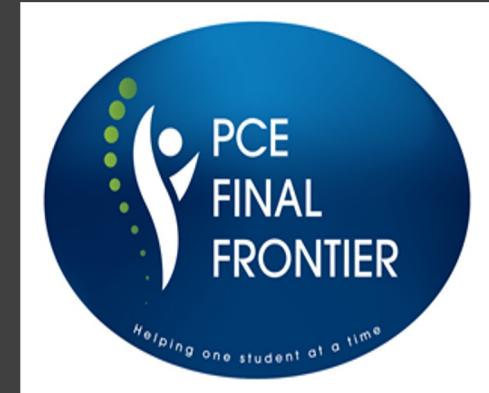


# Shoulder Joint

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SC joint – Saddle Joint

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AC joint – Plane synovial Joint

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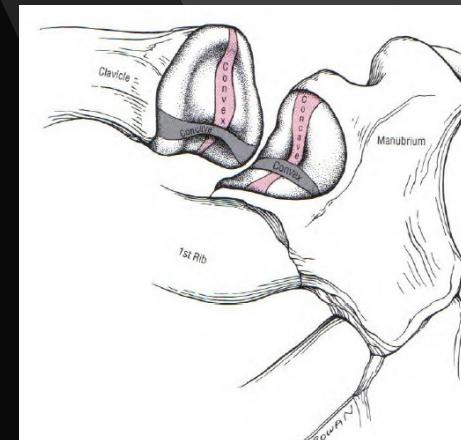
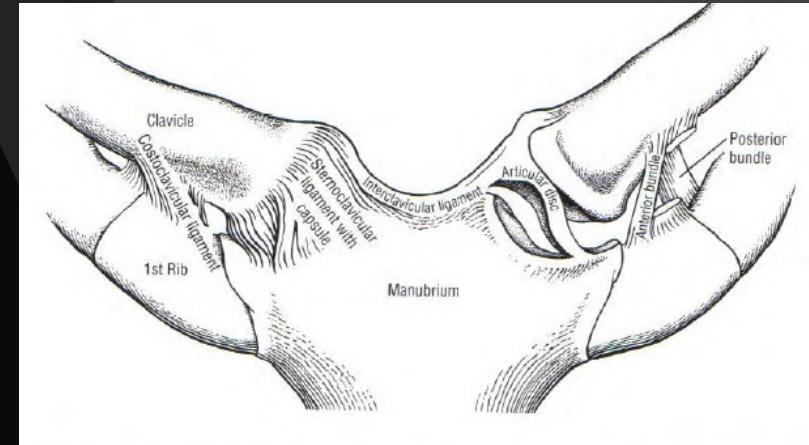
GH joint – Ball & Socket joint

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ST joint – Not a true joint

# Sternoclavicular joint

- Consist of Intra-Articular Disc and Sternoclavicular ligament.
- Movements possible –
  1. Elevation
  2. Depression
  3. Protraction
  4. Retraction
  5. Rotations – Anterior and Posterior



# Arthrokinematics of SC joint



- Two types of translations occur at this joint anterior to posterior and superior to inferior.
- **Protraction/ Retraction-** This is anterior to posterior direction movement. Moving surface is concave surface of medial end of clavicle moves on the convex surface so glide is in the same direction.
- **Elevation/ Depression-** Convex surface of lateral end of clavicle is the moving surface and hence the glide is in the opposite direction.

## BOX 17.2 Summary of Arthrokinematics of the SC Joint

Physiological Motion of the Clavicle	Roll	Slide
Protraction	Anterior	Anterior
Retraction	Posterior	Posterior
Elevation	Superior	Inferior
Depression	Inferior	Superior

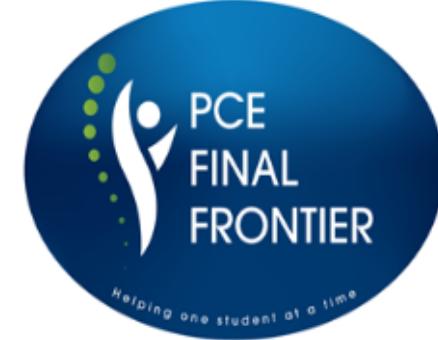


# Acromioclavicular joint

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- Articulations – Acromion process of scapula and lateral end of clavicle
- Major ligament – Acromioclavicular ligament and coracoclavicular ligament.
- AC joint dislocation – Fall on tip of shoulder (medial-Inferior forces)
- Movements of the scapula by the lateral end of clavicle may include upward and downward rotations, where scapula swings upward and outward, downward and inward respectively.
  - Movements of scapula against thorax includes internal and external rotations, Anterior & posterior tilting.

# Acromioclavicular Joint

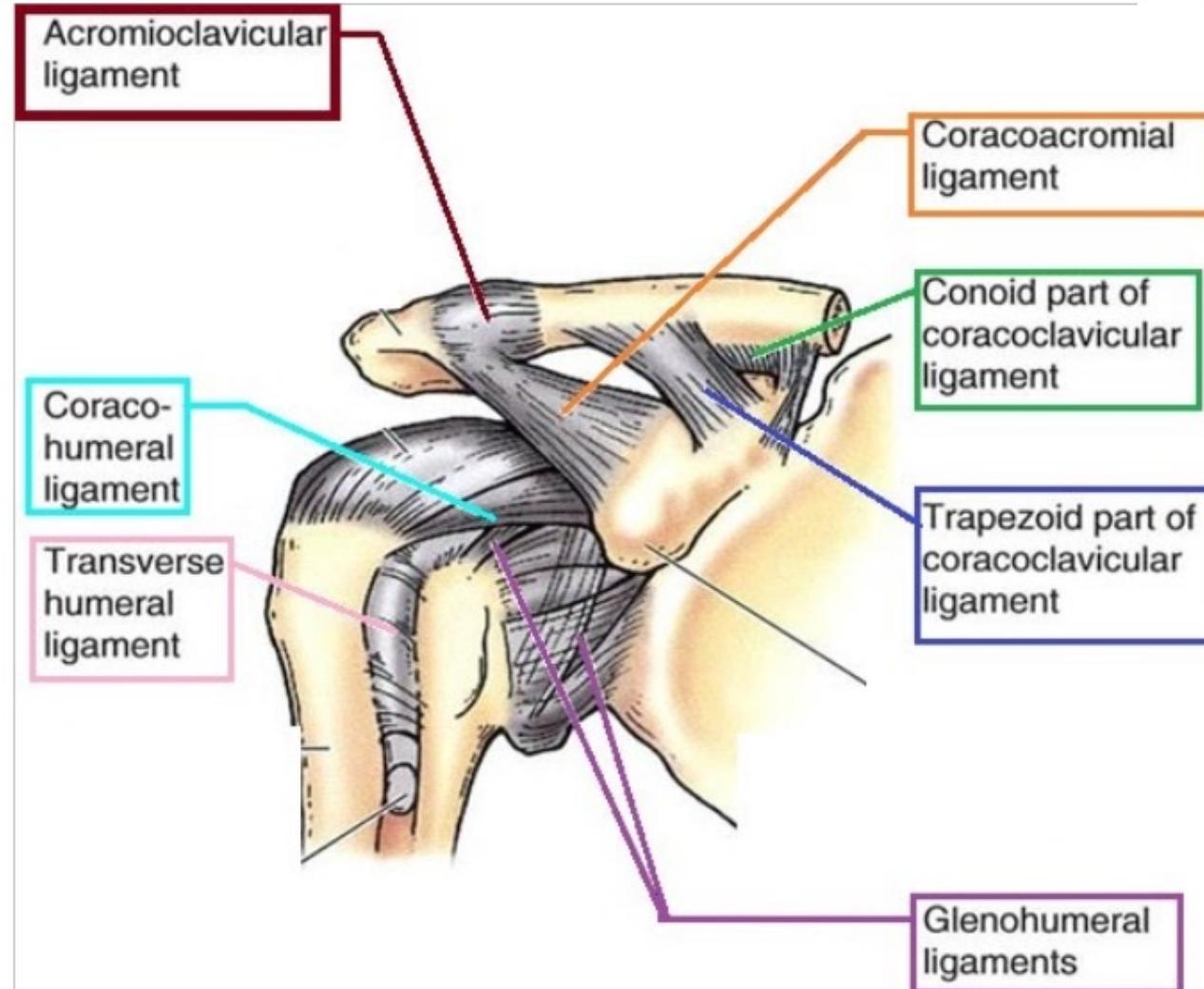
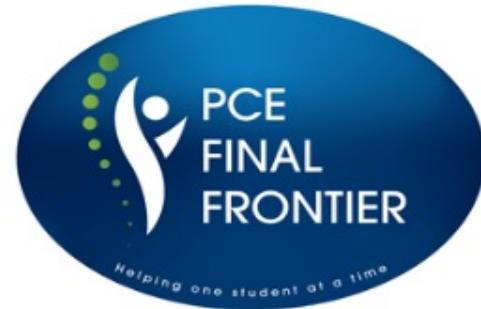


