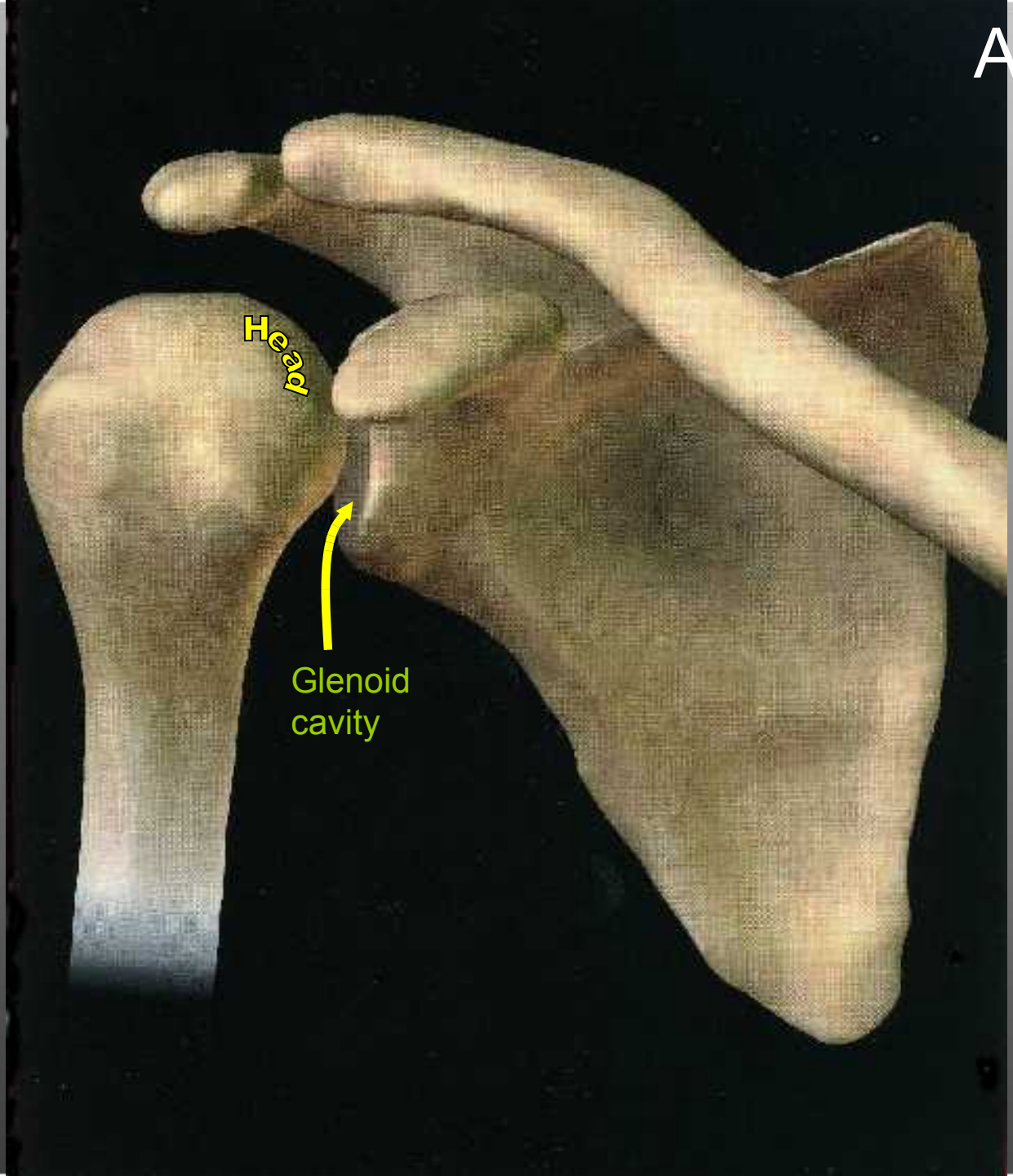
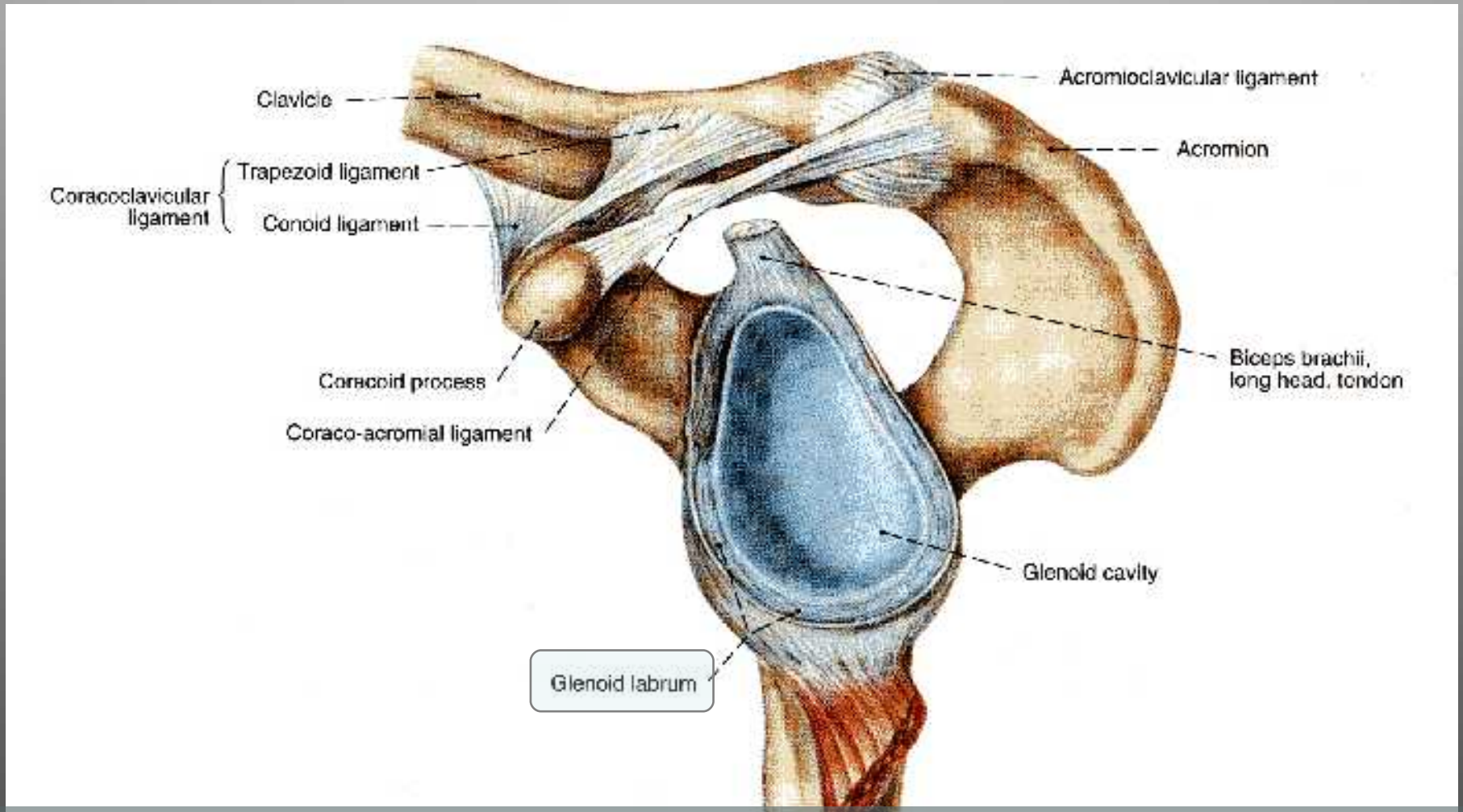
FUNCTIONAL ANATOMY OF SHOULDER JOINT

ARTICULATION



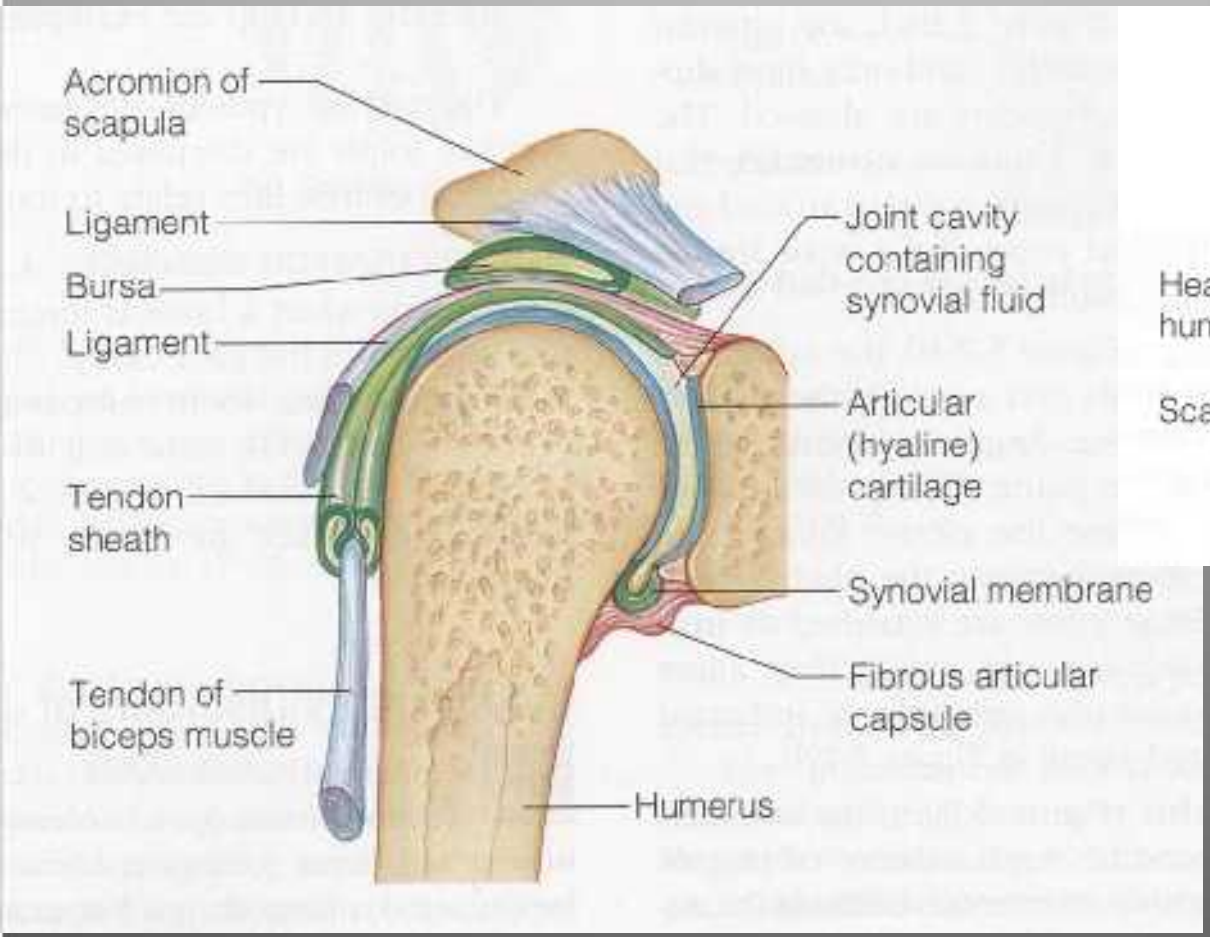
Articulation is between:

- The rounded **head** **of the humerus** and
- The shallow, pear-shaped **glenoid cavity** of the scapula.



- The articular surfaces are covered by ***hyaline cartilage.***
- The glenoid cavity is deepened by the presence of a ***fibrocartilaginous rim*** called the **glenoid labrum**.

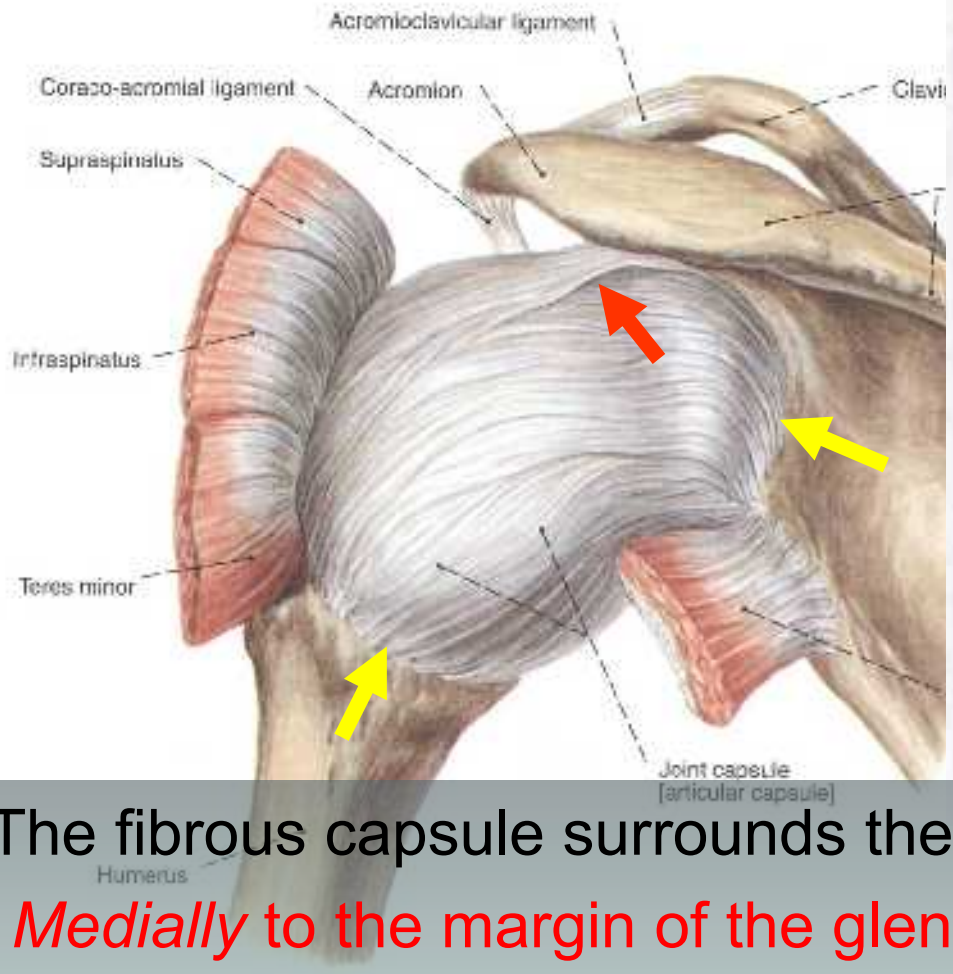
TYPE

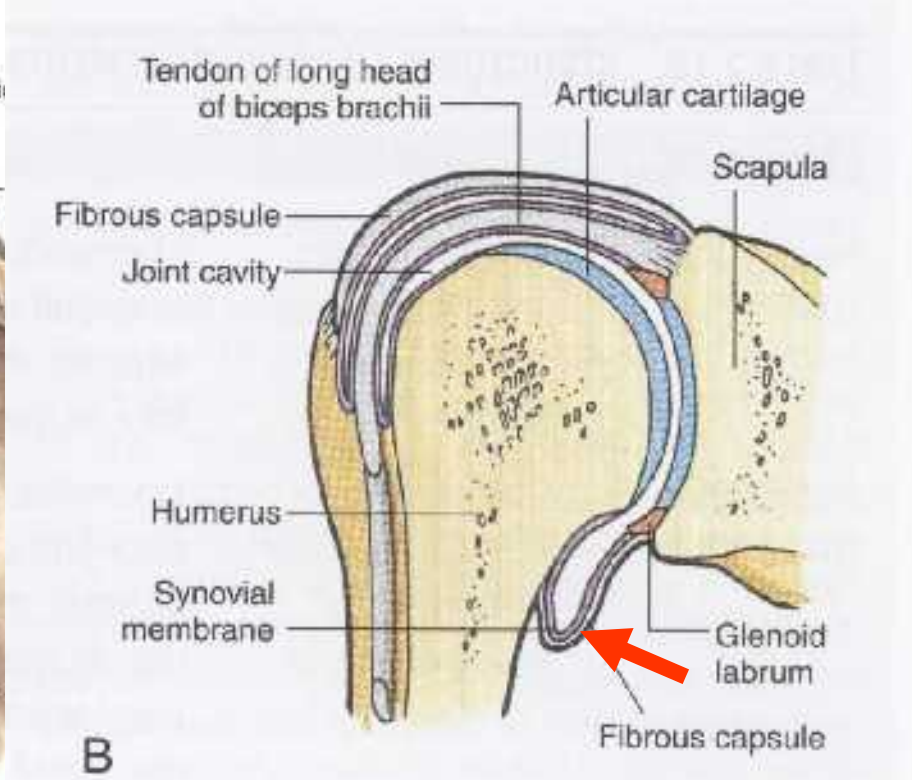


Ball-and-socket joint

- Synovial
- Ball-and-socket joint

FIBROUS CAPSULE





The fibrous capsule surrounds the joint and is attached:

Medially to the margin of the glenoid cavity outside the labrum;

Laterally to the anatomic neck of the humerus.

