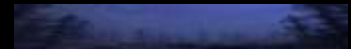




Upper limb- Part II

Muscles, Nerves and Arteries of the Arm

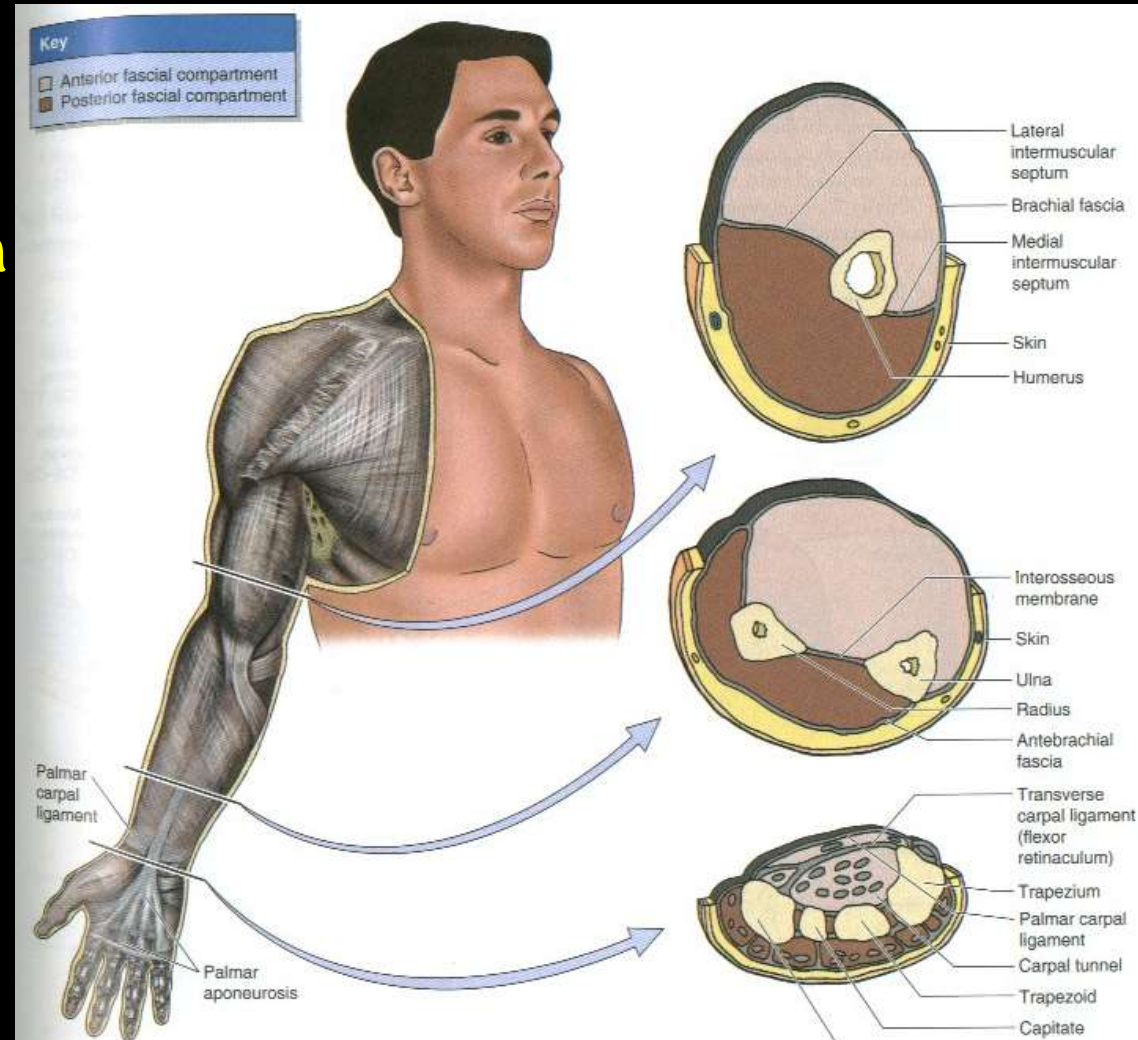


Brachial fascia (deep fascia of the arm)

❖ Brachial fascia is a continuation of the pectoral and axillary fasciae and passes in the antebrachial fascia

❖ Brachial fascia sends 2 intermuscular septa (lateral and medial) dividing the arm into 2 compartments:

- Anterior compartment of arm
- Posterior compartment of arm



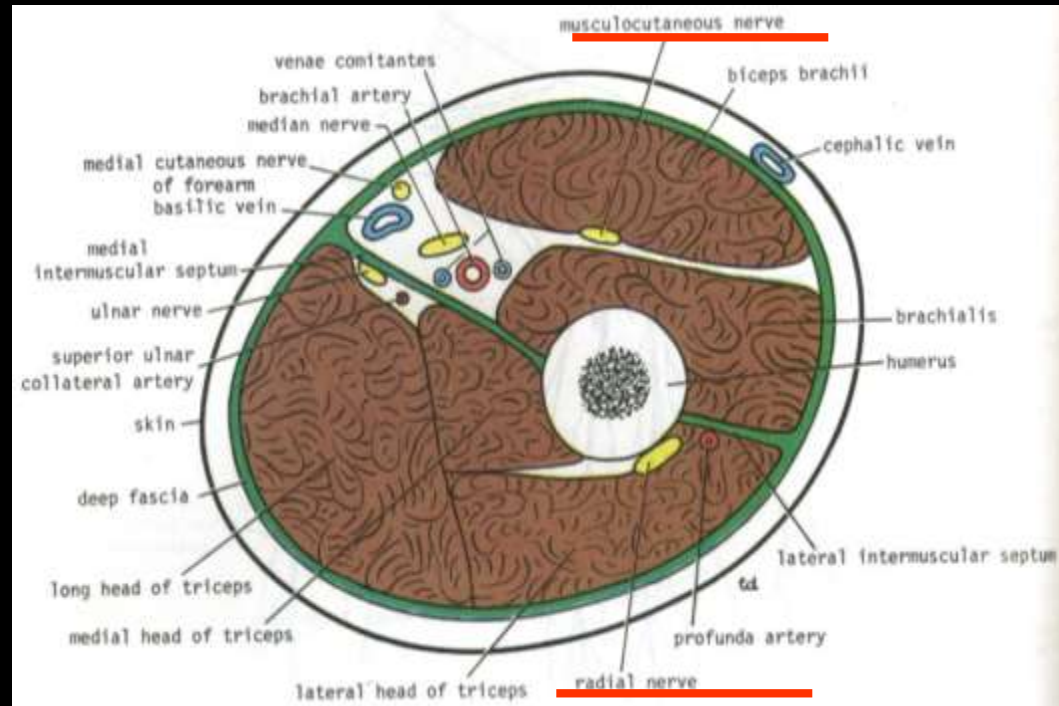
Muscles of the arm

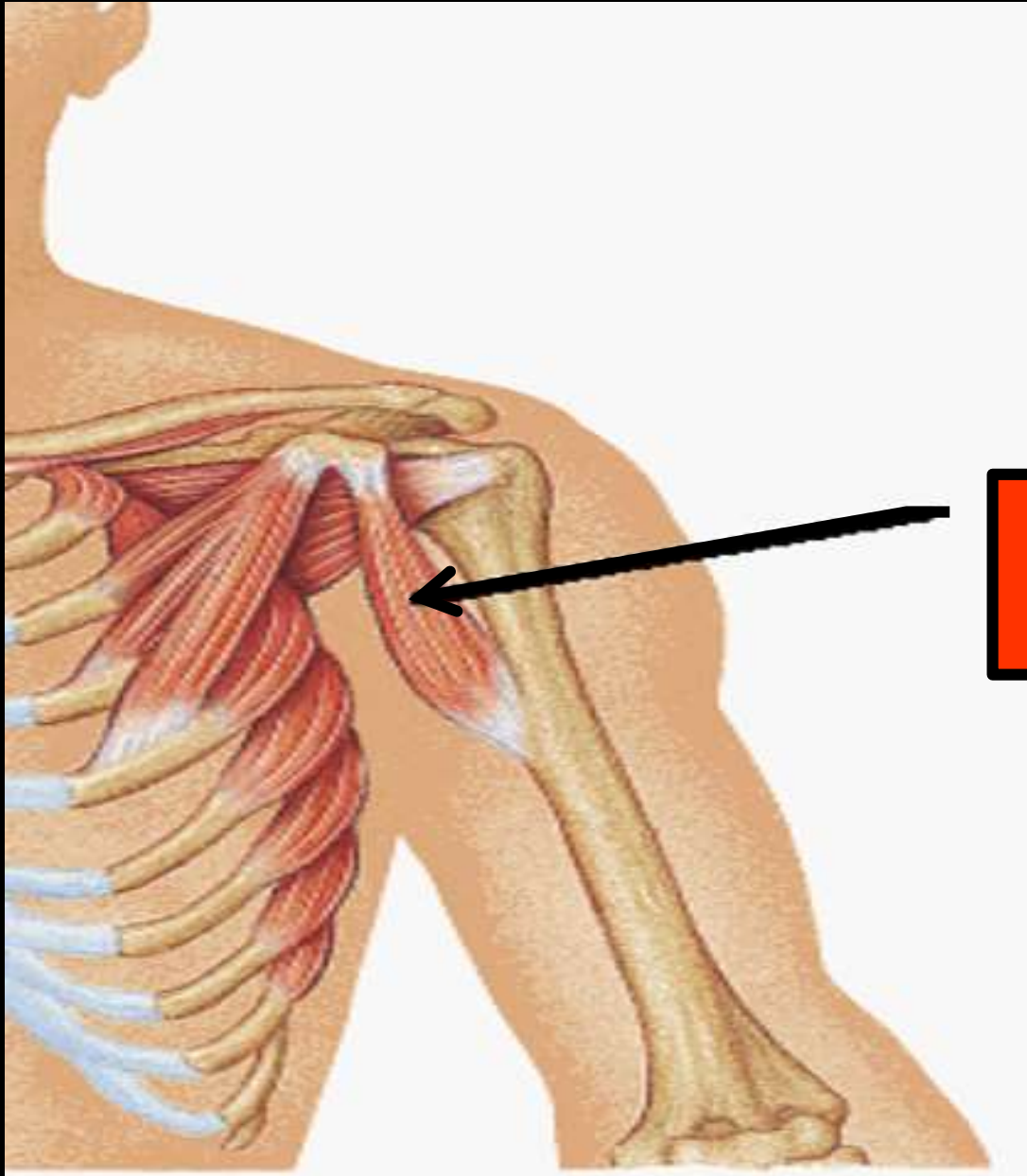
❖ Muscles of the **anterior** compartment of arm (flexors)- innervated by **musculocutaneous nerve**

- Coracobrachialis
- Biceps brachii
- Brachialis

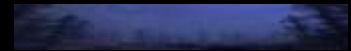
❖ Muscles of the **posterior** compartment of arm (extensors)- innervated by **radial nerve**

- Triceps brachii
- Anconeus





Coracobrachialis



Muscles of the anterior compartment of arm

Coracobrachialis

❖ Attachments

➤ Origin

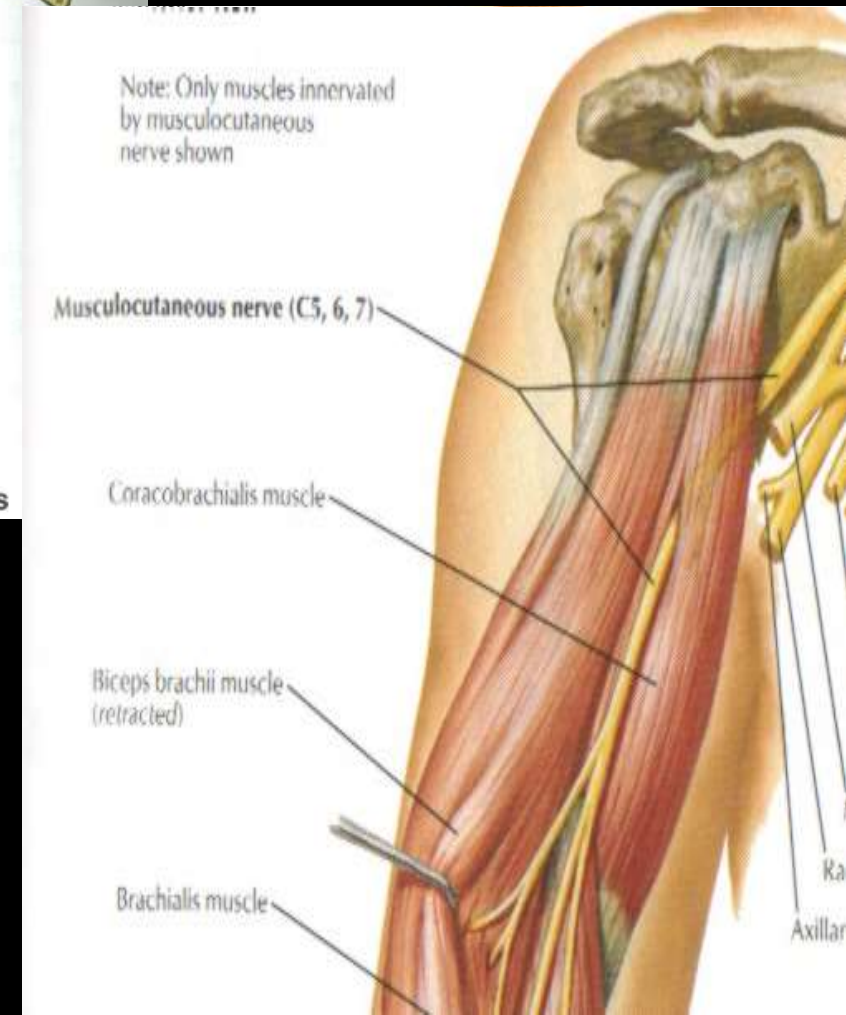
- Coracoid process of scapula

➤ Insertion

- Medial third of medial surface of humerus body

❖ Innervation

- Musculocutaneous nerve which pierces its belly

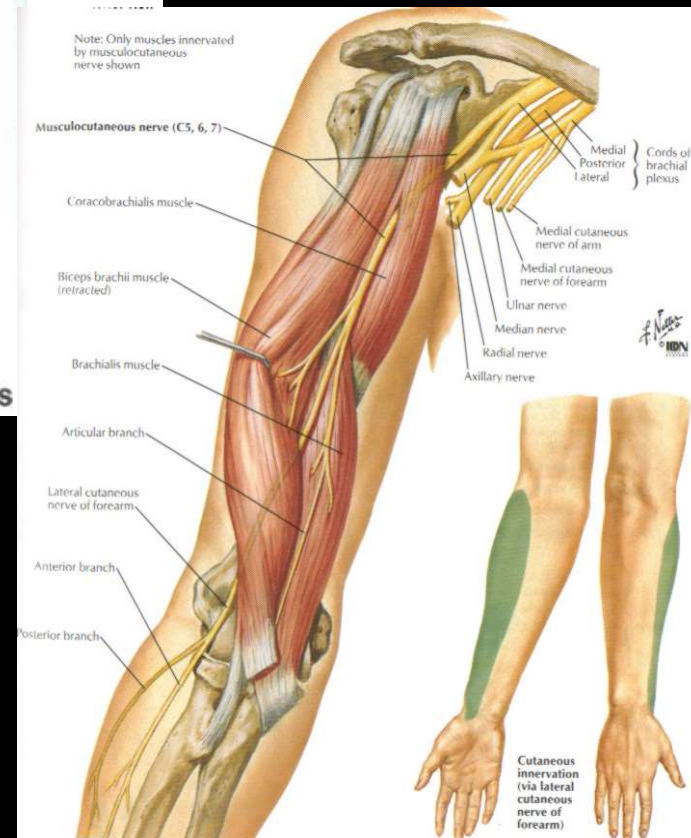
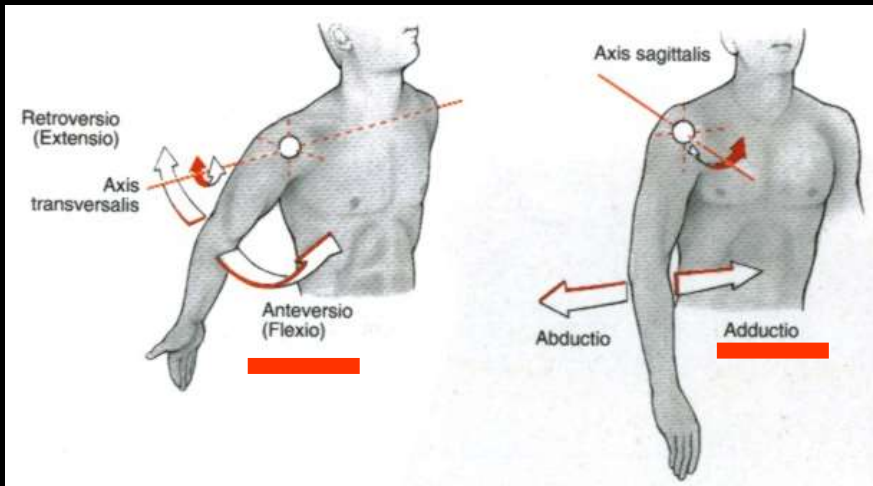


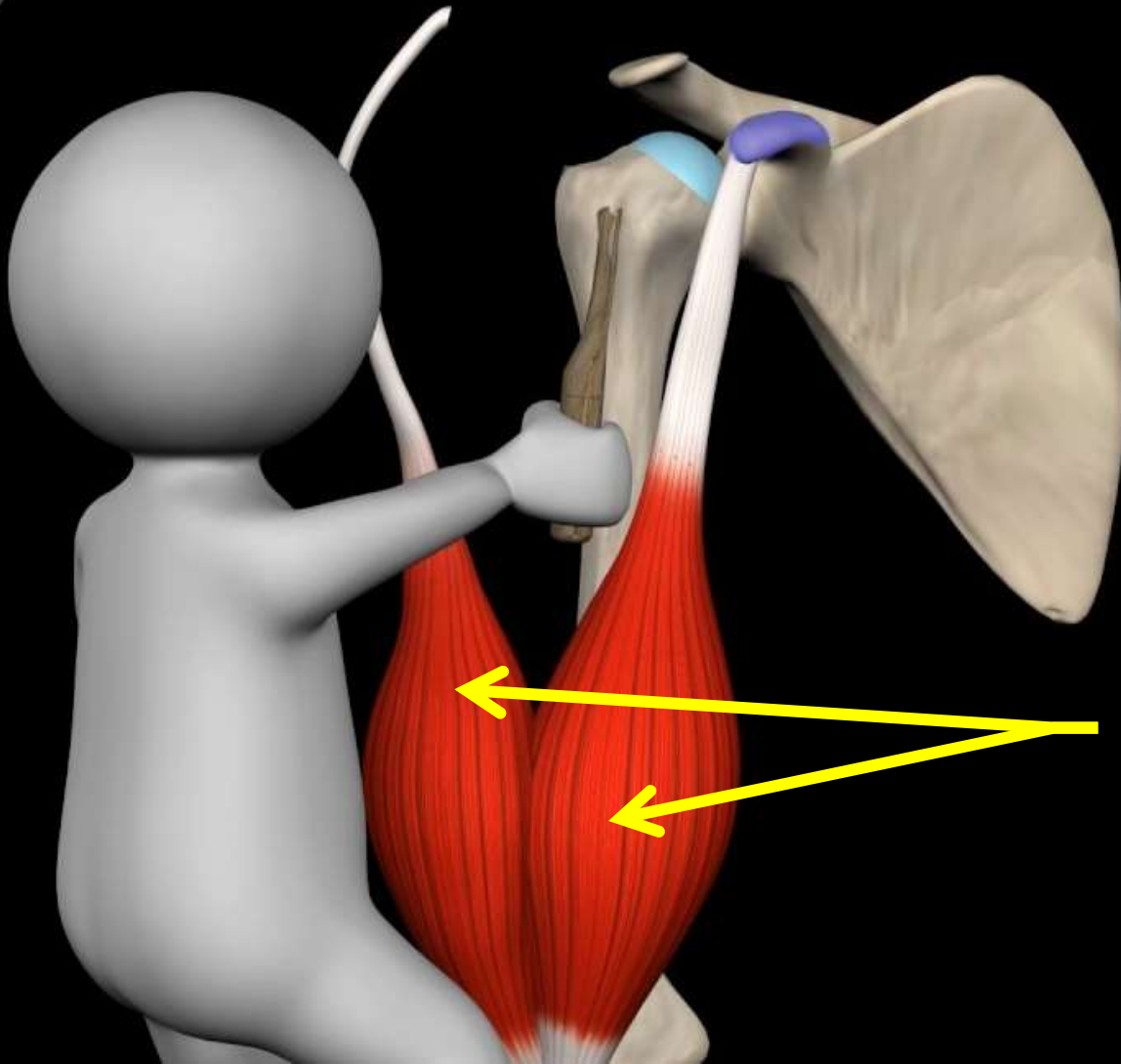
Muscles of the anterior compartment of arm

Coracobrachialis

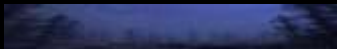
❖ Main action

- Resists downward dislocation of the head of humerus, especially during carrying heavy objects
- Flexion and adduction in the glenohumeral joint





