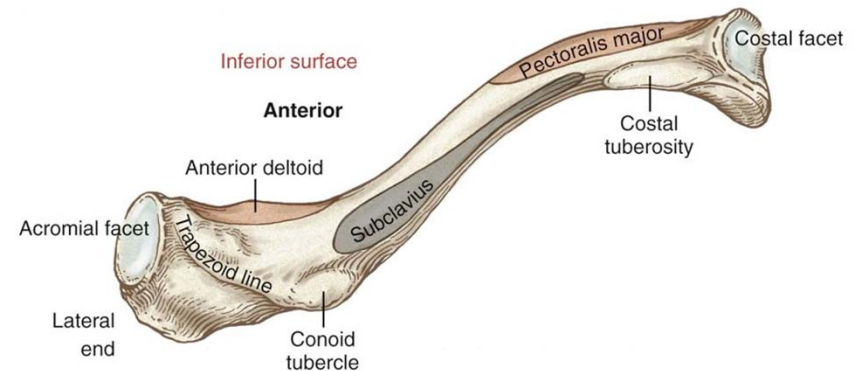
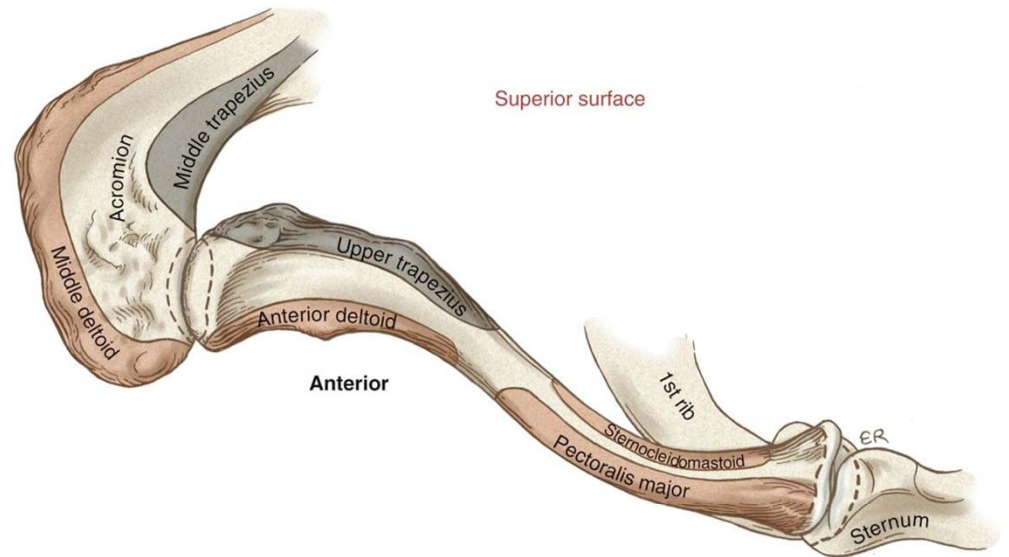
Sternum

- Composed of:
manubrium + body + xiphoid process
- **Sternoclavicular joint**
- **Manubrium**
 - Clavicular facets
 - Costal facets
 - Jugular notch