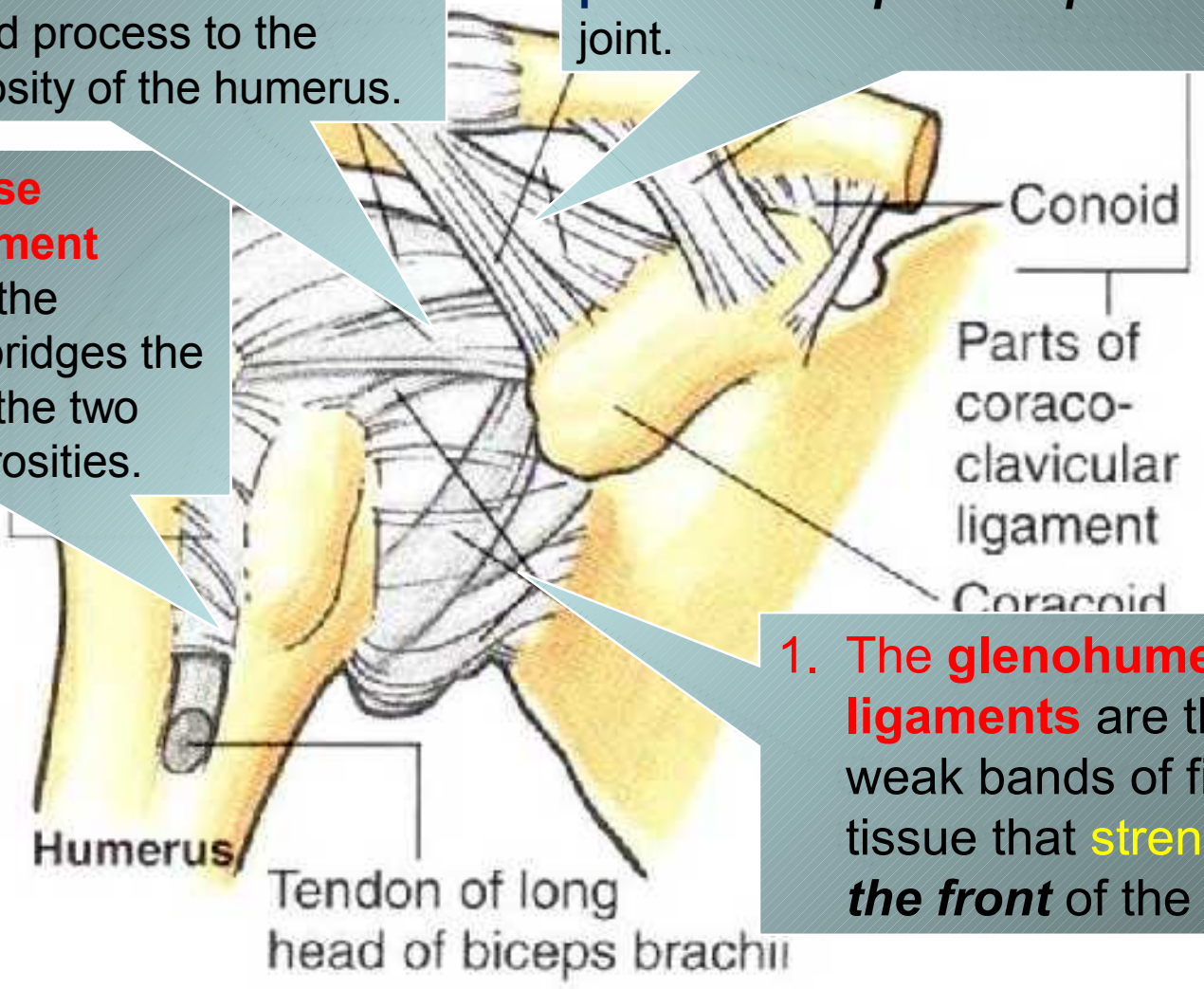
The capsule is **thin and lax**, allowing a wide range of movement.

LIGAMENTS

Accessory ligaments:
The **coracoacromial ligament** extends between the coracoid process and the acromion. Its function is to **protect** the ***superior aspect*** of the joint.

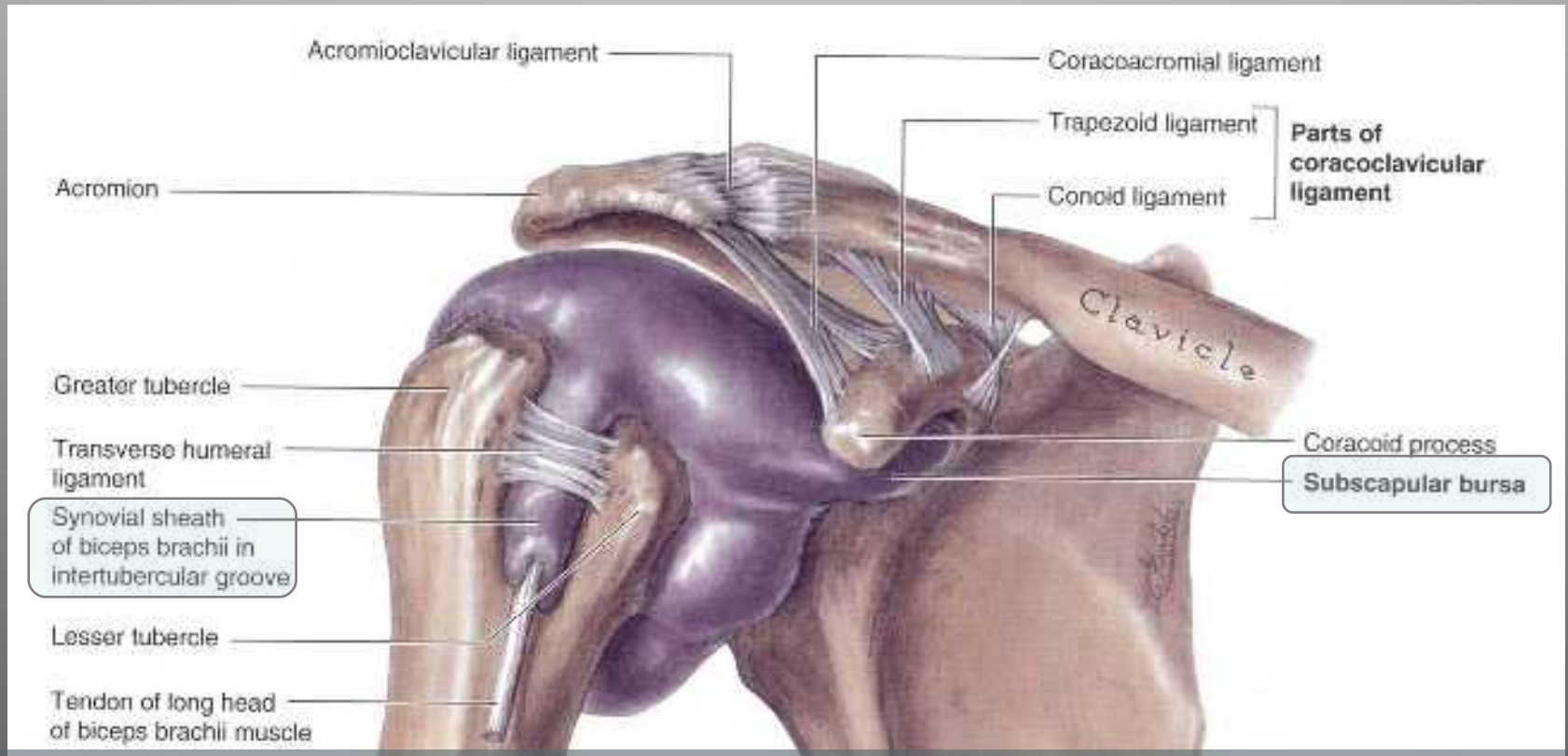
3. The **coracohumeral ligament** **strengthens** the capsule from ***above*** and stretches from the root of the coracoid process to the greater tuberosity of the humerus.

2. The **transverse humeral ligament** **strengthens** the capsule and bridges the gap between the two humeral tuberosities.



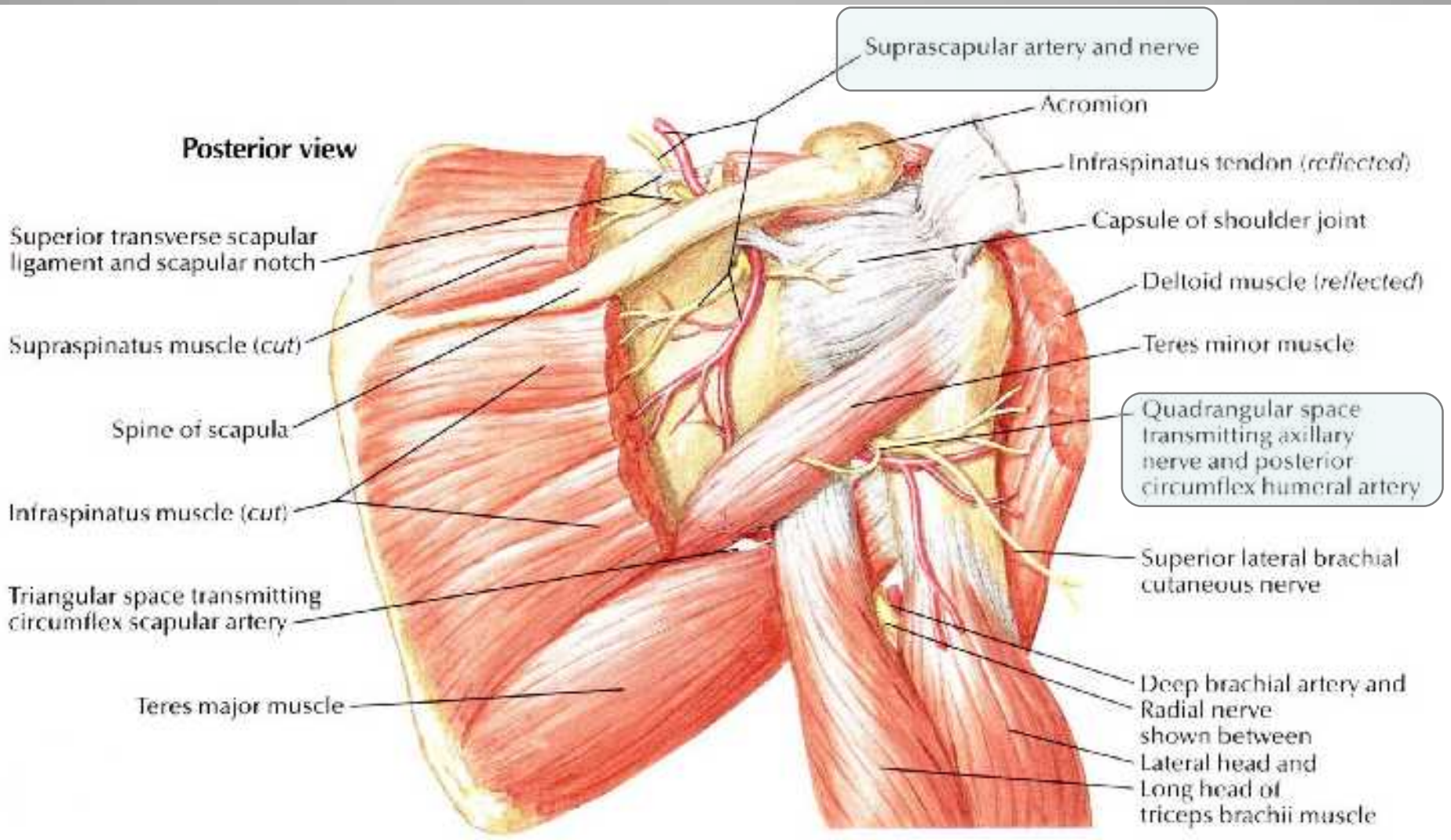
1. The **glenohumeral ligaments** are three weak bands of fibrous tissue that strengthen ***the front*** of the capsule.

SYNOVIAL MEMBRANE



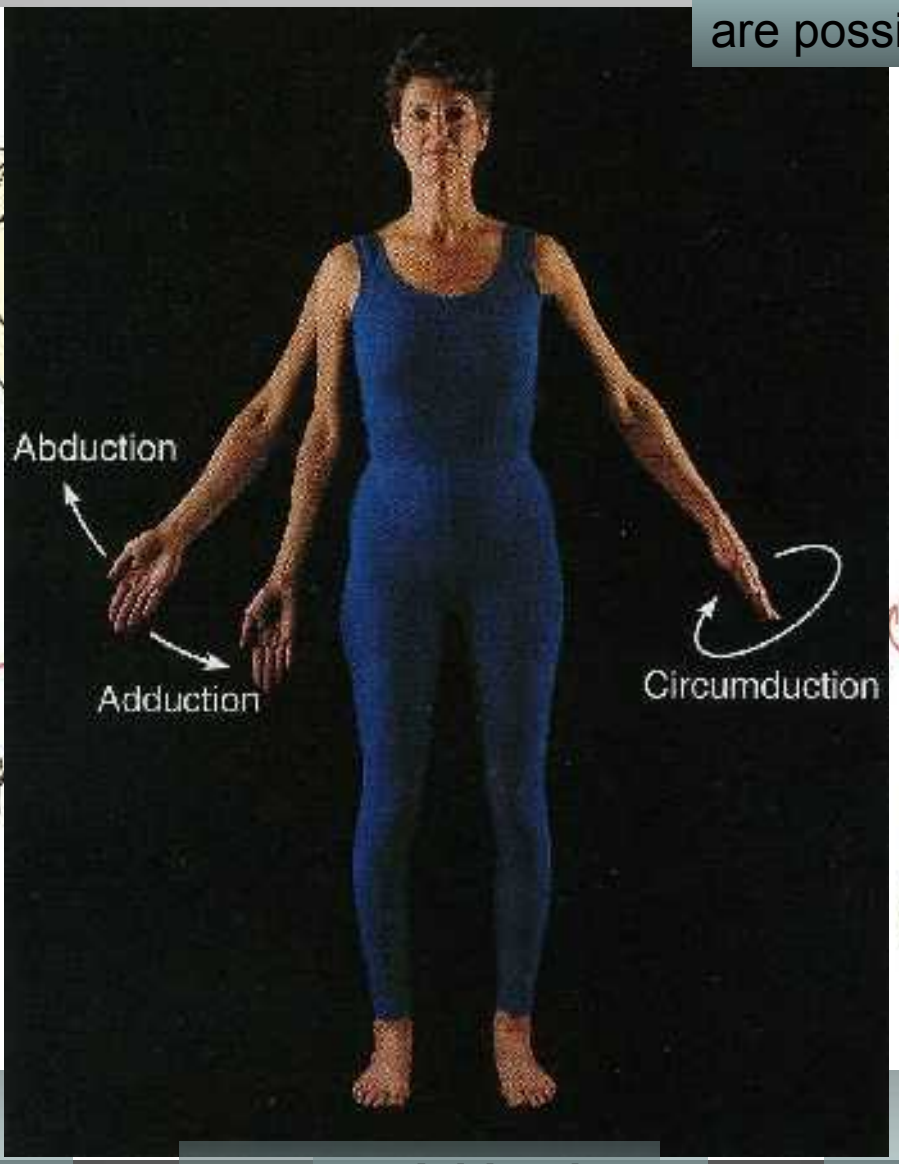
- It lines the fibrous capsule.
- ***It is attached to the margins of the cartilage*** covering the articular surfaces.
- It forms a **tubular sheath** around the tendon of the long head of the biceps brachii.
- ***It extends through the anterior wall of the capsule*** to form the **subscapularis bursa** beneath the subscapularis muscle.