Biceps brachii



Muscles of the anterior compartment of arm

Biceps brachii

Its proximal part is divided into 2 heads

- Short head
- Long head

❖ Origin of the short head

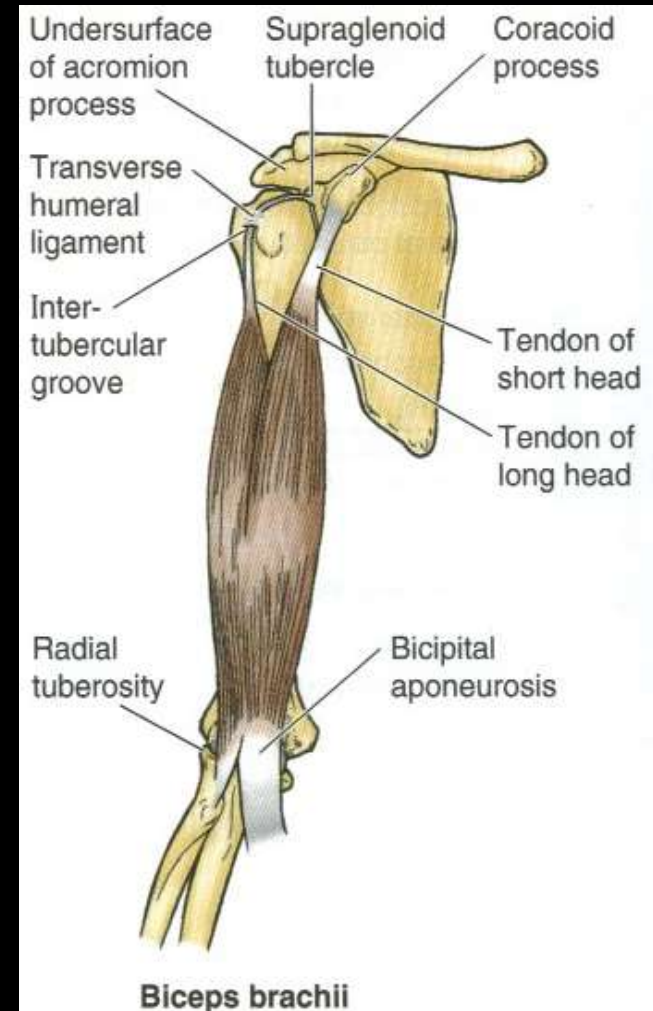
- Coracoid process of scapula

❖ Origin of the long head

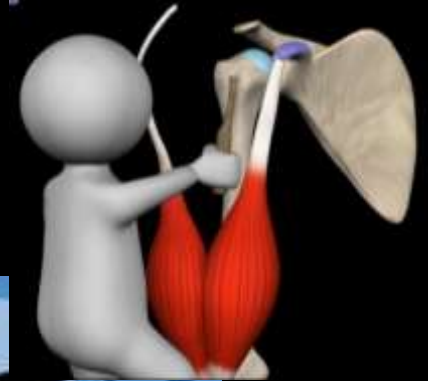
- Supraglenoid tubercle of scapula
- Its tendon occupies intertubercular groove and is situated within the shoulder joint

❖ Insertion of the entire muscle

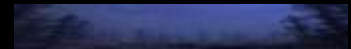
- **Radial tuberosity** (tendon situated within the cubital fossa)
- **Bicipital aponeurosis** (flat fibrous membrane blended with cubital fascia covering cubital fossa)



Rupture of tendon of long head of biceps brachii



Popeye deformity

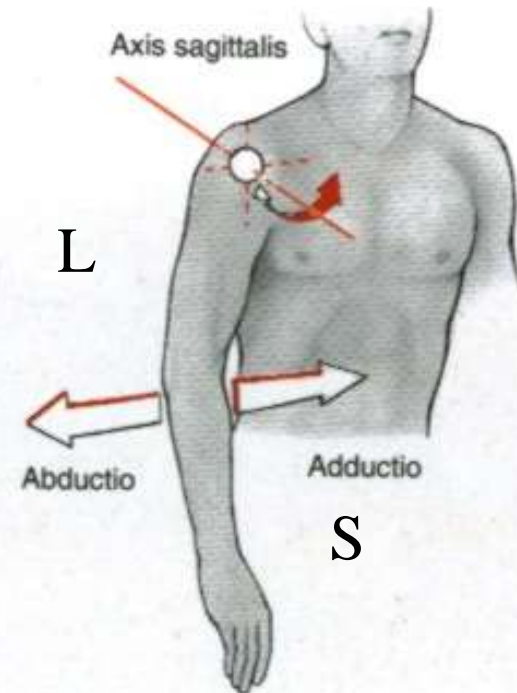
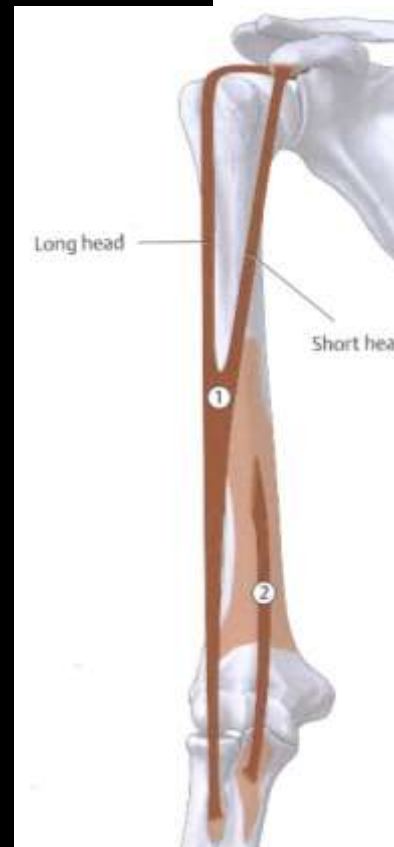
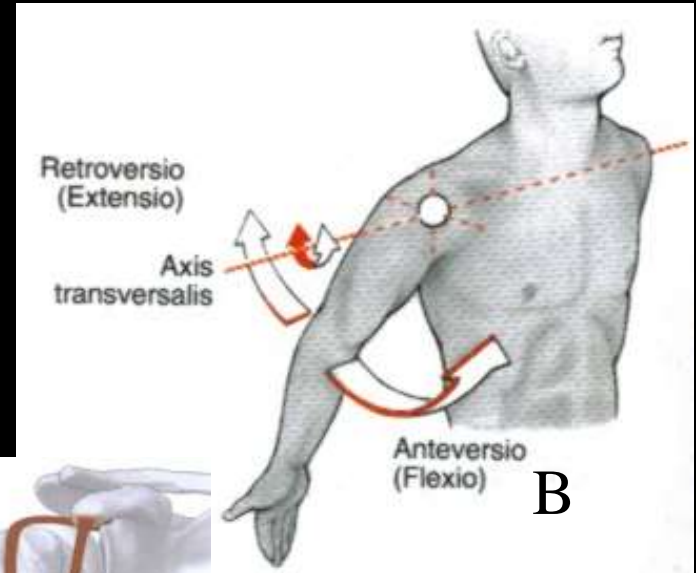


Muscles of the anterior compartment of arm

Main action of the biceps brachii

❖ In glenohumeral joint

- Flexion (both heads)
- Adduction (short head)
- Abduction (long head)
- Resisting downward dislocation of the head of humerus especially during carrying heavy objects (long head)



Muscles of the anterior compartment of arm

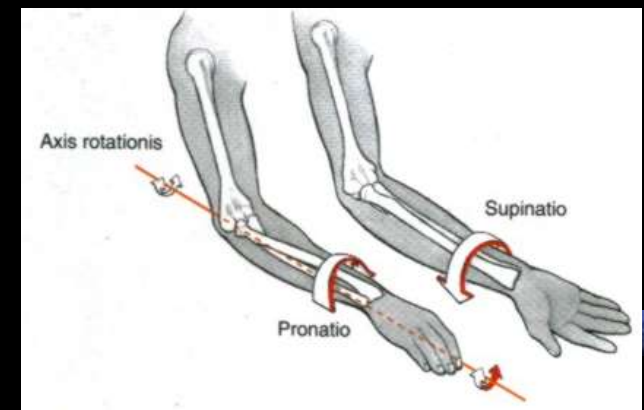
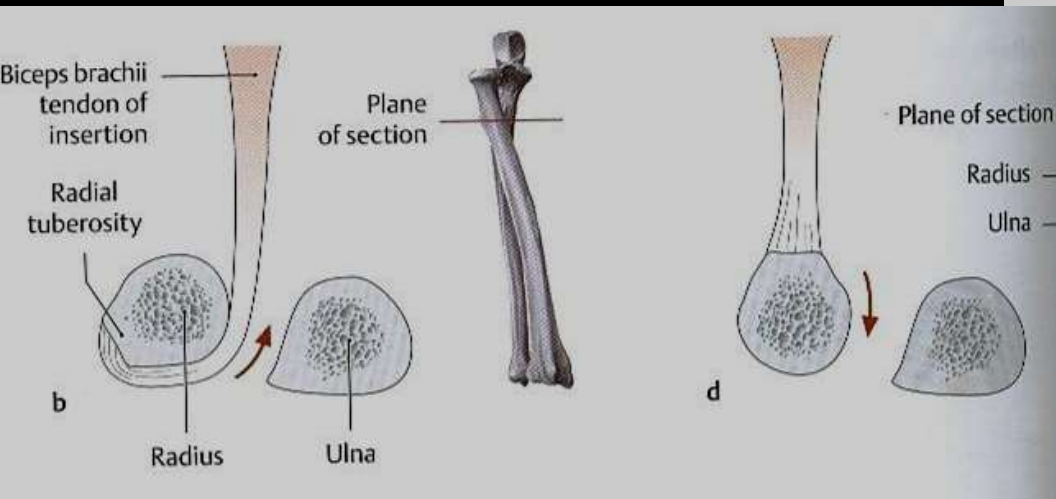
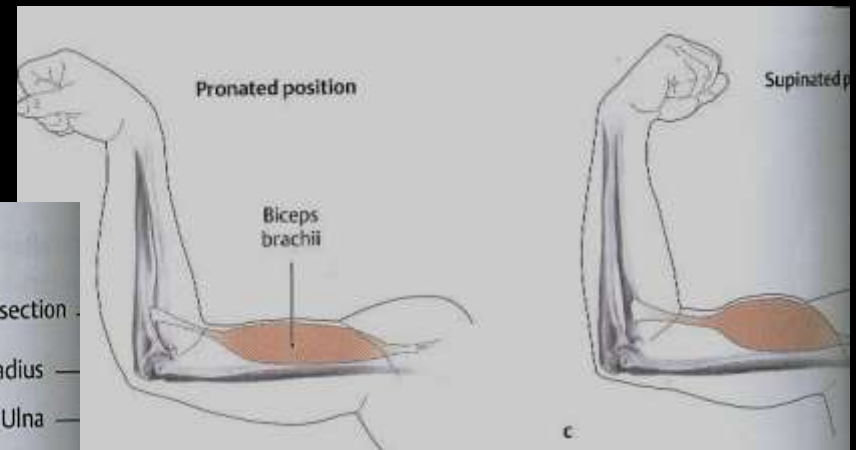
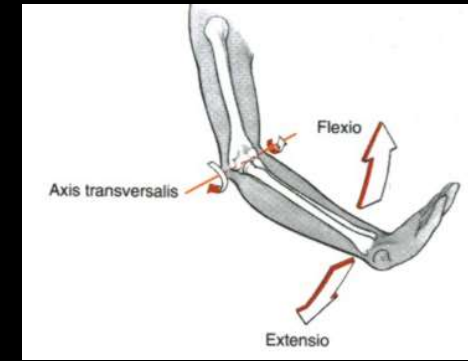
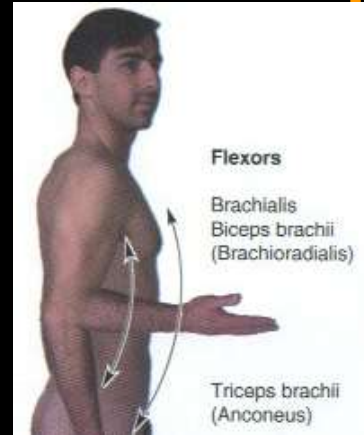
Main action of the biceps brachii

❖ Belongs to the flexors of the elbow joint

- Flexion of forearm (only in supine position)

❖ In the radioulnar joints

- Supination of the forearm



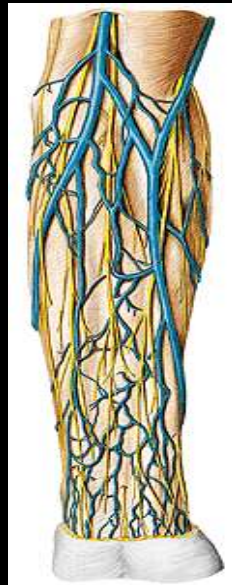


Muscles of the anterior compartment of arm

Main action of the biceps brachii

❖ Bicipital aponeurosis

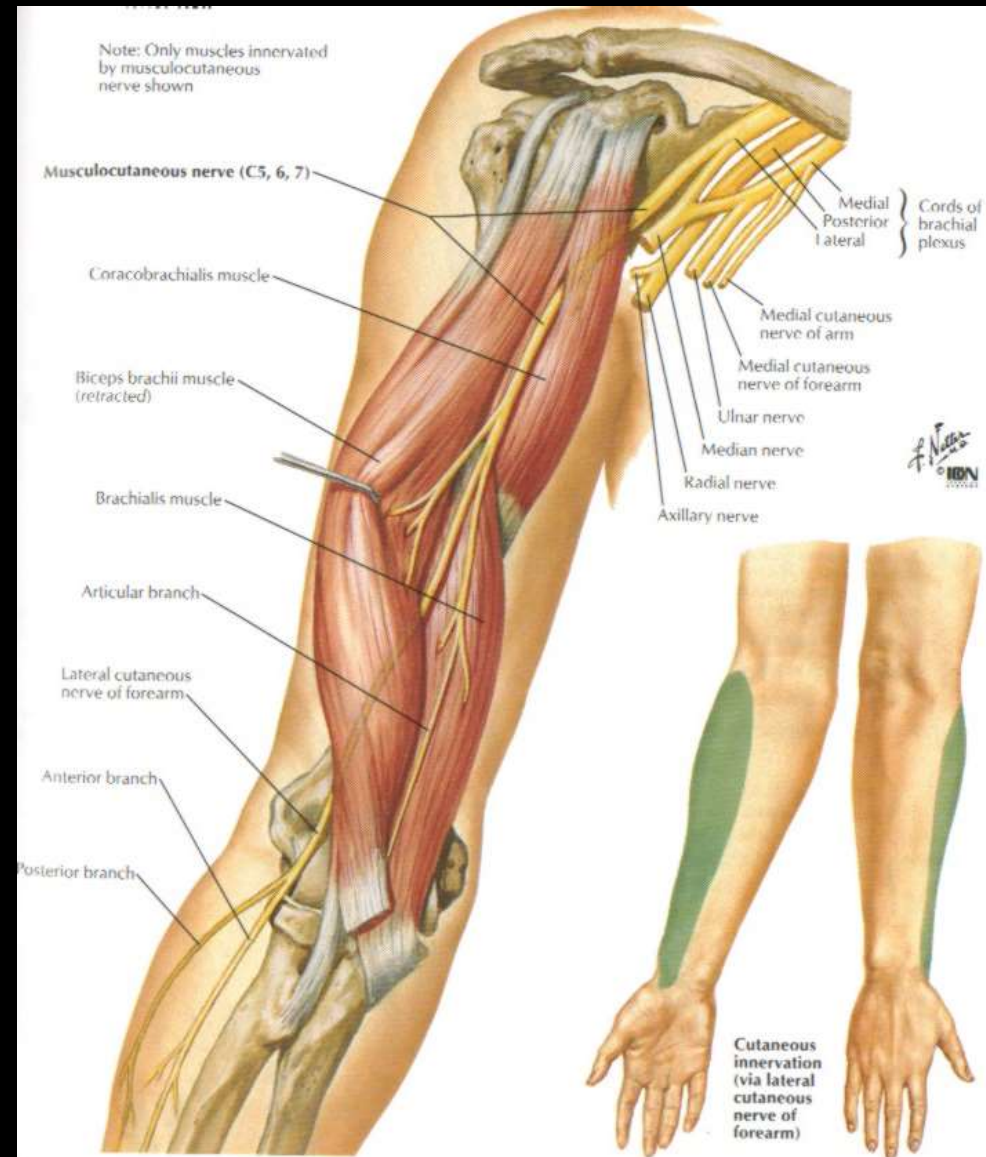
- Protection of the contents of cubital fossa (**especially brachial artery and median nerve** during intravenous injections)



Muscles of the anterior compartment of arm

Innervation of the biceps brachii

Musculocutaneous nerve



Muscles of the anterior compartment of arm

Brachialis

❖ Attachments

➤ Origin

- Distal half of anterior surface of humerus body

➤ Insertion

- Coronoid process and tuberosity of ulna

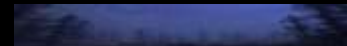
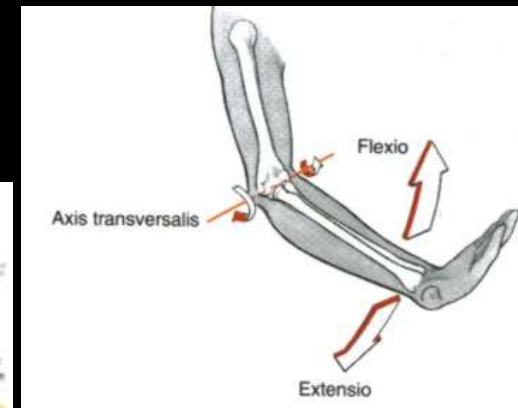
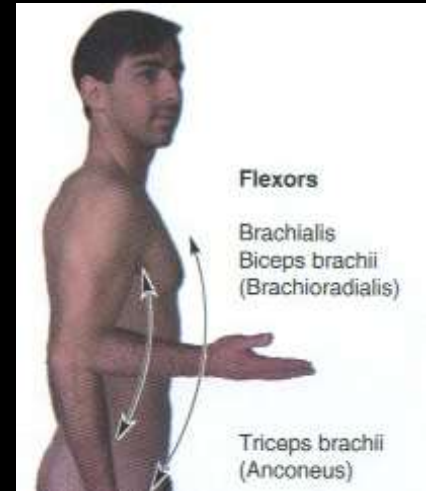
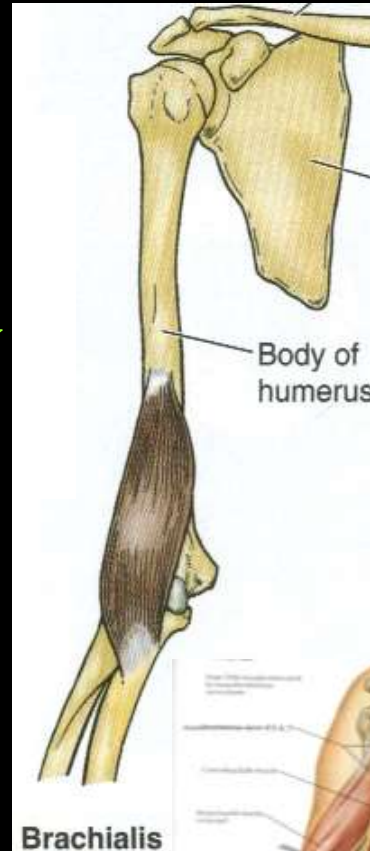
❖ Innervation

➤ Musculocutaneous nerve

❖ Main action

➤ In the elbow joint

- Flexion of forearm in all positions of forearm (either supined and pronated)



TRAINING

WORK THE BICEPS BRACHII & BRACHIALIS

With **Standing Dumbbell Curls**

BY STEPHEN E. ALWAY, PH.D., FACSM

Biceps brachii

Brachialis

Brachioradialis



TWINS Rx
THE BROTHERHOOD OF FITNESS

Muscles of the posterior compartment of arm

Triceps brachii

Its proximal part is divided into 3 heads

- Long head
- Lateral head
- Medial head

❖ Origin of the long head

- Infraglenoid tubercle of scapula

❖ Origin of the lateral head

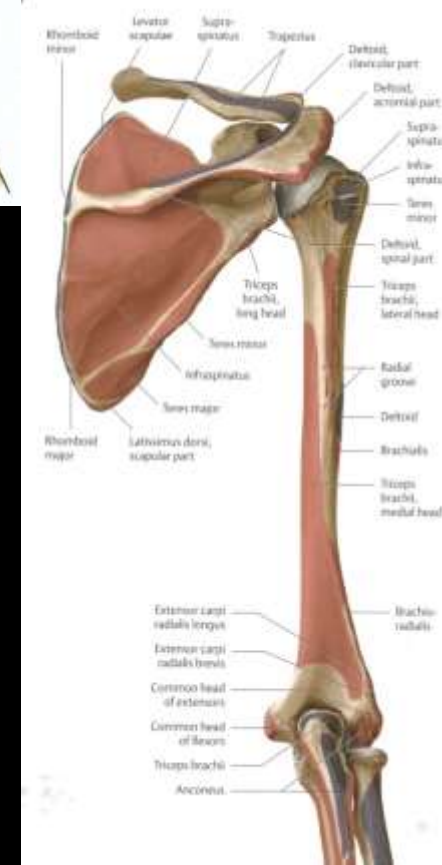
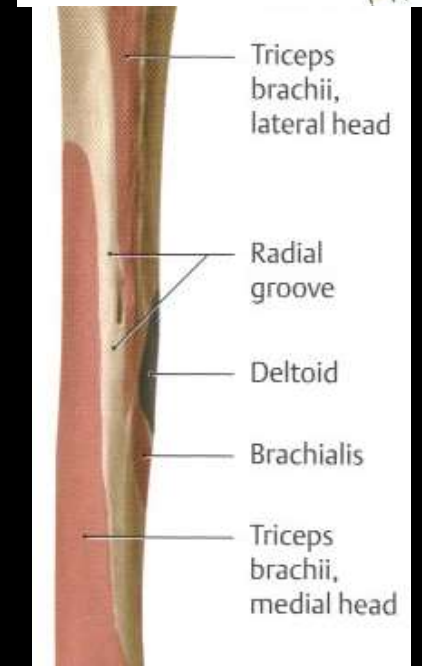
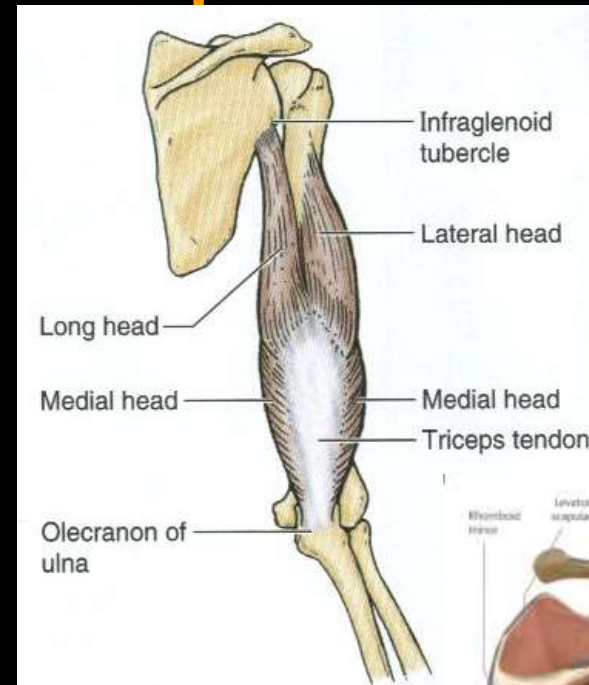
- Posterior surface of humerus (above the radial groove)

❖ Origin of the medial head

- Posterior surface of humerus (below the radial groove)