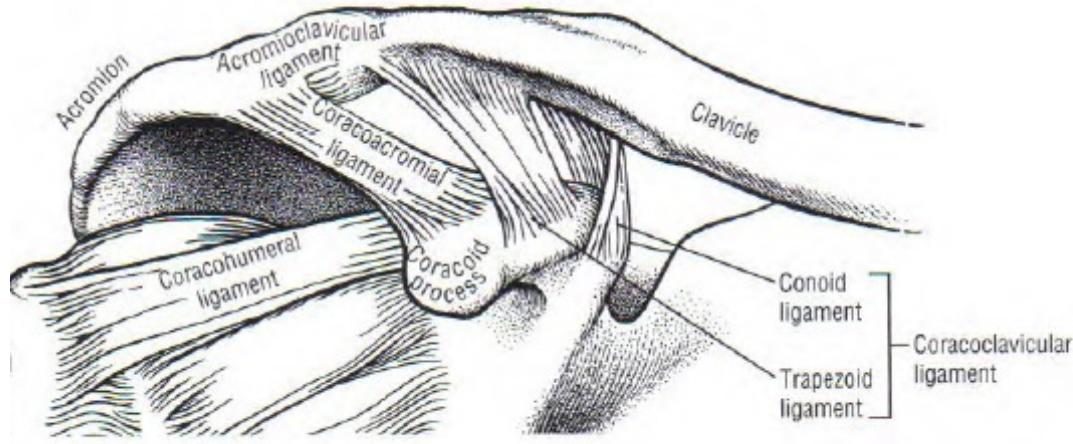
- The AC joint is a plane, triaxial joint.
- **Ligaments**- Superior and inferior AC ligaments, Strong coracoclavicular ligaments
- **Open pack position**- Arm resting by side in normal physiological position
- **Closed pack position**- 90 degrees abduction
- **Capsular pattern**- Pain at extremes of ROM, especially horizontal adduction and full elevation.
- **Arthrokinematics of AC joint**- The convex bony surface is facet on the lateral end of clavicle and moving surface is concave bony surface of acromion of the scapula .  
AC joint only contributes approximately 5-8 degrees of the rotation.



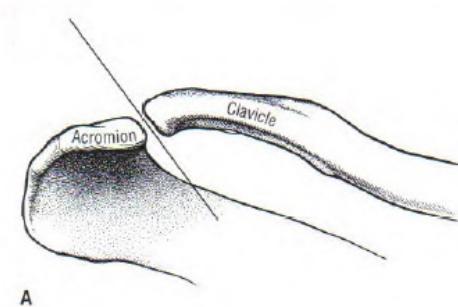
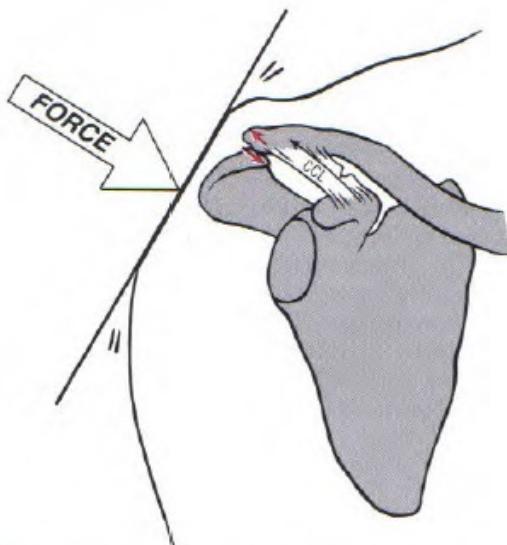
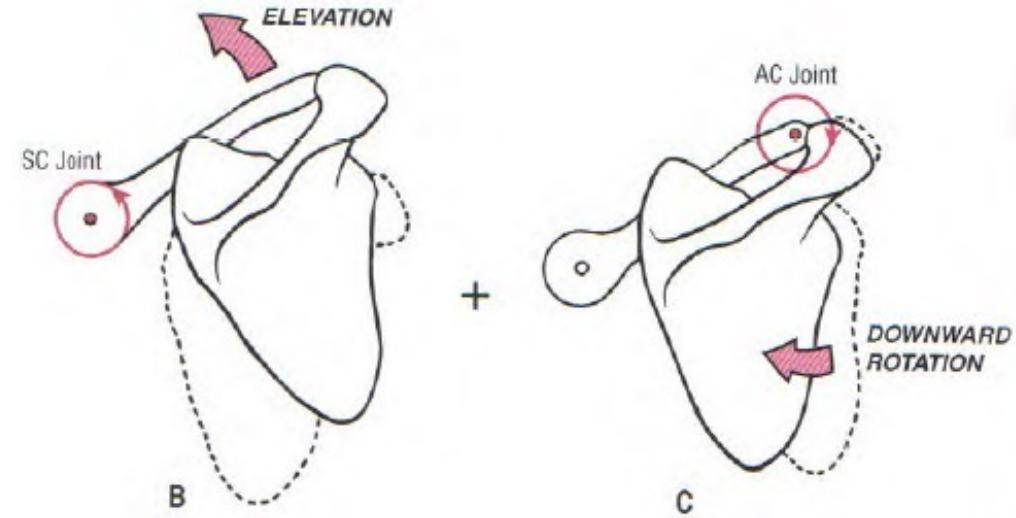
Always **Anterior glide** is used for AC joint

