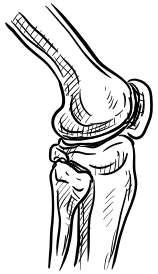
بسم الله الرحمن الرحيم



ANATMOY

FINAL | Lecture 3

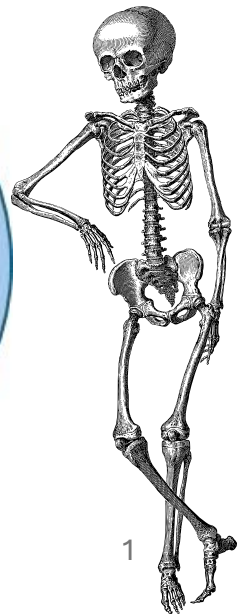
﴿ وَإِن تَتَوَلَّوْا يَسْتَبْدِلْ قَوْمًا غَيْرَكُمْ ثُمَّ لَا يَكُونُوا أَمْثَالَكُم ﴾

اللهم استعملنا ولا تستبدلنا

The Arm

Written by: Sara Masadeh, Sara Qudaisat

Reviewed by: Leen Mamoon



Click to test yourself on the previous lecture..

“رَبِّ اشْرَحْ لِي صَدْرِي ۝ وَيَسِّرْ لِي أَمْرِي ۝ وَاحْلُلْ عُقْدَةً مِنْ لِسَانِي ۝ يَفْقَهُوا قَوْلِي”

Remember from general anatomy

Flexes the arm = Flexes the shoulder joint (glenohumerul joint).
Flexes the forearm = Flexes the elbow joint.

Checklist, make sure to revise these bony landmarks before diving into the lecture :

1. Supracondylar ridge (slide 4)
2. Supraglenoid tubercle of scapula (slide 7)
3. Tuberosity of radius (slide 7)
4. Infraglenoid tubercle (slide 17)
5. Radial (spiral) groove (slide 17)
6. Olecranon process of ulna (slide 17)

The Arm

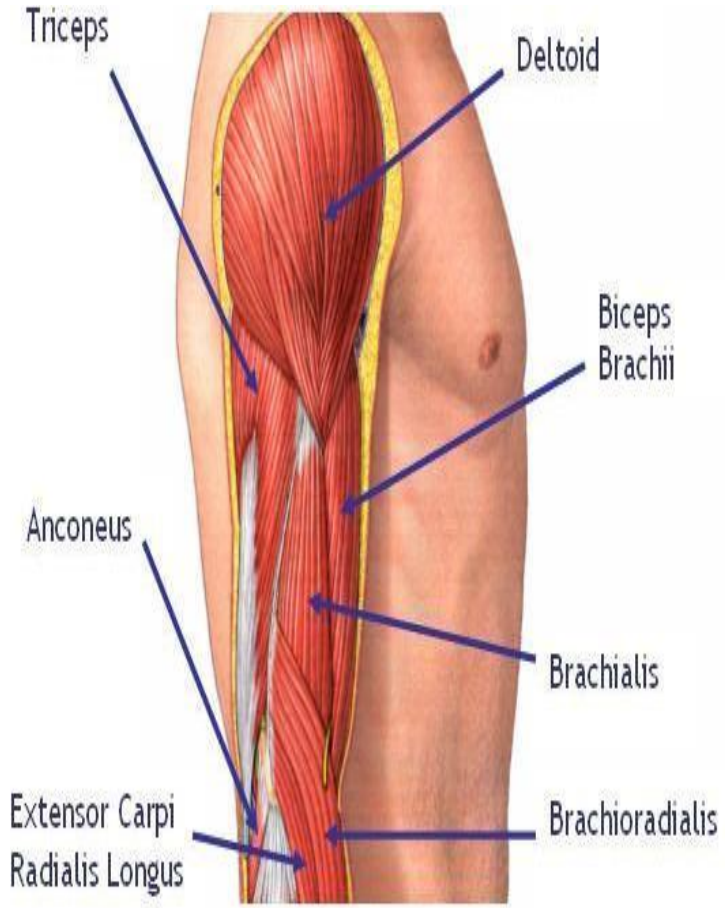
The arm is the region of the upper limb between the shoulder and the elbow.