❖ Insertion of the entire muscle

- Olecranon of ulna



Muscles of the posterior compartment of arm

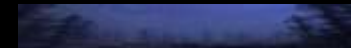
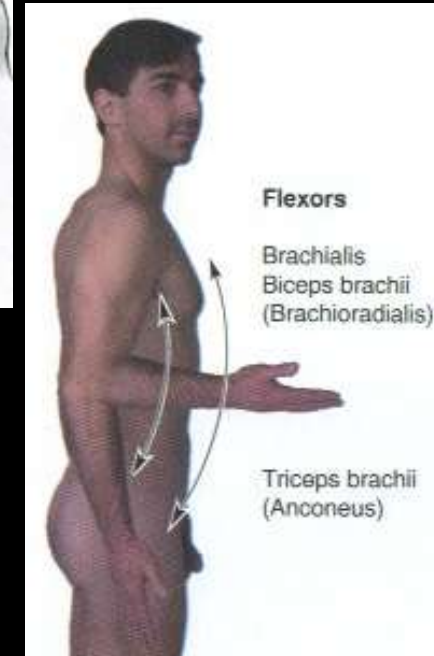
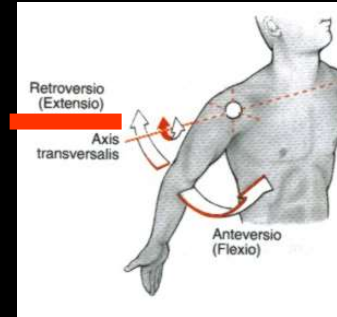
Main action of the triceps brachii

❖ In the glenohumeral joint (only long head)

- Extension
- Adduction
- Resisting downward dislocation of the head of humerus

❖ In the elbow joint

- Extension of forearm (main extensor)



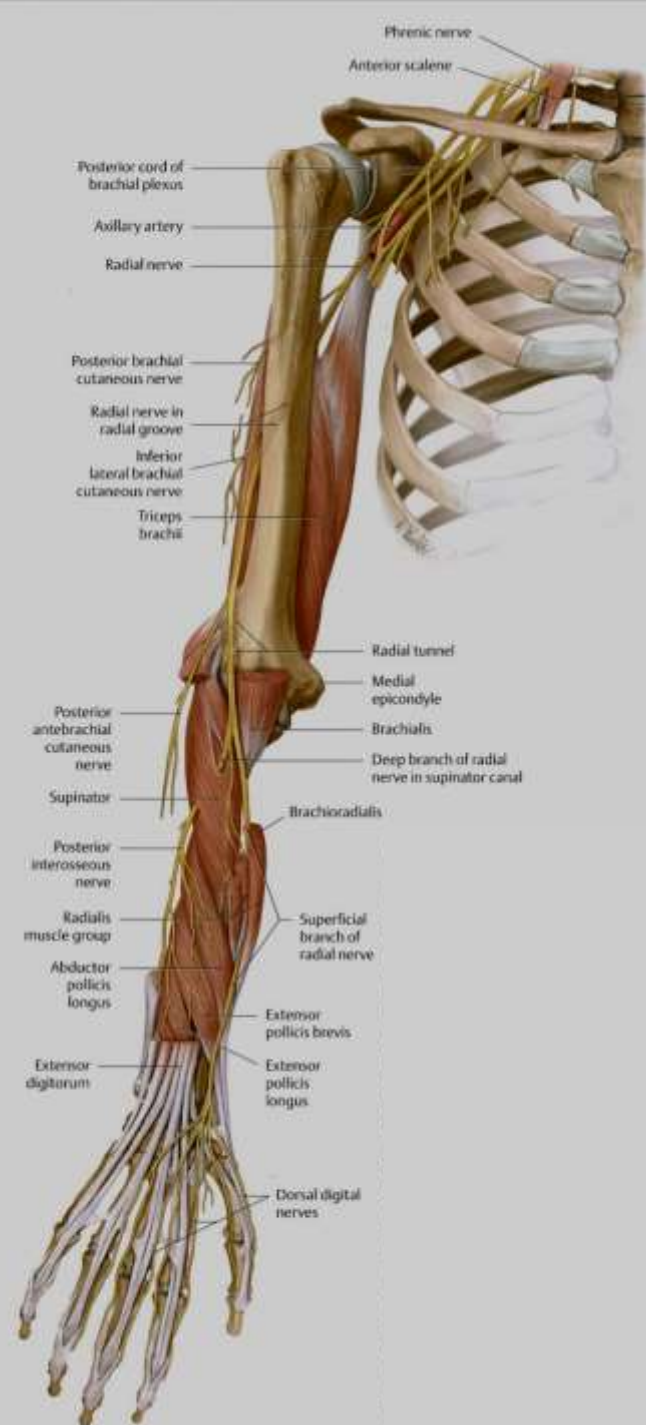


Muscles of the posterior compartment of arm

Innervation of the triceps brachii

❖ Radial nerve

- Its branches **to the long and lateral heads** arise before entering the radial groove
- Its branches **to the medial head** arise in the radial groove



Canal of the radial nerve (radial groove)

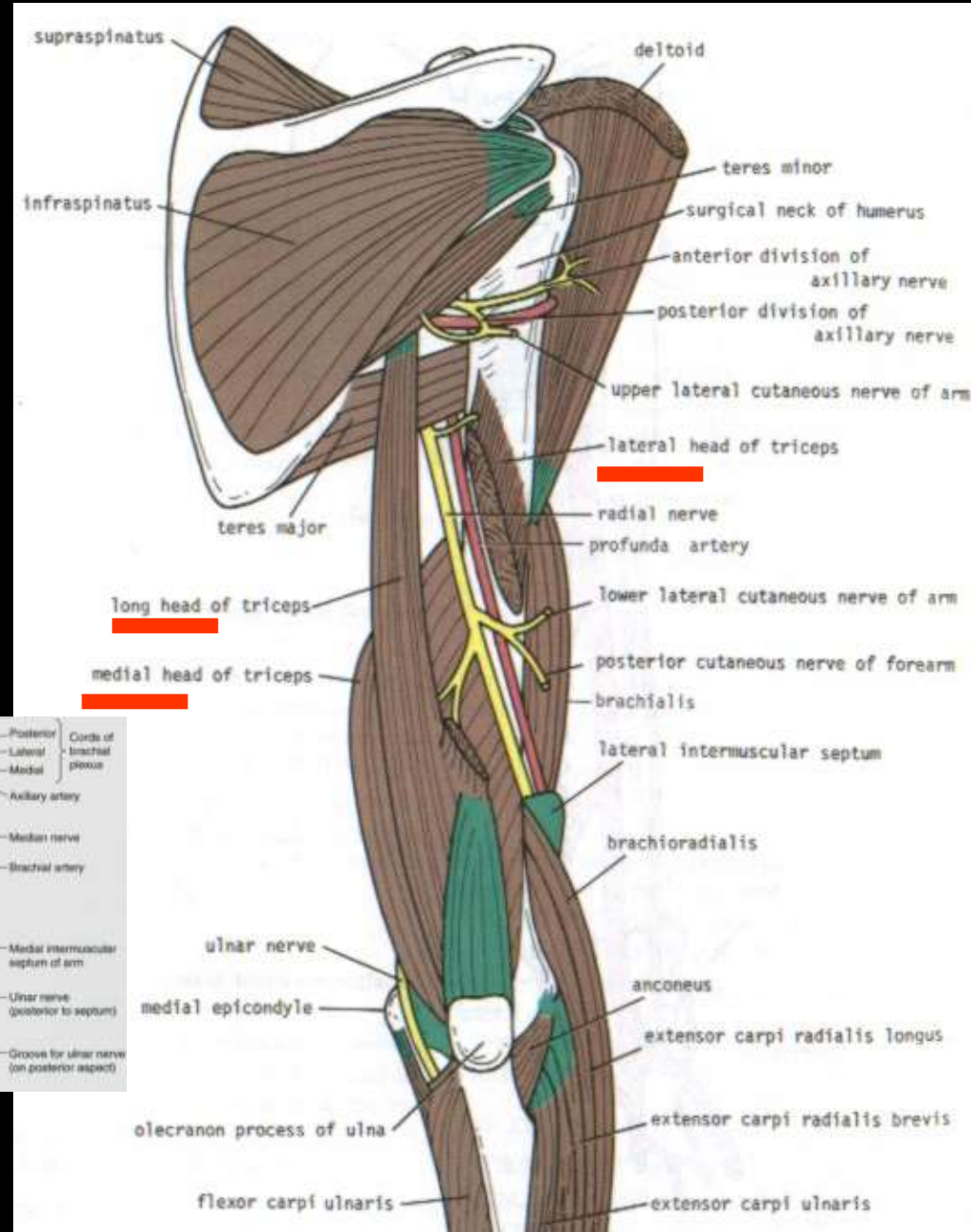
Situated on the posterior surface of the arm

❖ Boundaries

- **Superior**- lateral head of triceps brachii
- **Inferior**- medial head of triceps brachii
- **Posterior**- long head of triceps brachii
- **Anterior**- radial groove of the body of humerus

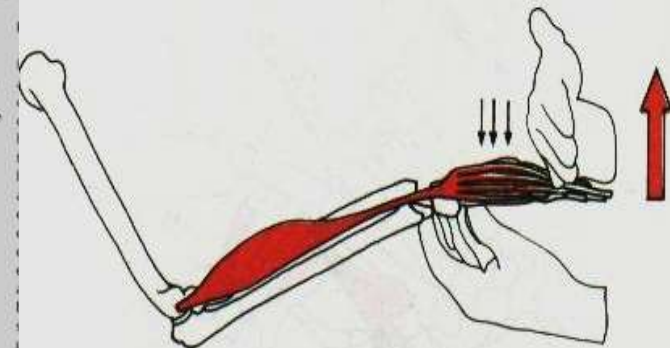
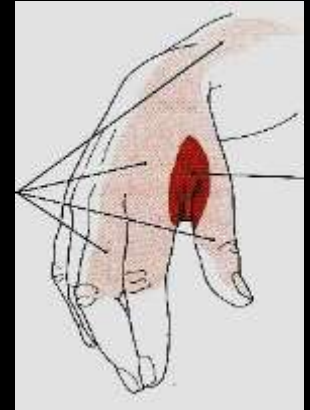
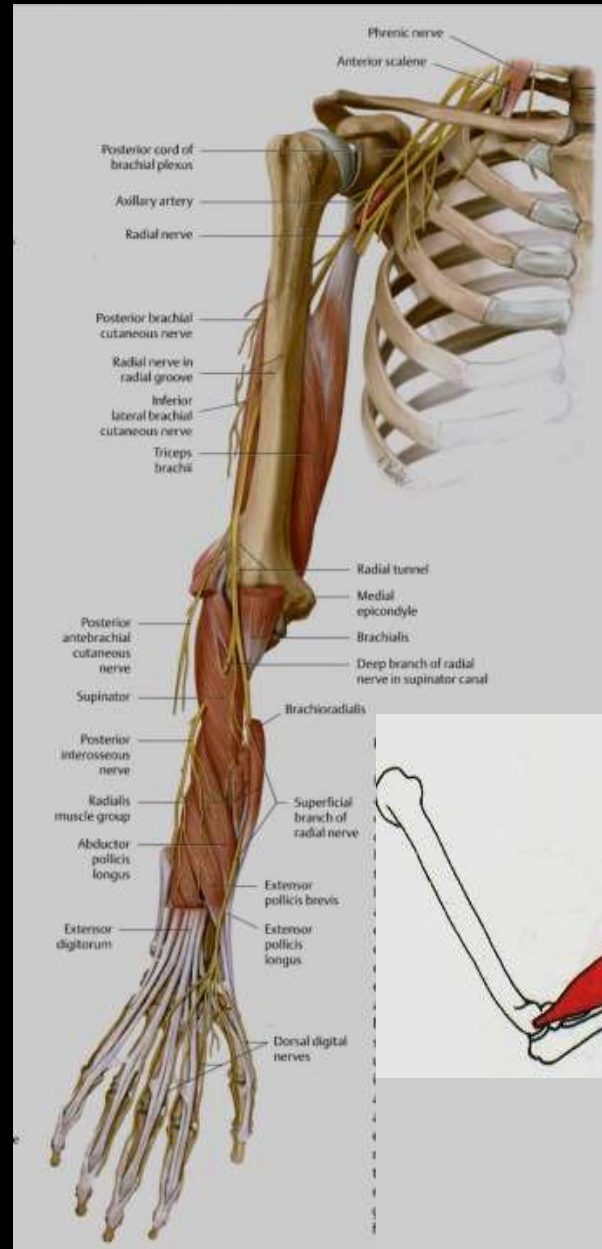
❖ Contents

- Radial nerve
- **Deep artery of arm (branch of brachial artery)**
- Deep veins of arm (tributaries of the brachial vein)



Clinical significance of the radial nerve canal

- ❖ Proximal palsy of the radial nerve results in palsy of the muscles of posterior compartment of forearm (extensors of the wrist and digits)
- ❖ Symptoms of proximal palsy of radial nerve is called the **wrist-drop**
- ❖ The **triceps brachii** is not paralyzed in the proximal palsy of the radial nerve



humerus



Radial Nerve Injury - Locations

Holstein - Lewis Fracture

Injury to the nerve at this level will
cause the condition of wrist drop
as well as weakness of finger
extension.



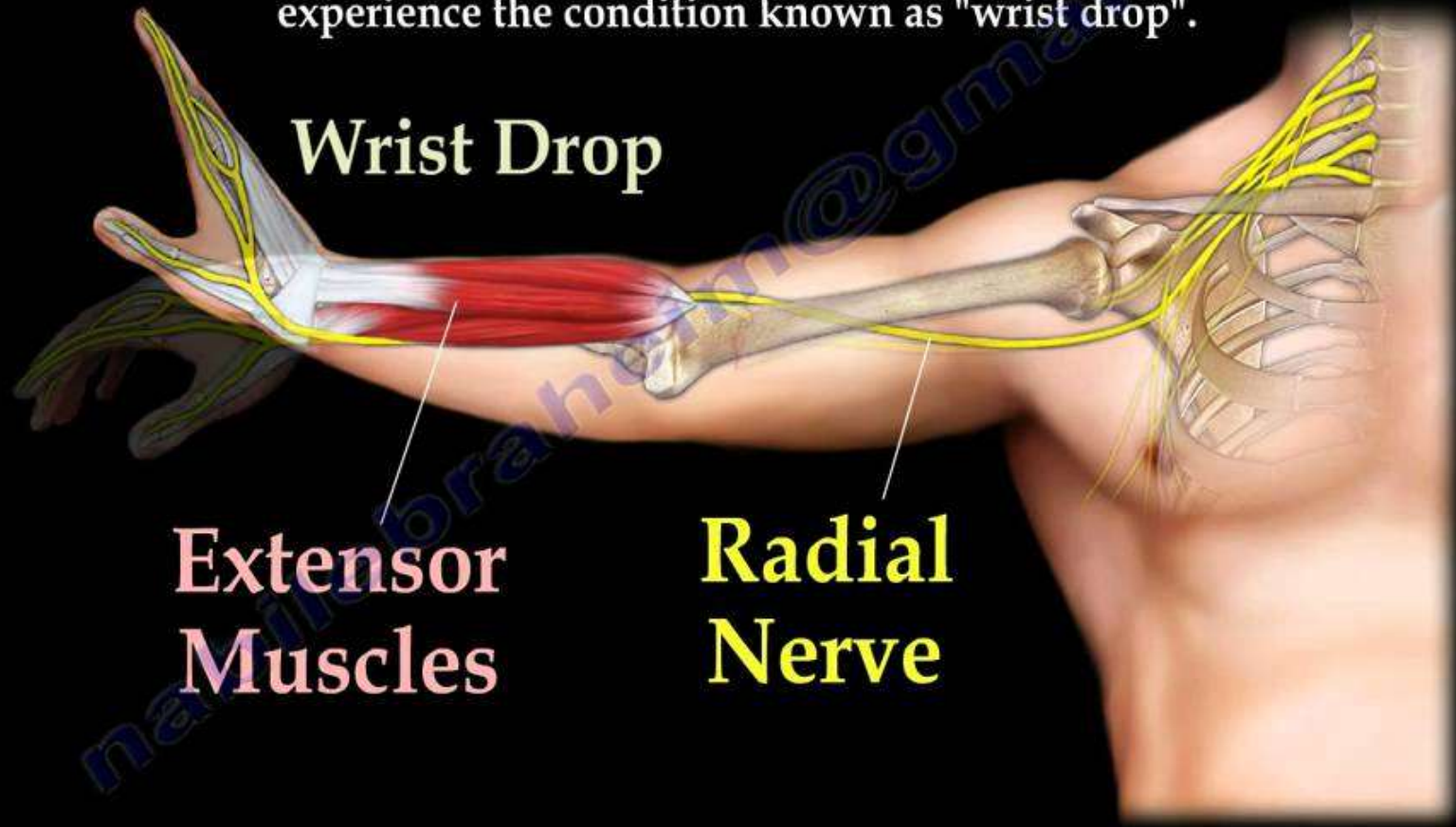
**WEAKNESS
of FINGER
EXTENSION**



Radial Nerve Palsy

The radial nerve supplies the extensor muscles allowing for extension of the wrist and fingers in addition to supplying the triceps that extends the elbow.

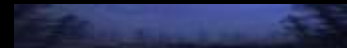
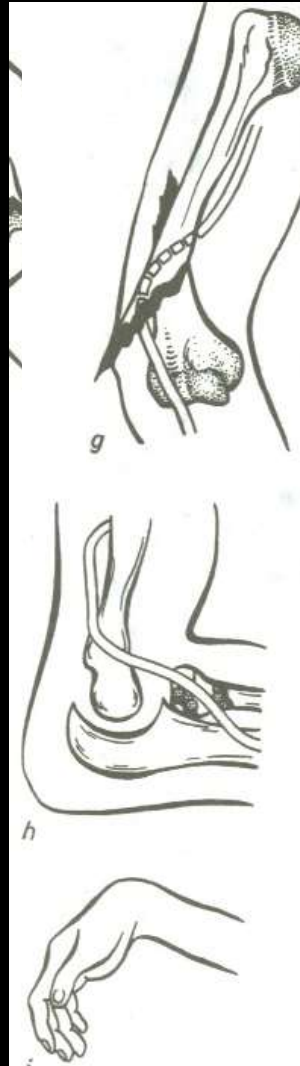
If the muscles are not working properly, the patient will experience the condition known as "wrist drop".



Clinical significance of the radial nerve canal

❖ Injury of the radial nerve in the canal of radial nerve may be result of:

- Fracture of the body of humerus
- Compression of the nerve by heavy objects (for example head laying on the arm during deep sleep, especially after drinking too much alcohol- Saturday night palsy)



Radial Nerve Palsy

Radial nerve injury results from acute trauma or compression of the radial nerve.

Condition is often referred to as:

- **Saturday Night Palsy**

- alcohol is sometimes a factor as person falls asleep with the back of their arm compressed by a chair back, bar edge, etc.

- **Honeymoon Palsy**

- from another individual sleeping on one's arm overnight, compressing the nerve.

- **Crutch Palsy**

- compression on nerve from walking with crutches.





Muscles of the posterior compartment of arm

❖ Anconeus

❖ Origin

- Lateral epicondyle of humerus

❖ Insertion

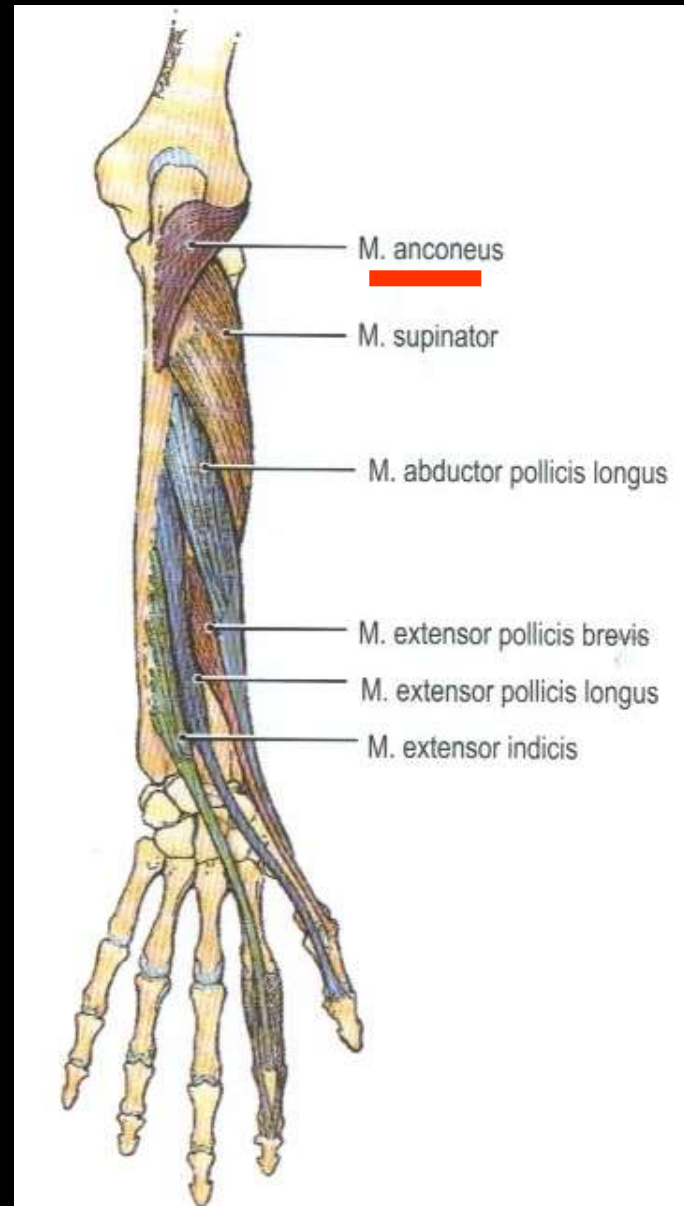
- Olecranon of ulna

❖ Innervation

- Radial nerve

❖ Action

- Extension of elbow joint
- Stabilization of elbow joint



Cubital fossa

Boundaries

❖ Lateral

➤ Brachioradialis

❖ Medial

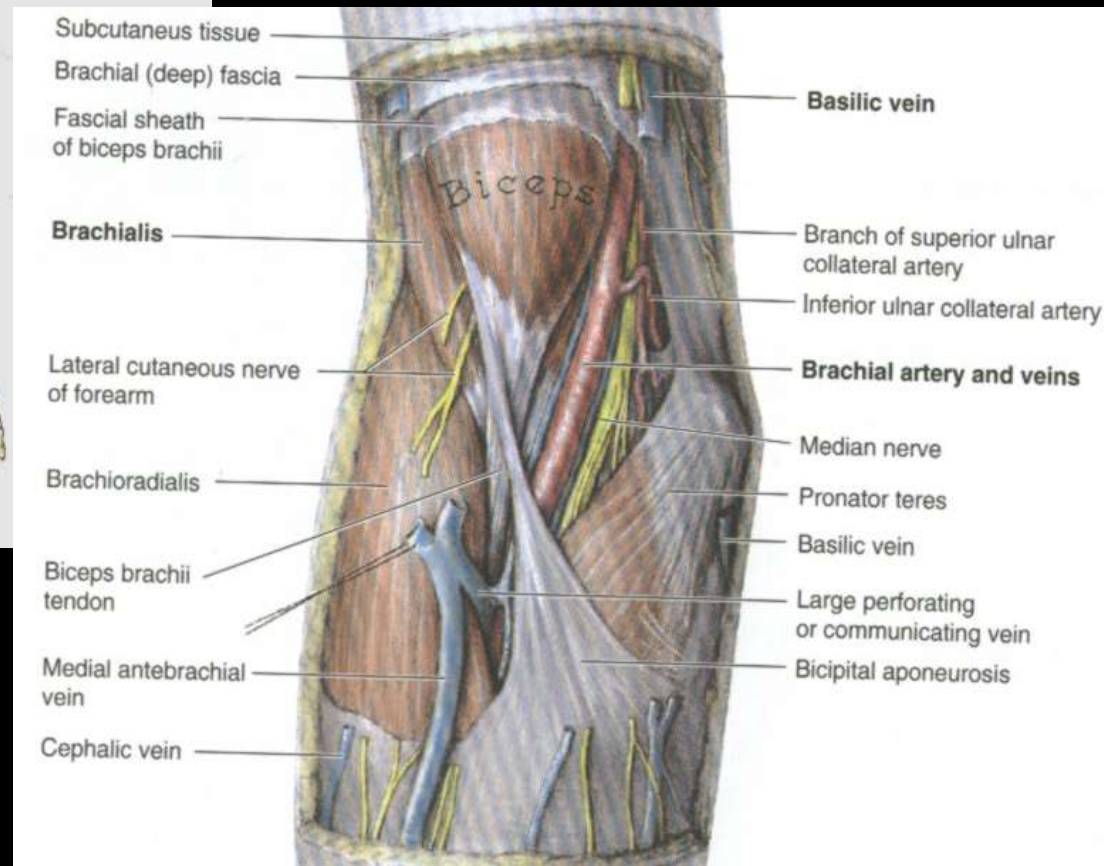
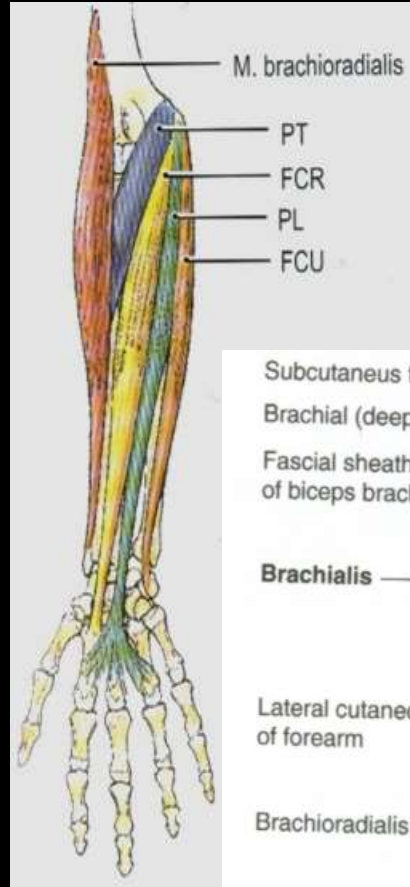
➤ Pronator teres