# AC joint ligaments

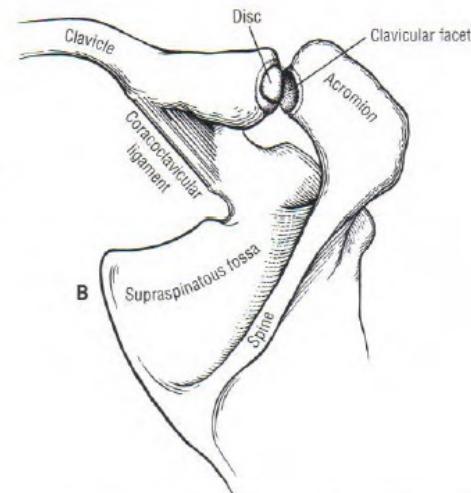




Posterior view



A

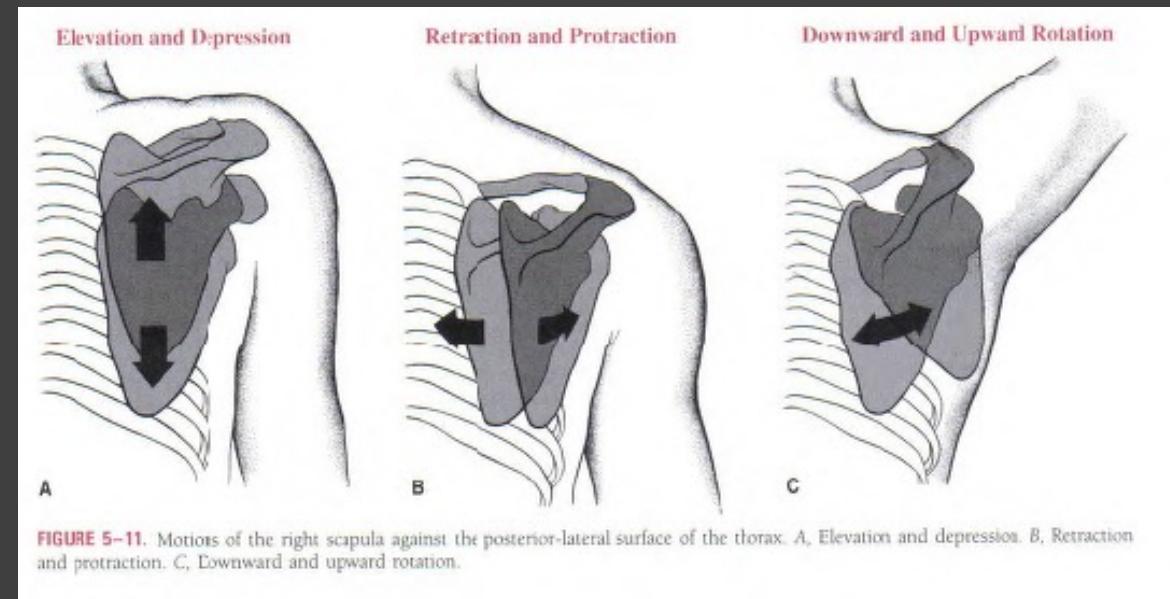


B

**FIGURE 5-17.** The right acromioclavicular joint. A, An anterior view showing the sloping nature of the articulation. B, A posterior view of the joint opened up from behind, showing the clavicular facet on the acromion and the disc.

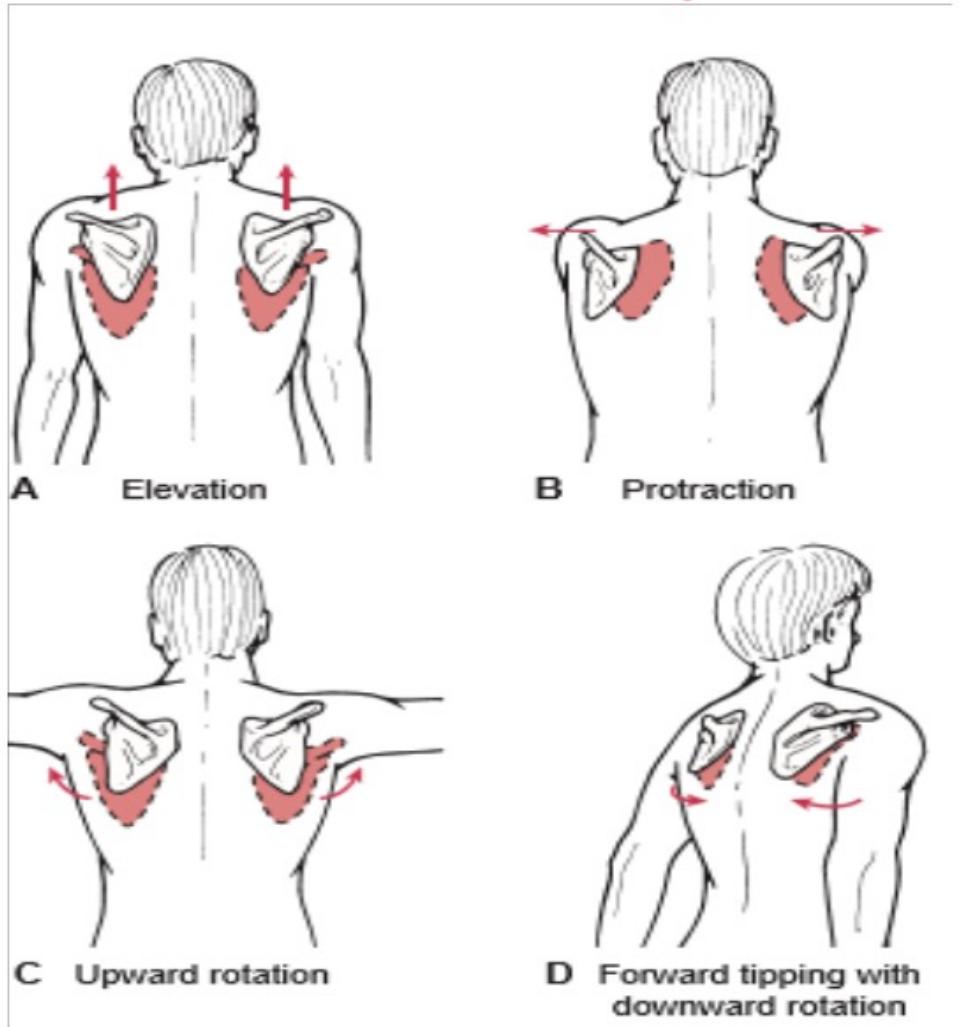
# Scapulothoracic joint

- The joint separated by Subscapularis, Serratus Anterior and Erector Spinae.
- Movements possible –
  1. Elevation and Depression
  2. Protraction and Retraction
  3. Upwards and Downward Rotation

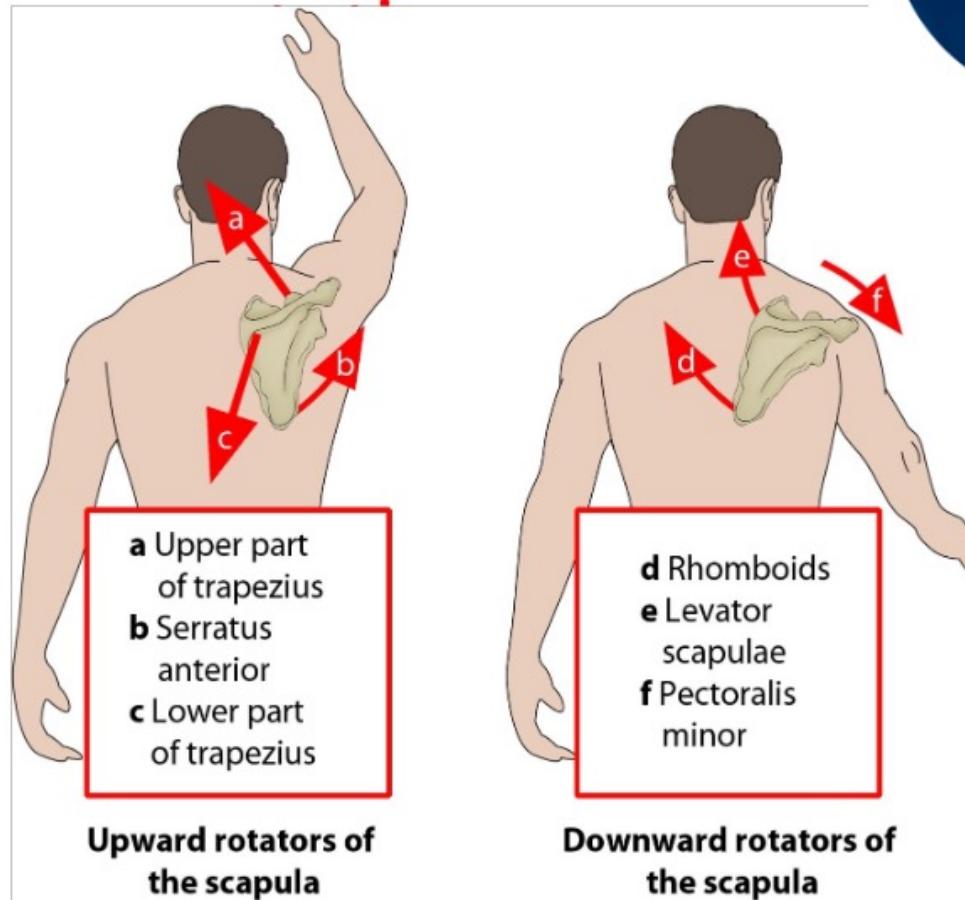


**FIGURE 5–11.** Motions of the right scapula against the posterior-lateral surface of the thorax. A, Elevation and depression. B, Retraction and protraction. C, Downward and upward rotation.