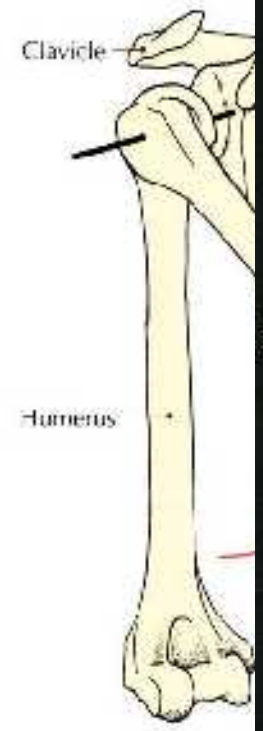
NERVE SUPPLY

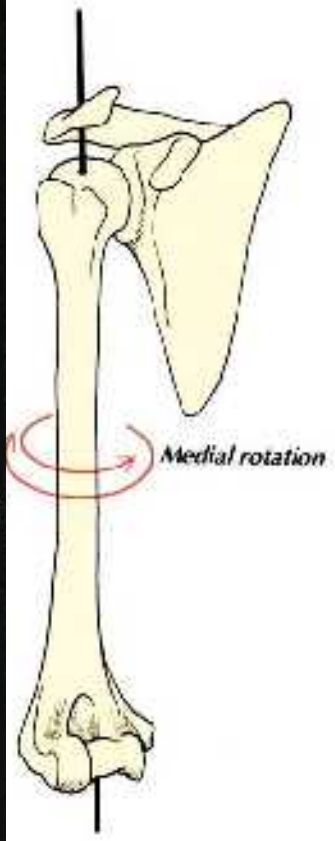


Articular branches of the **axillary &** the **suprascapular nerves**

The following movements are possible:



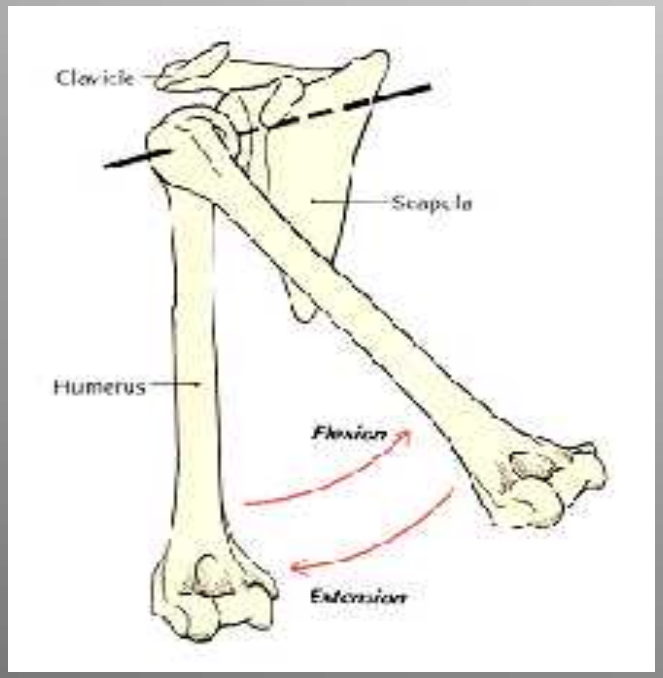


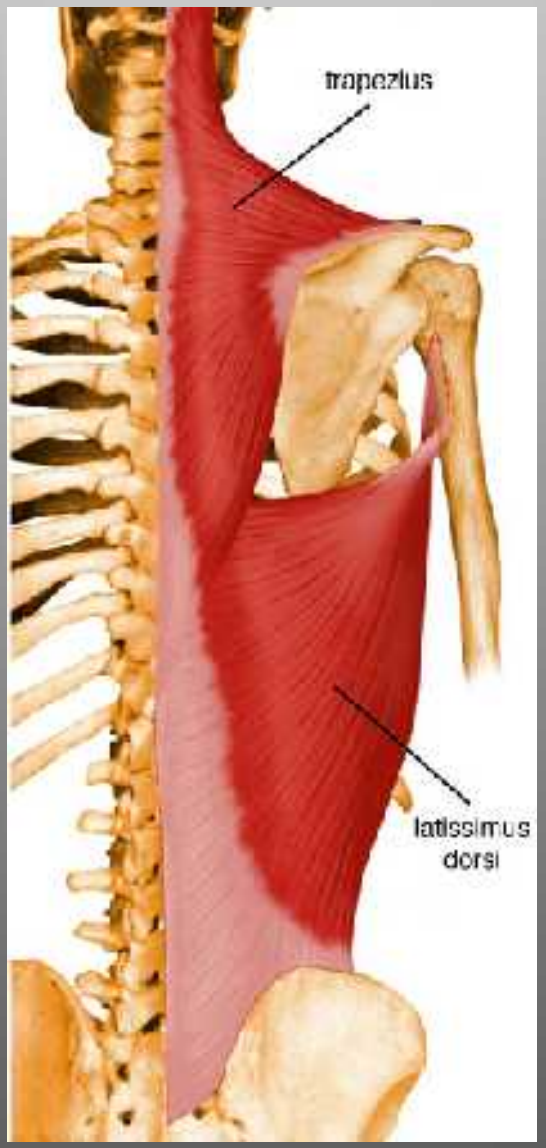


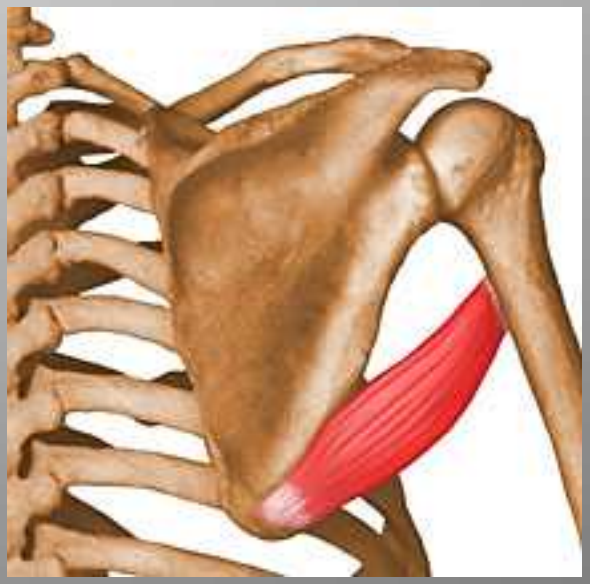
- **Flexion**
- **Extension**
- **Abduction**
- **Circumduction**
- **Lateral rotation**
- **Medial rotation**

Flexion

- Normal flexion is about 90°
- It is performed by the:
  1. ***Anterior fibers*** of the deltoid
  2. Pectoralis major
  3. Biceps brachii
  4. Coracobrachialis

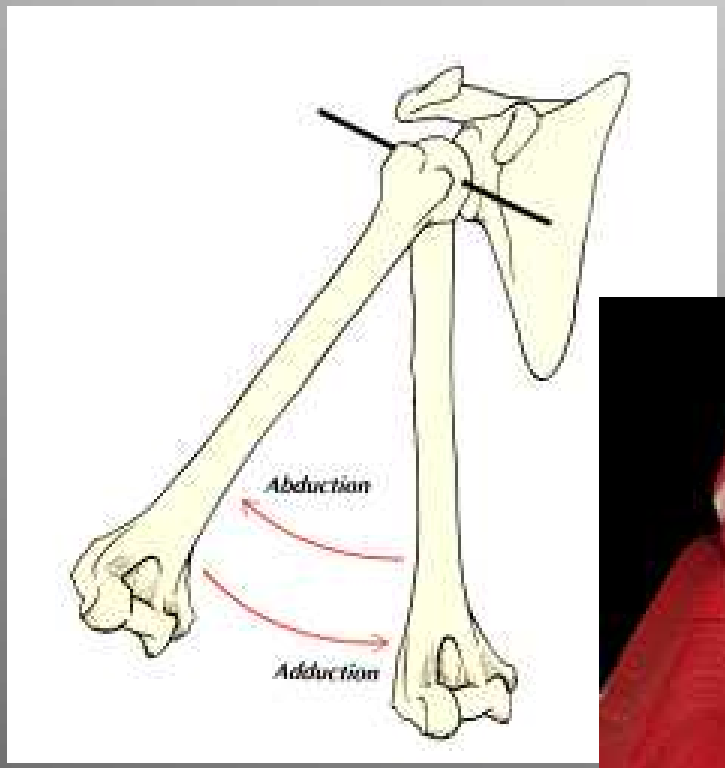


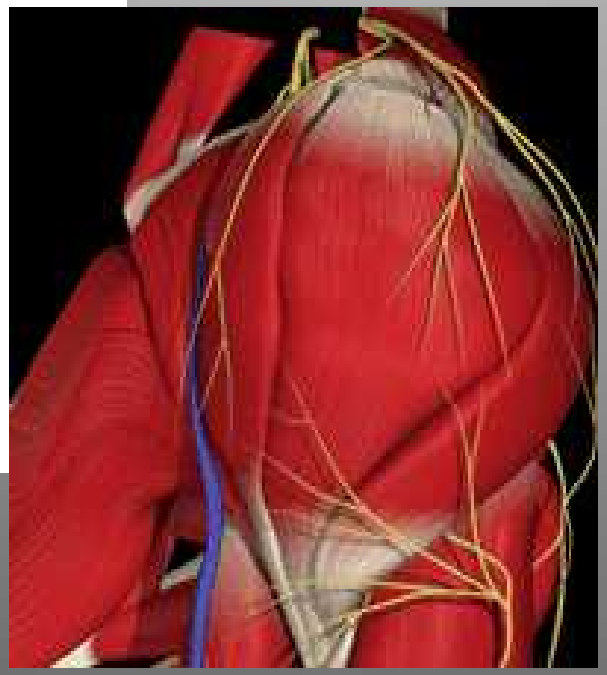




Extension:

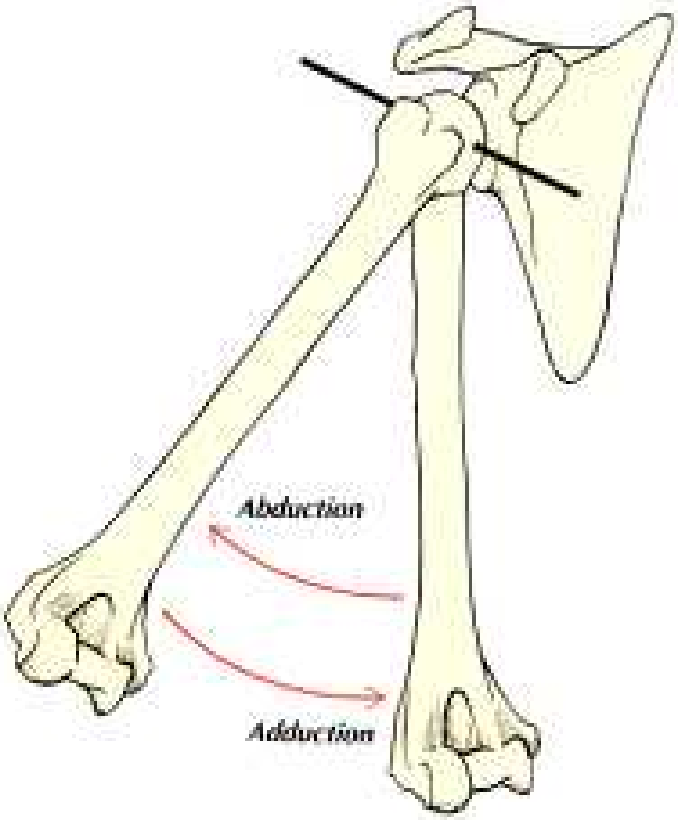
- Normal extension is about 45°
- It is performed by the:
  1. ***Posterior fibers*** of the deltoid,
  2. Latissimus dorsi
  3. Teres major

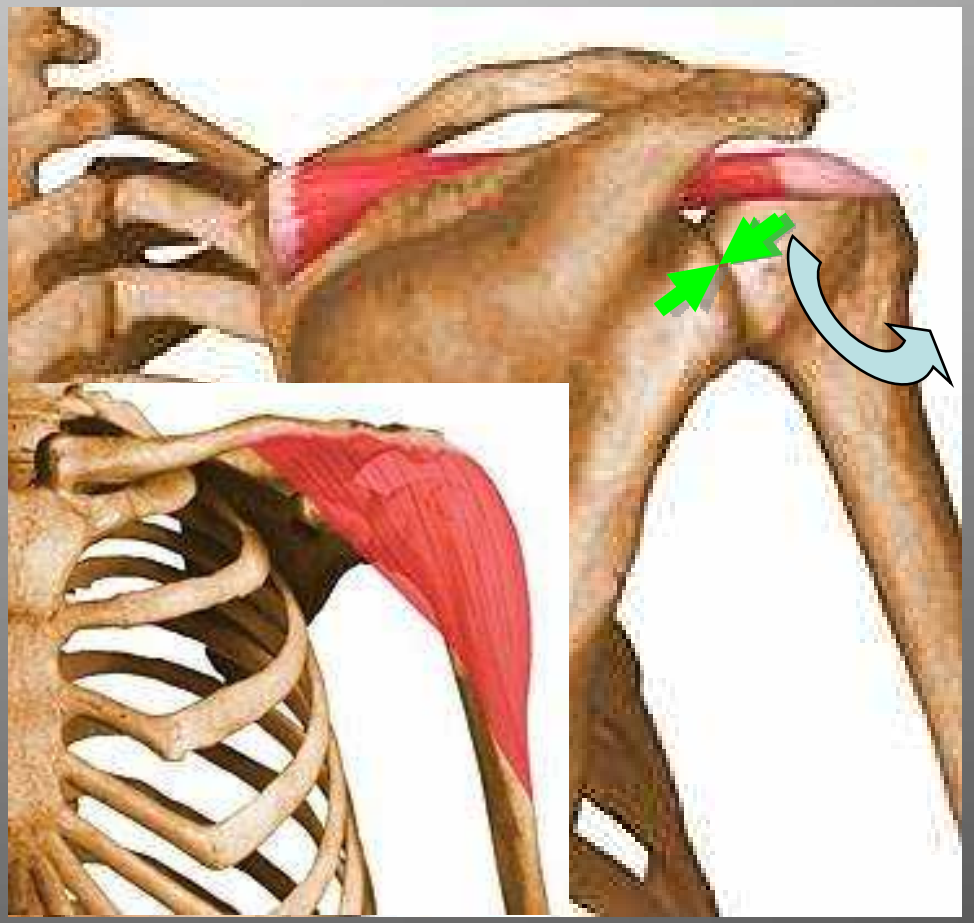




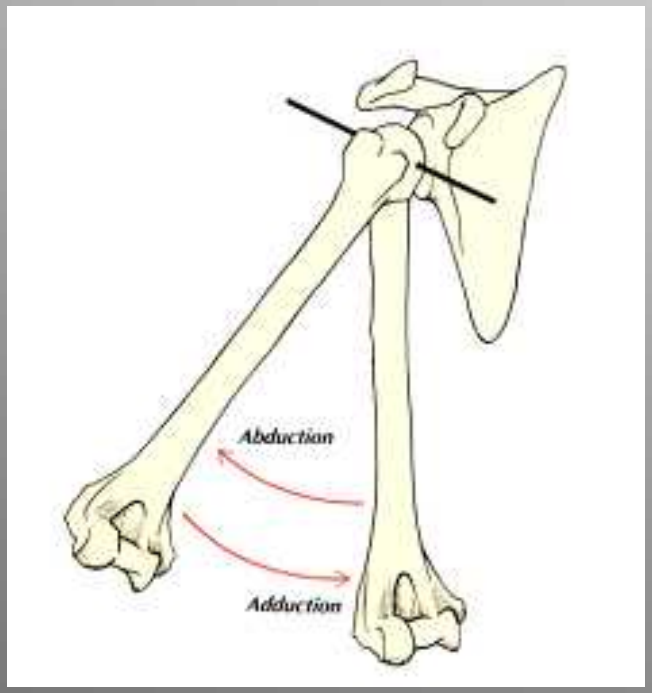
Abduction:

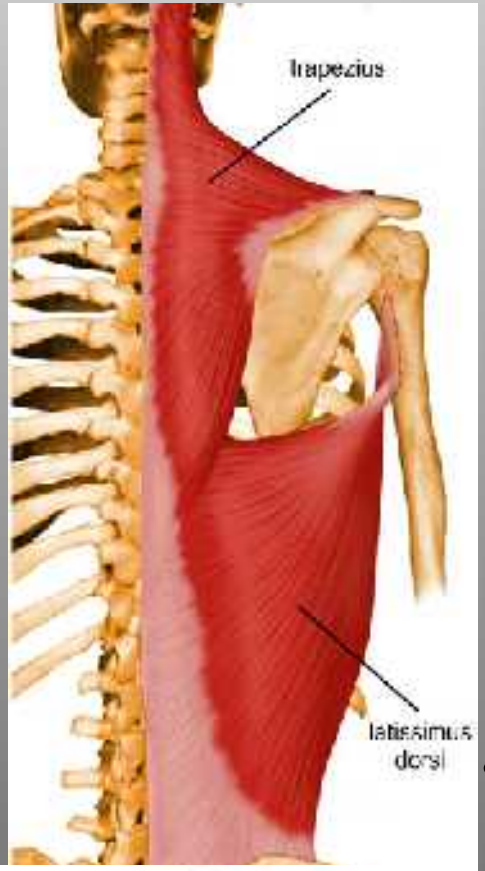
- Abduction of the upper limb occurs both at the shoulder joint and between the scapula and the thoracic wall.
- It is initiated by supraspinatus from 0 to 18
- Then from 19 to 120 by the ***middle fibers*** of the deltoid.
- Then above 90 by rotation of the scapula by 2 muscles (Trapezius & S.A..)