❖ Floor

➤ Brachialis and supinator

❖ Roof

➤ Cubital fascia and bicipital aponeurosis



Cubital fossa

Contents

❖ Nerves

- **Median nerve** (in the central part of cubital fossa)
- **Radial nerve** divided into superficial and deep branches (in the lateral part of cubital fossa)

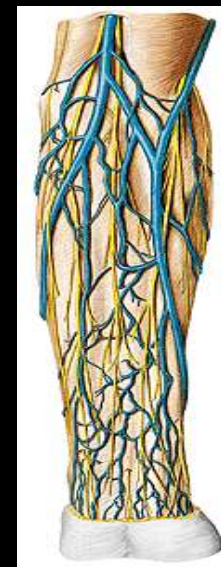
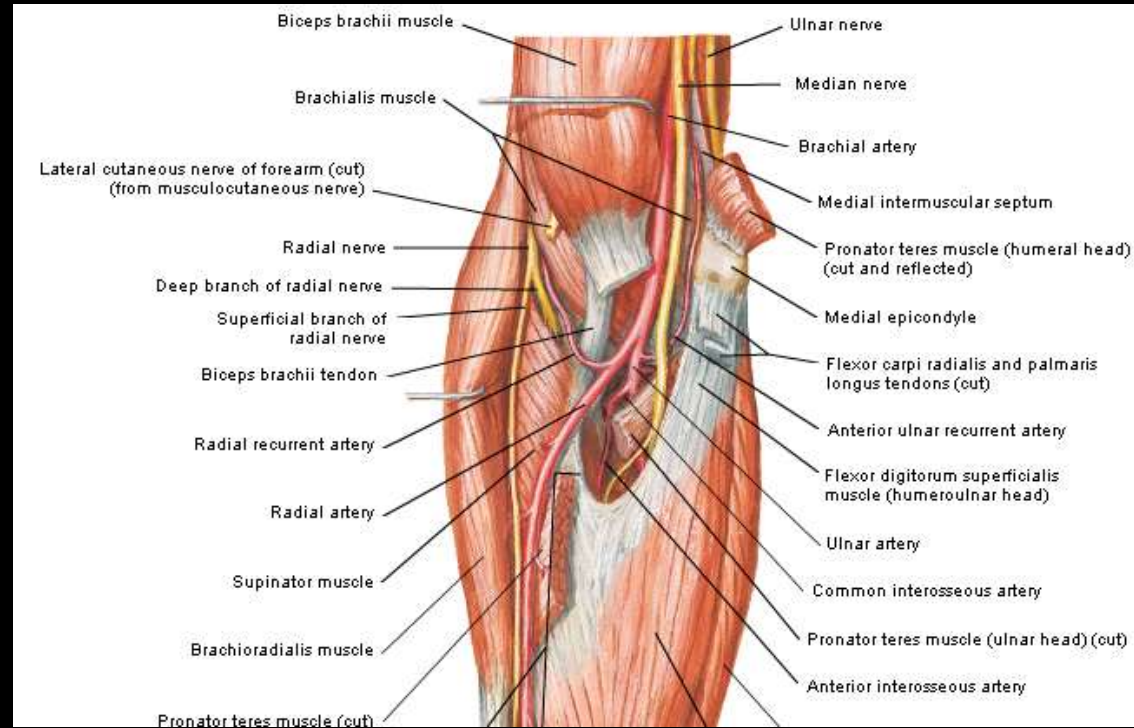
❖ Vessels

- **Brachial artery** and its division into radial and ulnar artery
- **Brachial veins**

❖ Cubital lymph nodes

❖ Superficially

- **Superficial veins**
- **Cutaneous nerves**

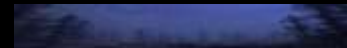
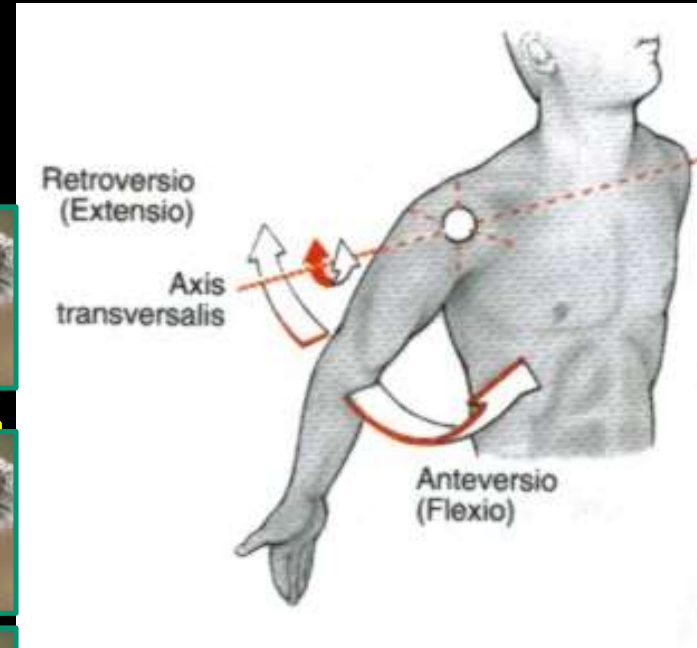


Muscles influencing on the movements of the glenohumeral joint

Flexion

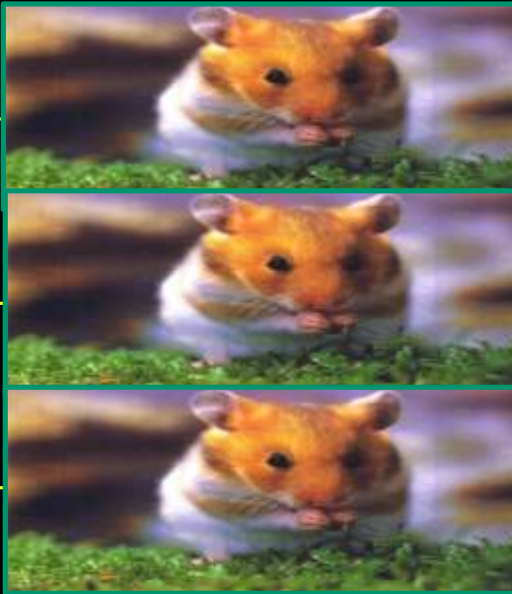


Extension

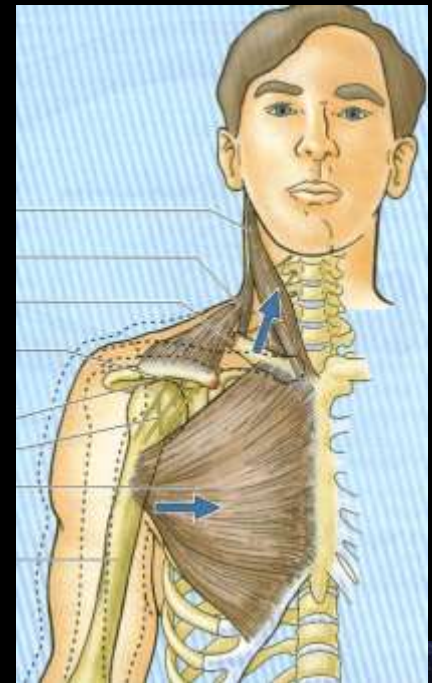
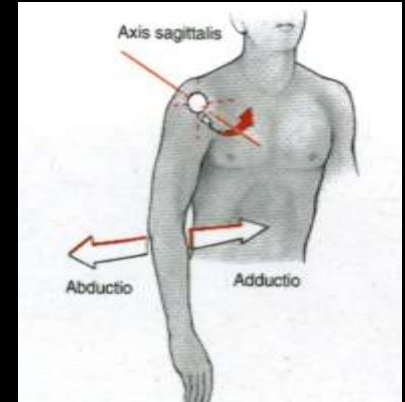
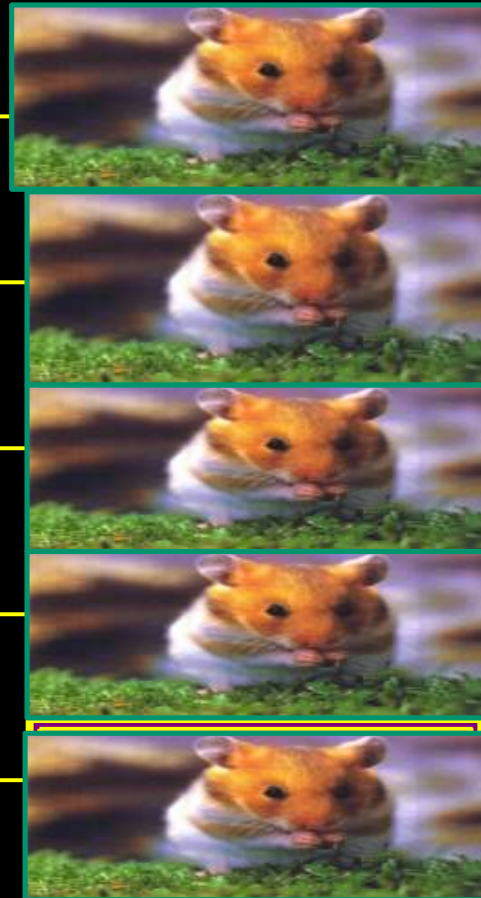


Muscles influencing on the movements of the glenohumeral joint

Abduction



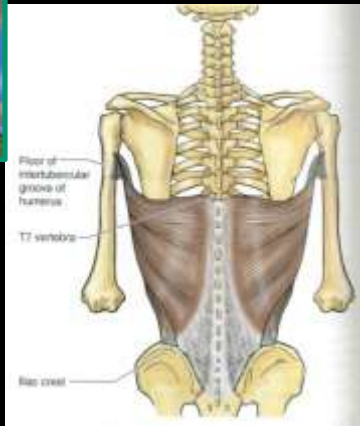
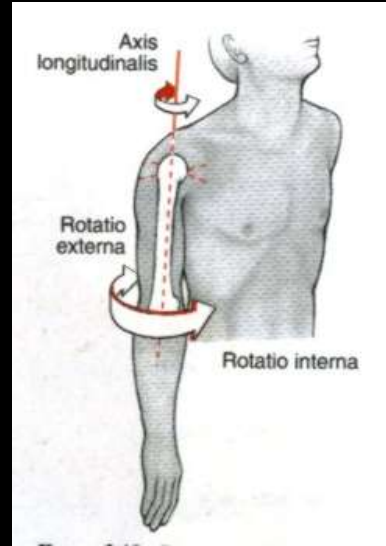
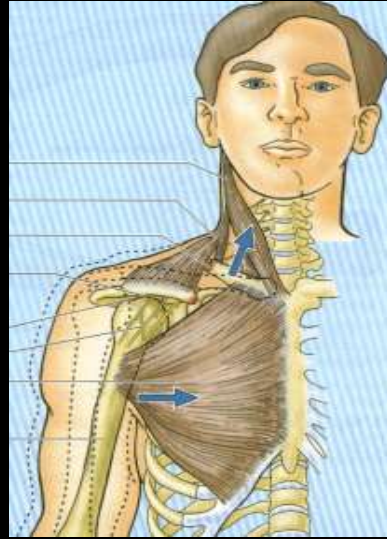
Adduction



Muscles influencing on the movements of the glenohumeral joint

Medial rotation

Lateral rotation

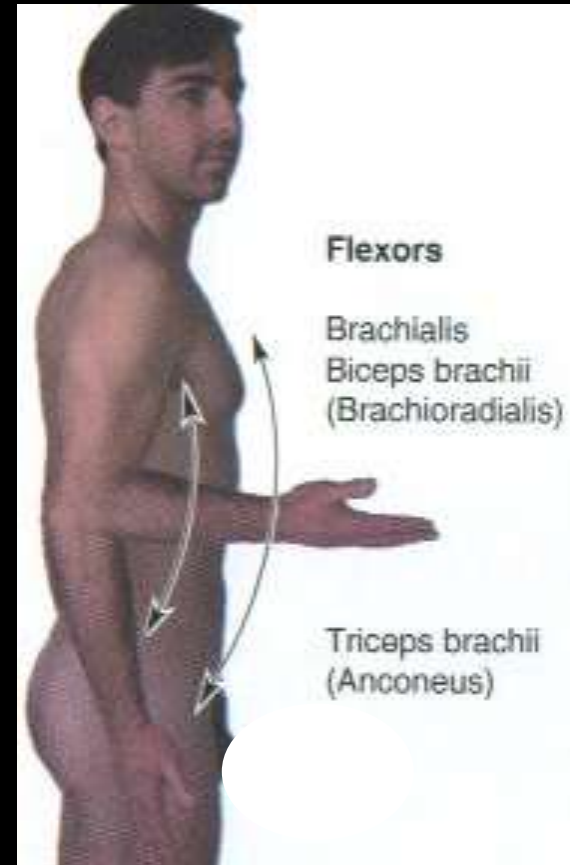
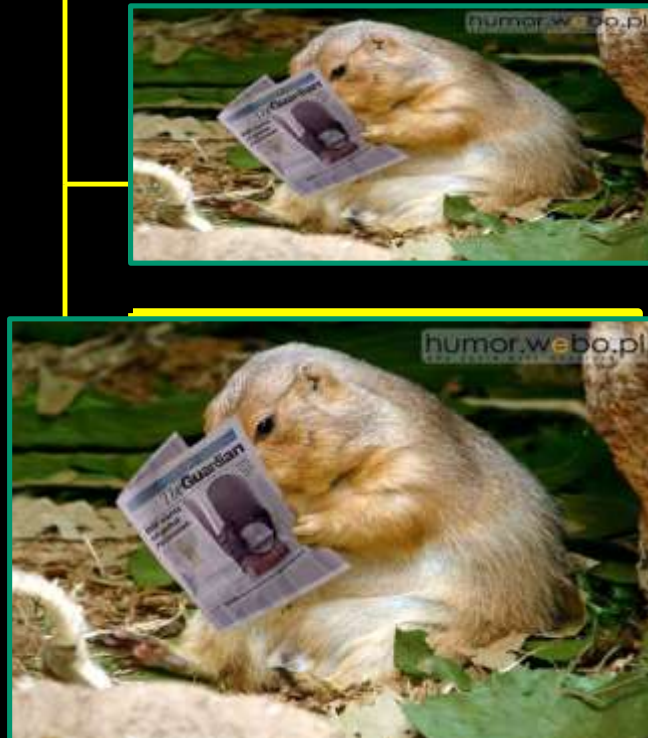


Muscles influencing on the movements of the elbow joint

Flexion



Extension



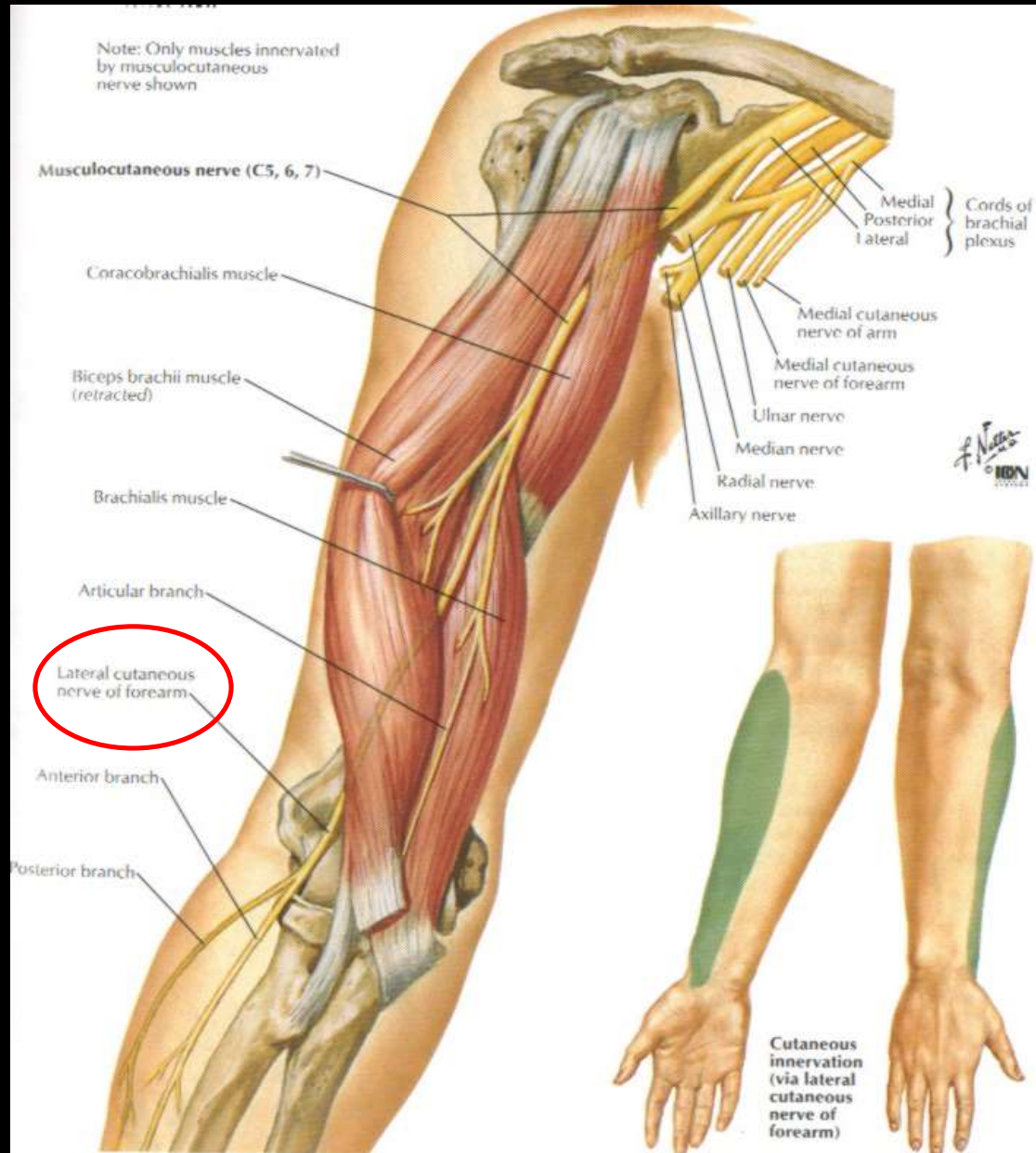
Musculocutaneous nerve

❖ Origin

- Lateral cord of the brachial plexus (contains fibers of C5, C6, and C7 nerves)

❖ Course

- Pierces the coracobrachialis and then passes between biceps brachii and brachialis
- Supplies muscles of the anterior compartment of arm
- Terminates as a **lateral cutaneous antebrachial nerve**