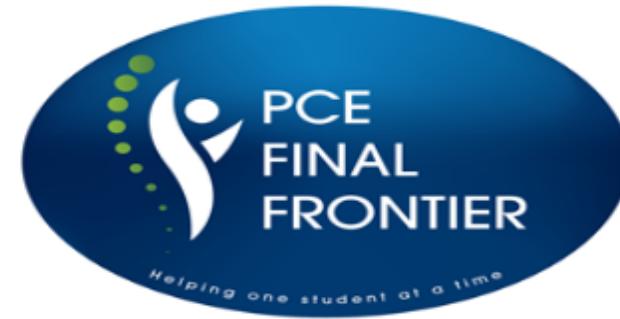
# Actions of scapula



# Muscles responsible for upward and downward



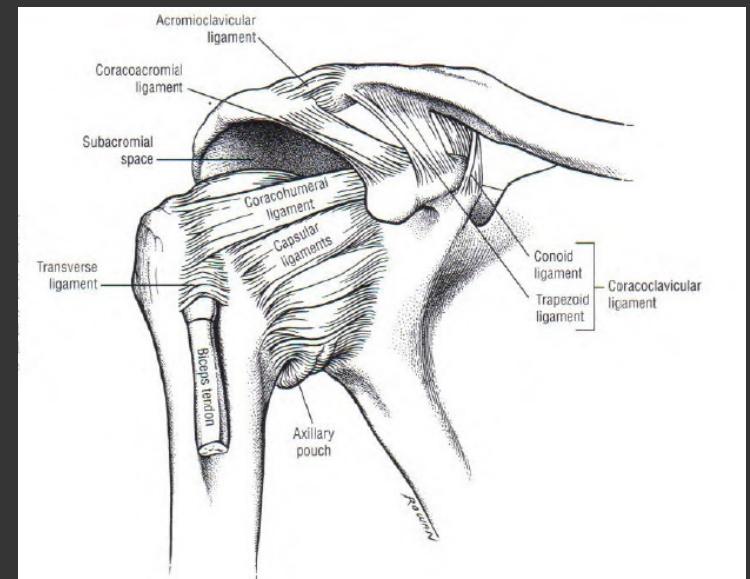
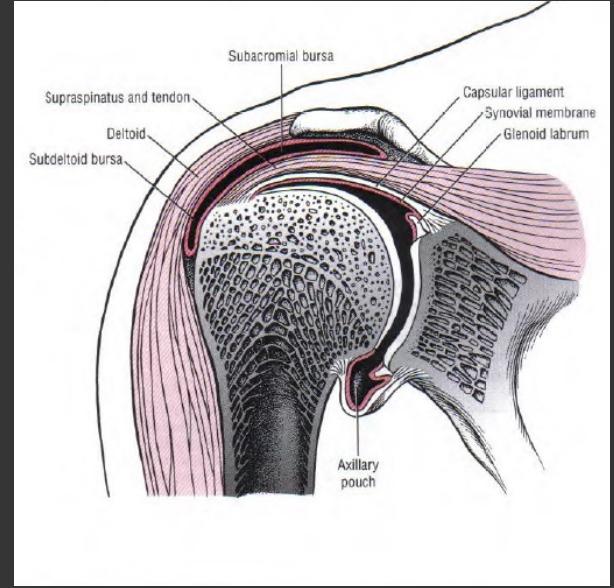
# Observation



- **Atrophy of the trapezius** may indicate compromise of the spinal accessory nerve.
- Atrophy of the trapezius is characterized by the appearance of a shoulder girdle that droops in association with a protracted inferior border of the scapula and an elevated acromion.
- **Atrophy of the serratus anterior muscle** can create a prominent superior medial border of the scapula and a depressed acromion

# Glenohumeral Joint

- Glenoid fossa – Anterior-lateral plane of scapula
- GH Joint stability –
  1. GH Capsule
  2. Long Head of Biceps
  3. Rotator cuff muscles (Dynamic Stabilizers) – SITS
- Superior Longitudinal Ligament – prevents adduction
- Middle longitudinal ligament- prevents External rotation
- Inferior Longitudinal Ligament – Axillary pouch: gets taught in 90 degrees of abduction, external rotation
- Coracohumeral ligament - prevents adduction, inferior translation of humeral head and external rotation

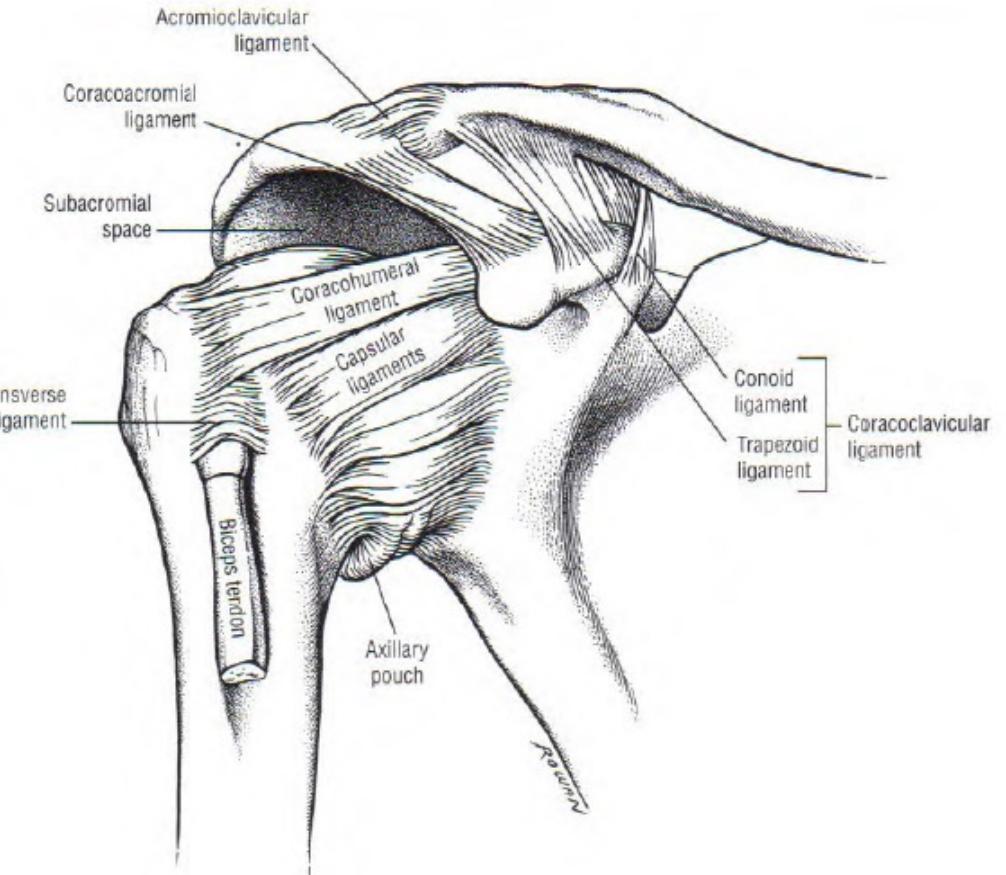
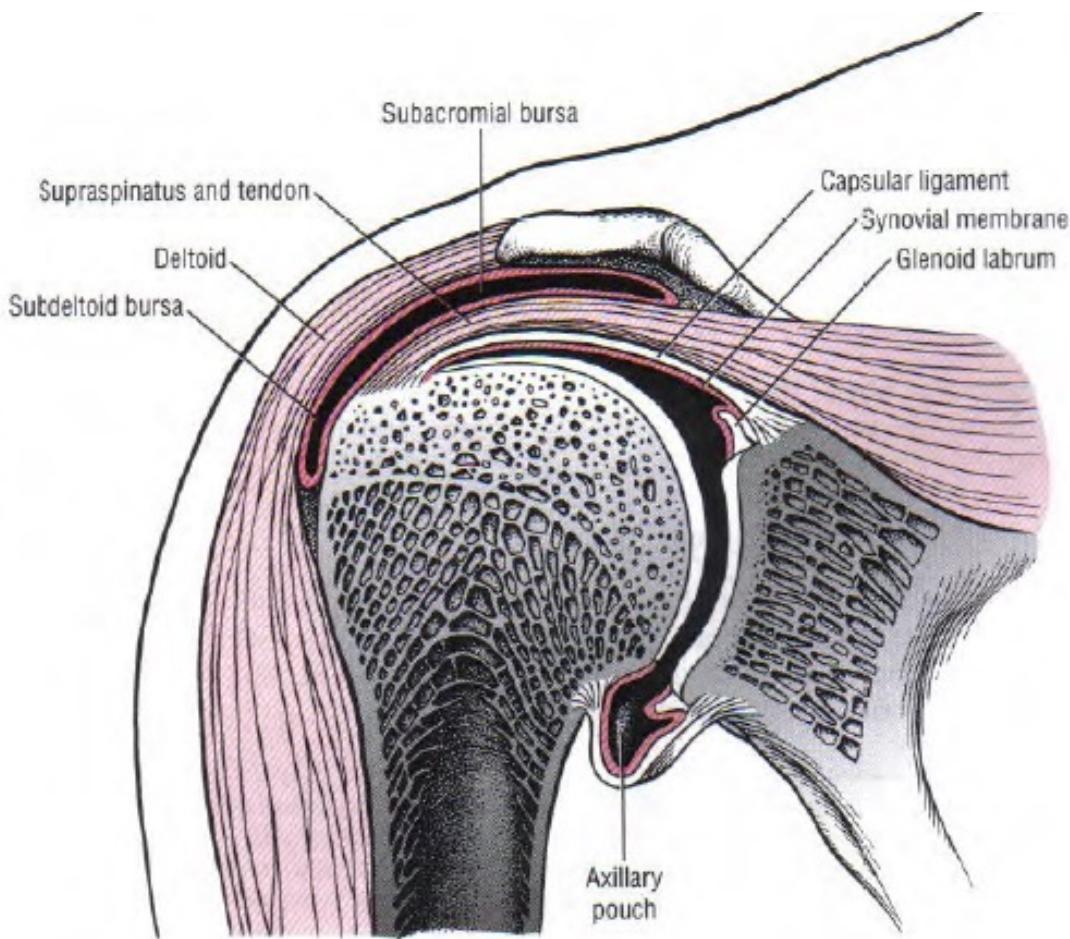