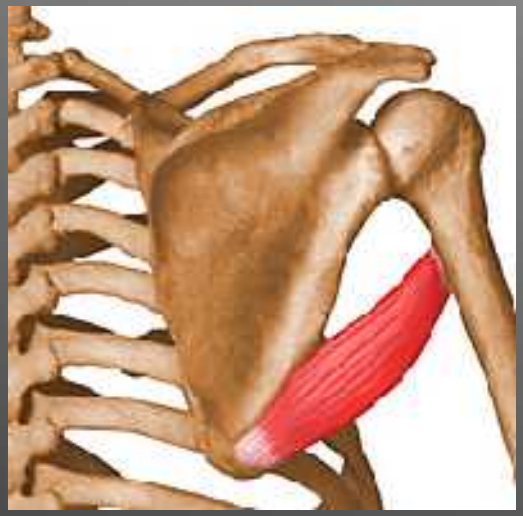




- The supraspinatus muscle:
  - ***initiates*** the movement of abduction(from 0 to 19) and
  - ***holds the head of the humerus*** against the glenoid fossa of the scapula;
- This latter function of the supraspinatus **allows** the deltoid muscle to contract and abduct the humerus at the shoulder joint.

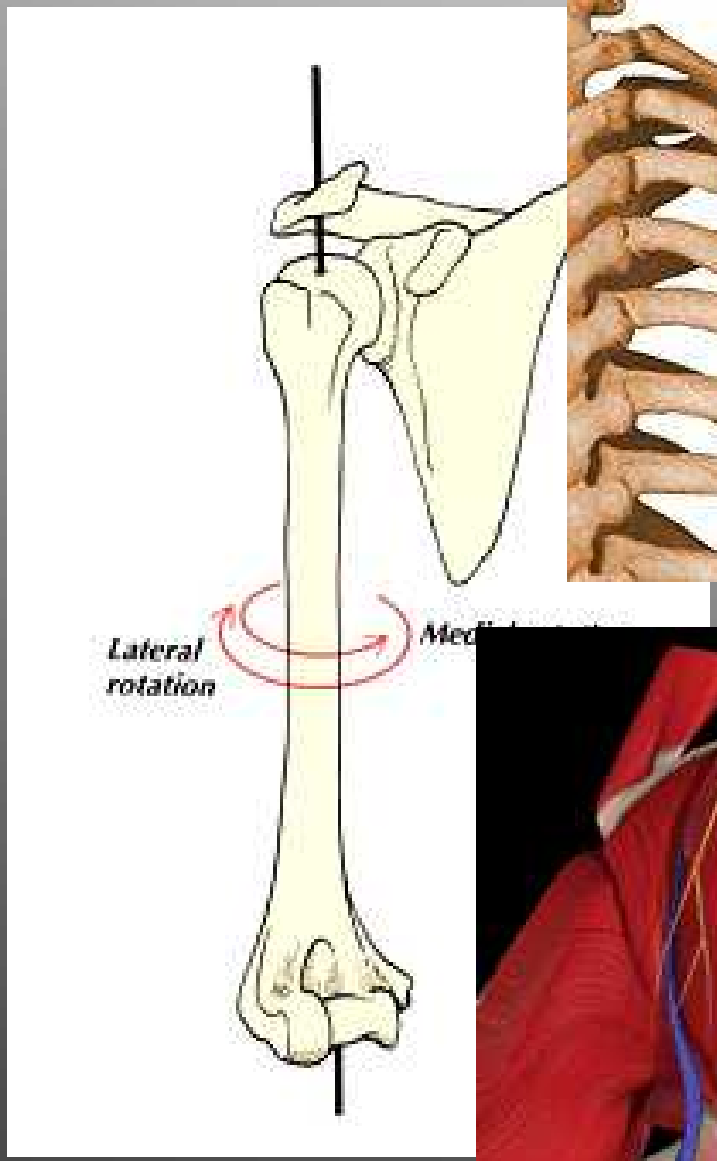


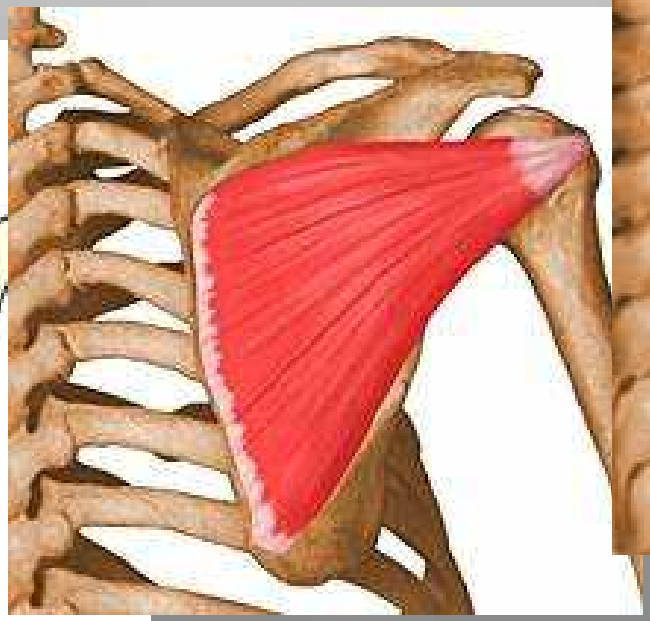


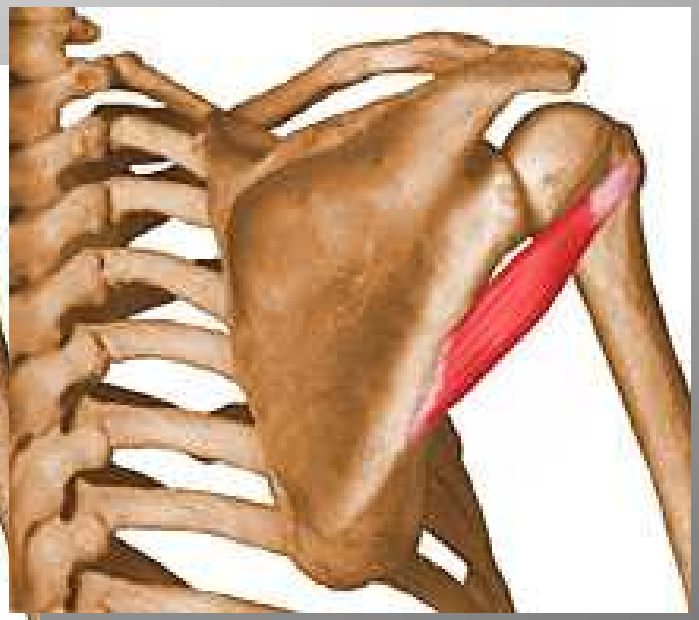


Adduction:

- Normally the upper limb can be swung 45° across the front of the chest.
- This is performed by:
  1. pectoralis major
  2. latissimus dorsi
  3. teres major
  4. teres minor

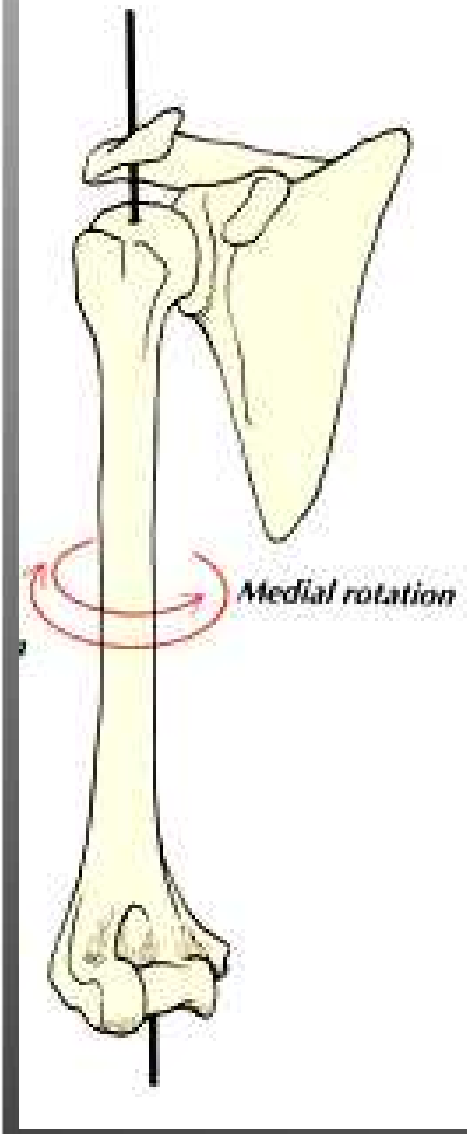


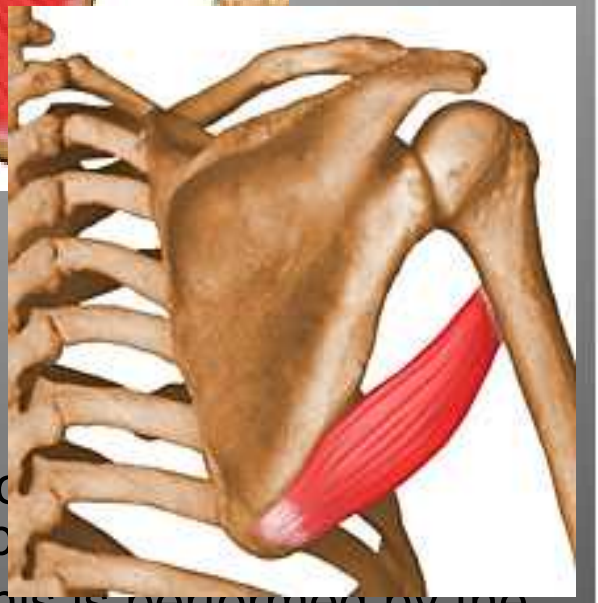


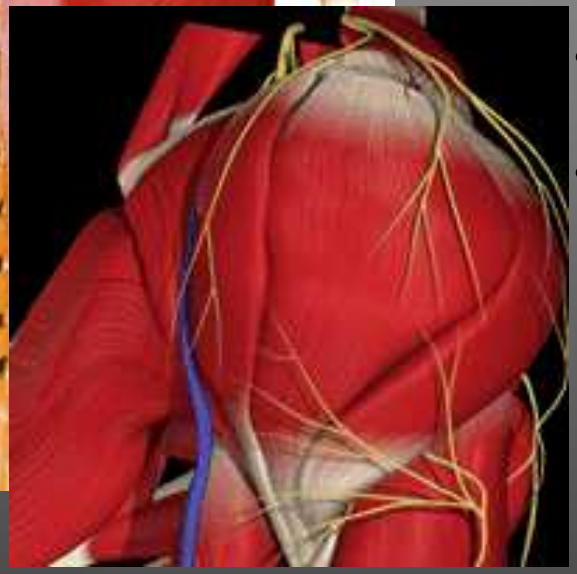


Lateral rotation:

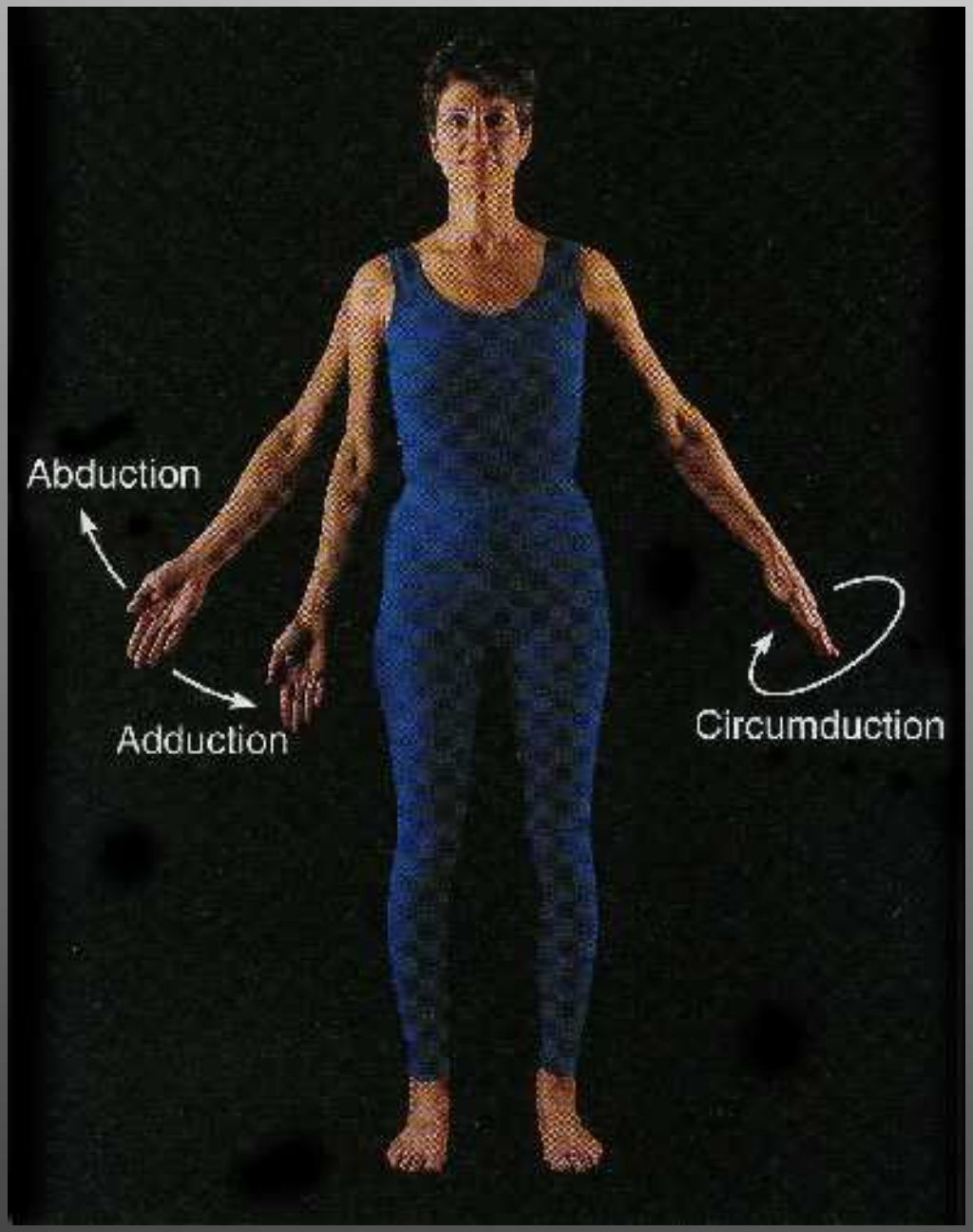
- Normal lateral rotation is about 40 to 45°.
- This is performed by the:
  1. infraspinatus
  2. teres minor
  3. the ***posterior*** fibers of the deltoid muscle







- No
  ab
- This is performed by the:
  1. subscapularis
  2. latissimus dorsi
  3. teres major
  4. ***anterior*** fibers of the deltoid.