Musculocutaneous nerve

❖ Range of motor innervation

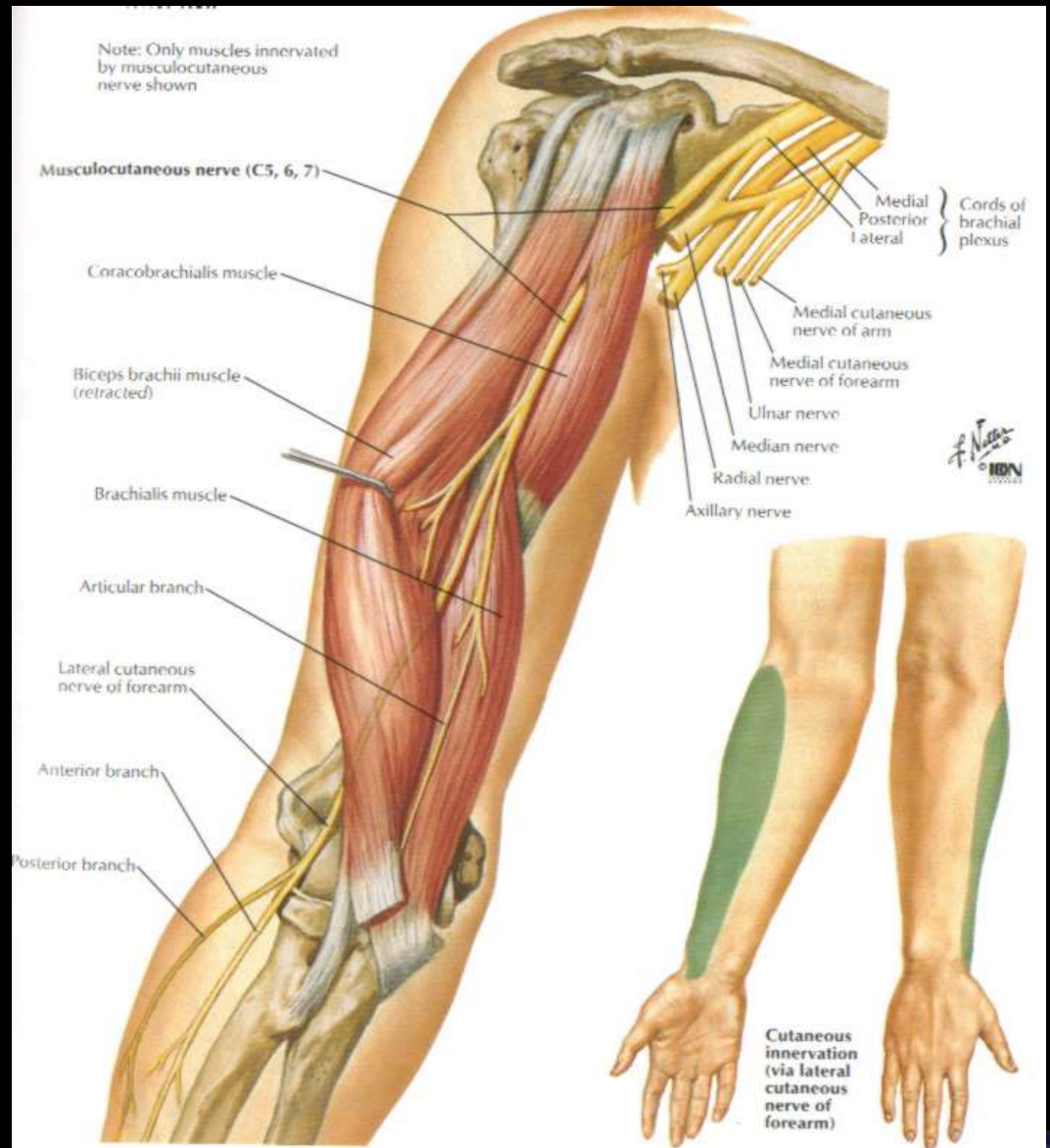
- Coracobrachialis
- Biceps brachii
- Brachialis

❖ Range of sensory innervation

- Skin of the lateral surface of forearm

❖ Symptoms of palsy

- Atrophy of the anterior muscles of arm
- Impairment of flexion at the elbow joint and supination of the forearm
- Loss of sensation on the lateral surface of forearm



MUSCULOCUTANEOUS NERVE

FLEXOR COMPARTMENT

- CORACOBRACHIALIS
- BRACHIALIS
- BICEPS BRACHII



Median nerve-brachial section

❖ Origin- union of 2 roots:

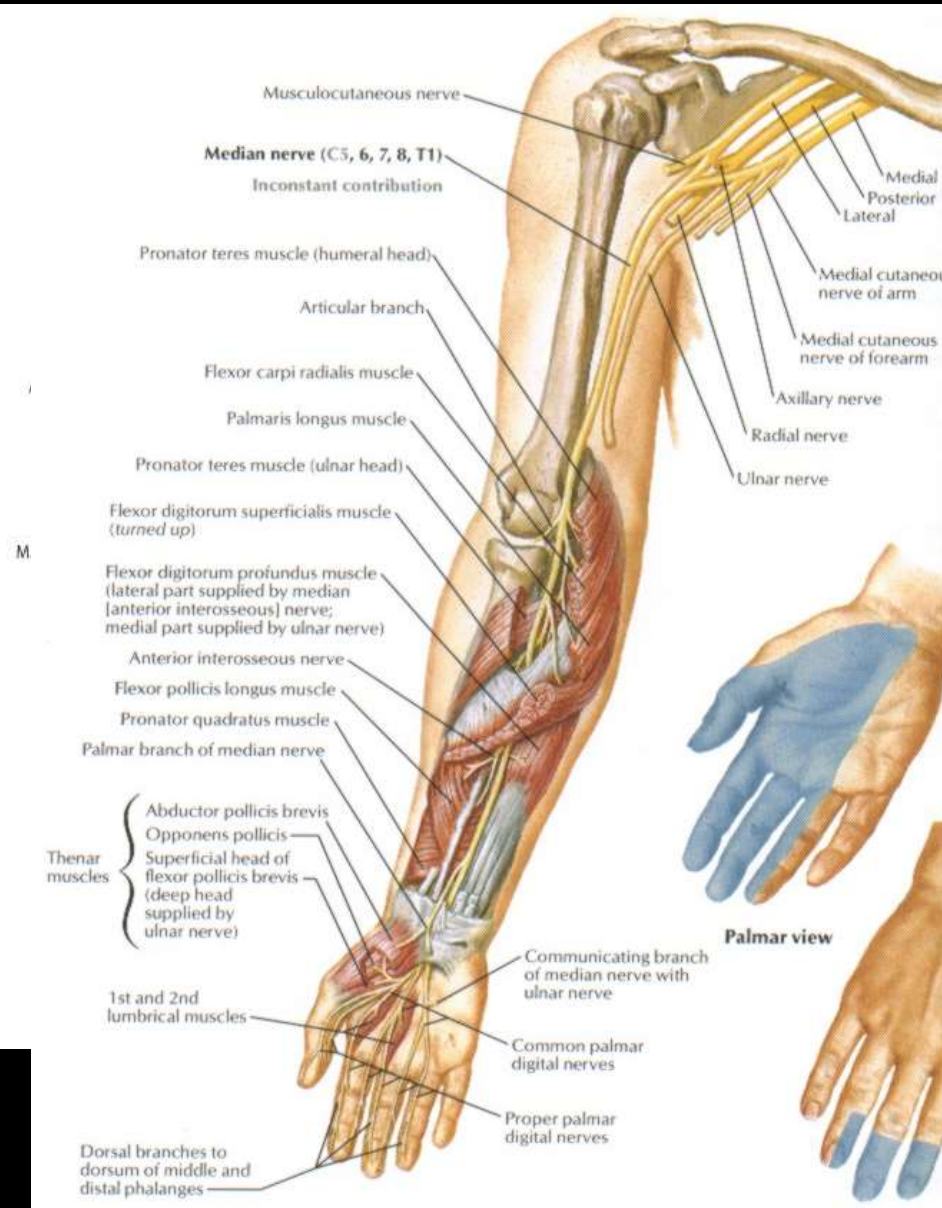
- **Lateral root** from the lateral cord of the brachial plexus (contains fibers of C6, C7 nerves)
- **Medial root** from the medial cord of the brachial plexus (contains fibers of C8, T1 nerves)

❖ Course

- In arm runs along the biceps brachii (in the medial bicipital groove) **together with brachial artery**
- Running on the brachialis enters the cubital fossa in which is covered by the bicipital aponeurosis
- Passes to the anterior compartment of the forearm
- Passes between the heads of the pronator teres

❖ In arm gives no branches

❖ Supplies the capsule of the elbow joint



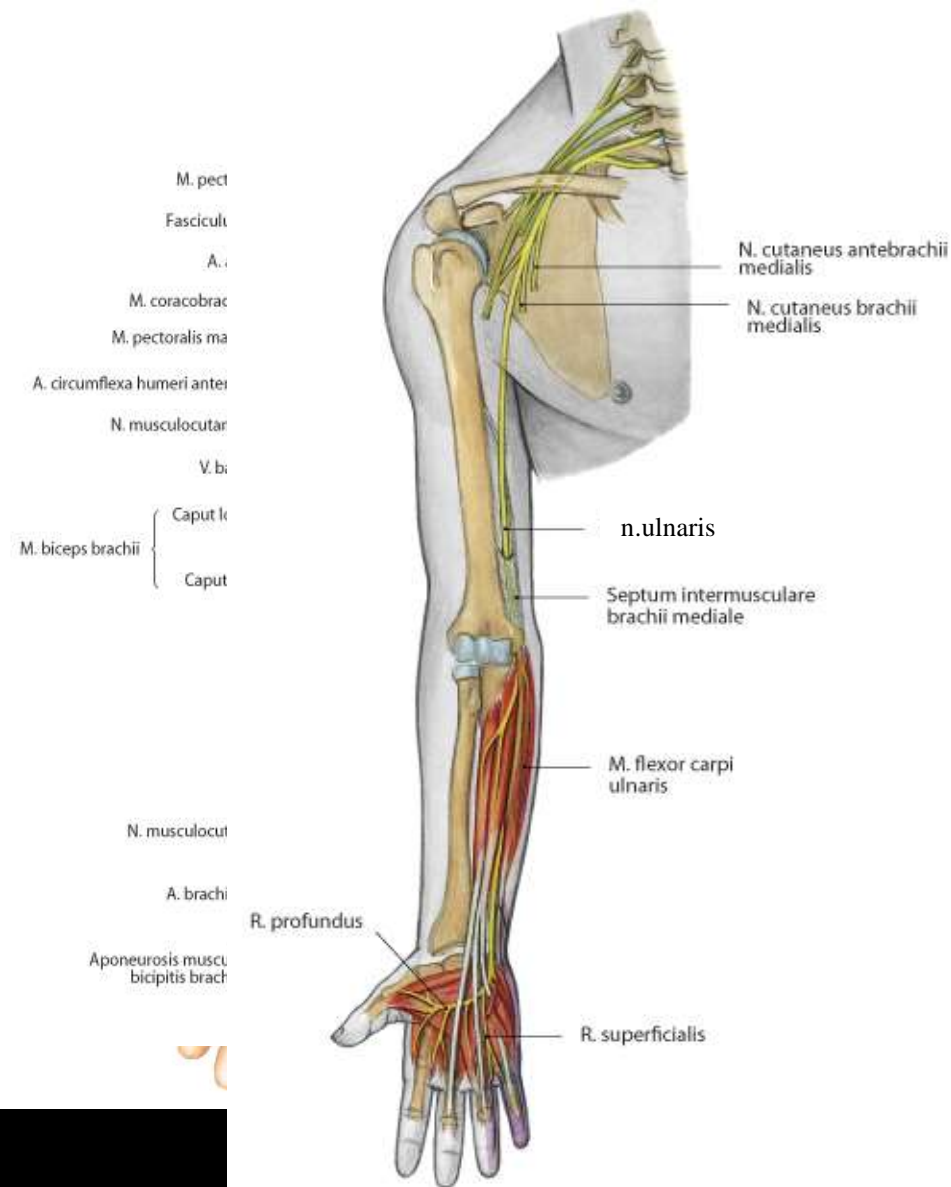
Ulnar nerve- brachial section

❖ Origin

- Medial cord of the brachial plexus (contains fibers of C8, T1 nerves)

❖ Course

- Initially runs together with the brachial artery
- In the middle of the arm pierces the medial intermuscular septum
- Runs along the medial head of triceps brachii
- Passes behind the medial epicondyle of the humerus
- Enters the forearm and passes between the heads of the flexor carpi ulnaris



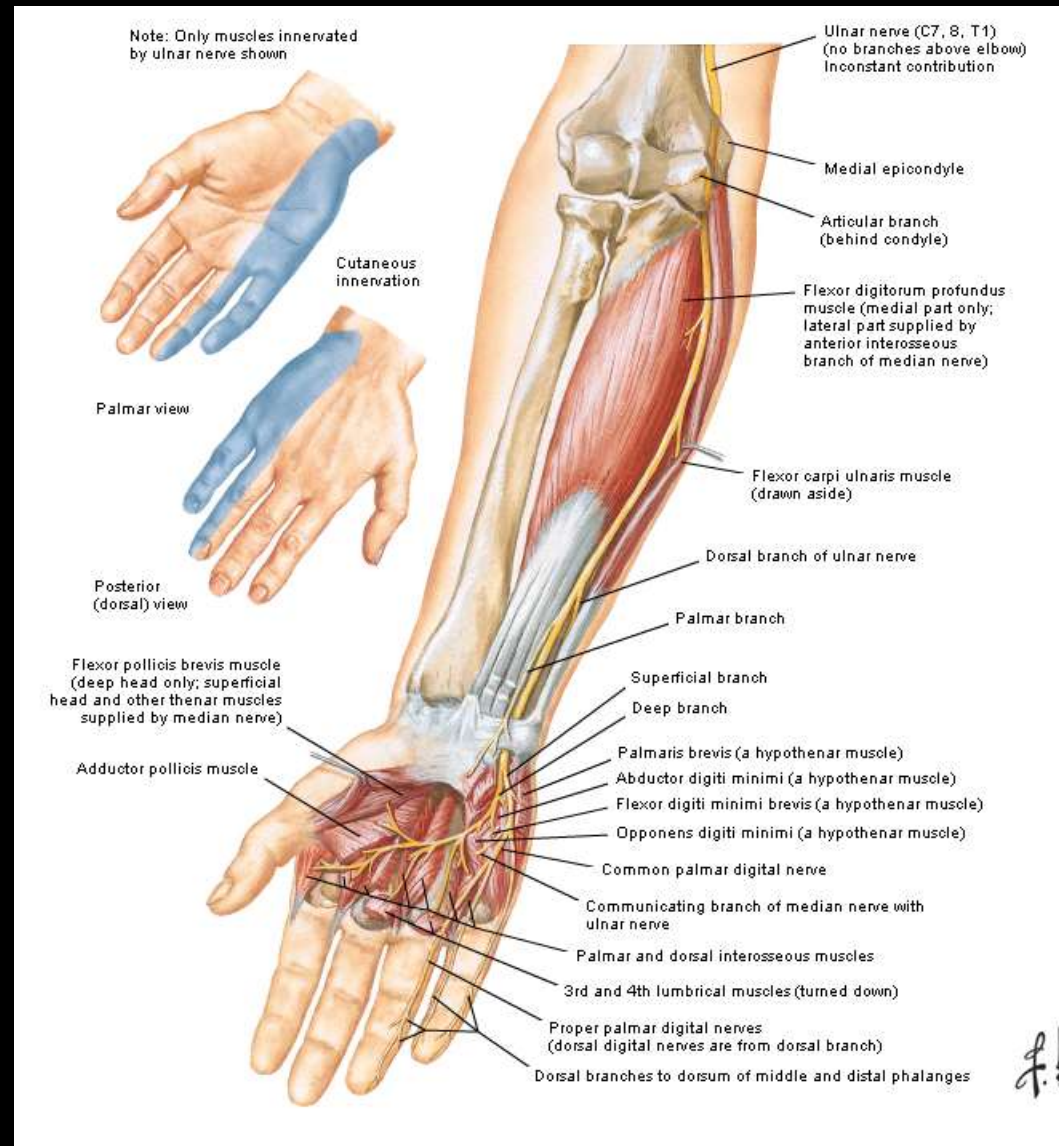
Ulnar nerve

❖ Range of motor innervation

- Muscles of the anterior compartment of the forearm
-flexor carpi ulnaris and medial half of the flexor digitorum profundus
- Some muscles of the thenar of hand
- Muscles of the hypothenar
- Short muscles of the hand

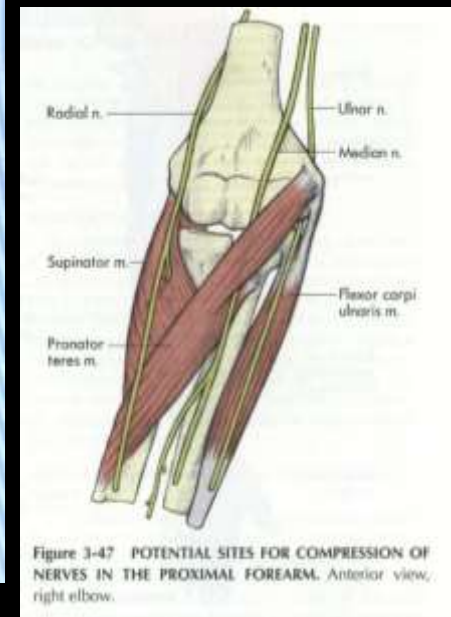
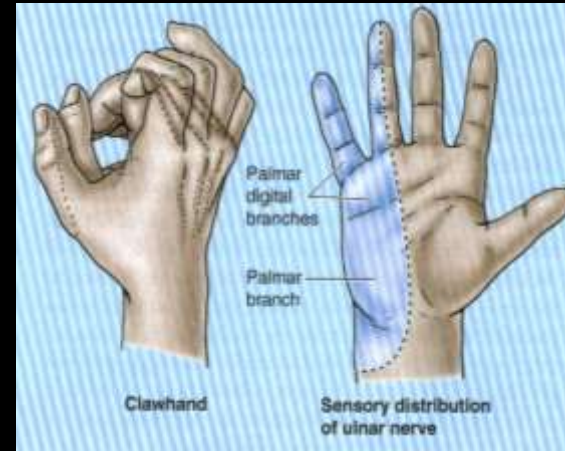
❖ Range of sensory innervation

- Medial one third of the palm of hand
- Medial half of the dorsum of hand



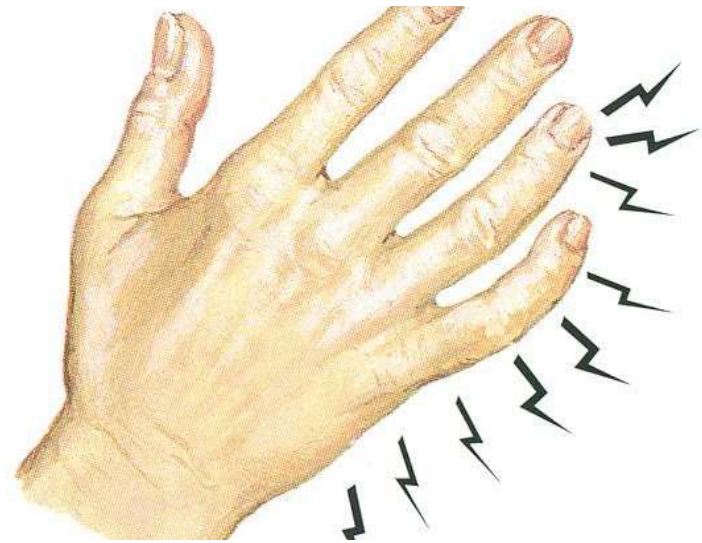
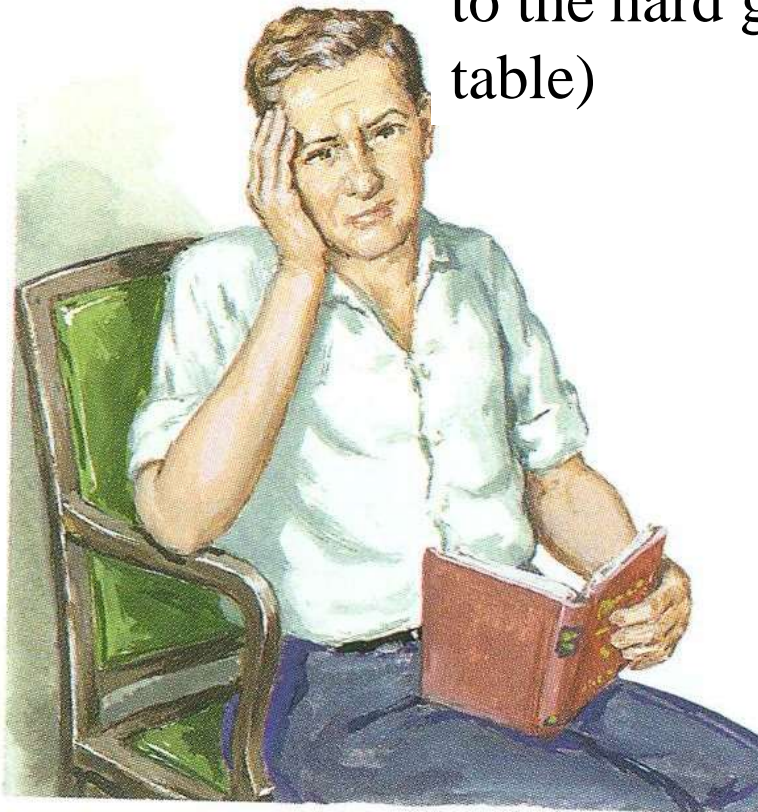
Potential places of compression or injury of the ulnar nerve

- ❖ Place of passage behind the medial epicondyle of humerus
- ❖ Hand has image similar to the „clawhand” because of atrophy of the short interosseus muscles of hand and inability of extension of digits at the interphalangeal joints and contracture of flexors of digits



Student's elbow- neuropathy of ulnar nerve

reason of ulnar nerve neuropathy- compression to the hard ground (arm of chair, desk, surgery table)



Pins and needles and numbness sensations in the region of skin supplied by the ulnar nerve; atrophy of interosseus muscles