# Arthrokinematics of GH joint

- GH joint has a concave glenoid fossa and convex humeral head.
- According to concave- convex rule, moving surface is the convex humeral head so glide will be in the **opposite** direction.

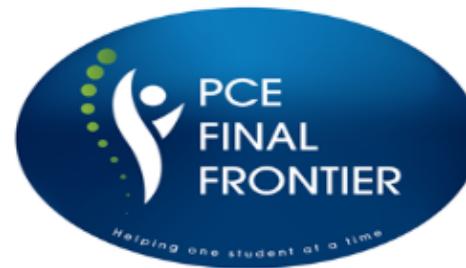
## BOX 17.1 Summary of Joint Arthrokinematics of the GH Joint

Physiological Motion of the Humerus	Roll	Slide
Flexion		Spin (minimal roll and slide)
Horizontal adduction	Anterior	Posterior
Internal rotation at 0° Abduction	Anterior	Posterior
Extension		Spin (minimal roll and slide)
Horizontal abduction	Posterior	Anterior
External rotation at 0° Abduction	Posterior	Anterior
Abduction	Superior	Inferior



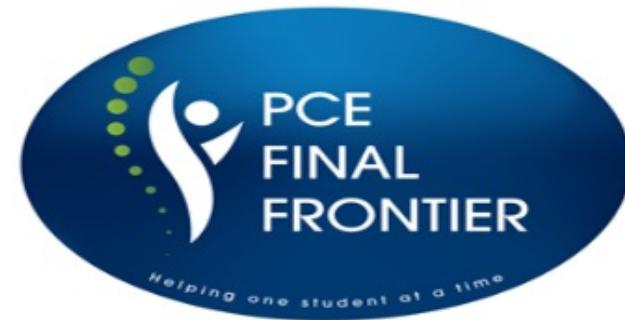
as a broad sheet to the ante-

The GH joint capsule receives additional reinforcement



# Scapulohumeral Rhythm

- Motions of the scapula synchronous with motions of the humerus, which allows 150 to 180 degrees of shoulder ROM into flexion or abduction with elevation.
- The ratio is **2:1** (2 degrees of glenohumeral motion to 1 degree of scapular rotation)
- Setting Phase- 0 to 30 degrees of abduction , 0 to 60 degrees of flexion primarily at GH joint, whereas scapula seeks a stable position.
- During mid range of humeral motion, scapula has greater motion 1:1 ratio with the humerus.



**TABLE 5–3.** Summary of the Major Kinematic Events during Shoulder Abduction<sup>†,†</sup>

	SC Joint	AC Joint	Scapulothoracic Joint	GH Joint
Early phase 0 to 90 degrees	25 degrees of elevation	5 degrees of upward rotation	30 degrees of upward rotation	60 degrees of abduction
Late phase 90 to 180 degrees	5 degrees of elevation and 35 degrees of posterior rotation of the clavicle	25 degrees of upward rotation	30 degrees of upward rotation	60 degrees of abduction
Total 0 to 180 degrees	30 degrees of elevation and 35 degrees of poste- rior rotation of the clavi- cle	30 degrees of upward ro- tation	60 degrees of upward rotation	120 degrees of abduction

# Static Stability of Shoulder – compression forces

- **Superior capsular structures –**

1. Superior capsular ligament
2. Coracohumeral ligament
3. Supraspinatus muscle

Rotator cuff muscles controlling Arthrokinematics of Abduction

**Supraspinatus** – Drives the superior roll

Compresses the humeral head against glenoid fossa

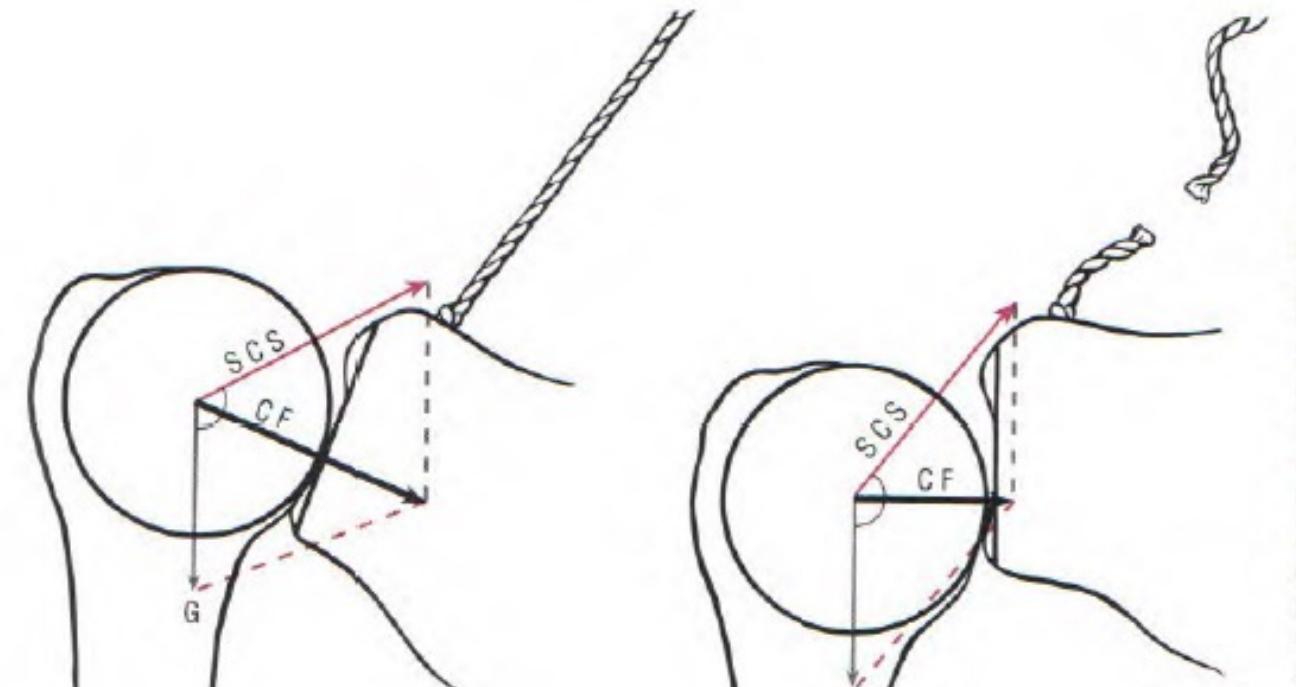
Creates space above humeral head, to prevent excessive translation of humerus