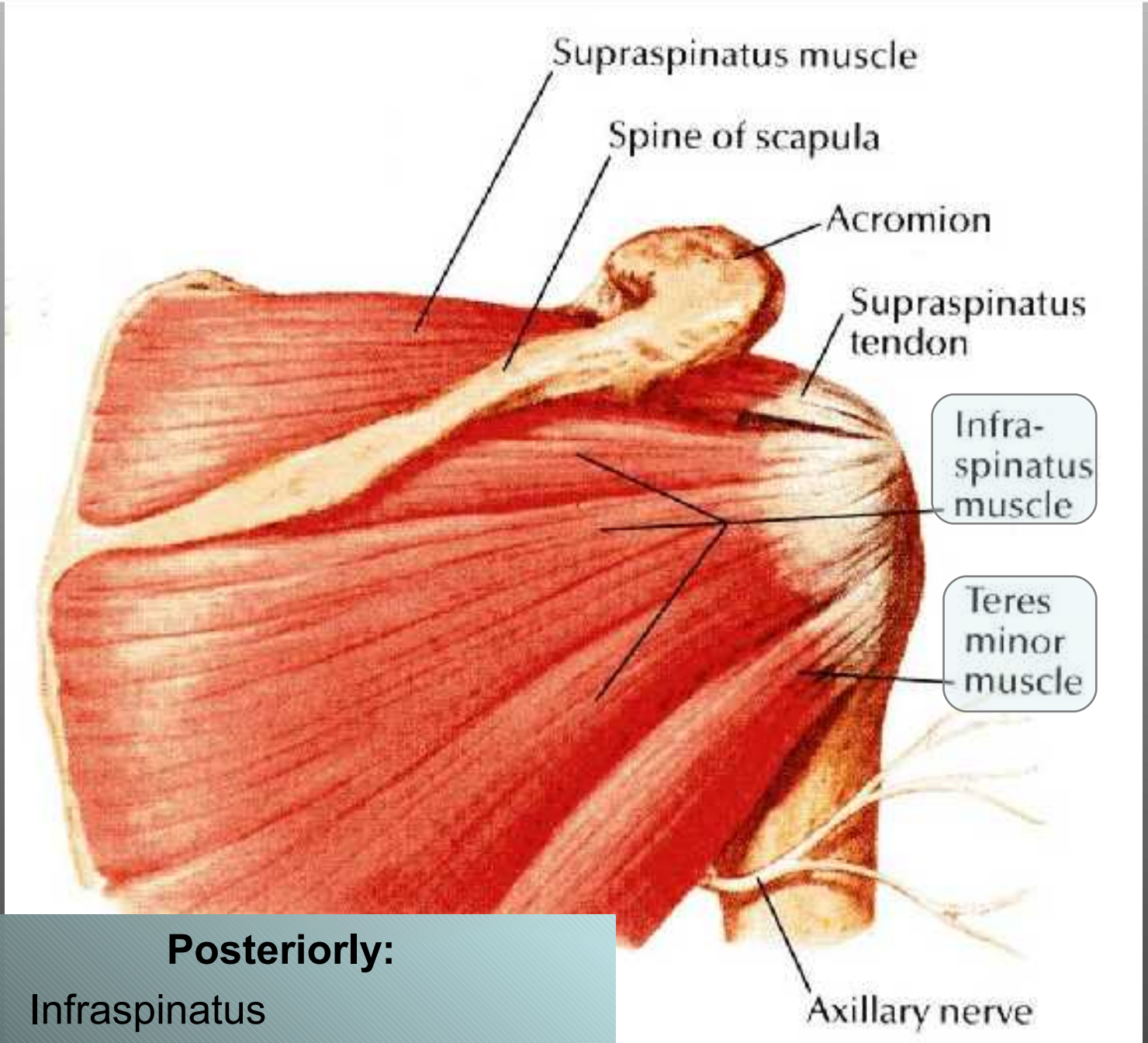


Circumduction:

This is a movement in which the distal end of the humerus moves in circular motion while the proximal end remains stable

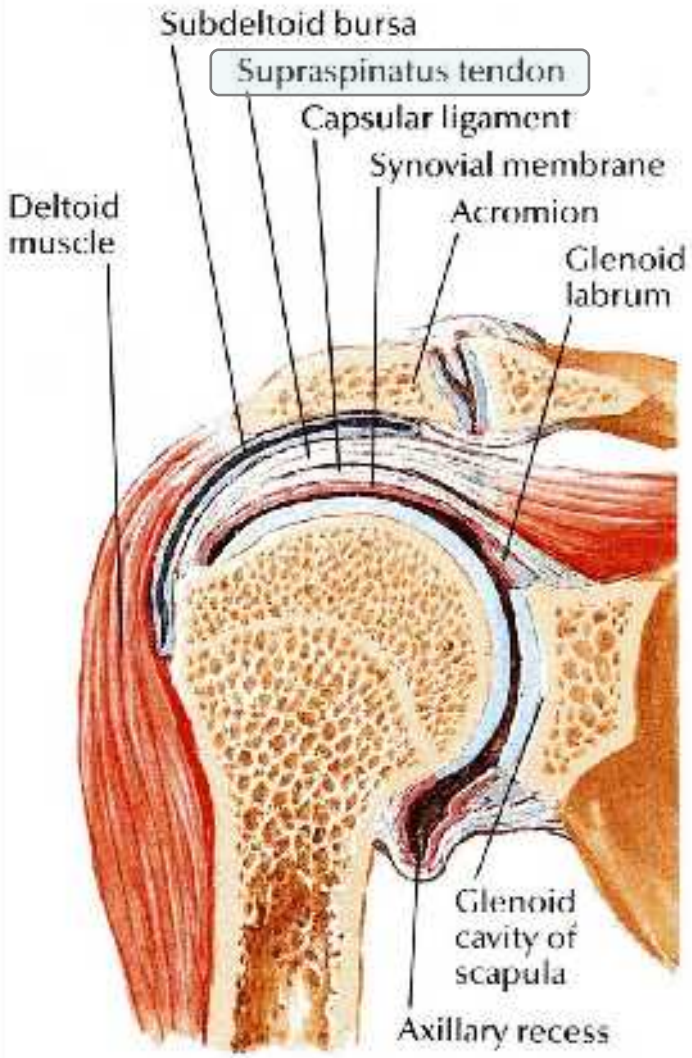
- It is formed by flexion, abduction, extension and adduction.

Successively



Posteriorly:

- Infraspinatus
- Teres minor muscles.

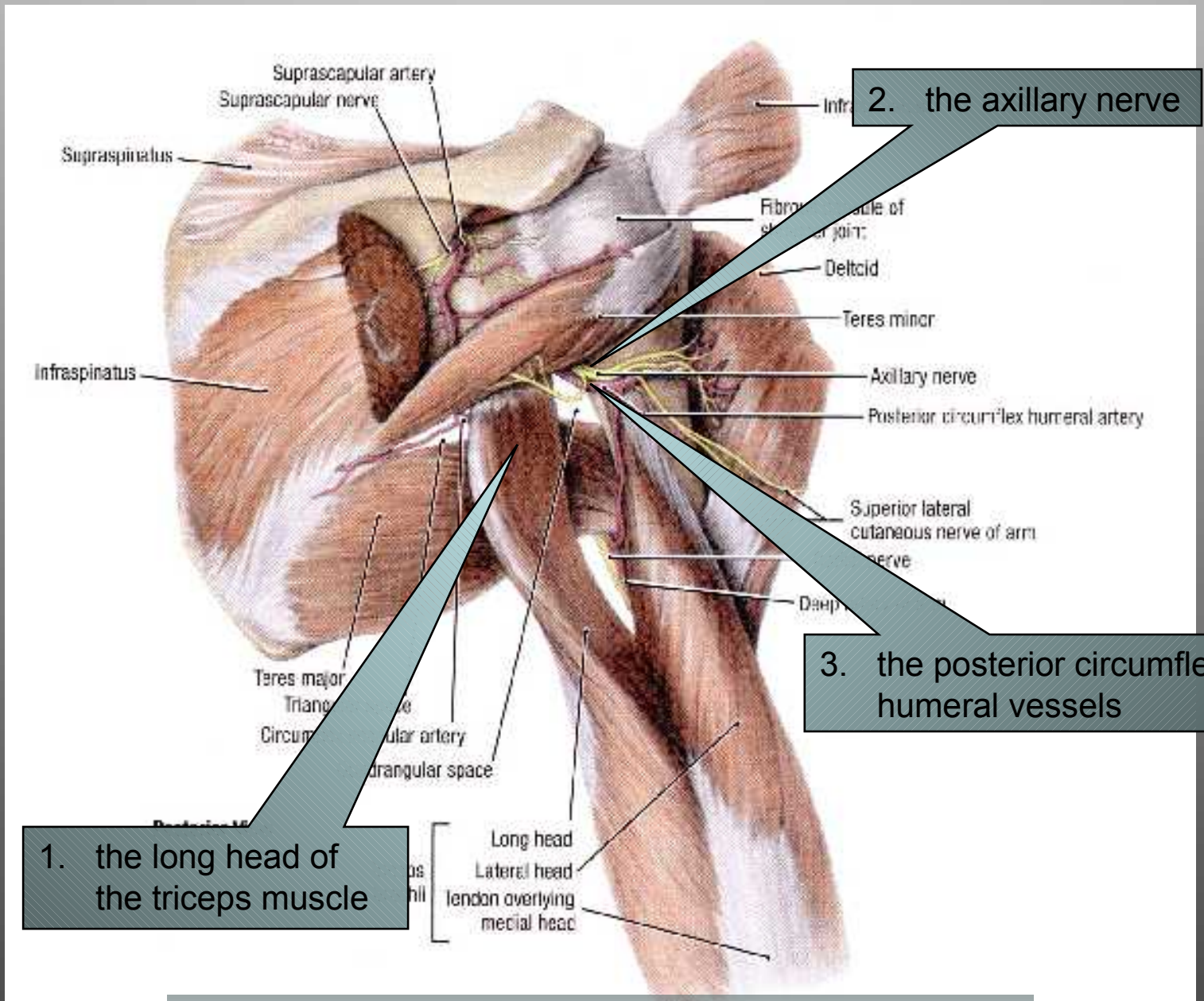


Coronal section through joint

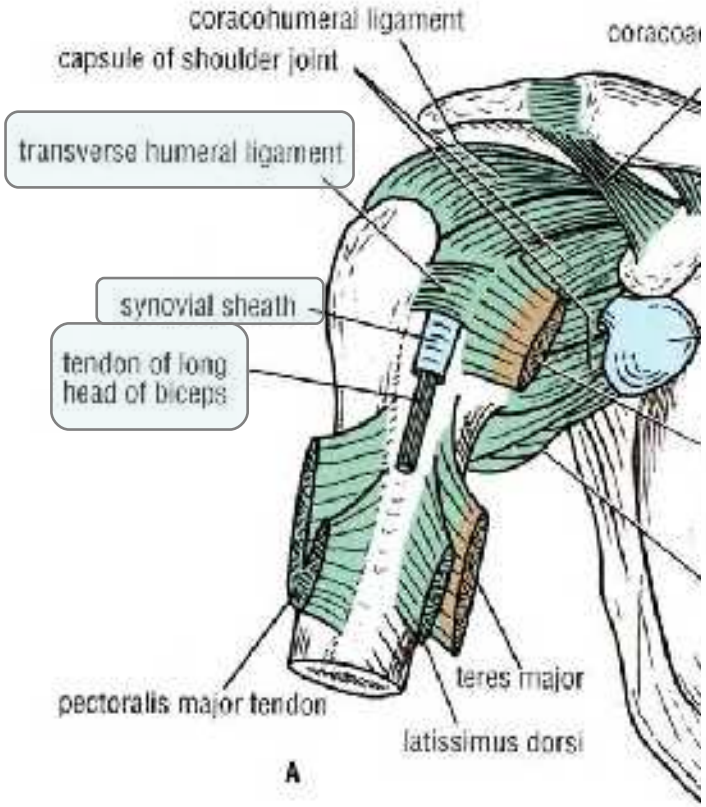
Superiorly:

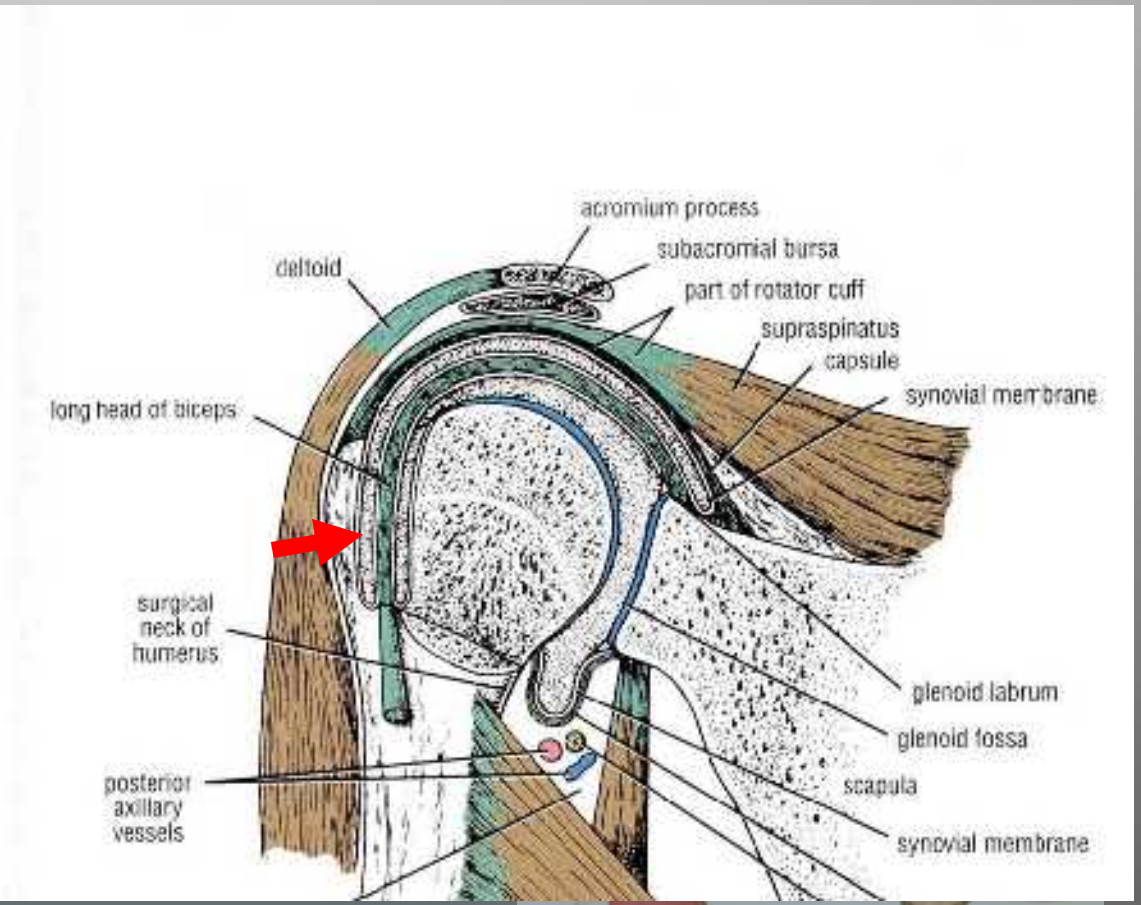
1. Deltoid muscle
2. Coracoacromial ligament
3. Subacromial (subdeltoid) bursa
4. Supraspinatus muscle & tendon

epicondyle

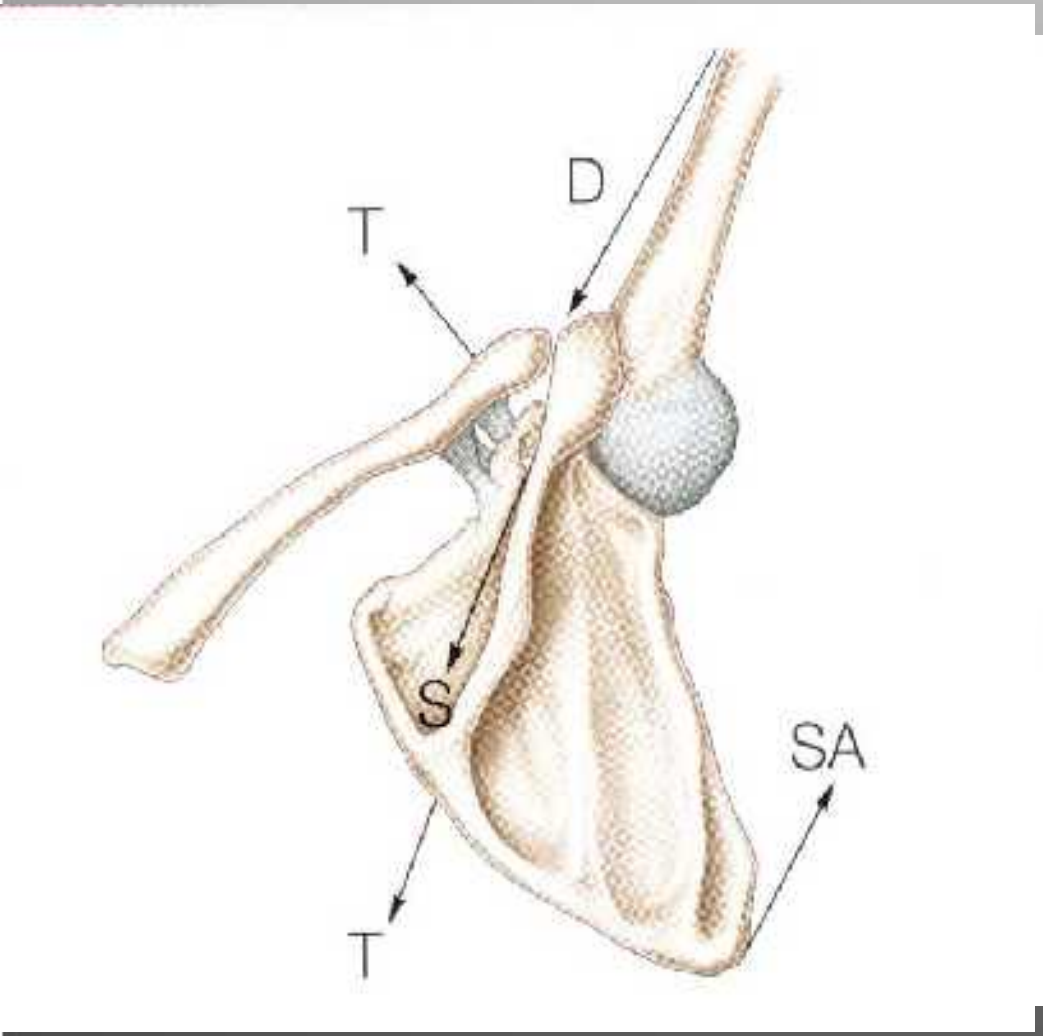

Suprascapular artery
Suprascapular nerve
Supraspinatus
Infraspinatus
Deltoid
Teres minor
Axillary nerve
Posterior circumflex humeral artery
Superior lateral cutaneous nerve of arm
Teres major
Long head
Lateral head
tendon overlying medial head
2. the axillary nerve
3. the posterior circumflex humeral vessels
1. the long head of the triceps muscle