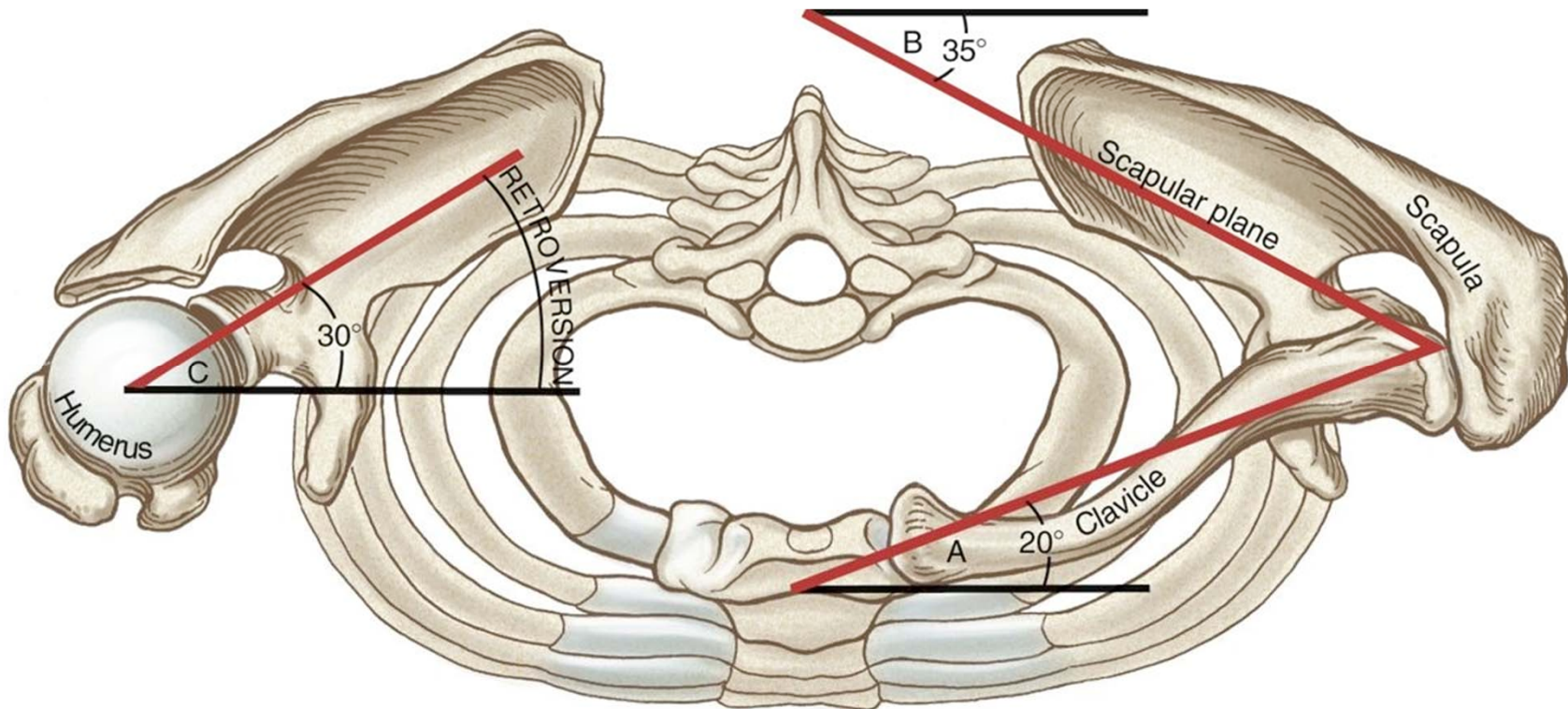


Clavicle

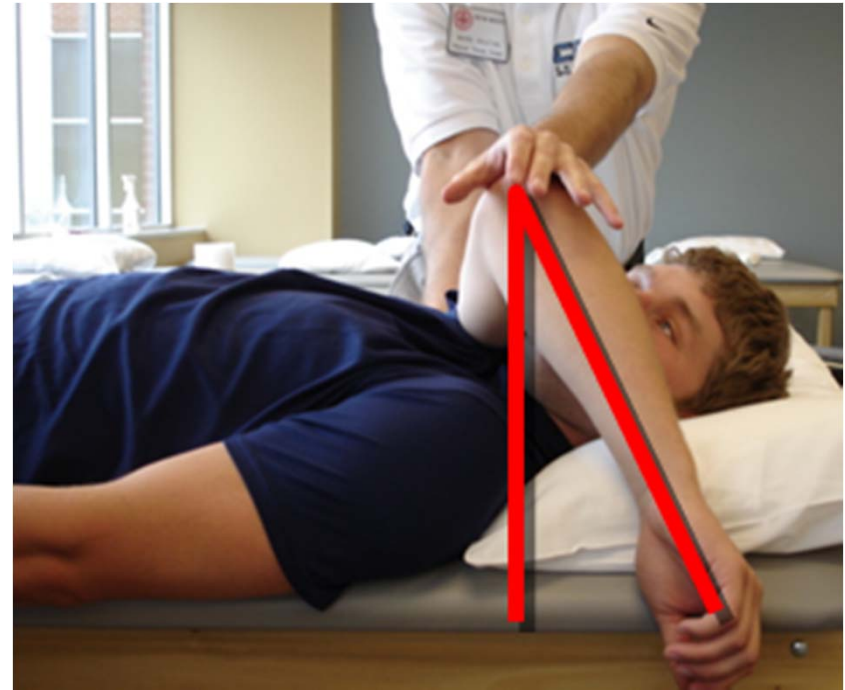
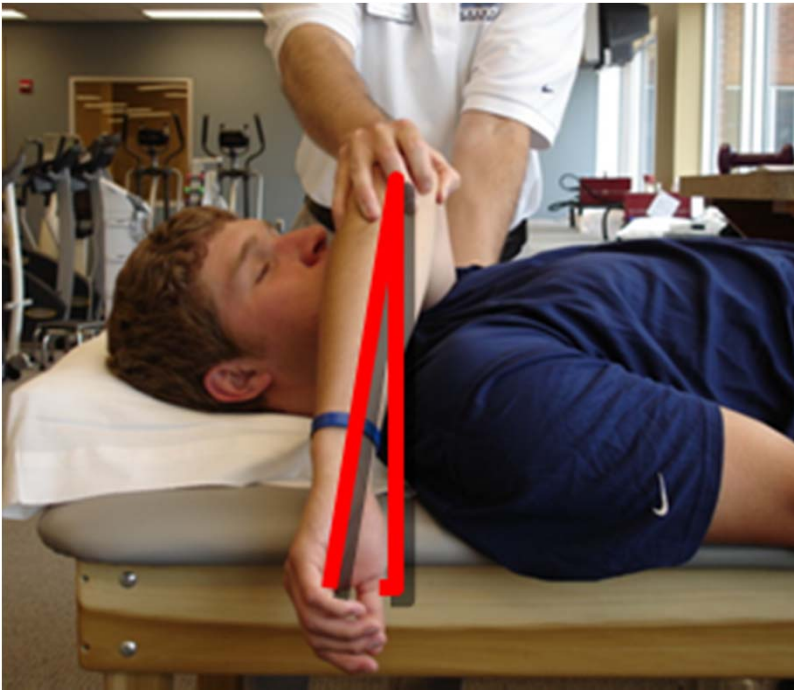
- Shaft
- Sternal end
(Sternoclavicular joint)
- Costal facet
- Costal tuberosity
- Acromial end
(Acromioclavicular joint)
- Acromial facet
- Conoid tubercle
- Trapezoid line



Clavicle (Superior View)