**Infraspinatus, Teres Minor and Subscapularis**

Exert a depression on humeral head

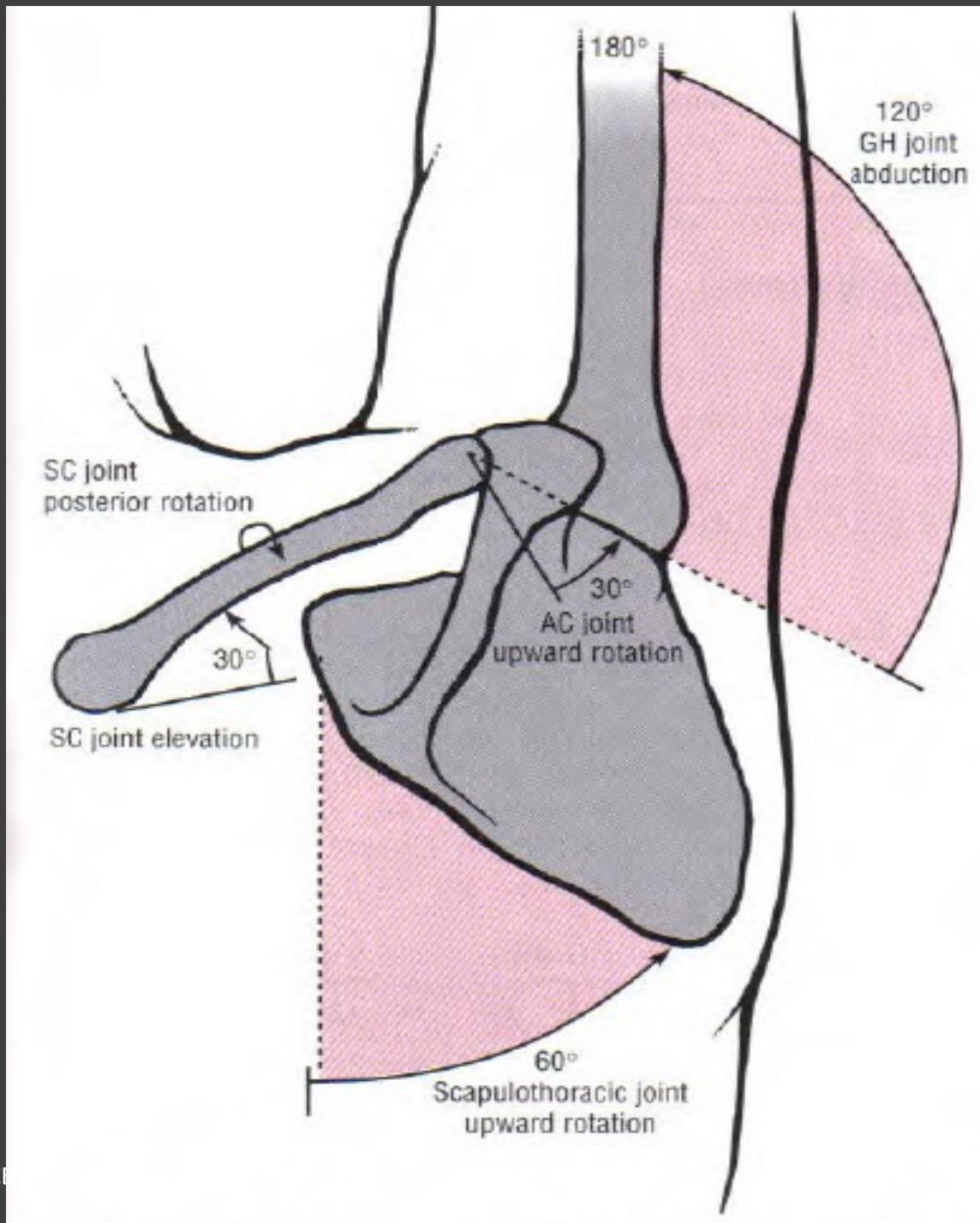
**Infraspinatus and Teres Minor**

Externally rotate the humerus.



# Shoulder joint complex full abduction

- 2:1 Scapulohumeral rhythm
- Coordination of Sc and AC joint
- Clavicle retraction
- Posterior tilting and external rotation of scapula
- Clavicle posterior rotation
- GH external rotation



# Primary muscles – Scapulothoracic joint

## **Elevators**

Upper trapezius

Levator Scapulae

Rhombooids

## **Retractors**

Middle trapezius

Rhombooids

Lower trapezius

## **Downward Rot**

Rhombooids

Pectoralis minor

## **Depressors**

Lower trapezius

Latissimus Dorsi

Pectoralis minor

Subclavius

## **Protractors**

Serratus anterior

## **Upwards Rotation**

Serratus Anterior

Upper and Lower trapezius

# Muscles Elevation of arm

- **GH joint Muscles**

Anterior and middle joint

Supraspinatus

Coracobrachialis

Biceps

## **ST joint**

Serratus anterior

Trapezius

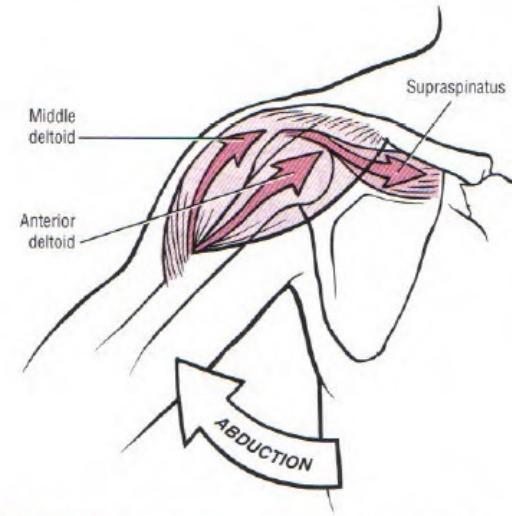
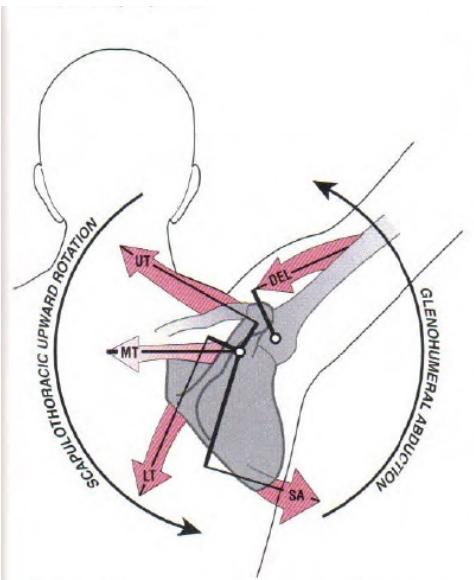
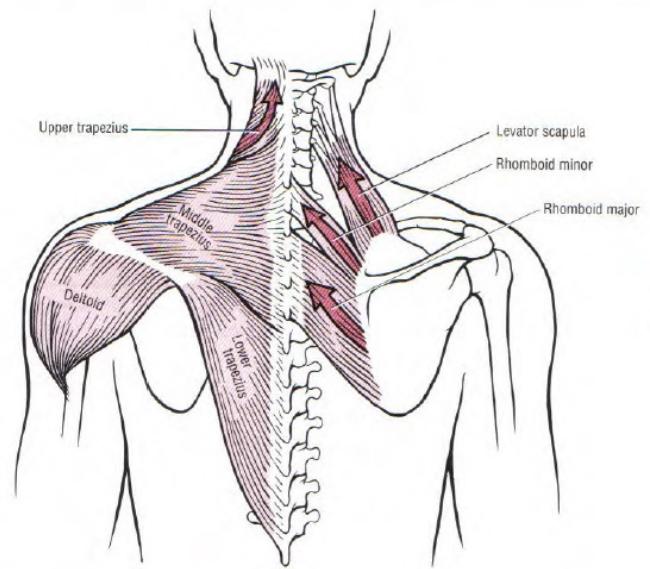
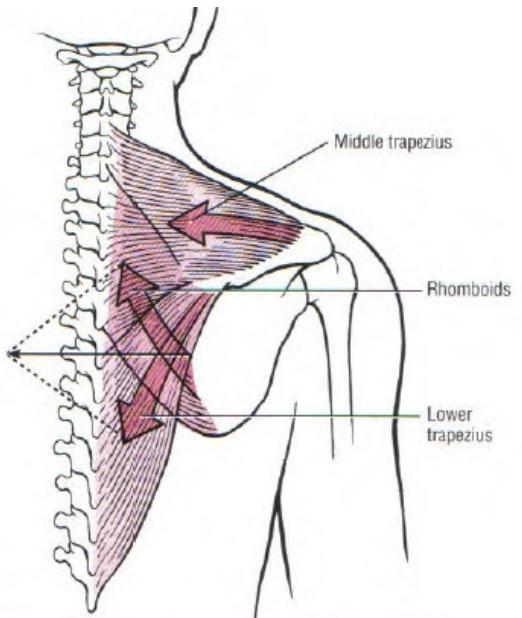
## **Rotator cuff muscles**