Inferiorly:



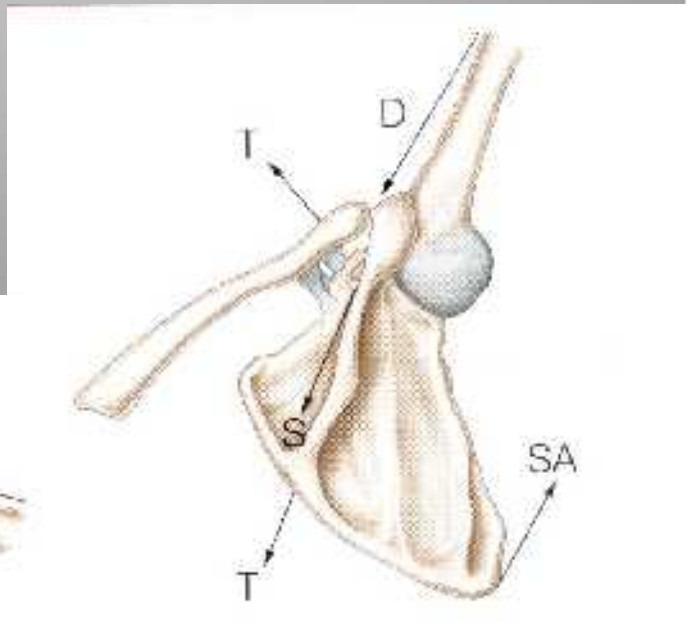


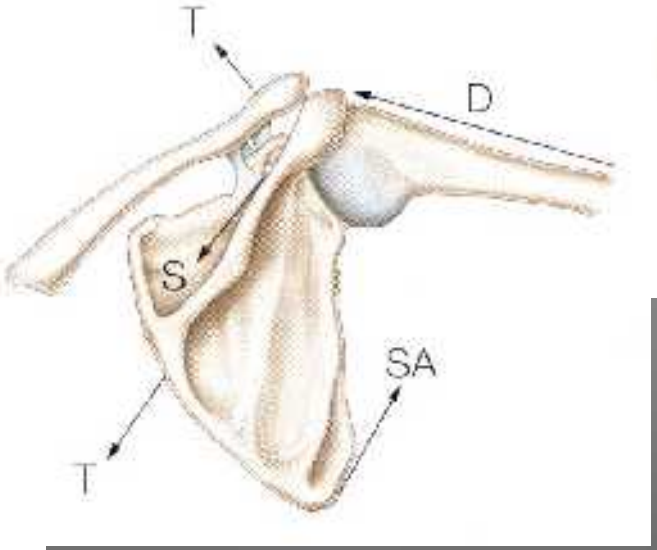
- The long head of the biceps brachii originates from the **supraglenoid tubercle** of the scapula,
- It is intracapsular but extrasynovial
- It's tendon passes through the shoulder joint and emerges ***beneath the transverse humeral ligament.***
- Inside the joint, the tendon is surrounded by a separate tubular sheath of the synovial capsule.

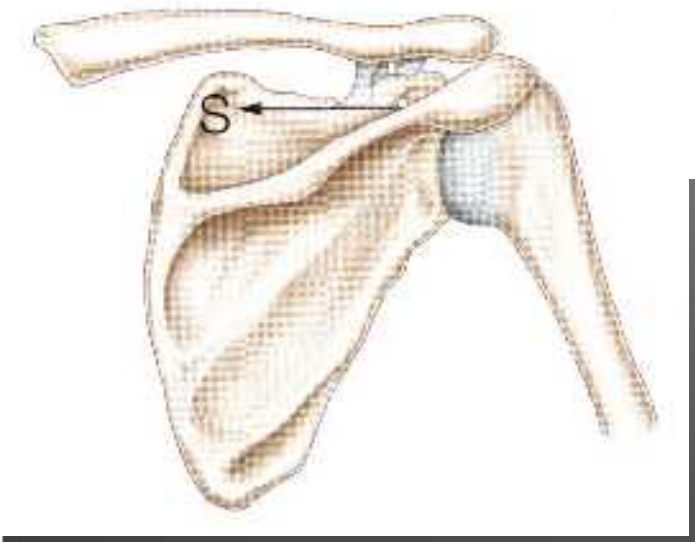


- Abduction involves rotation of the scapula as well as movement at the shoulder joint.
- For every 3° of abduction of the arm, a 2° abduction occurs in the shoulder joint and a 1° abduction occurs by rotation of the scapula.
- At about 120° of abduction of the arm, the greater tuberosity of the humerus comes into contact with the acromion.
- Further elevation of the arm above the head accomplished by rotating the scapula.

MUSCLES IN THE SCAPULAR-HUMERAL MECHANISM

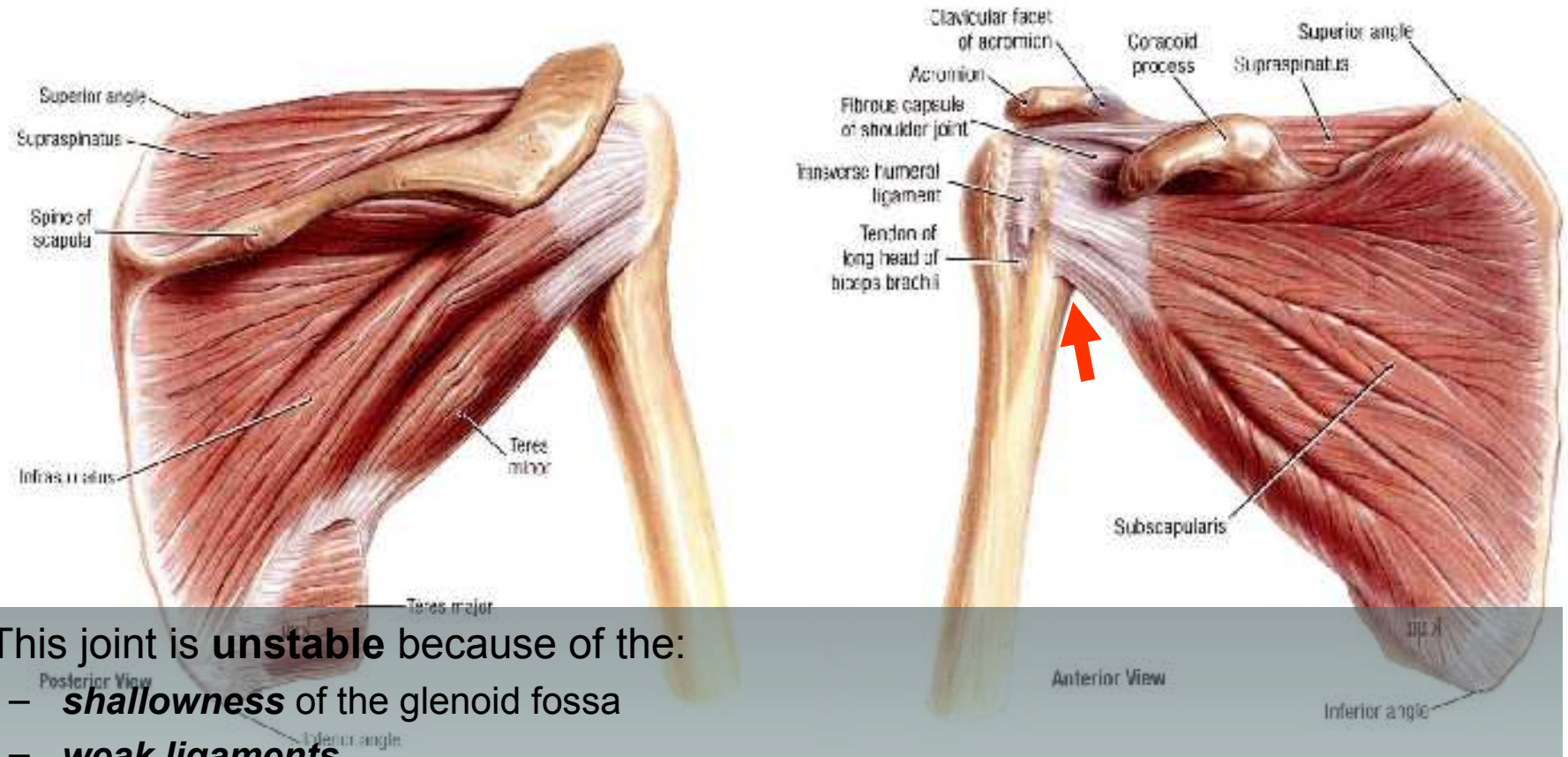






KEY		
	S	= Supraspinatus
	D	= Deltoid
	T	= Trapezius
	SA	= Serratus anterior

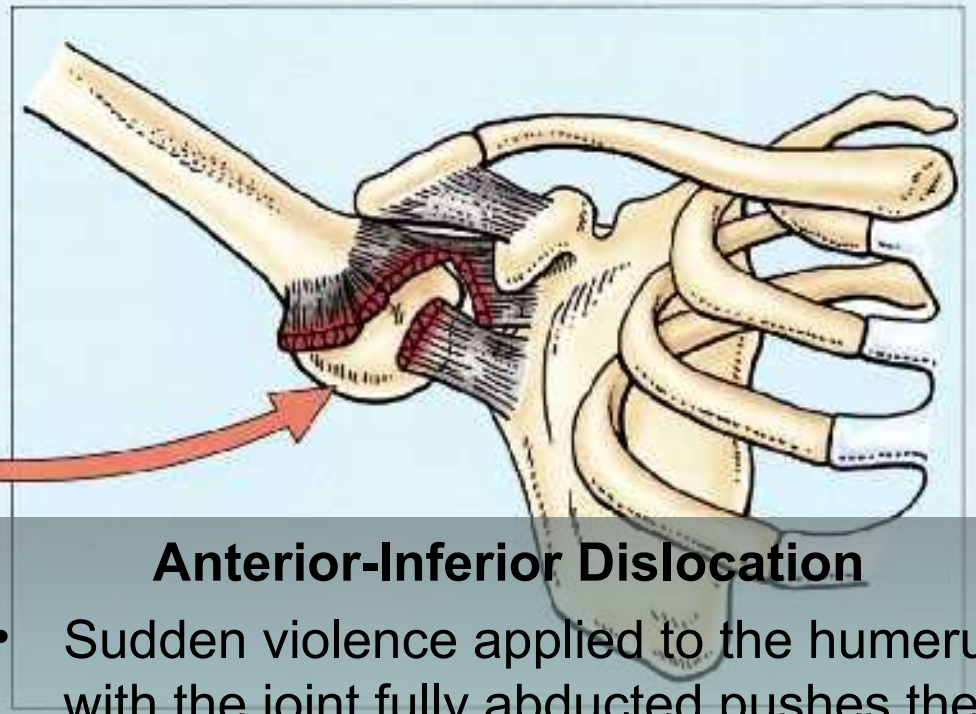
STABILITY OF THE SHOULDER JOINT

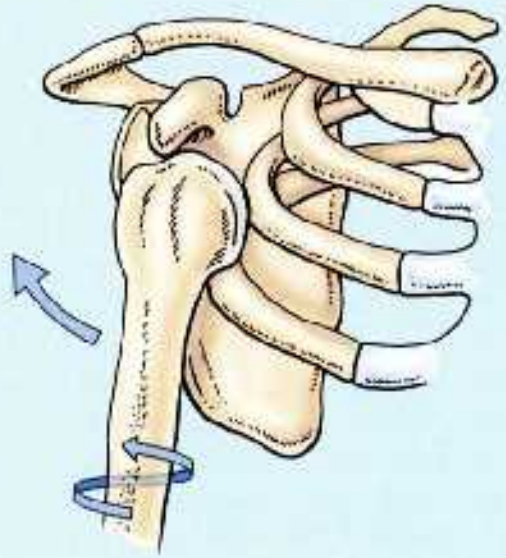


- This joint is **unstable** because of the:
  - ***shallowness*** of the glenoid fossa
  - ***weak ligaments***
- Its strength almost entirely depends on the **tone** of the rotator cuff muscles.
- The tendons of these muscles are fused to the underlying capsule of the shoulder joint.
- ***The least supported part of the joint*** lies in the **inferior** location, where it is unprotected by muscles.

DISLOCATIONS OF THE SHOULDER JOINT

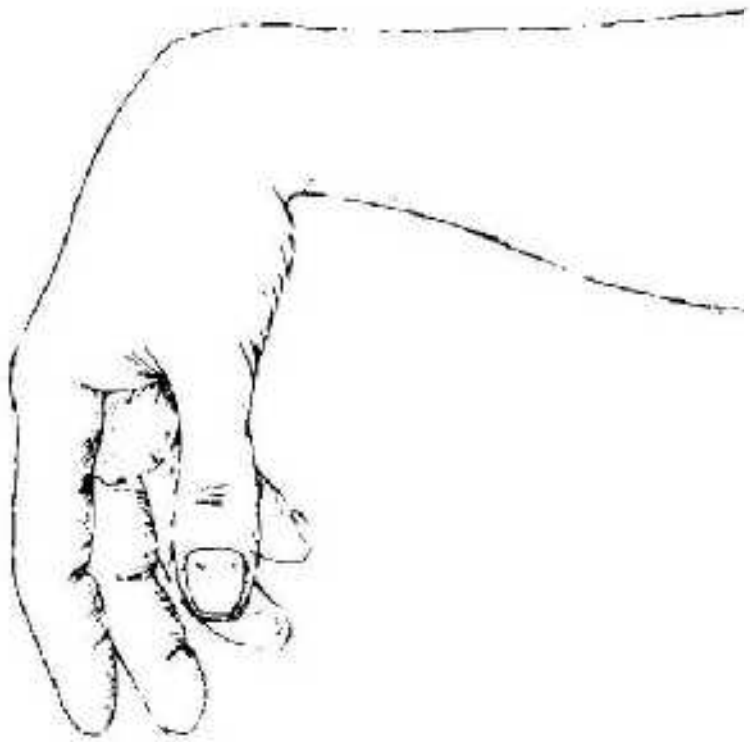
The shoulder joint is the most commonly dislocated large joint.