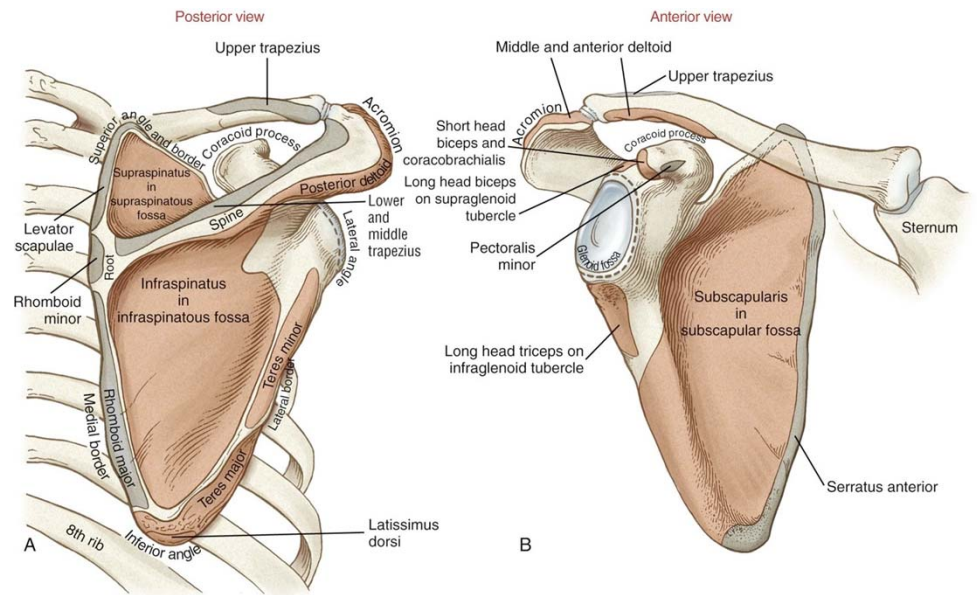
Clinical Assessment of GHJ Retroversion



<http://www.mikereinold.com/2010/03/measuring-humeral-retroversion.html>

Scapula

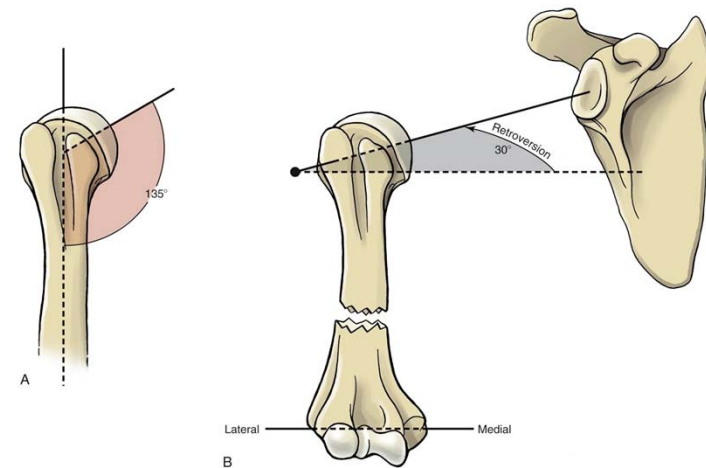
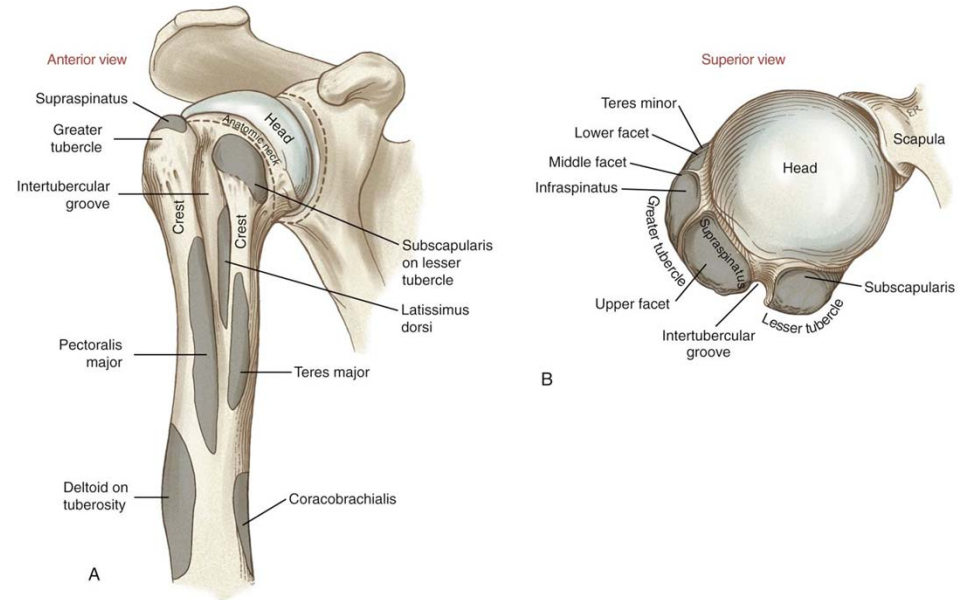
- 3 angles
- 3 borders
- 3 fossa
- At rest: scapula positioned against the posterior lateral surface of the rib cage
- Glenoid fossa: ~35 degrees anterior to the frontal plane defining the scapular plane



Proximal to Mid Humerus

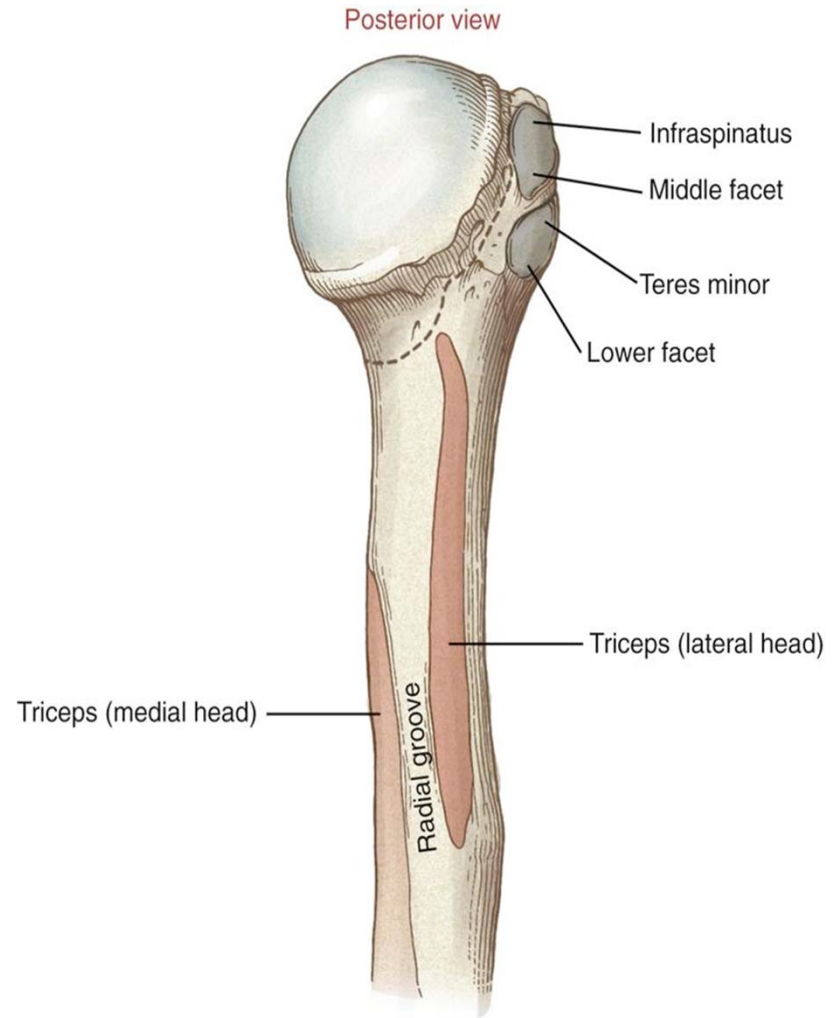
- Anterior and Superior Views

- Head of humerus: convex
- Humeral head rotated ~ 30° posteriorly within the horizontal plane
- **Retroversion**: aligns the humeral head within the scapular plane for articulation within the glenoid fossa



Proximal to Mid Humerus

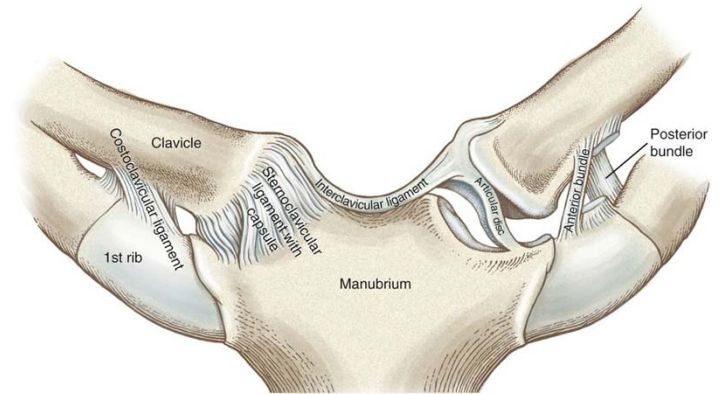
- Posterior View
 - Radial grooves run obliquely across the posterior aspect of the humerus
 - Groove separates the proximal attachments of the lateral and medial head of the triceps