Supraspinatus

Infraspinatus

Teres Minor

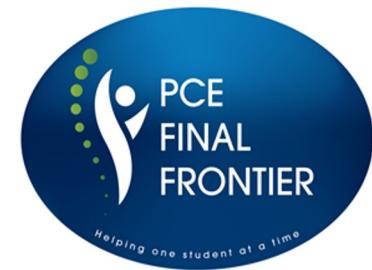
Subscapularis



## PATIENT HISTORY

1. **Patient's age-** Why it is important??

- a) **Rotator cuff degeneration** usually occurs in patients who are between **40 and 60 years** of age.
- b) **Primary impingement** due to degeneration and weakness is usually seen in patients **older than 35**, whereas **Secondary impingement** due to instability caused **by weakness** in the scapular or humeral control muscles is more common in people in **their late teens or twenties**, especially those involved in vigorous overhead activities, such as swimmers or pitchers in baseball.
- c) **Calcium deposits** may occur between the ages of **20 and 40**.
- d) **Chondrosarcomas** may be seen in those older **than 30 years** of age
- e) **Frozen shoulder** is seen in persons between the ages of **45 and 60 years** if it results from causes other than trauma



### **Observation:**

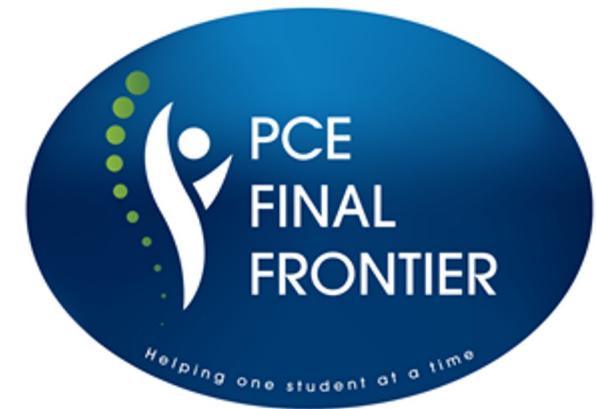
An examiner can observe if the patient supports the upper limb in a **protected position** or hesitate to move it. This action could mean that one of the joints of the shoulder complex is **unstable** or that there is an acute problem in the shoulder.

### **Mechanism of injury:**

- Fall on out-stretched hand (**FOOSH**), which could indicate a **fracture or dislocation** of the **glenohumeral joint**.
- If the patient fell on or receive a blow to the tip of the shoulder, or if the patient landed on the elbow, driving the humerus up against the acromion. This finding may indicate an **acromioclavicular dislocation or subluxation**.
- Overuse injuries are more evident immediately after the patient does repeated activity. This may indicate gross or anatomical instability, such as in recurrent shoulder dislocation, subluxation, or subtle translational instability.

## Movements or positions that cause pain or symptoms:

- **Cervical spine** movements may cause pain in the shoulder.
- Anterior instability – Lateral rotation (EXAMPLE - Pitchers)
- Long head of biceps pathology - PAIN with medial and lateral rotation of the shoulder.
- **DEAD ARM SYROME** –
- **Secondary impingement** implies that although impingement signs are present, they result from a primary problem somewhere else, commonly in the scapular or humeral control or stabilizer muscles.
- **Primary impingement** implies that impingement or pinching is the primary cause of the pain.
- **Night pain and resting pain** - rotator cuff, Tumor
- **Arthritis** - ?
- **Acromioclavicular pain** - is especially evident at greater than 90° of abduction and tends to be localized to the joint. Similarly, sternoclavicular pain is localized to the joint and increases on horizontal adduction.



**Extent and behavior of patient's pain:**

- a) Deep, boring, toothache-like pain in the neck, shoulder region, or both may indicate **Thoracic Outlet Syndrome** or **acute Brachial Plexus neuropathy**.
- b) Strains of the **rotator cuff** usually cause dull, toothache-like pain that **is worse at night**
- c) **Acute calcific tendinitis** usually causes a **hot, burning type of pain**.
- d) Sprain of the first or second rib from direct trauma or sudden contraction of the scaleni may mimic an acute impingement or rotator cuff injury.

**Aggravating factors:**

- a) Bicipital paratenonitis or tendinosis 35 are often seen in skiers.
- b) With chronic **overuse**, tendinosis is more likely **than paratenonitis (e.g.- Swimmers)**

**Relieving factors:**

- a) Patients with nerve root pain may find that **elevating the arm over the head relieves** symptoms.
- b) Patient with **instability or inflammatory conditions**, **lifting the arm over the head** usually exacerbates shoulder problems.

### **Functional limitations:**

- a) Is the patient able to talk or swallow? Is the **patient hoarse**? These signs could indicate an injury to the **sternoclavicular joint** (if there is swelling) or a posterior dislocation of the joint because pressure is being applied to the **trachea**.
- b) The shoulder has been overstressed or **over-used** is important. For example, in swimmers and baseball pitchers, it is important to determine.

### **How long the problem has bothered the patient:**

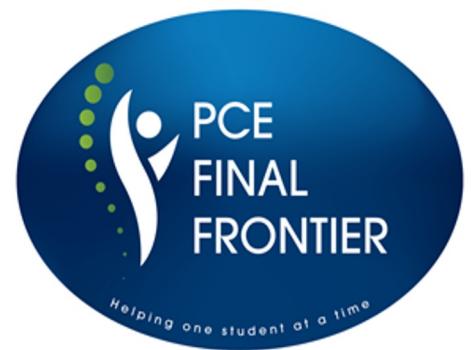
For example, an idiopathic **frozen shoulder** goes through three stages - ??

### **Is there any indication of muscle spasm, deformity, bruising, wasting, paresthesia or numbness?**

*If the patient complains of* weakness and heaviness in the limb after activity or if the limb **tires easily**, it may indicate **vascular** involvement.

Venous symptoms – Girth of the limb

Arterial symptoms – color of the limb, temperature



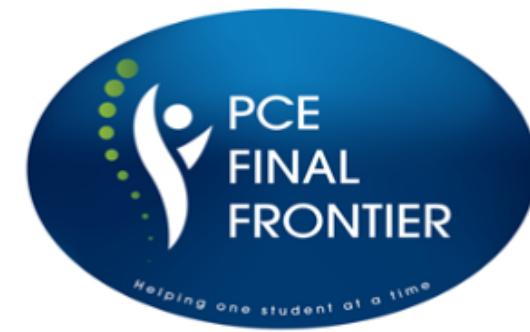
### Anterior view

- **Forward head posture -**
- Step Deformity
- Sulcus
- Anterior Dislocation of the shoulder

### Posterior view

### Scapular Mal-positioning

- When viewing the patient from behind, the examiner again notes bony and soft-tissue contours and body alignment especially The spines of the scapulae, which begin medially at the level of the third thoracic (T3) vertebra, should be at the same angle.
- The scapula itself should extend from the T2 or T3 spinous process to the T7 or T9 spinous process of the thoracic vertebrae.
- If the scapula is sitting lower than normal against the chest wall, the superior medial border of the scapula may “washboard” over the ribs, causing a snapping or clunking sound (snapping scapula) during abduction and adduction.
- Other causes of snapping may be spinal kyphosis, rounded shoulders, forward tipped scapula, and a chin poking posture.
- The inferior angles of the scapulae should be equidistant from the spine.