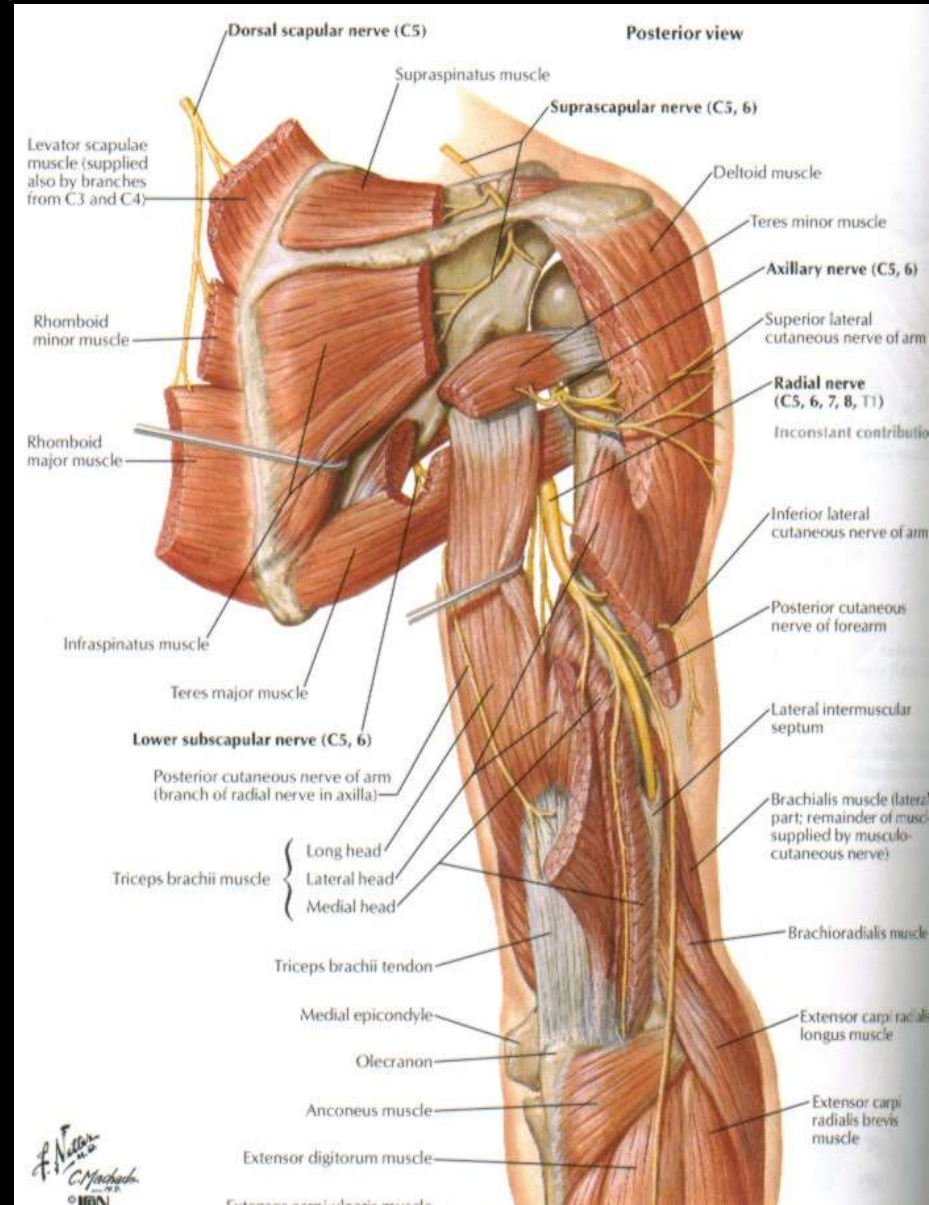
Radial nerve

❖ Origin

- Posterior cord of the brachial plexus (contains fibers of C5, C6, C7, C8, and T1 nerves), so radial nerve is the largest branch of brachial plexus

❖ Course

- From axilla passes to the posterior compartment of arm
- Runs between the heads of triceps brachii in the radial groove of humerus, together with the deep artery of arm
- Gives rise to the posterior antebrachial cutaneous nerve and inferior lateral brachial nerve
- Pierces the lateral intermuscular septum
- Passes into cubital fossa between brachialis and brachioradialis
- In the cubital fossa, at the level of lateral epicondyle of the humerus divides into
 - Superficial branch
 - Deep branch



Innervation of the skin of arm

❖ Medial surface

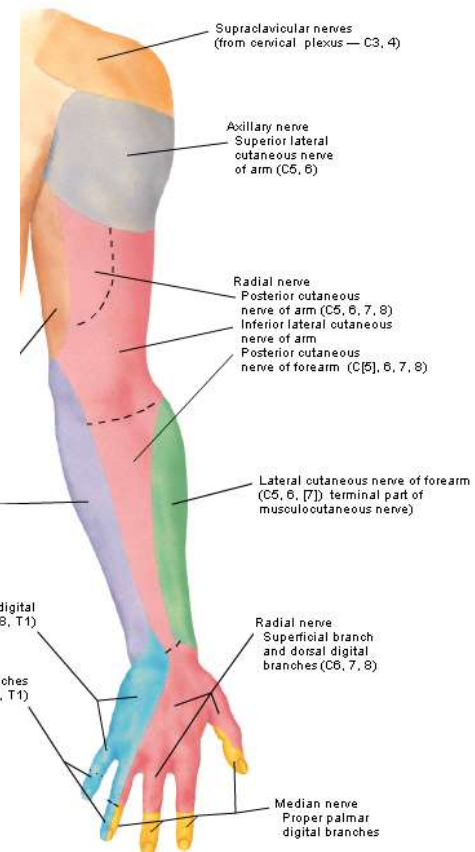
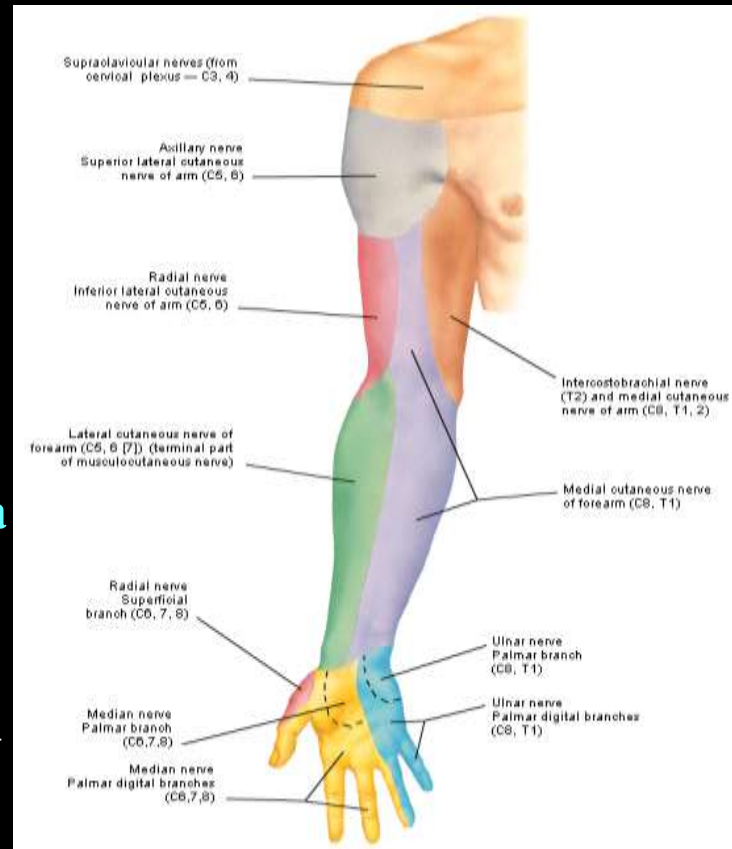
- Medial cutaneous nerve of arm (from medial cord of brachial plexus)
- Intercostobrachial nerves (from 2nd intercostal nerve)- innervates skin of axilla

❖ Lateral surface

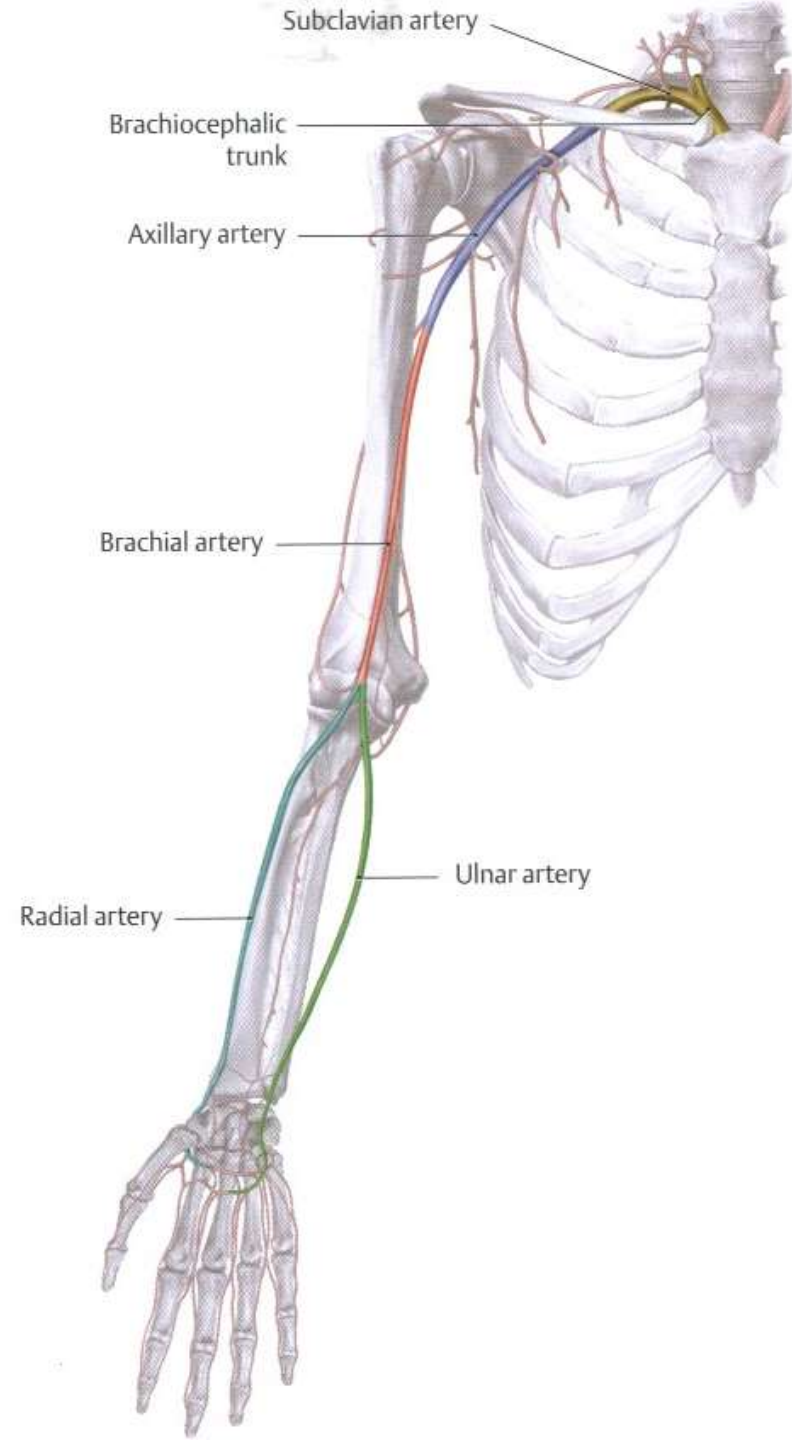
- Superior lateral cutaneous nerve of arm (from axillary nerve)
- Inferior lateral cutaneous nerve of arm (from radial nerve)

❖ Posterior surface

- Posterior cutaneous nerve of arm (from radial nerve)



Arteries of the upper limb



Subclavian artery

❖ Origin

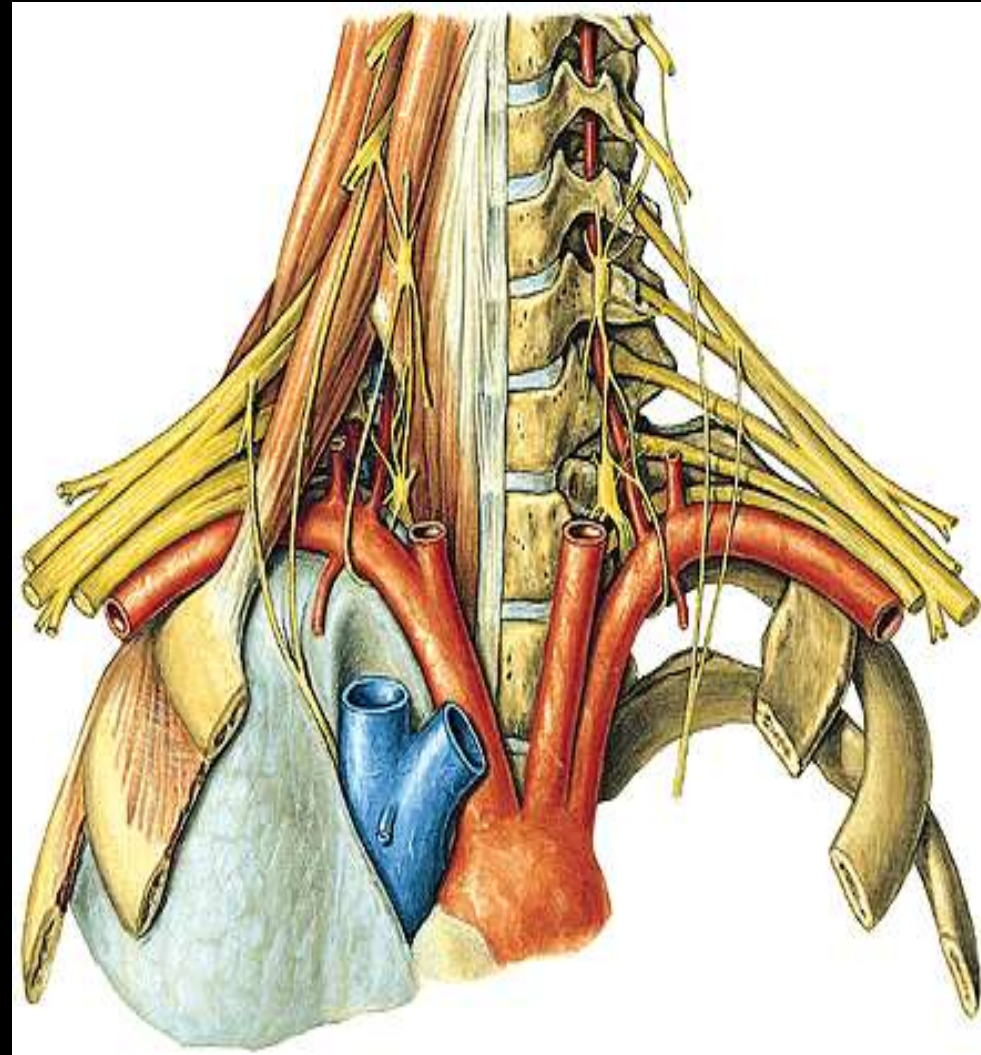
- Right subclavian artery- **brachiocephalic trunk**
- Left subclavian artery- **arch of aorta**

❖ General course

- Passes over the apex of lung (enclosed within the cupula of pleura)
- **Together with brachial plexus passes between clavicle and 1st rib (cervicoaxillary canal posteriorly to the anterior scalene muscle)**
- Enters the axilla and in the place of crossing with the lateral border of the 1st rib **elongates in the axillary artery**

❖ Region of vasculature:

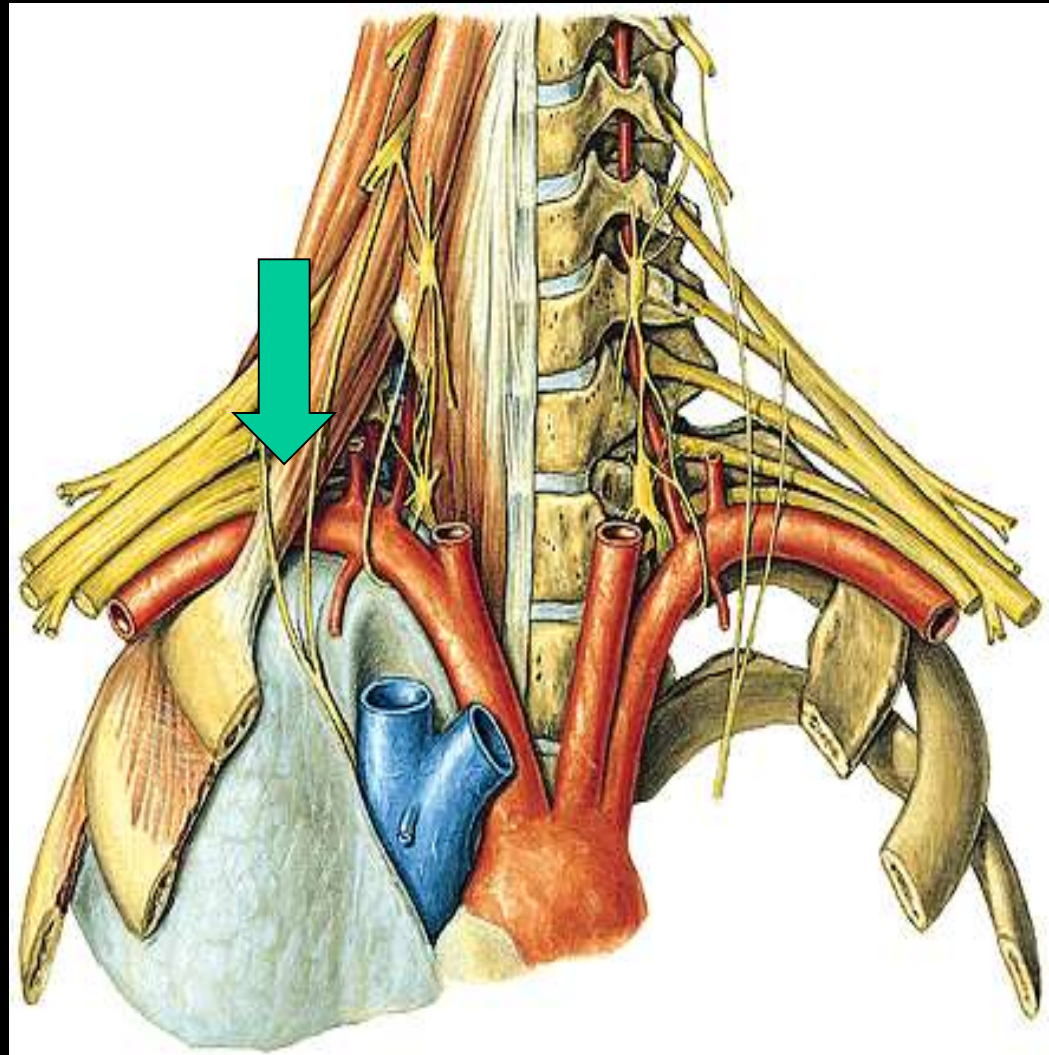
- Brain (mainly brainstem), **spinal cord**, neck, **thorax** and **upper limb**



Sections of the subclavian artery

❖ **Anterior scalene muscle divides the subclavian artery into three sections:**

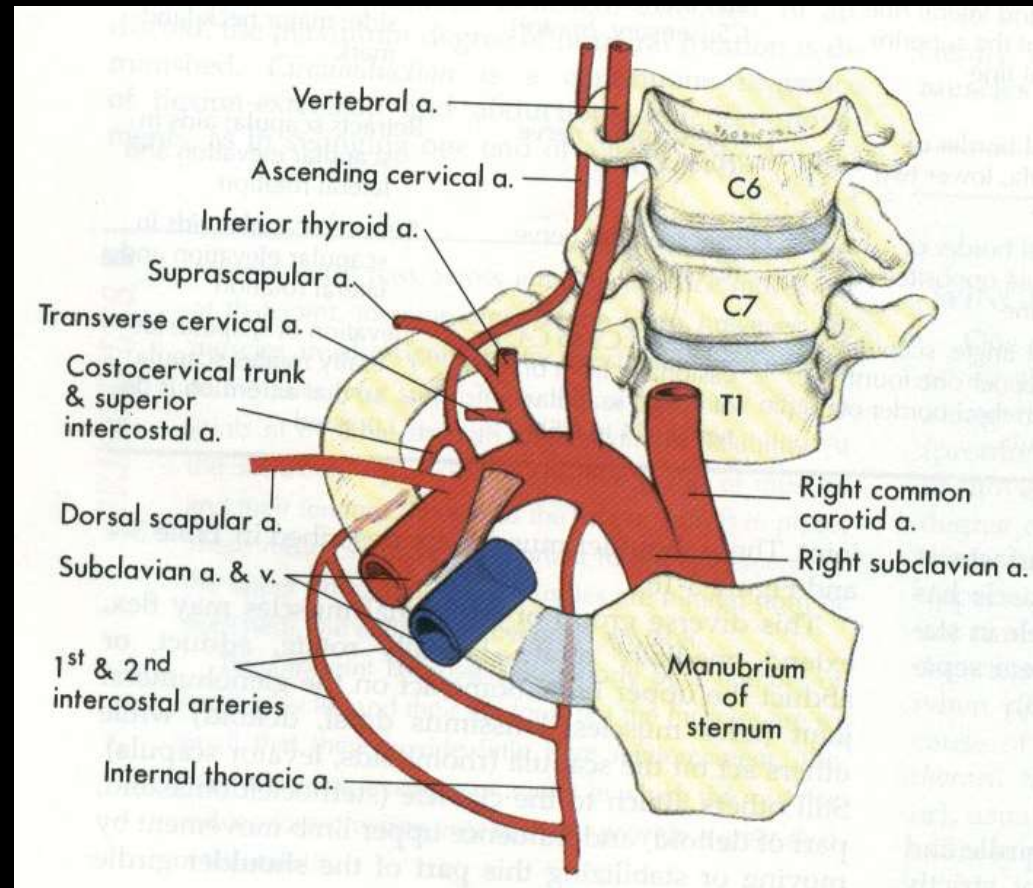
- **First section-** medial to the anterior scalene muscle
- **Second section-** posterior to the anterior scalene muscle
- **Third section-** lateral to the anterior scalene muscle



Branches of the subclavian artery

Branches of the first section

- ❖ **Vertebral artery-** takes part in blood supply of spinal cord, brainstem, internal ear and occipital lobes of brain
- ❖ **Internal thoracic artery-** takes part in blood supply of walls and organs of thorax
- ❖ **Thyrocervical trunk**
 - **Inferior thyroid artery-** takes part in blood supply of thyroid gland, trachea and esophagus
 - **Suprascapular artery-** supplies muscles on the posterior aspect of scapula
 - **Transverse cervical artery-** supplies posterior triangle of the neck