Arthrology

- Sternoclavicular
- Acromioclavicular
- Scapulothoracic
- Glenohumeral

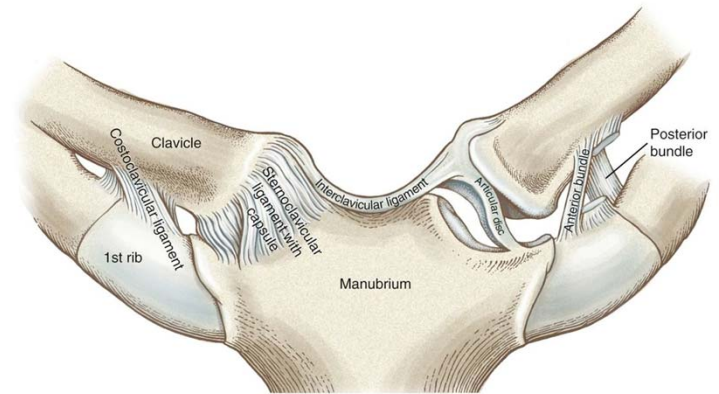
Sternoclavicular Joint



- **General features:**

- Central joint of the entire UE linking appendages to the skeleton
- Articulation between the medial end of the clavicle, the clavicular facet on the sternum, and the superior border of the cartilage of the first rib
- Firm joint articulation yet needed for considerable ROM
- Medial end of the clavicle: convex
- Clavicular facet: concave

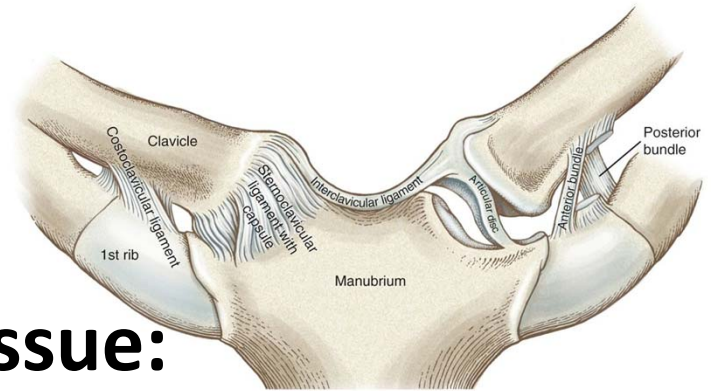
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- Firm joint articulation yet needed for considerable ROM
- Medial end of the clavicle: convex, and Clavicular facet: concave (convex on concave for elevation and depression)

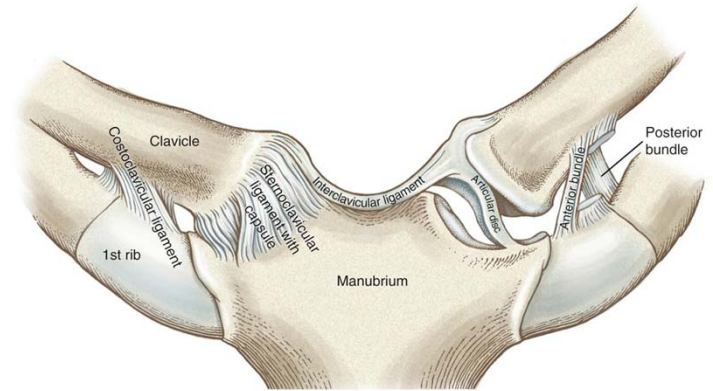
Sternoclavicular Joint



- **Peri-articular Connective Tissue:**

- Enclosed by a capsule
- Reinforced by 2 capsular ligaments
 - **Anterior and posterior sternoclavicular ligaments**
- Active movement requires muscular stability (SCM/STHY/STHY/SUBC)
- Connection of left and right clavicle via the **interclavicular ligament**
- Additional stabilization via the **costoclavicular ligament** (2 bands / crisscross formation / 1st rib to costal tuberosity on the inferior surface of the clavicle)

Sternoclavicular Joint



- **Periarticular Tissue:**

- Articular disc

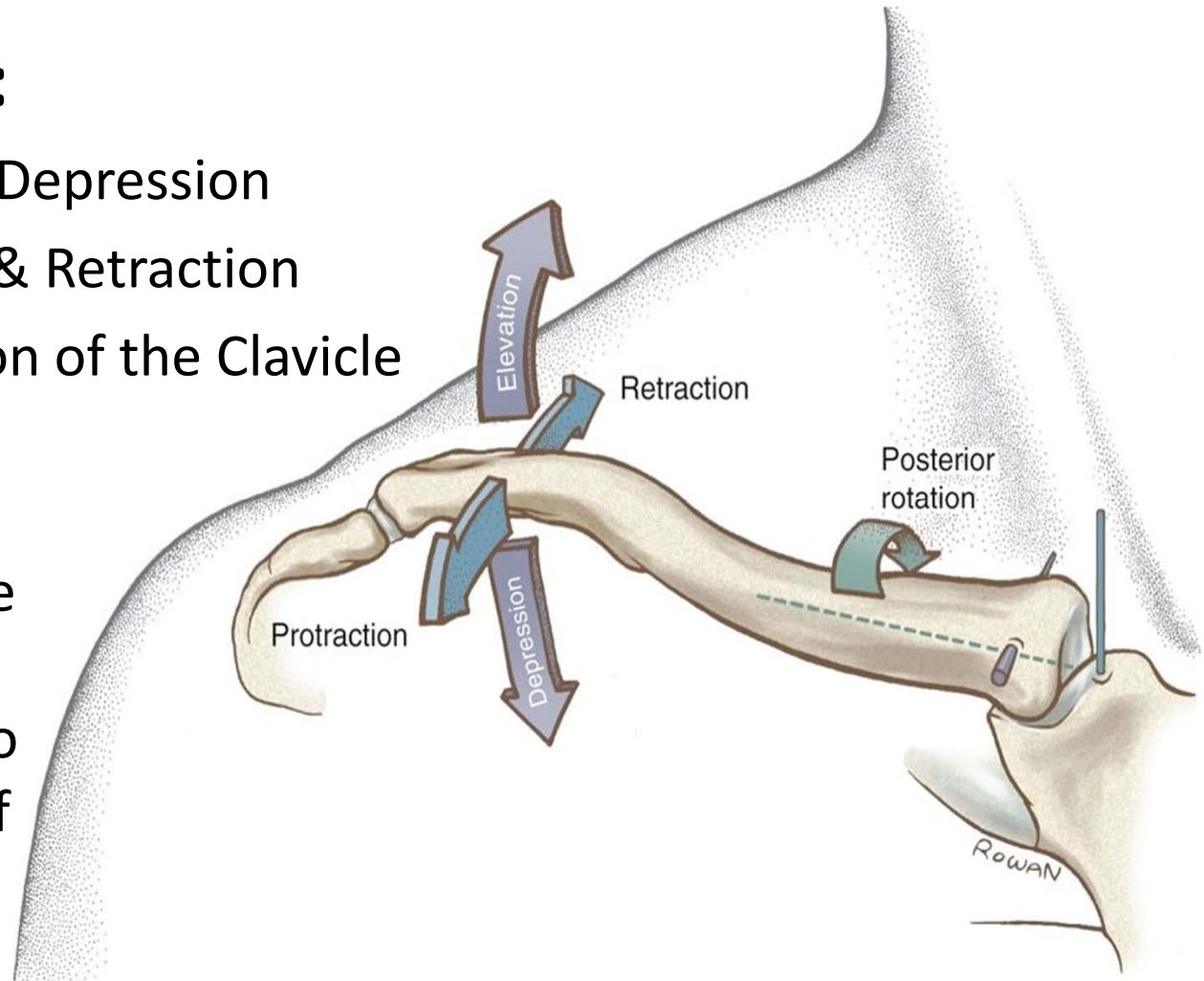
- Flattened piece of fibrocartilage
- Attaches superiorly: sternal end of the clavicle and the interclavicular ligament
- Attaches inferiorly: near the lateral edge of the clavicular facet
- Remaining outer edge of the disc attaches to the joint capsule
- Functions to assist with stabilization and shock absorption