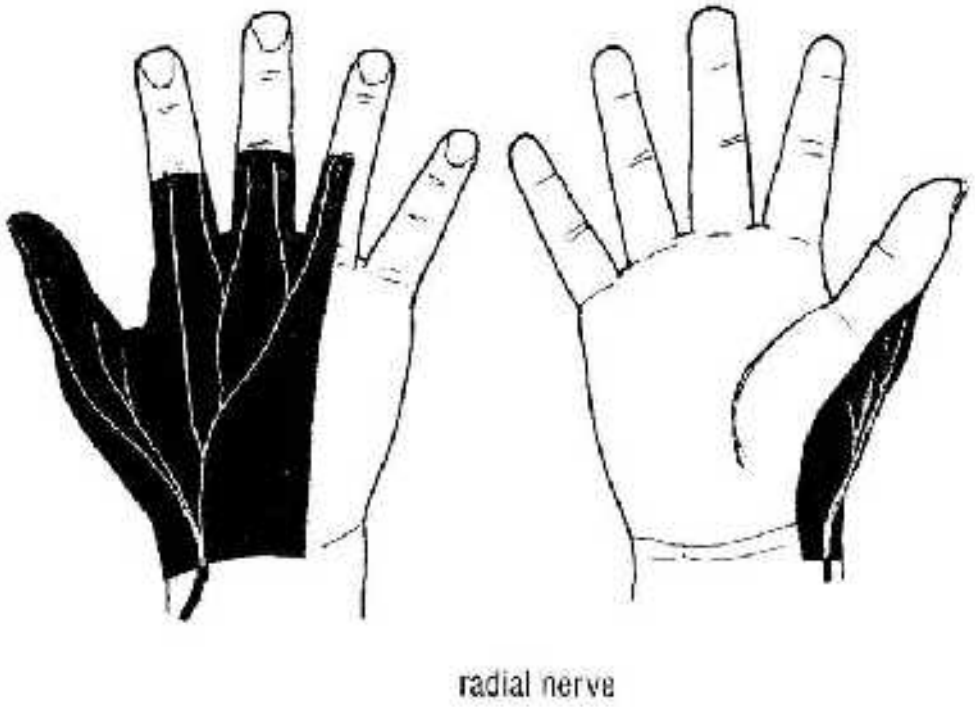




Anterior-Inferior Dislocation

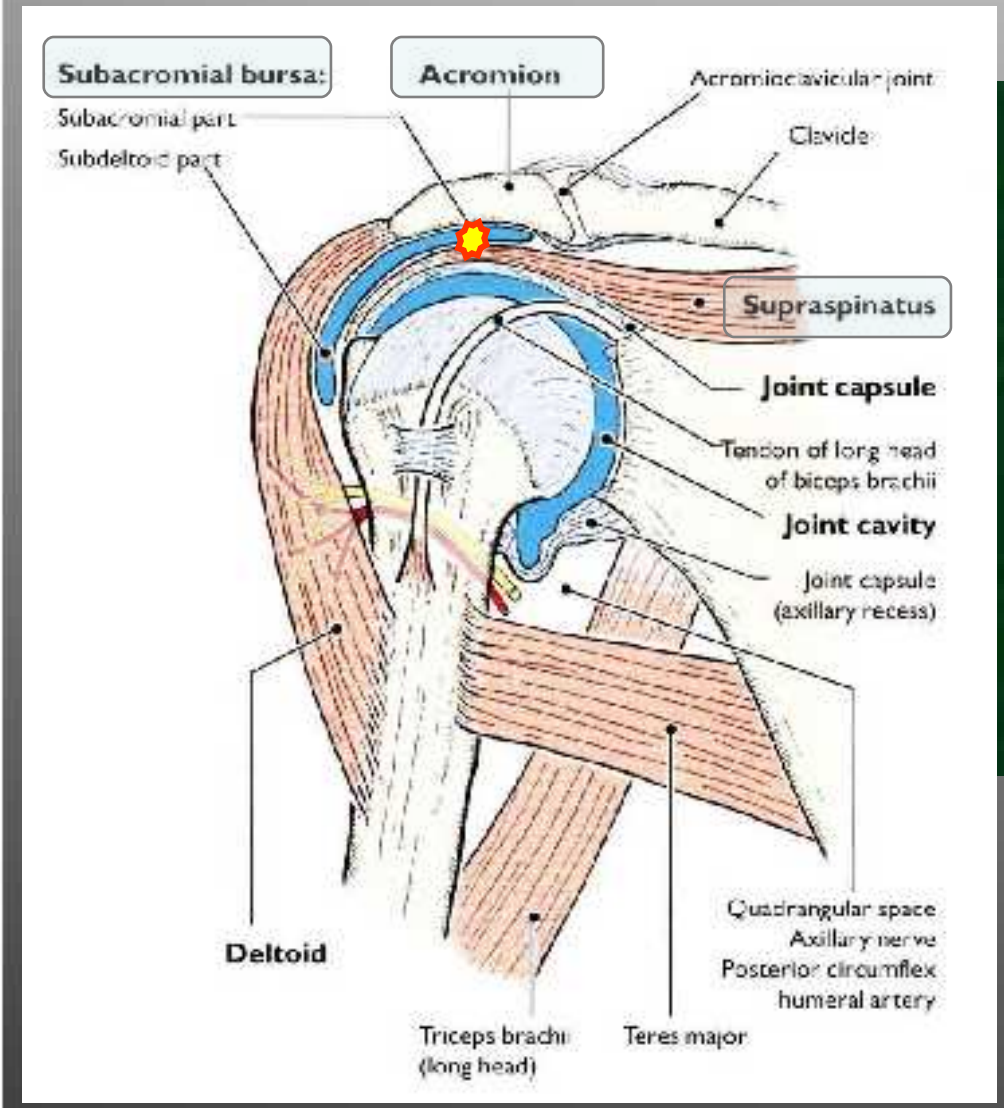
- Sudden violence applied to the humerus with the joint fully abducted pushes the humeral head downward onto the inferior weak part of the capsule, which tears, and the humeral head comes to lie inferior to the glenoid fossa.



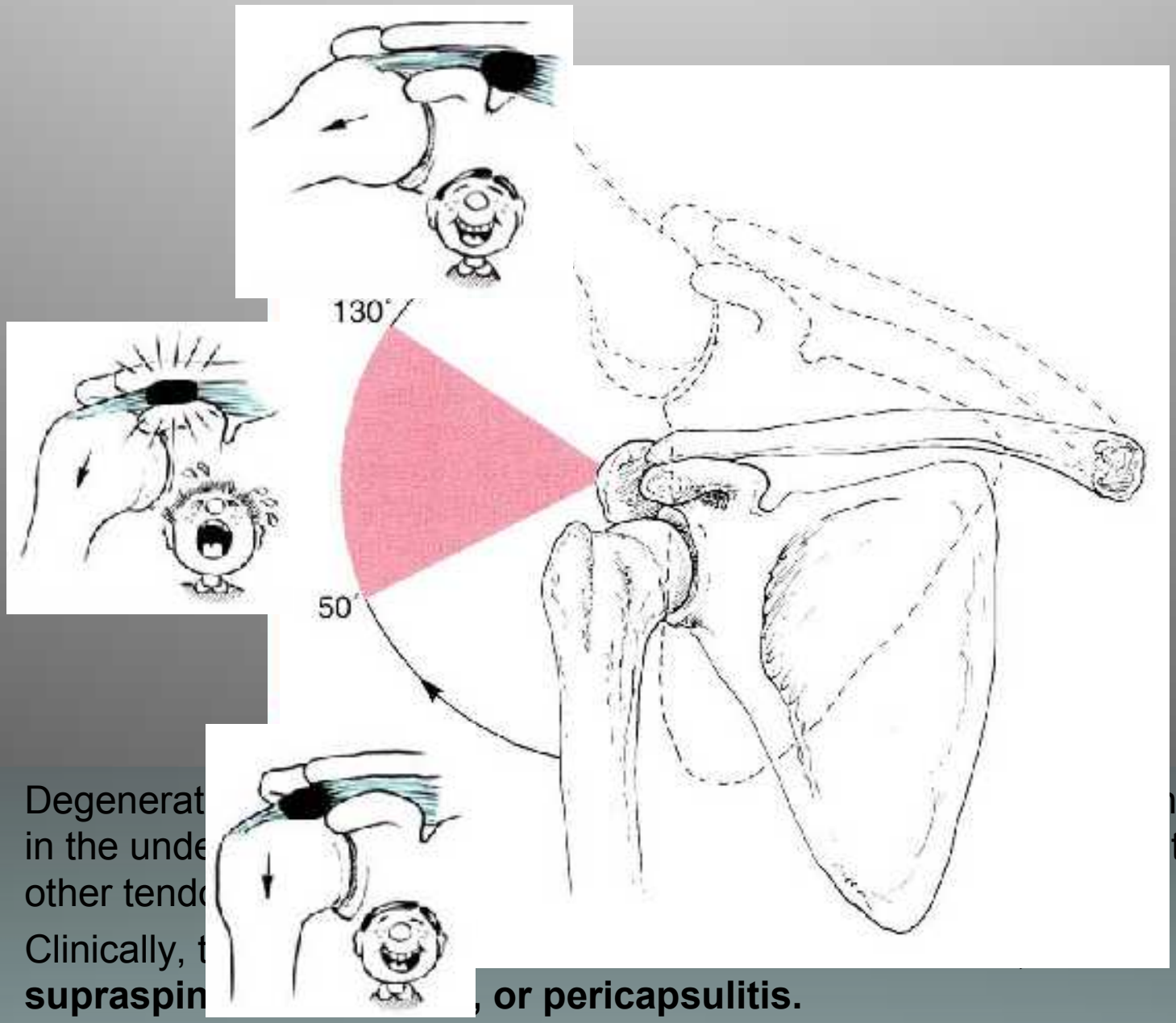


- A ***subglenoid*** displacement of the head of the humerus into the quadrangular space can cause **damage to the axillary nerve.**
- This is indicated by ***paralysis of the deltoid muscle*** and ***loss of skin sensation*** over the lower half of the deltoid.
- Downward displacement of the humerus can also **stretch and damage the radial nerve**.

ROTATOR CUFF TENDINITIS



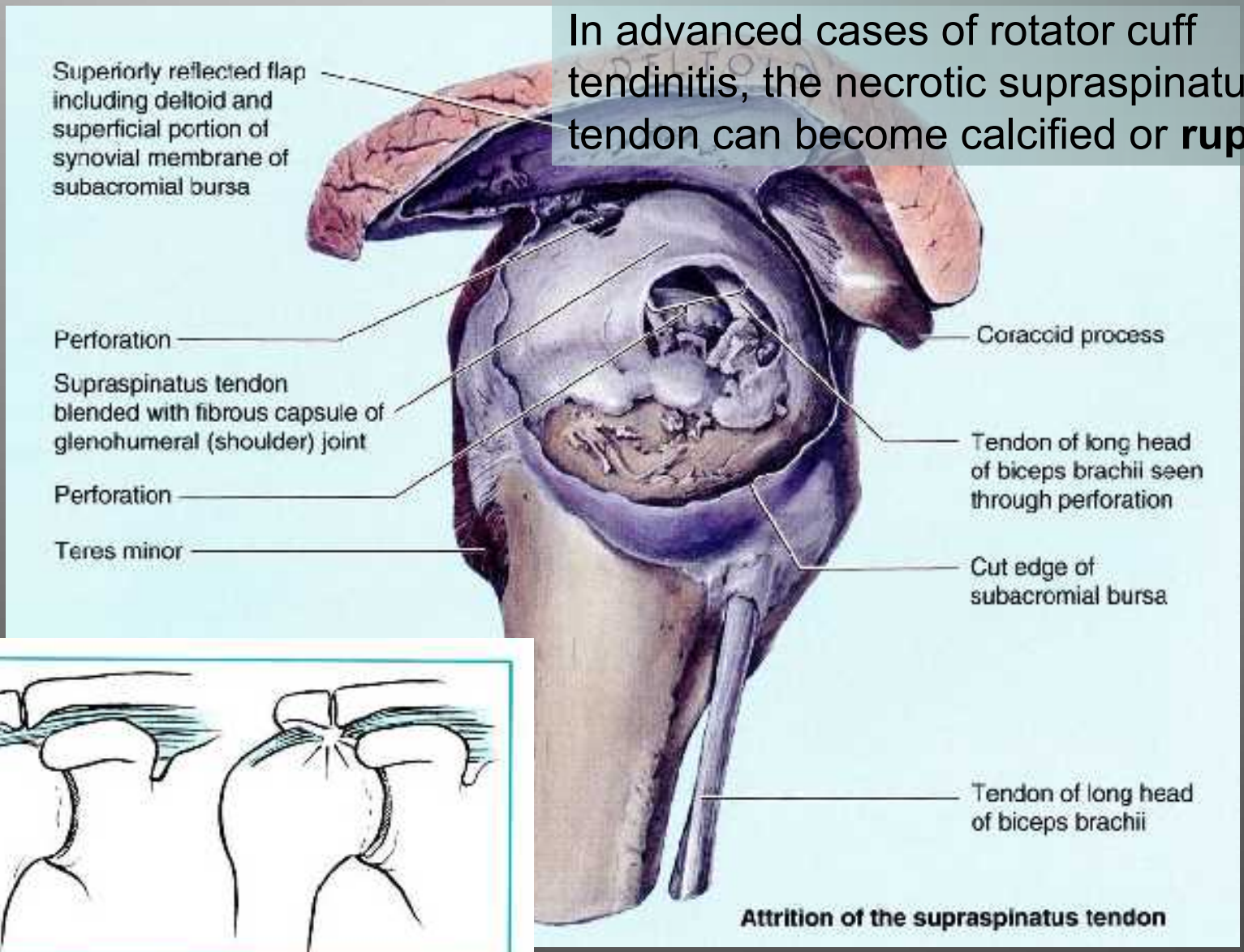
- Lesions of the rotator cuff are a common **cause of pain** in the shoulder region.
- **Excessive overhead activity** of the upper limb may be the cause of tendinitis, although many cases appear spontaneously.
- During abduction of the shoulder joint, the supraspinatus tendon is exposed to **friction against the acromion.**
- Under normal conditions the amount of friction is reduced to a minimum by the large **subacromial bursa,** which extends laterally beneath the deltoid.

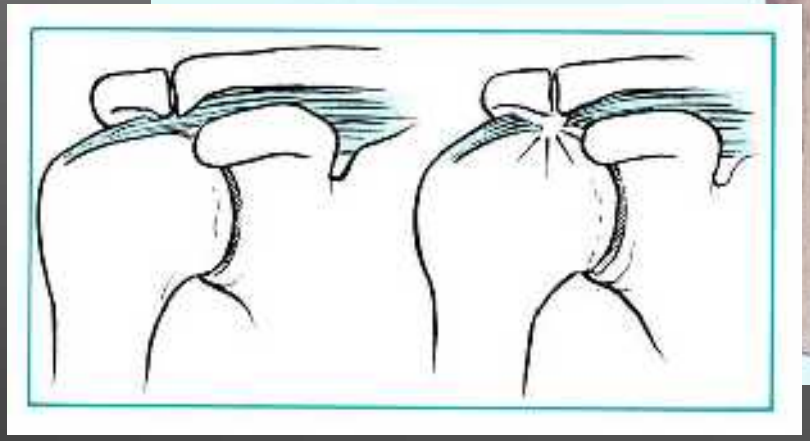


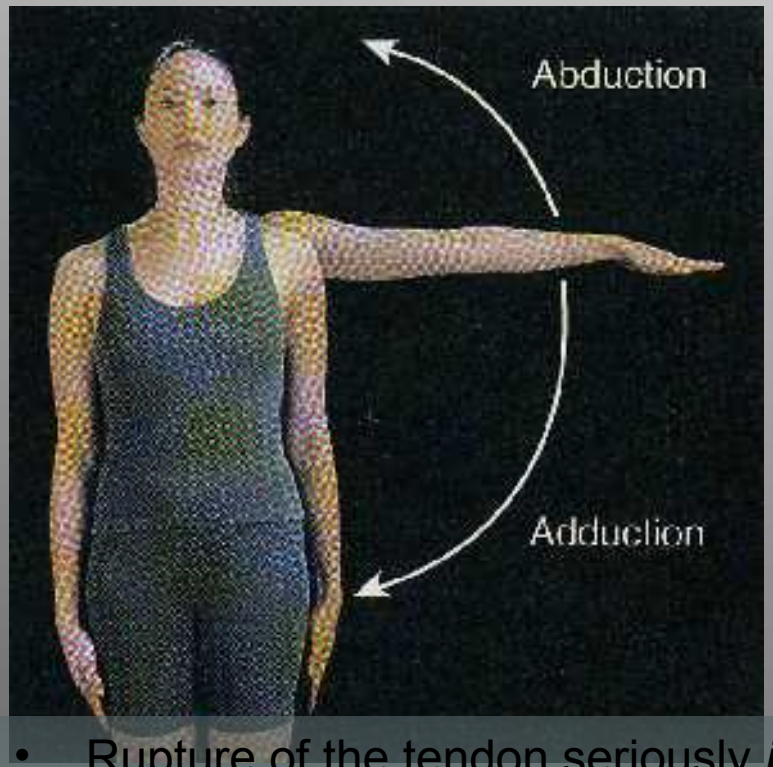
- Degenerat anges in the unde the other tend
- Clinically, t **supraspin , or pericapsulitis.**
- It is characterized by the presence of a **spasm of pain in the middle range of abduction** when the diseased area impinges on the acromion.

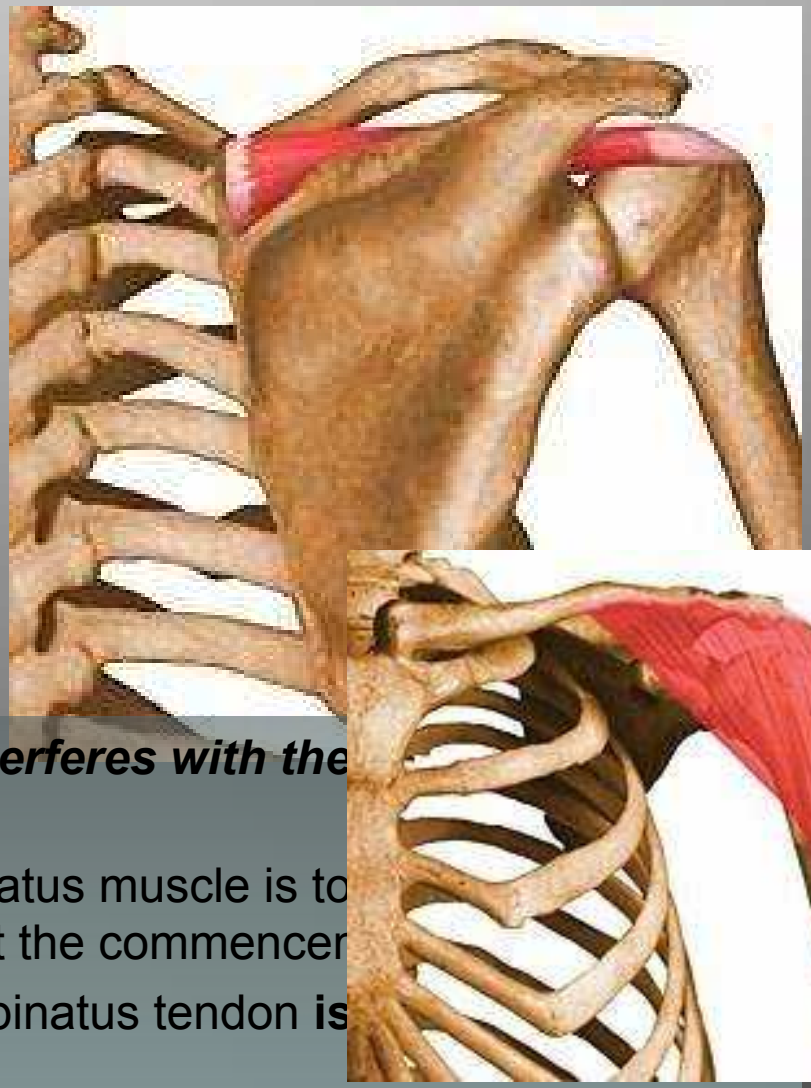
RUPTURE OF THE SUPRASPINATUS TENDON

In advanced cases of rotator cuff tendinitis, the necrotic supraspinatus tendon can become calcified or **rupture**.