Branches of the subclavian artery

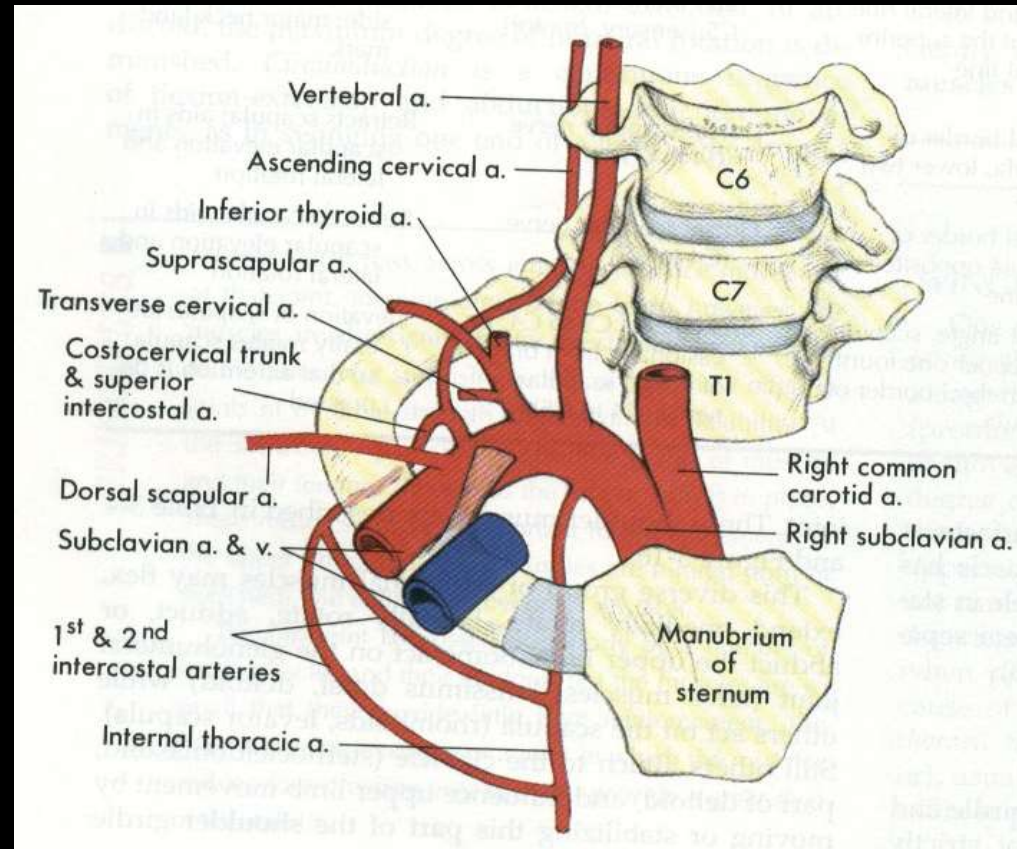
Branch of the second section

❖ Costocervical trunk

- **Superior (supreme) intercostal artery**- supplies two upper intercostal space (1st and 2nd posterior intercostal arteries)
- **Deep cervical artery**-supplies deep neck muscles

Branch of the third section

- **Dorsal scapular artery**- together with dorsal scapular nerve supplies the levator scapulae and rhomboids



Axillary artery

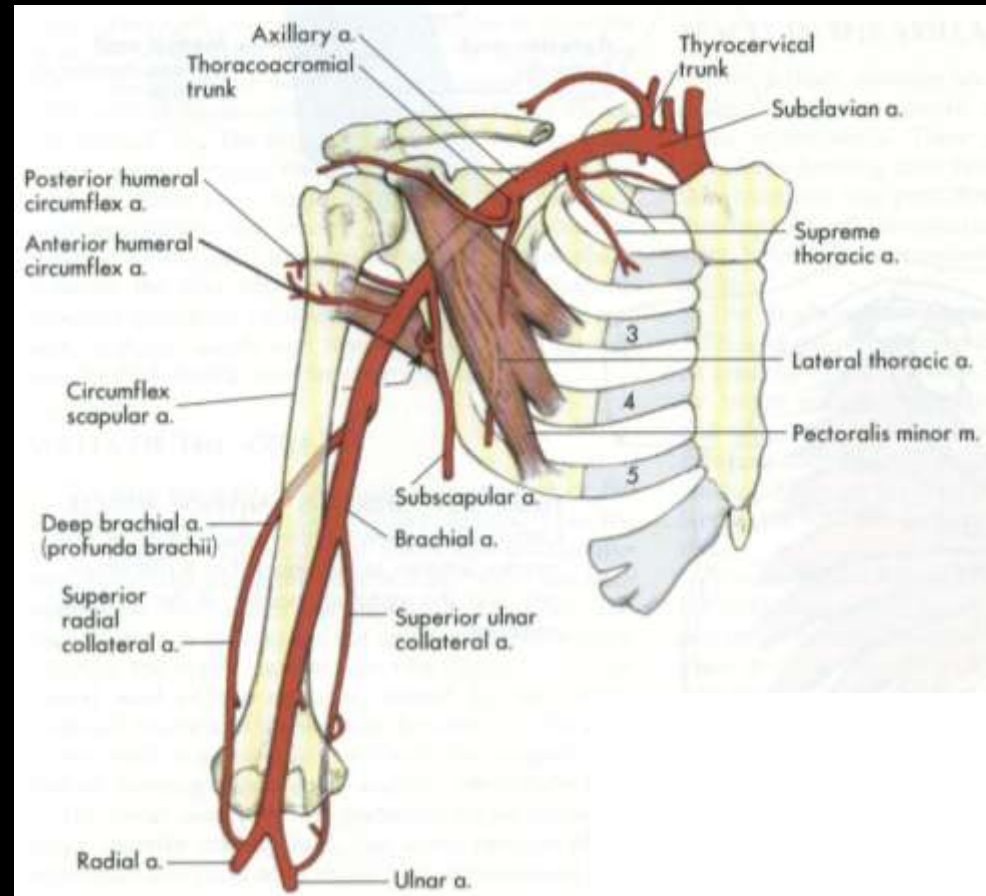
❖ Origin

- Continuation of the subclavian artery, **begins in the place of crossing with the lateral border of the 1st rib**

❖ General course

- Passes posteriorly to the pectoralis minor in the direction of the axilla
- **Within axilla is surrounded by the cords of the brachial plexus**

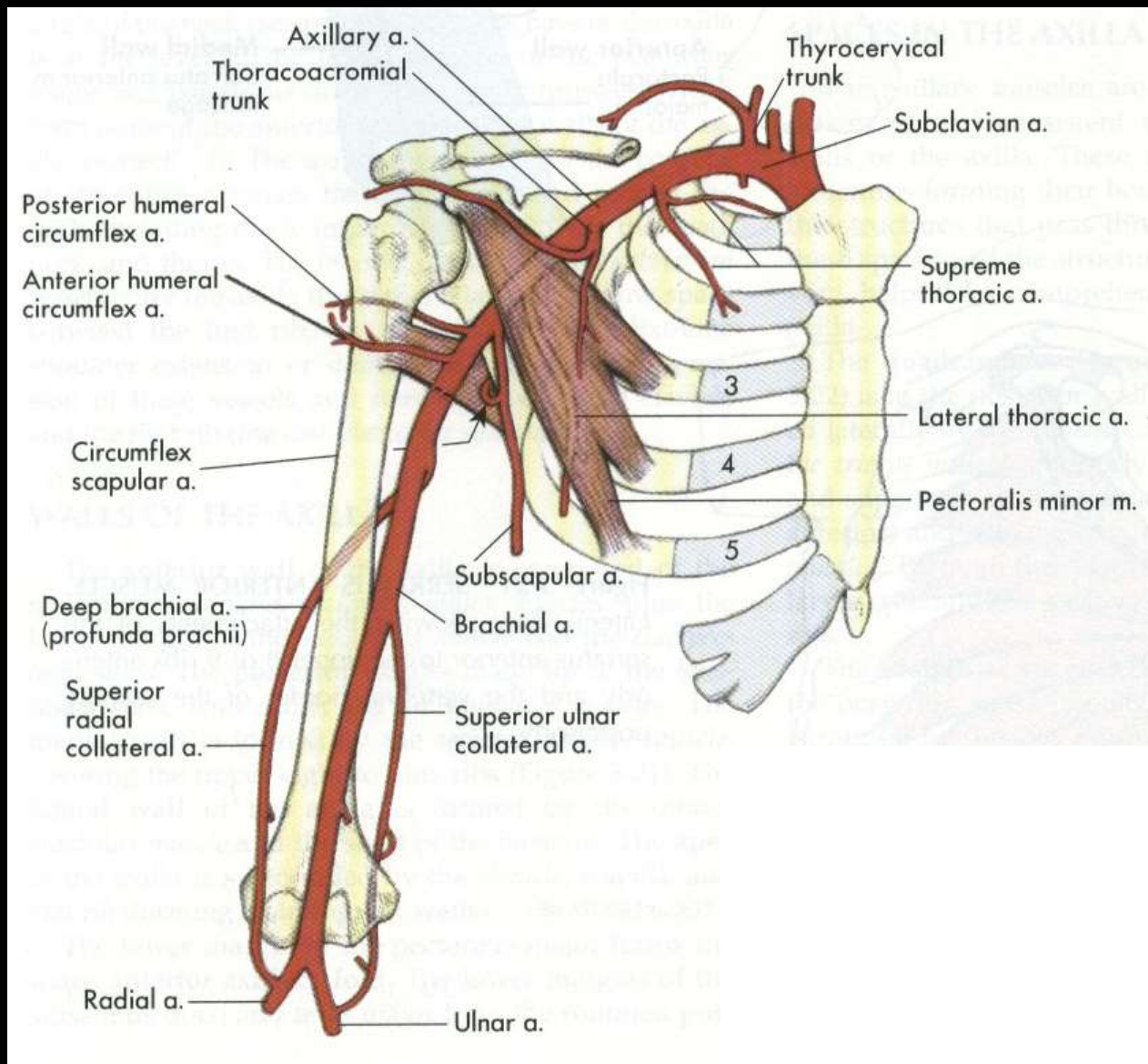
- ❖ **Ends in the place of crossing with the inferior border of the teres major and passes in the brachial artery**



Sections of the axillary artery

❖ **Pectoralis minor muscle divides the axillary artery into three sections:**

- **First section-** superior to the pectoralis minor muscle
- **Second section-** posterior to the pectoralis minor muscle
- **Third section-** inferior to the pectoralis minor muscle



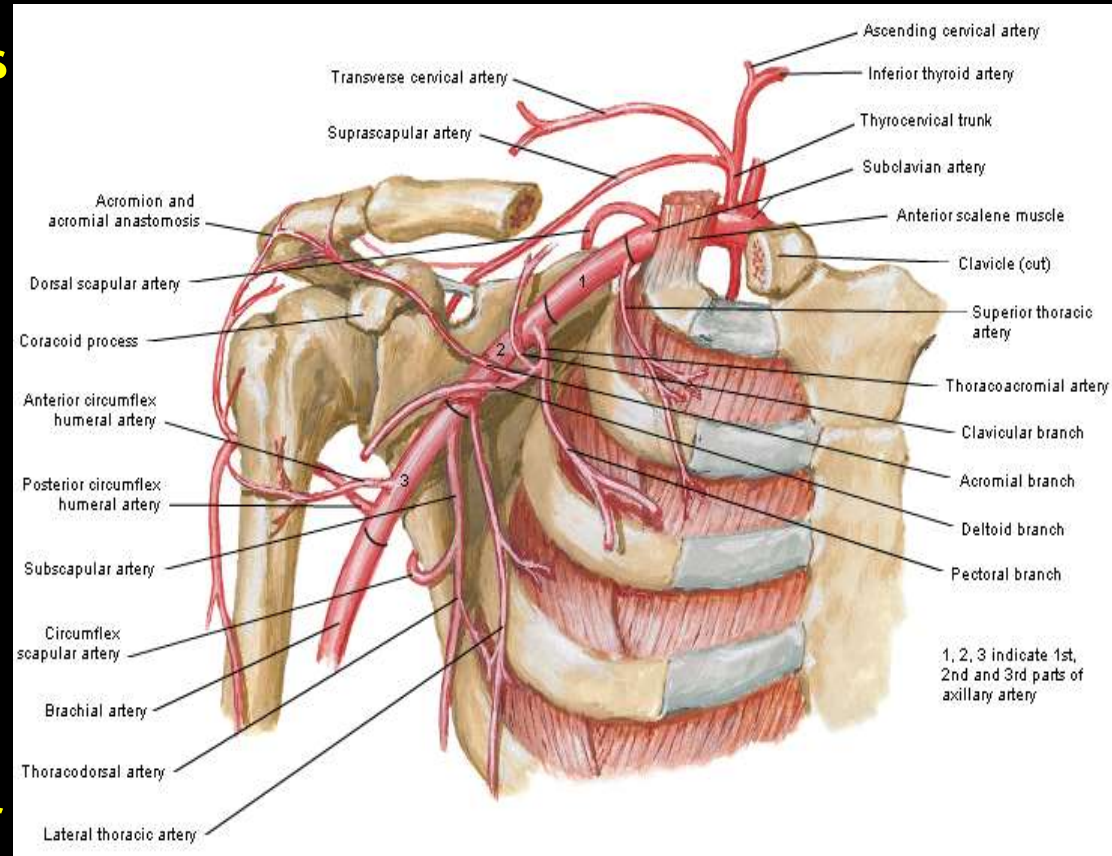
Branches of the axillary artery

Branches of the first section

- ❖ Superior thoracic artery- takes part in blood supply of two upper intercostal spaces and serratus anterior

Branches of the second section

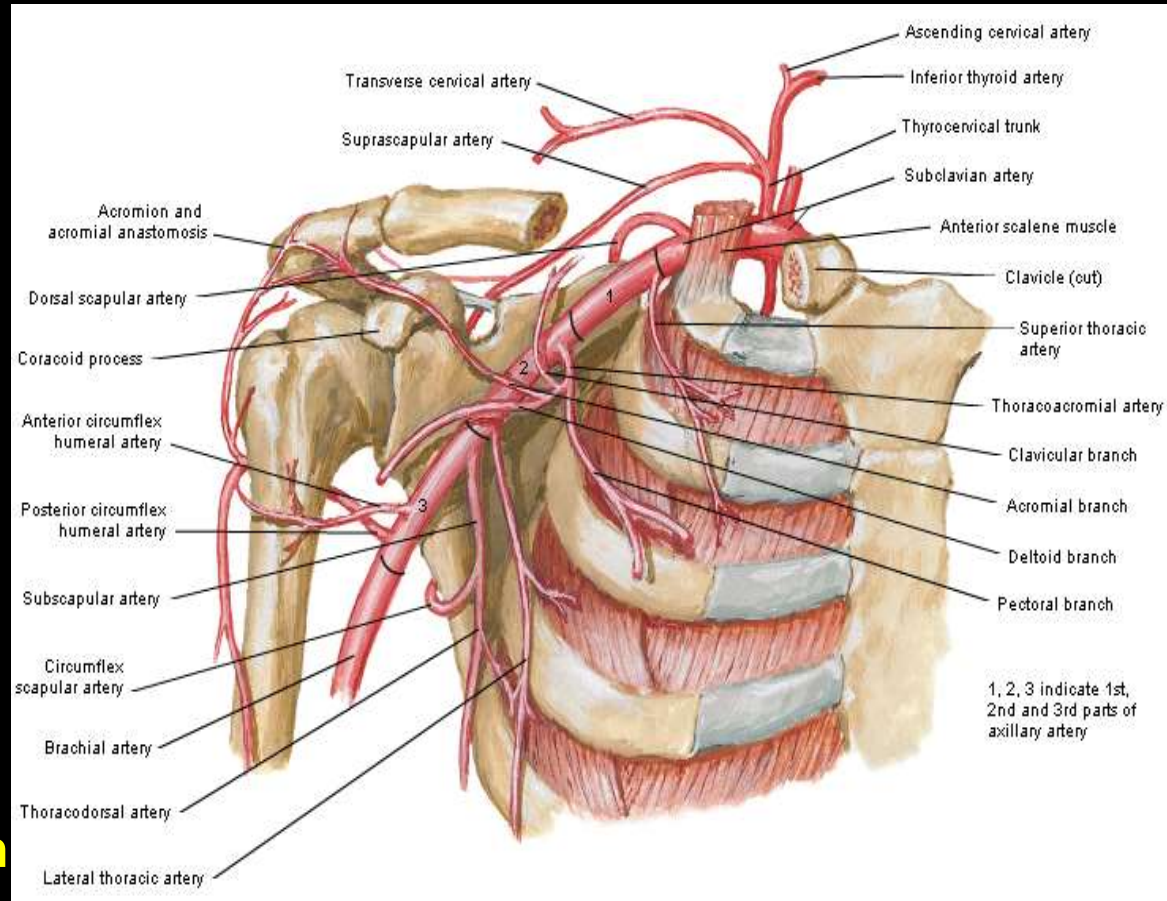
- ❖ Thoracoacromial artery- divides into 4 branches: acromial, deltoid, pectoral and clavicular which supply corresponding muscles and areas
- ❖ Lateral thoracic artery- takes part in blood supply of lateral wall of thorax (serratus anterior muscle, breast)



Branches of the axillary artery

Branches of the third section

- ❖ **Subscapular artery- divides into 2 branches: circumflex scapular and thoracodorsal which supply subscapularis, infraspinatus, teres major and latissimus dorsi muscles**
- ❖ **Anterior circumflex humeral artery**
- ❖ **Posterior circumflex humeral artery - runs with axillary nerve and takes part in blood supply of muscles surrounding the quadrangular space and deltoid**



Brachial artery

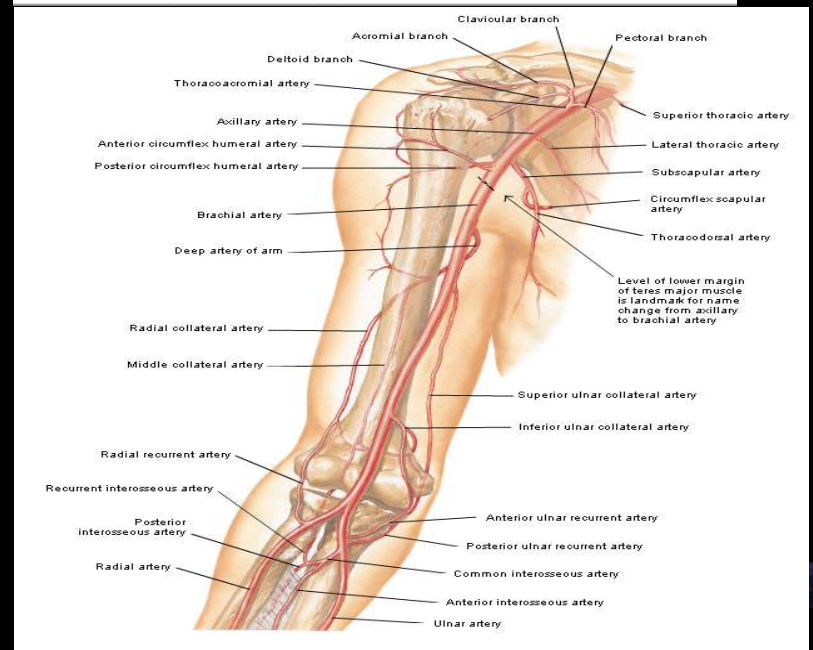
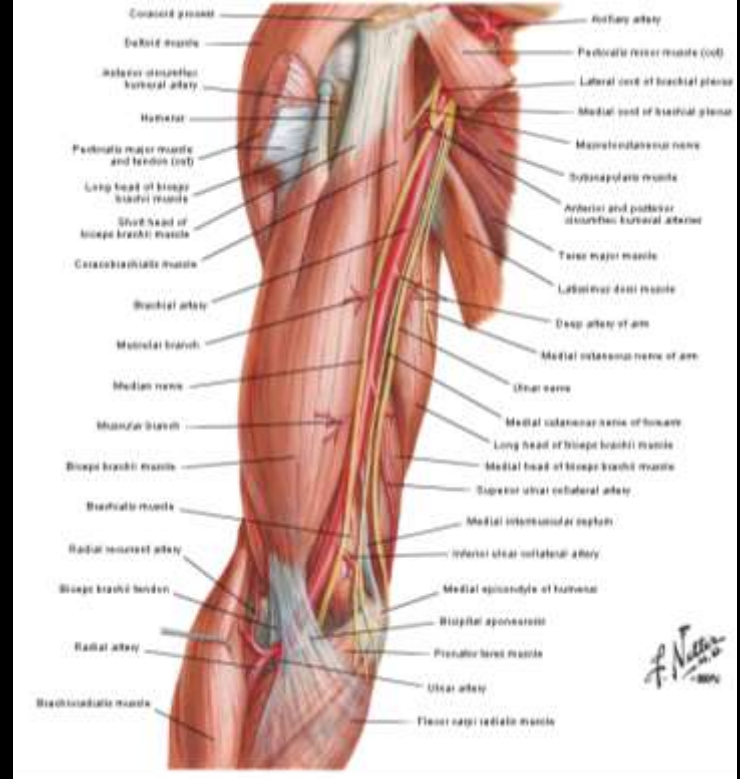
❖ Origin

- Is a continuation of the axillary artery (begins at the level of inferior border of the teres major)

❖ Course

- In the arm runs **together with median nerve** along the medial surface of the biceps brachii
- **Enters the cubital fossa where divides into terminal branches:**

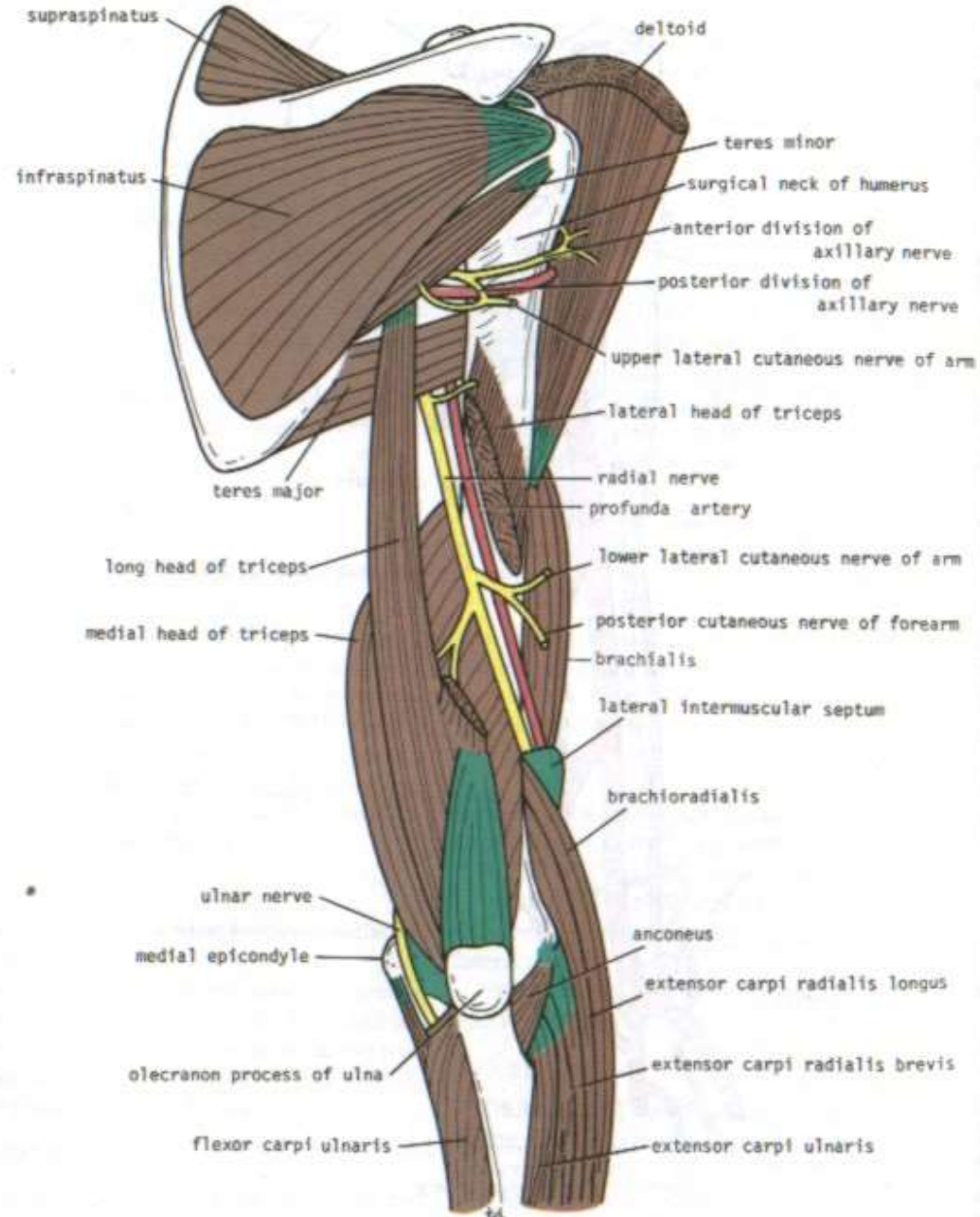
- **Radial artery**
- **Ulnar artery**



Branches of the brachial artery

❖ Deep artery of arm

- Runs **together with the radial nerve** on the posterior surface of humerus (within the radial groove)
- **Supplies posterior compartment of the arm**
- Takes part in arterial anastomoses around the elbow (via its branch **radial collateral artery** and **middle collateral artery**)