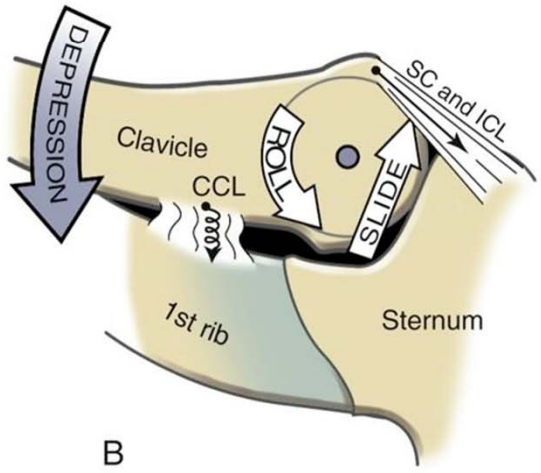
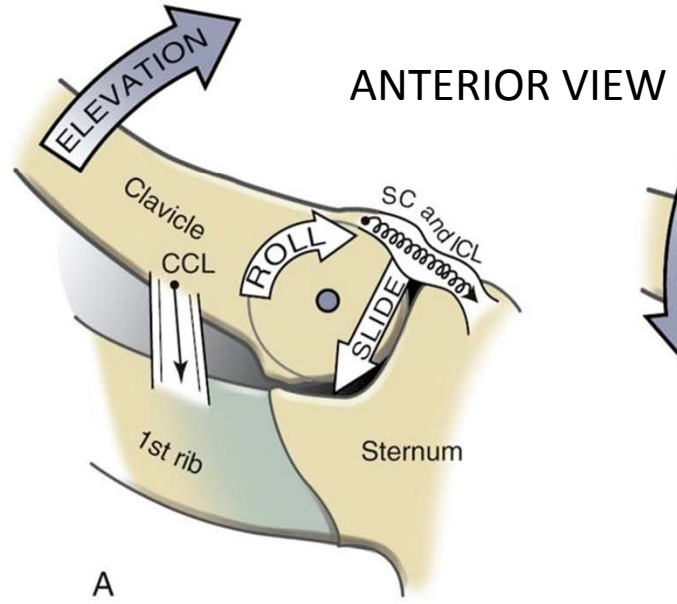
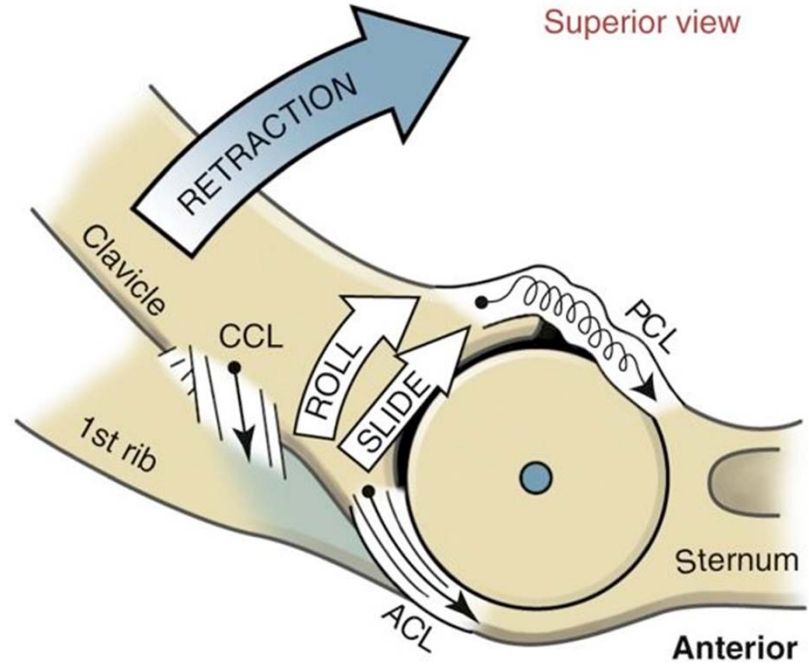
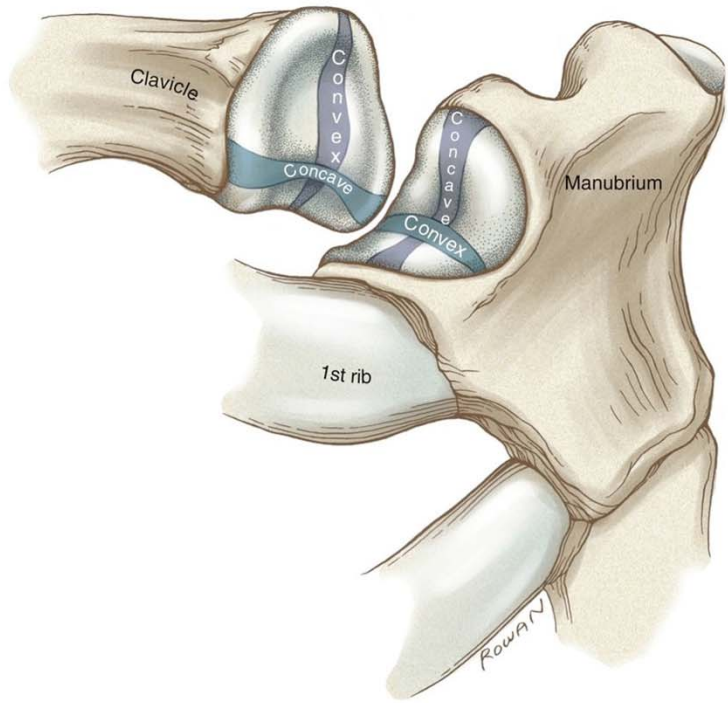
Sternoclavicular Joint