# Observation

- **Atrophy of the deltoid** from axillary nerve neuropathy can result in a squared appearance of the lateral shoulder, which is best observed from the front.
- **Atrophy of the posterior deltoid** can occur in patients with multidirectional instability.
- **Atrophy at the infraspinatus or supraspinatus fossa** is a hallmark of a rotator cuff tear or suprascapular nerve entrapment.
- **Wasting of the supraspinatus and infraspinatus** can be determined by pushing the examining finger into the respective muscle bellies.

# Scapular dyskinesia



Mechanism	Associated Effects
Inadequate serratus anterior activation	Lesser scapular upward rotation and posterior tilt
Excess upper trapezius activation	Greater clavicular elevation
Pectoralis minor tightness	Greater scapular medial rotation and anterior tilt
Posterior glenohumeral joint soft tissue tightness	Greater scapular anterior tilt
Thoracic kyphosis or flexed posture	Greater scapular medial rotation and anterior tilt, lesser scapular upward rotation

## Passive movements

### Passive Movements of the Shoulder Complex and Normal End Feel

Elevation through forward flexion of the arm (**tissue stretch**)

Elevation through abduction of the arm (**bone-to-bone or tissue stretch**)

Elevation through abduction of the glenohumeral joint only  
**(bone-to-bone or tissue stretch)**

Lateral rotation of the arm (**tissue stretch**)

Medial rotation of the arm (**tissue stretch**)

Extension of the arm (**tissue stretch**)

Adduction of the arm (**tissue approximation**)

Horizontal adduction (**tissue stretch or approximation**) and

Abduction of the arm (**tissue stretch**)

# Special Tests

- Speed's test
- Neer's Impingement test
- Empty Can test
- Drop Arm test
- Clunk test
- Anterior apprehension test
- Shear test
- Posterior apprehension test
- Rent sign
- Horizontal Adduction test
- Bear hug test

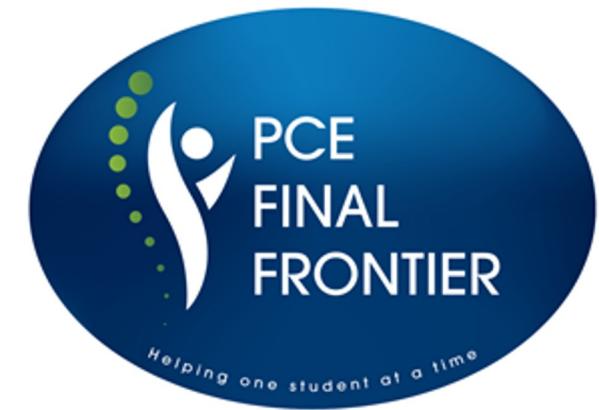


TABLE 16-32 Differential Diagnosis for Common Causes of Shoulder Pain

Condition	Approximate Patient's Age of Injury	Mechanism	Area of Symptoms	Symptoms Aggravated by	Observation	AROM	PROM	End-Feel	Pain with Resisted	Tenderness Palpation
Rotator cuff tendinitis										
Acute	20–40	Microtrauma/ macrotrauma	Anterior and lateral shoulder	Overhead motions	Swelling— anterior shoulder	Limited abduction	Limited abduction		Abduction	Pain below anterior acromial rim
								ER		
Chronic	30–70	Microtrauma/ macrotrauma	Anterior and lateral shoulder	Overhead motions Atrophy of shoulder area	Atrophy of scapular area	Limited abduction and flexion	Pain on IR and ER at 90-degree abduction		Abduction Pain below anterior acromial rim	Anterior shoulder
								ER IR		
Bicipital tendinitis	20–45	Microtrauma	Anterior shoulder	Overhead motions May see signs of concomitant rotator cuff pathology	Possible swelling— anterior shoulder Pain on full flexion from full extension	Limited ER when arm at 90-degree abduction Biceps stability test may be abnormal (if tendon unstable)	Pain on combined extension of shoulder and elbow	Speed test painful, Yergason test occasionally painful	Elbow flexion	Of biceps tendon over bicipital groove
Rotator cuff rupture	40+	Macrotrauma	Posterior/ superior shoulder	Arm elevation	Atrophy of scapular area Pain with or without restriction	Limited abduction	Full and pain free	ER	Abduction	Pain below anterolateral acromial rim

TABLE 16-32 Differential Diagnosis for Common Causes of Shoulder Pain (Continued)

Condition	Approximate Patient's Age	Mechanism	Area of Symptoms	Symptoms Aggravated by		Observation	AROM	PROM	End-Feel	Pain with Resisted	Tenderness Palpation
Adhesive capsulitis	35–70	Microtrauma/ macrotrauma	Shoulder and upper arm— poorly localized	All motions	Atrophy of shoulder area	All motions limited especially ER and abduction	All motions limited especially ER and abduction	Capsular	Most/all	Varies	
A-C joint sprain	Varies	Macrotrauma	Point of shoulder	Horizontal adduction	Step/bump at point of shoulder	Limited abduction	Limited abduction	Flexion	ER	Point of shoulder	
Subacromial bursitis	Varies	Microtrauma	Anterior and lateral shoulder	Overhead motions	Often unremarkable	Limited abduction and IR	Pain on IR at 90-degree abduction		Most/all	Pain below anterolateral acromial rim	
Glenohumeral arthritis	50+	Gradual onset, but can be traumatic	Poorly localized	Arm activity	Possible posterior positioning of humeral head	Capsular pattern (ER> abduction>IR)	Pain	Capsular	Weakness of rotator cuff, rather than pain	Poorly localized	

SICK Scapula	20-40	Microtrauma	Anterior/ superior shoulder  Posterosuperior scapular  Arm, forearm, hand	Overhead activities	Scapular malposition  Inferior medial border prominence  Dyskinesia of scapular movement	Decreased forward flexion which diminishes when clinician manually repositions the scapula into retraction and posterior tilt	Normal		Weakness rather than pain	Medial coracoid  Superomedial angle of scapula
Cervical radiculopathy	Varies	Typically none but can be traumatic	Upper back, below shoulder	Cervical extension, cervical side bending and rotation to ipsilateral side, full arm elevation	May have lateral deviation of head away from painful side	Decreased cervical flexion, cervical side bending and rotation to ipsilateral side; decreased arm elevation on involved side	Painful into restricted active range of motions  Positive Spurling's test	Empty	Weakness rather than pain  Other neurological changes	Varies; may have numbness over dermatomal area

# Thoracic Outlet Syndrome

Compression area	Inter-scalene Triangle anterior & medius scalenes muscles	Costoclavicular space	Axillary interval
Cause	Scalene tightness	Decrease space	Pectoralis minor tightness
Special Test	Adsons test	Military Brace test	Wright test
Mechanism	Stretches scalene & nerve	Raises the 1 <sup>st</sup> rib & depresses the clavicle	Pectoralis minor stretch compresses the neurovascular bundle

# DISLOCATION

Dislocation	Anterior-inferior	Posterior
<b>Cause</b>	Shoulder ER & abduction	Shoulder internal rotation
<b>Held in position</b>	External rotation & horizontal abduction	Internal rotation & adduction
<b>Prominence</b>	Below sub-coracoid or sub-clavicular	Posteriorly inferiorly
<b>Structures affected</b>	<ul style="list-style-type: none"><li>• Ant inferior labrum</li><li>• Ant capsule</li><li>• Superior, middle, inferior GH ligament</li><li>• Biceps long head</li><li>• Subscapularis</li></ul>	<ul style="list-style-type: none"><li>• Posterior labrum</li><li>• Posterior capsule</li><li>• Posterior inferior GH ligament</li><li>• Infraspinatus</li><li>• Teres minor</li></ul>

## Slap vs Bankart's

- **SLAP** : Superior labrum anterior to post-happens due to dislocation, injury, rep throwing– injures the biceps

- **Bankart**: Anterior inferior glenoid labrum is torn due to anterior shoulder dislocation



Thank you

Happy Studying