Branches of the brachial artery

❖ Nutrient humeral artery

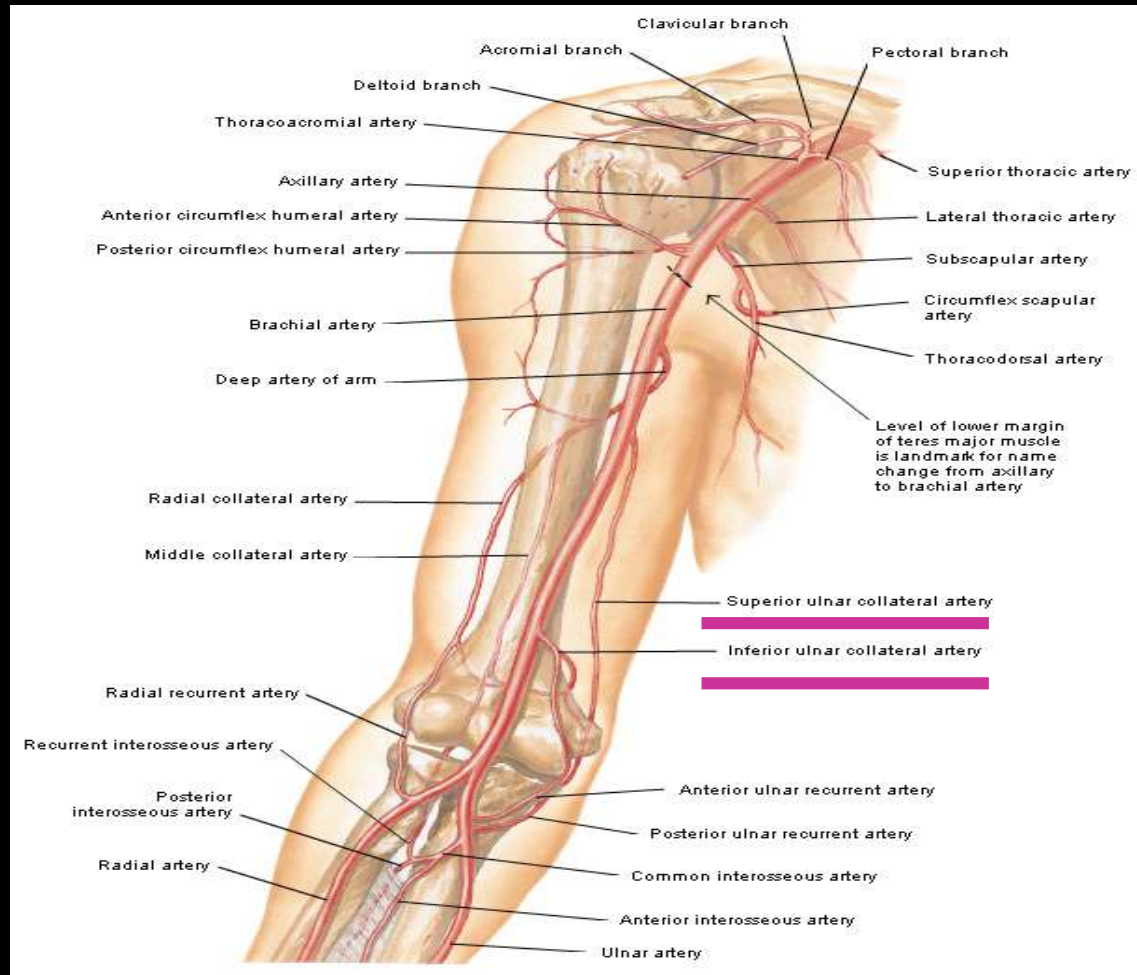
- Runs to the body of humerus via the nutrient foramen

❖ Superior ulnar collateral artery

- Runs together with the ulnar nerve behind the medial epicondyle of humerus

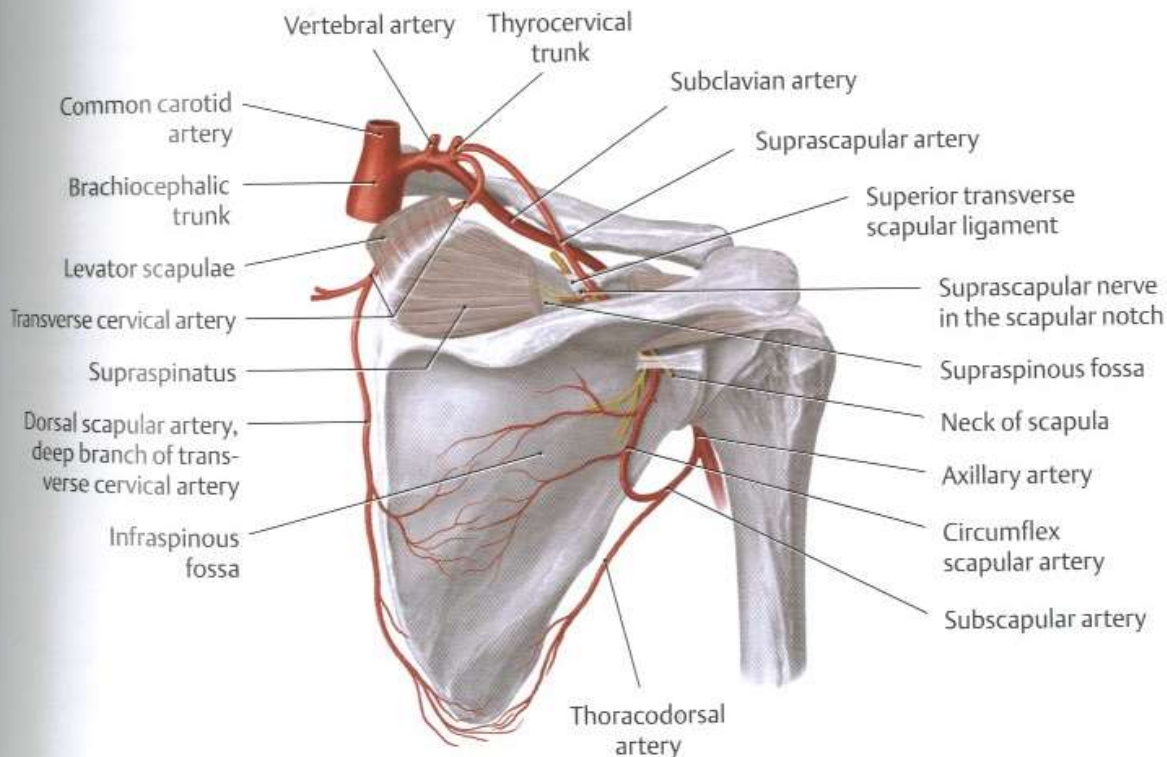
❖ Inferior ulnar collateral artery

- Take part in arterial anastomoses around the elbow



Arterial anastomoses (network) around scapula

- ❖ Arterial anastomoses around scapula form possibility of collateral circulation for upper limb when the direct blood supply is impossible (for example in cases of occlusion or ligation of lacerated subclavian or axillary artery)
- ❖ **Arterial anastomoses around scapula is formed by:**
 - Dorsal scapular and suprascapular arteries (branches of subclavian artery)
 - Subscapular artery (branch of axillary artery)



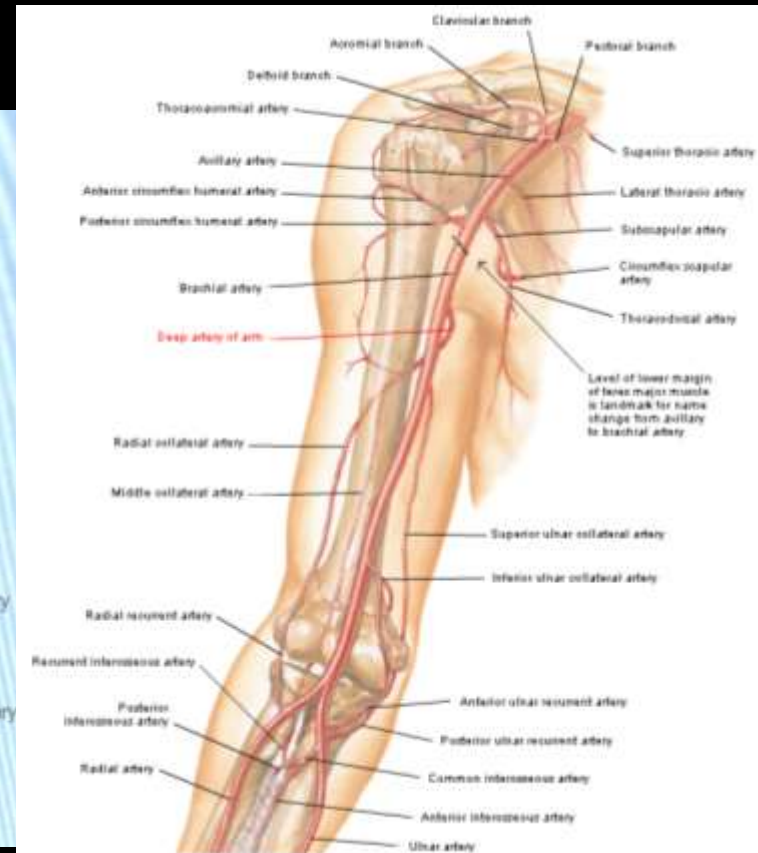
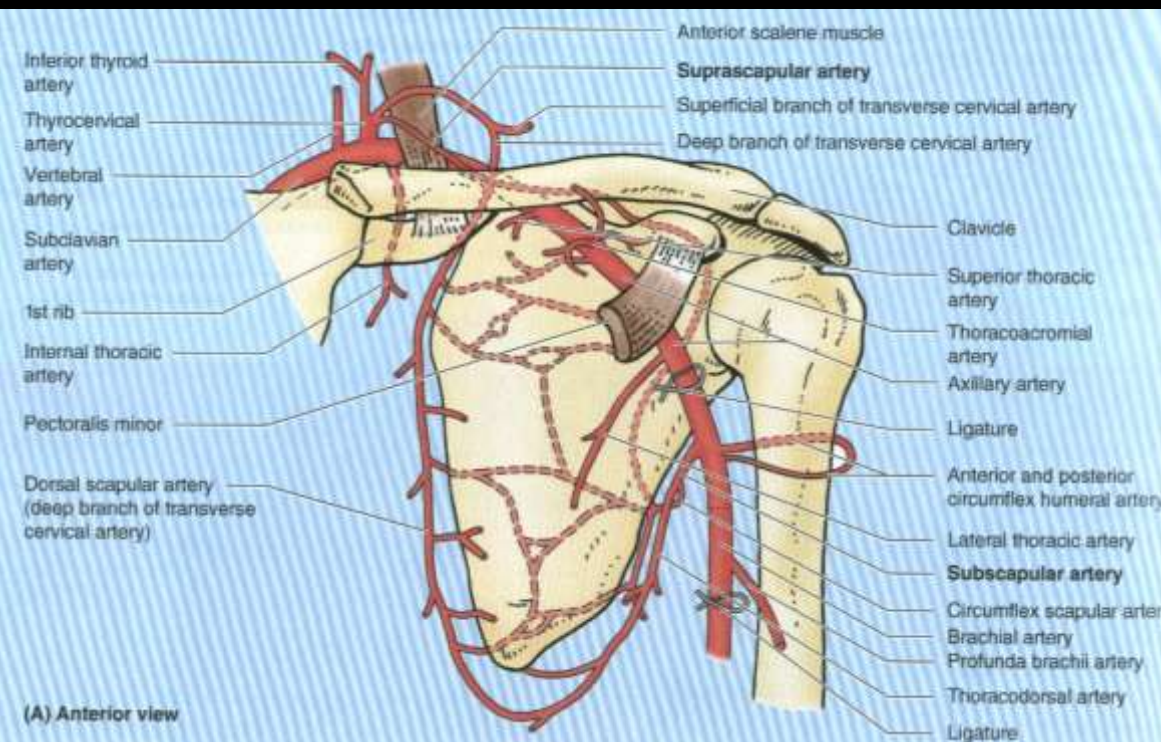
D Scapular arcade

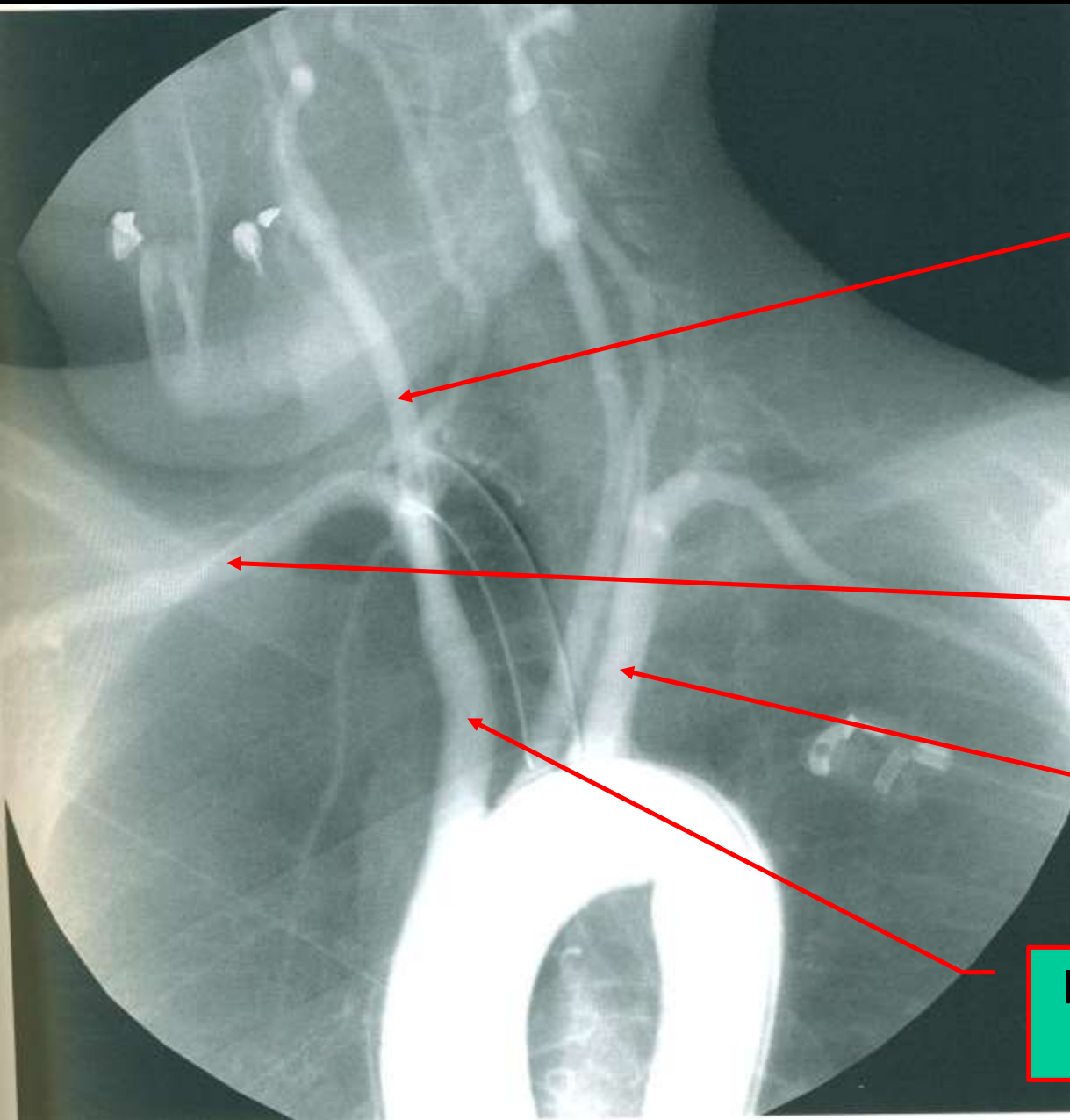
Right scapula, posterior view. The suprascapular artery arises from the thyrocervical trunk and passes over the *superior* transverse scapular ligament to enter the suprascapular fossa. From there it runs past the neck of the scapula, passing *under* the *inferior* transverse scapular ligament (often absent), and enters the infrascapular fossa where it communicates with the circumflex scapular artery (from the subscapular artery) and the deep branch (dorsal scapular artery) of the transverse cervical artery.

Note the anastomosis between the suprascapular artery and the circumflex scapular artery (scapular arcade). It is important clinically because it can provide a collateral circulation in response to ligation or occlusion of the axillary artery (see also p. 342).

Arterial anastomoses (network) around scapula

- ❖ Ligation of the axillary artery is possible only proximally to subscapular artery
- ❖ Ligation of the brachial artery is possible only distally to deep artery of arm





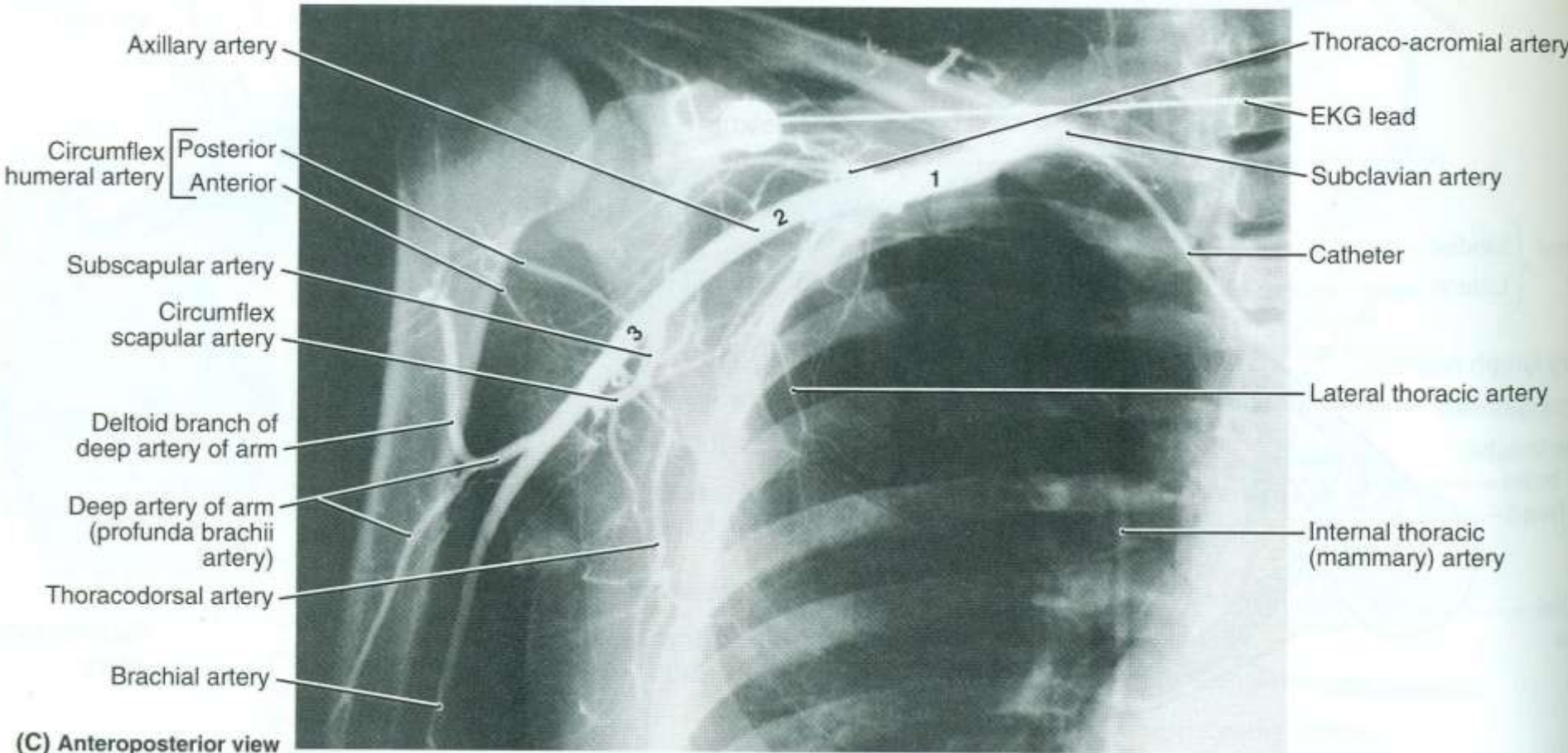
Right common
carotid artery

Right subclavian
artery

Left subclavian
artery

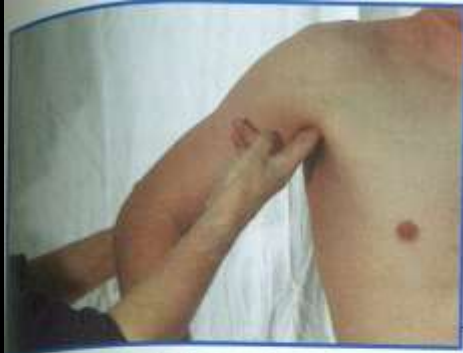
Brachiocephalic
trunk





(C) Anteroposterior view

A



Axillary pulse



Brachial pulse in mid-arm



Radial pulse in distal forearm



Brachial pulse in the cubital fossa



Ulnar pulse in distal forearm