- **Kinematics:**

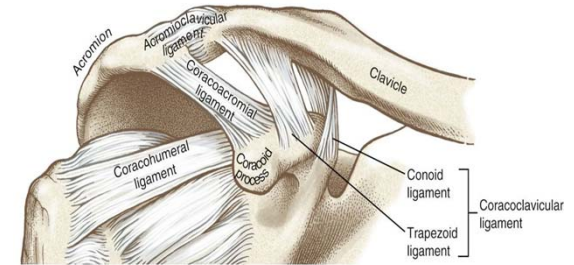
- Elevation & Depression
- Protraction & Retraction
- Axial Rotation of the Clavicle

GOAL: Position the scapula in an optimal position to accept the head of the humerus





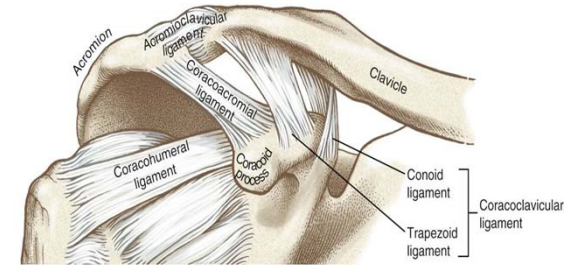
Acromioclavicular Joint



- **General features:**

- Articulation between the lateral end of the clavicle and the acromion of the scapula
- An articular disc is present in most AC joints
- Gliding or Plane Joint (flat contour of the surfaces)
- Because of these surfaces being relatively “flat” the AC joint does not have specific arthrokinematic rules although it has been stated the clavicle may be convex related to a concave acromion (opposite)

Acromioclavicular Joint



- **Periarticular Tissue:**

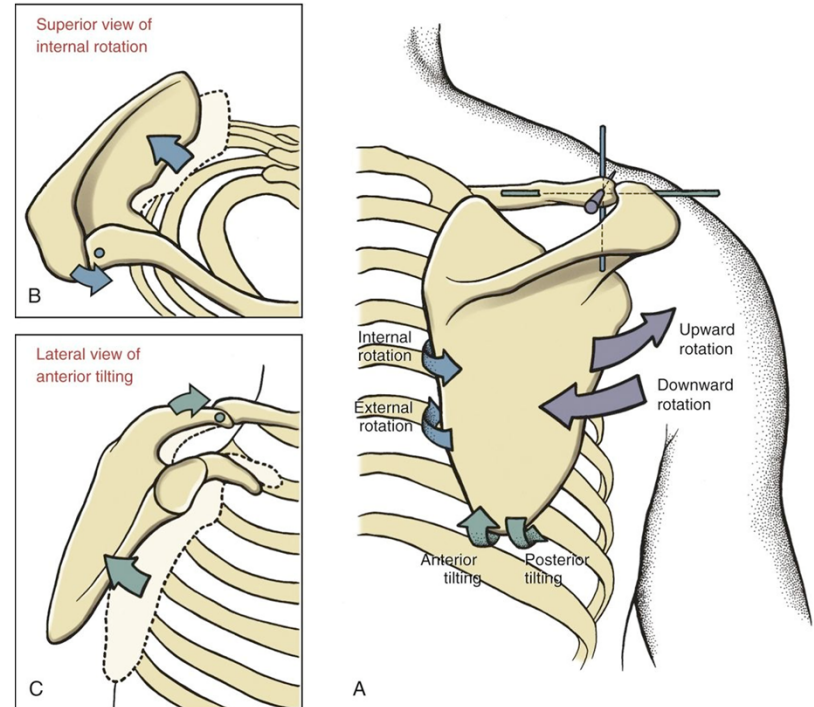
- Enclosed by a capsule
- Supported by the **superior and inferior acromioclavicular ligaments**
- Extrinsic stability via the **coracoclavicular ligament** which has 2 distinct parts: **Trapezoid** and **Conoid ligaments**
- Articular disc; not always present and sometimes only partially there (complete disc in only 10% of the population)

Acromioclavicular Joint

- **Kinematics:**

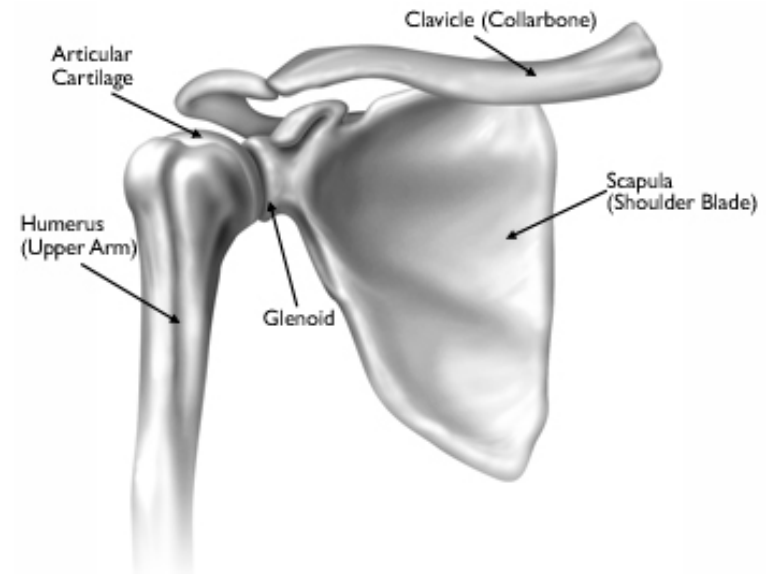
- Upward & Downward Rotation
- *Horizontal Plane Adjustments*
- *Sagittal Plane Adjustments*