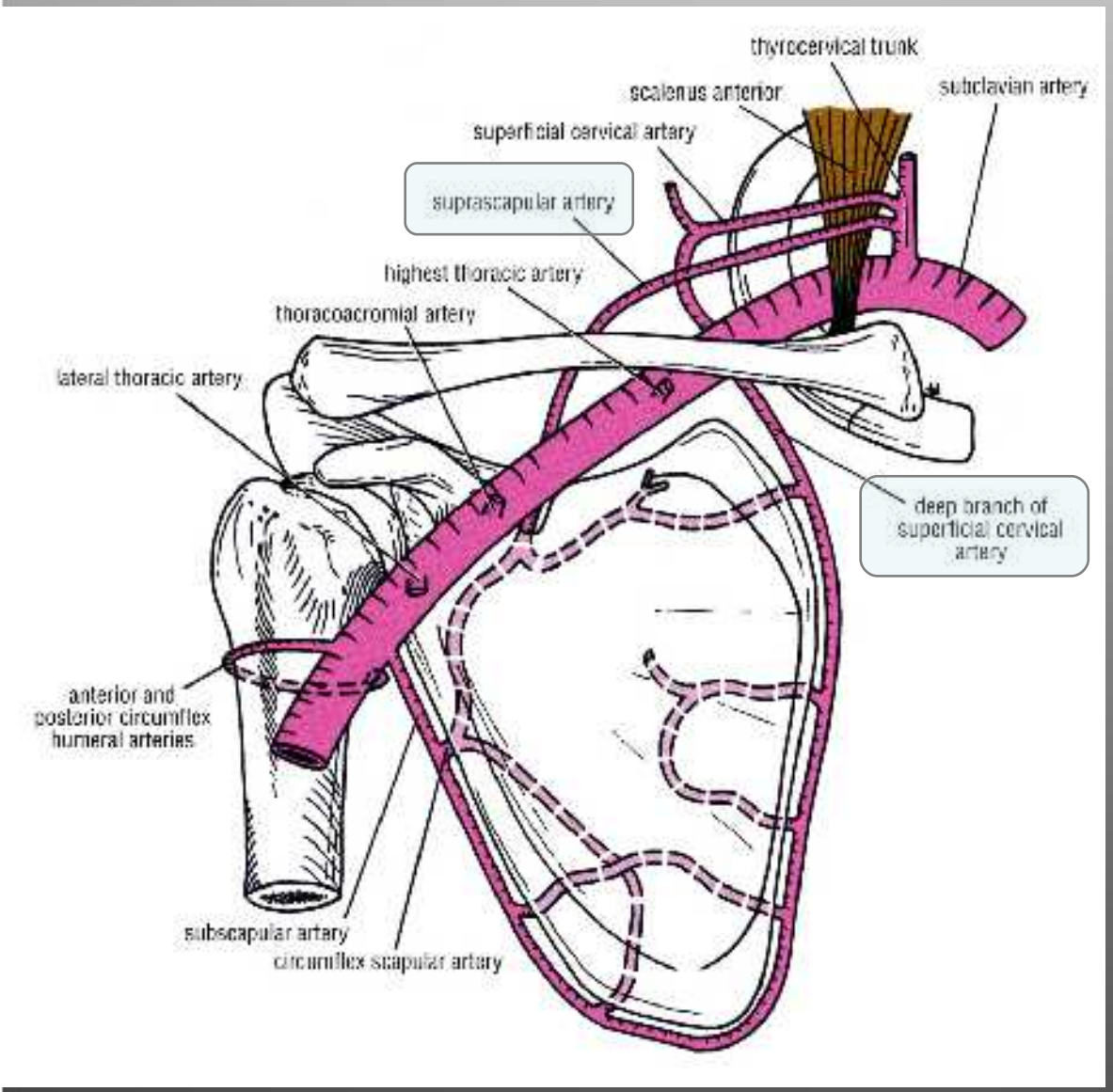
- Rupture of the tendon seriously ***interferes with the movement*** of the shoulder joint.
- The main function of the supraspinatus muscle is to the humerus in the glenoid fossa at the commencer
- The patient with a ruptured supraspinatus tendon **is abduction of the arm.**
- ***However, if the arm is passively assisted for the first 15° of abduction, the deltoid can then take over and complete the movement to a right angle.***

SHOULDER PAIN

- The synovia… joint are innervated b…
- The joint is s… distension.
- The muscles… ponse to pain originating ir… ***oint*** and thus reduce the pain.
- Injury to the shoulder joint is followed by pain, limitation of movement, and muscle atrophy owing to disuse.

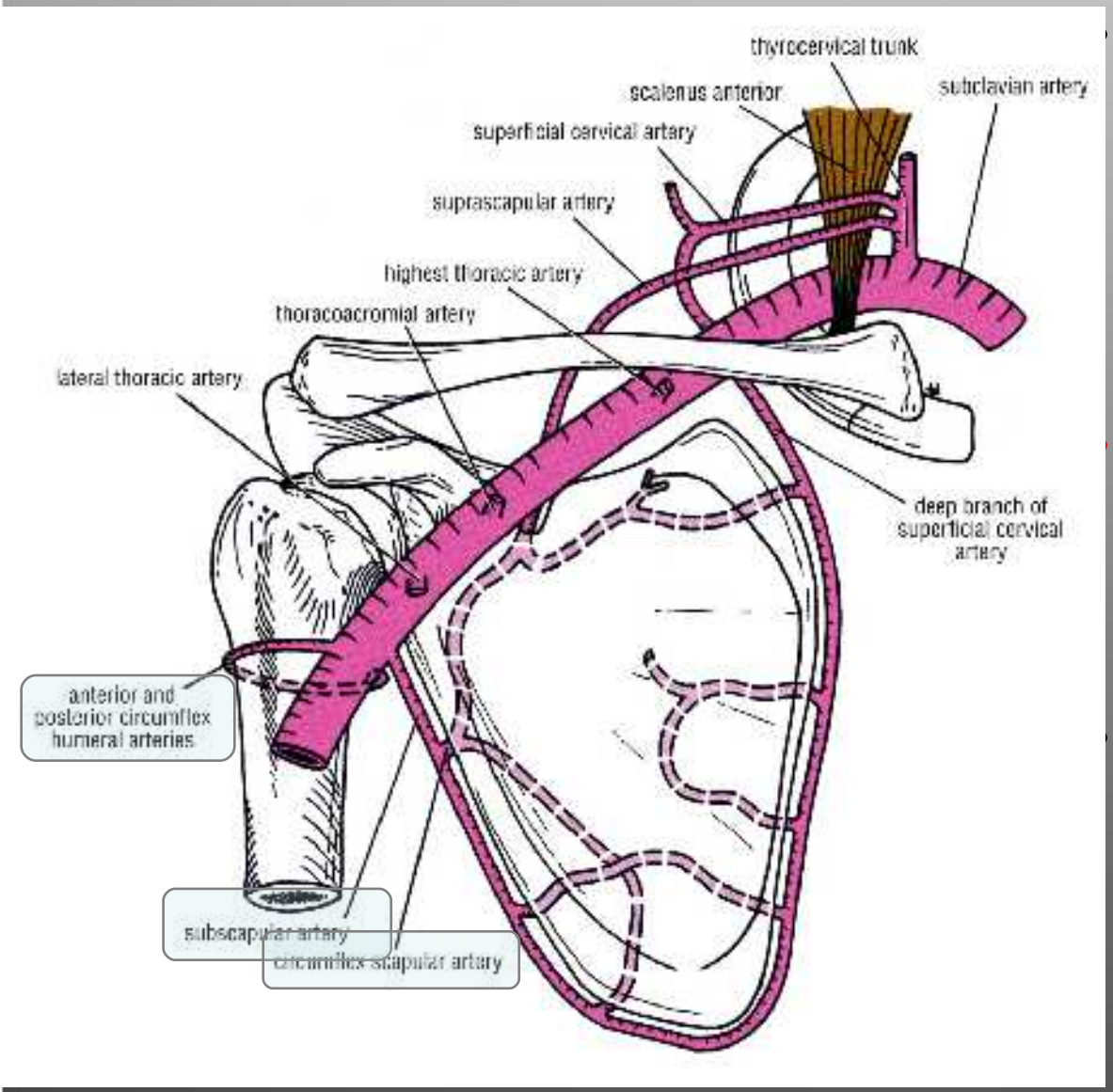
ANASTOMOSES AROUND THE SCAPULAR REGIONS

BRANCHES FROM THE SUBCLAVIAN ARTERY



- **The suprascapular artery, (**branch from 1st part of subclavian artery) distributed to the supraspinous and infraspinous fossae of the scapula.
- **The superficial cervical artery,** which gives off a ***deep branch*** that runs down the medial border of the scapula.

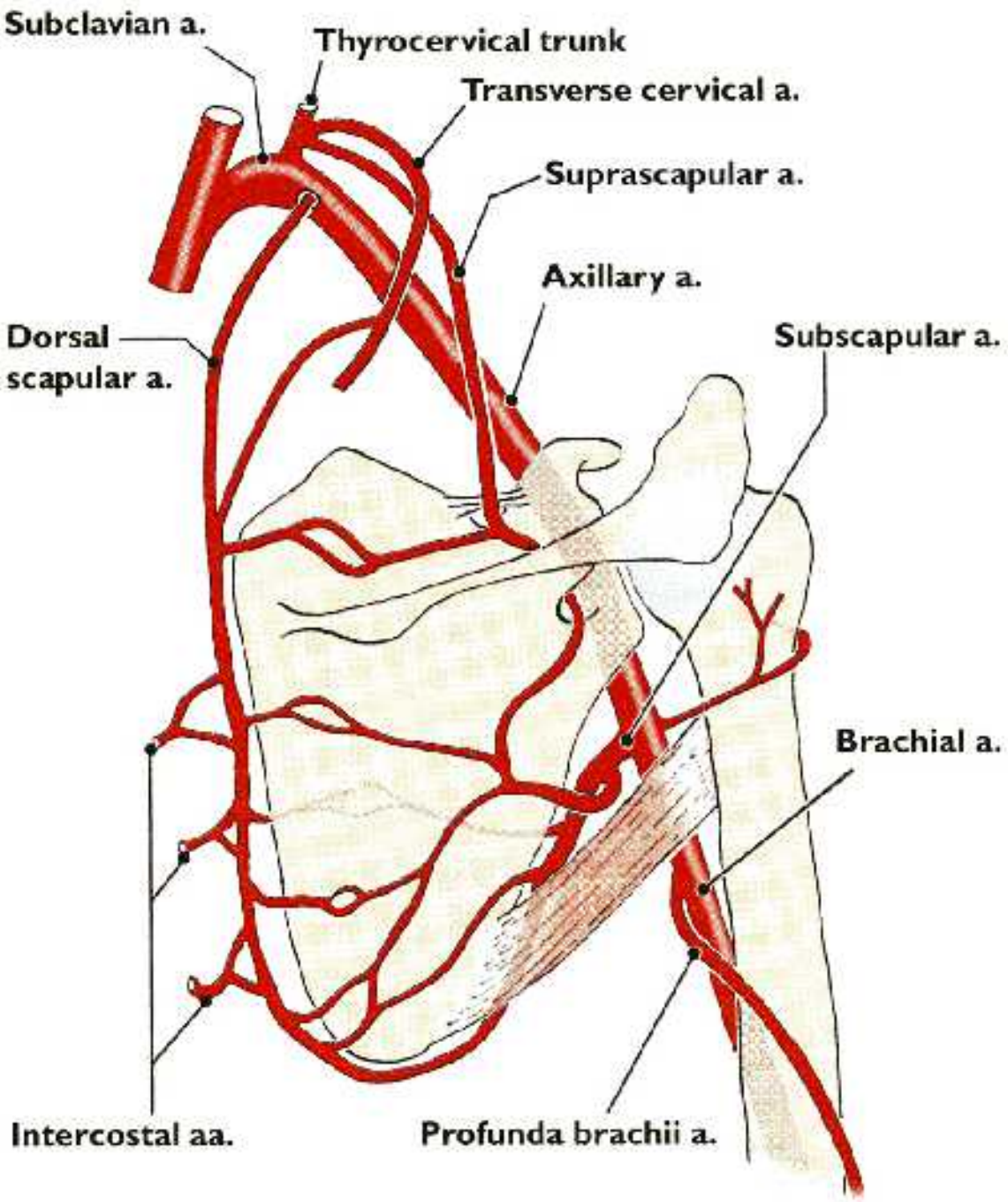
BRANCHES FROM THE AXILLARY ARTERY



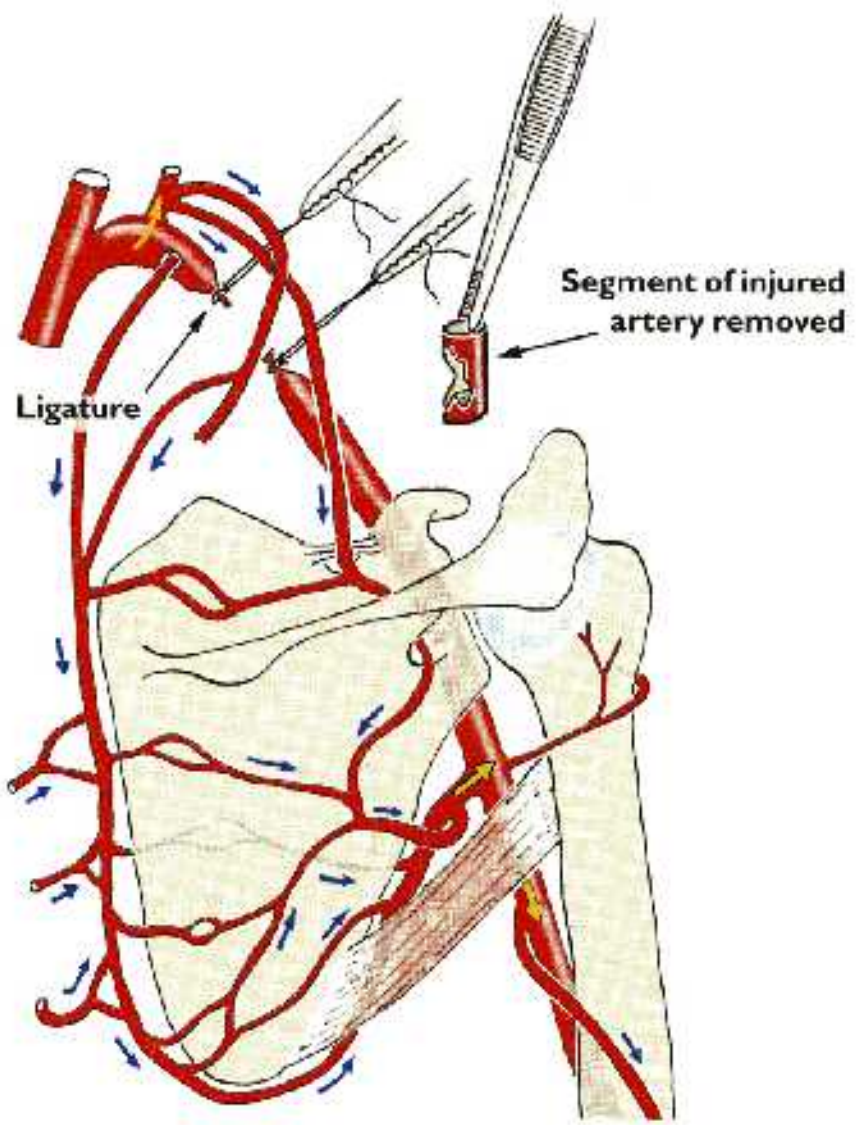
The subscapular artery and its ***circumflex scapular branch*** supply the subscapular and infraspinous fossae of the scapula.

The anterior & posterior circumflex humeral artery.

Both the circumflex arteries form an ***anastomosing circle*** around the surgical neck of the humerus.


Subclavian a.
Thyrocervical trunk
Transverse cervical a.
Suprascapular a.
Axillary a.
Dorsal scapular a.
Subscapular a.
Brachial a.
Intercostal aa.
Profunda brachii a.

LIGATION OF THE AXILLARY ARTERY



The existence of the anastomosis around the shoulder joint is vital to preserving the upper limb if it should it be necessary to ligate the axillary artery.