GOAL: Assist in the positioning (and motion) of the scapula on the thorax with shoulder movements



Glenohumeral Joint

- True ball and socket relationship
- Clinical importance of humeral head retroversion (~130 - 150 degrees): it hides the humeral head from direct palpation by placing the greater tuberosity more anteriorly
- Glenoid of the scapula sits at a 30-45 degree angle in the coronal plane (scaption)
- Glenoid fossa surface contact is 1/3 the size of the humeral head leading to increased mobility at the expense of decreased stability



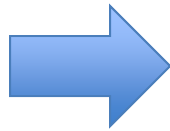
Glenohumeral Joint (Basics)

- Concave Surface: glenoid fossa
- Convex Surface: humeral head
- Closed Pack Position: 90° Abduction and ER
- Resting Position: 55° scaption with mild external rotation and 30 ° horizontal adduction
- Capsular Pattern: ER > Abd > IR

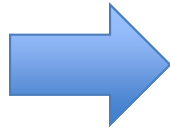
Glenohumeral Joint (Basics)

- **Shoulder glides:** (convex surface moving on a stable concave component) = motion = OPPOSITE

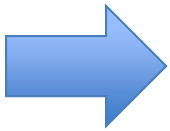
- **Posterior glide**
– FLEXION + IR



- **Anterior glide**
– EXTENSION + ER



- **Inferior glide**
– ABD



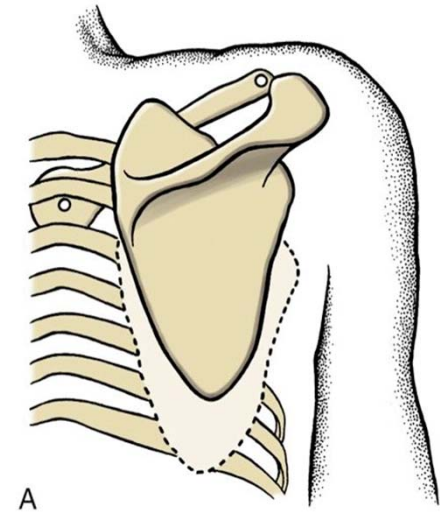
Distraction



Scapulothoracic Joint

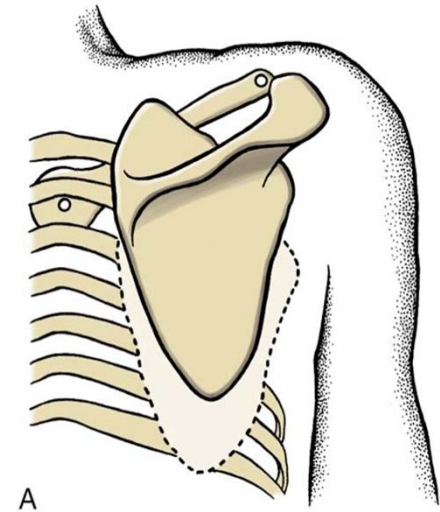
- **General features:**

- Not a true joint
- Serves as a point of contact between the anterior surface of the scapula and the posterior-lateral wall of the thorax
- Positioned between 2nd and 7th ribs and ~ 6 cm from the spine (medial border)
- Average resting posture of the scapula
 - 10° of anterior tilt
 - 5-10° of upward rotation
 - 35° of internal rotation (scapular plane)

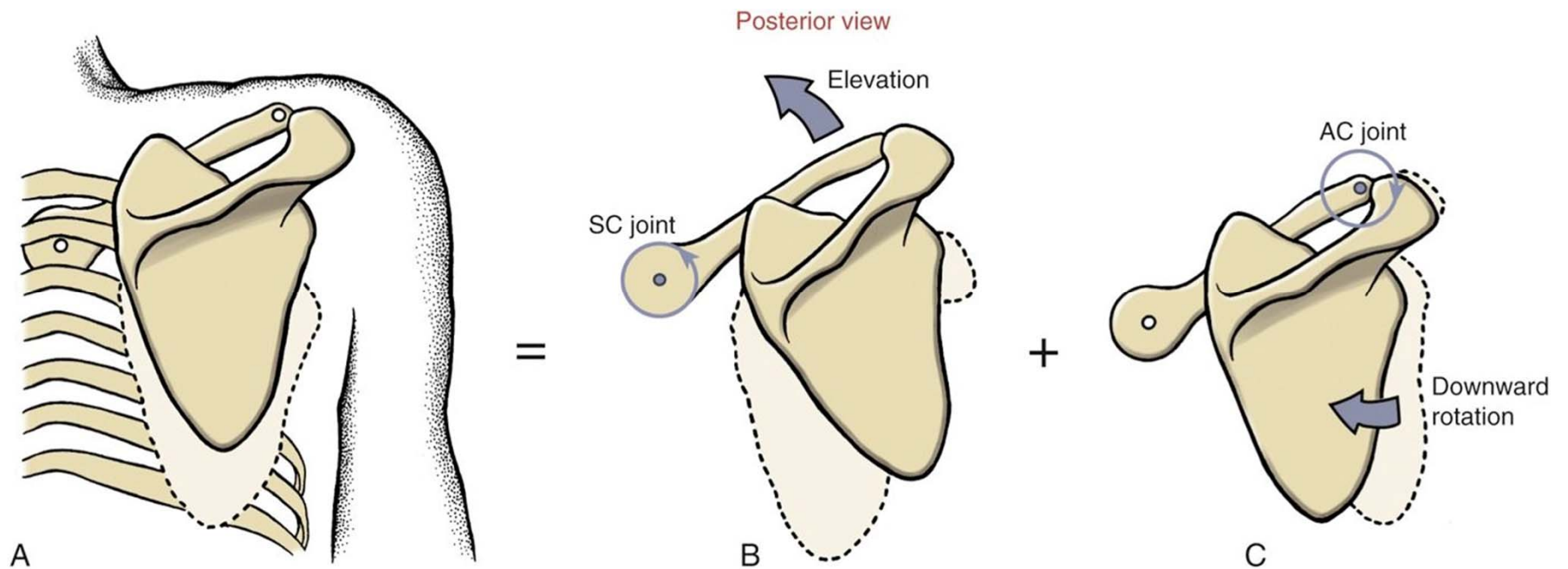


Scapulothoracic Joint

- **Kinematics:**
 - Elevation & Depression
 - Protraction & Retraction
 - Upward & Downward Rotation

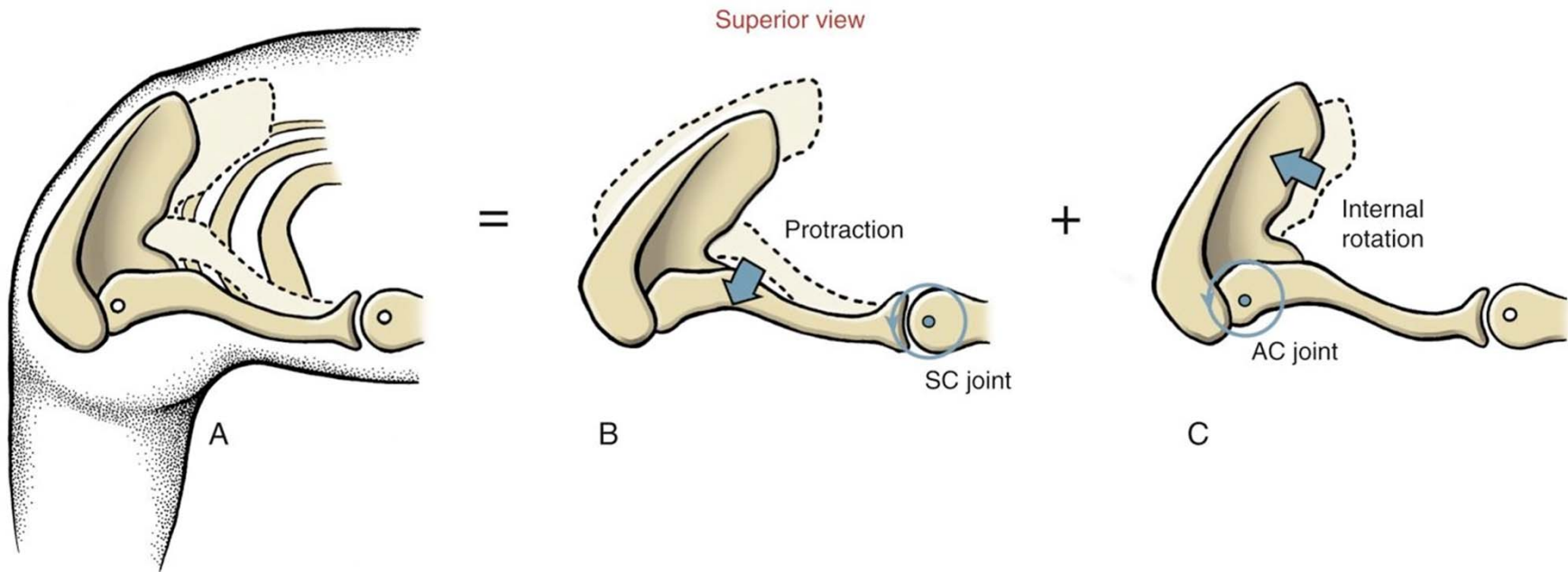


Scapulothoracic Elevation & Depression



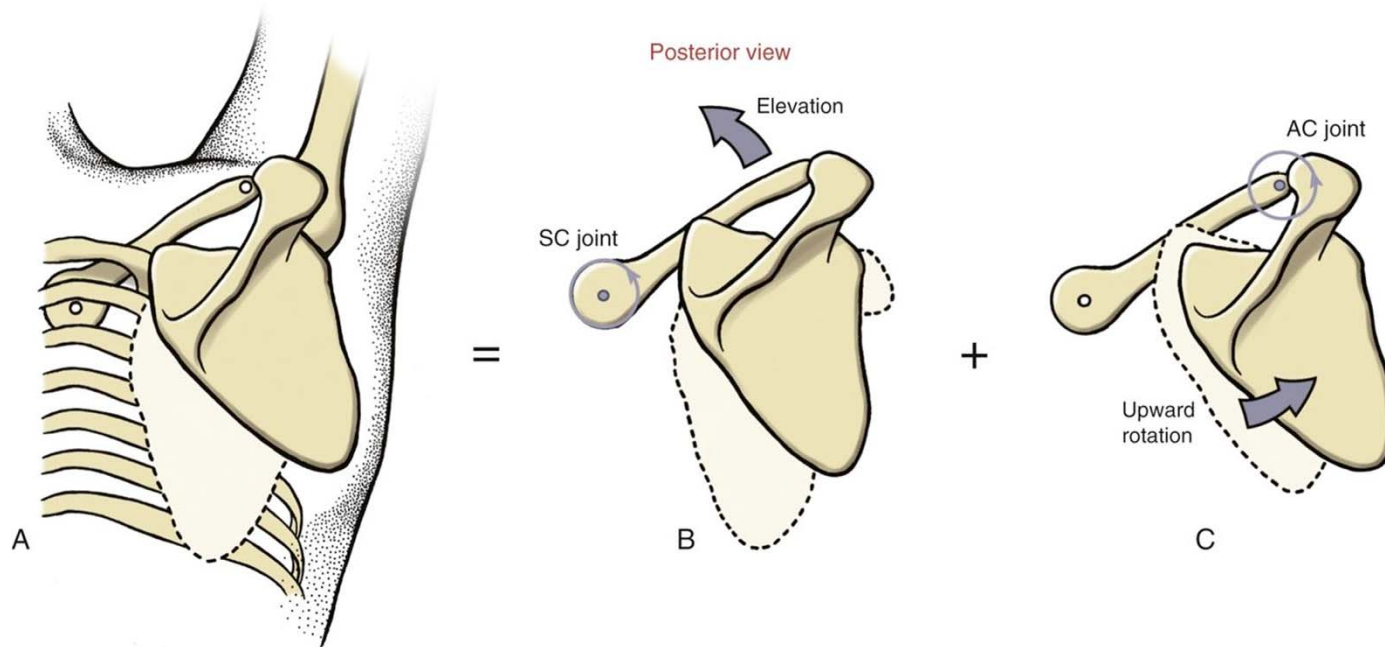
**Elevation is shown – the reverse would be true for depression

Scapulothoracic Protraction & Retraction



**Protraction is shown – the reverse would be true for Retraction

Scapulothoracic Upward & Downward Rotation



**Upward Rotation is shown – the reverse would be true for Downward Rotation

Shoulder Sheet Assignment

- In pairs take the next 20 minutes to complete this sheet we will then go over the answers as a group to make sure we are all on the same page (I will call on random students to complete)
- This will be helpful as you start to establish primary hypothesis for both muscle function / source as well as nerve palsy deficits / issues



Summary

- The role the AC and SC joint play in shoulder movement
- Know the motions of the shoulder and scapula in regards to the osteokinematics and arthrokinematics
- Glides for the GHJ and what motion they theoretically attempt to achieve according to the concave / convex rule
- Muscle groups associated with GHJ and Scapulohumeral (STHJ) movements