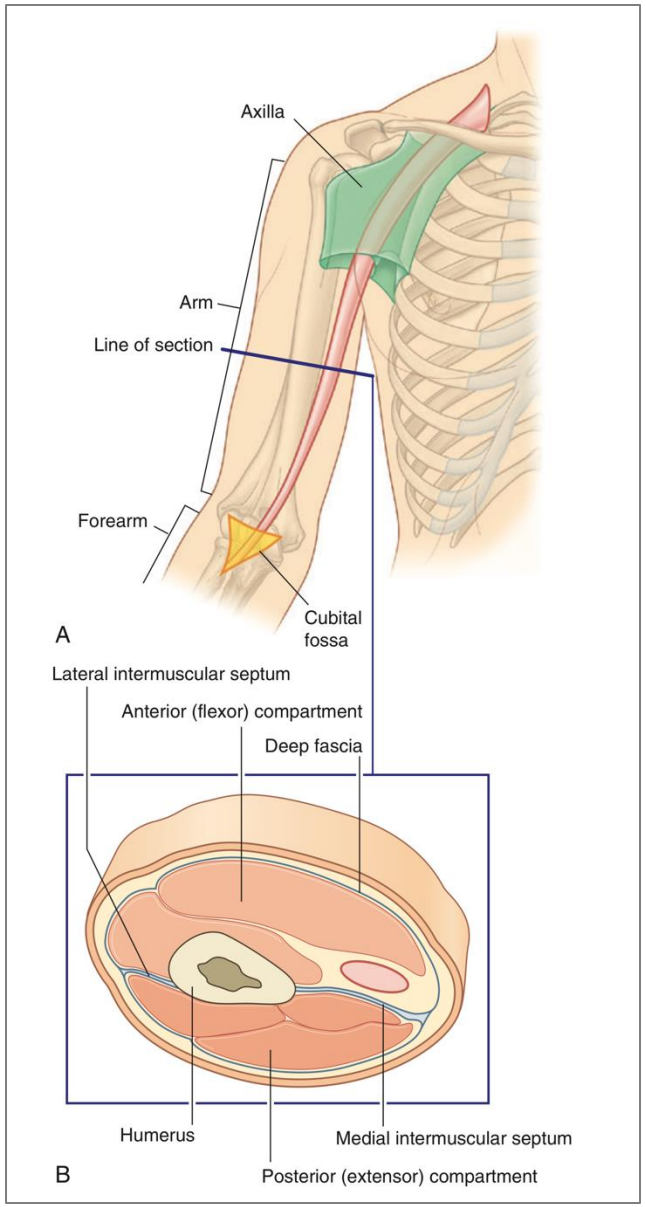
The Arm

- The upper arm is enclosed in a sheath of deep fascia **(Fascial sheath).**

- **The arm is divided into two compartments by medial and lateral intermuscular septa:**
  Two fascial septa, one on the medial side and one on the lateral side, extend from this sheath and are attached to the medial and lateral supracondylar ridges of the humerus.

- **The importance of the medial and lateral intermuscular septa:**
  By this means, the upper arm is divided into an anterior and a posterior fascial compartment, each having its muscles, nerves, and arteries.





Extra figure for further understanding

Contents of the Anterior Fascial Compartment of the Upper Arm

- Muscles: Biceps brachii, coracobrachialis, and brachialis.

The anterior compartment of the arm contains the muscles: Biceps brachii, beneath it lies the brachialis, anteriorly to the humerus as well as the brachium *, and coracobrachialis which lies on the medial side of the midshaft of the humerus .

- Blood supply: Brachial artery.

- Nerve supply to the muscles: Musculocutaneous nerve which originates from the lateral cord of the brachial plexus.

- Structures passing through the compartment: Musculocutaneous, median, and ulnar nerves; brachial artery and basilic vein. The radial nerve is present in the lower part of the compartment.

*The brachium ≠ The humerus.

The brachium refers to the upper arm region (including its muscles (biceps, triceps, brachialis), nerves, blood vessels, and the humerus), while the humerus is the specific bone within that region.

Muscles of the Anterior Fascial Compartment

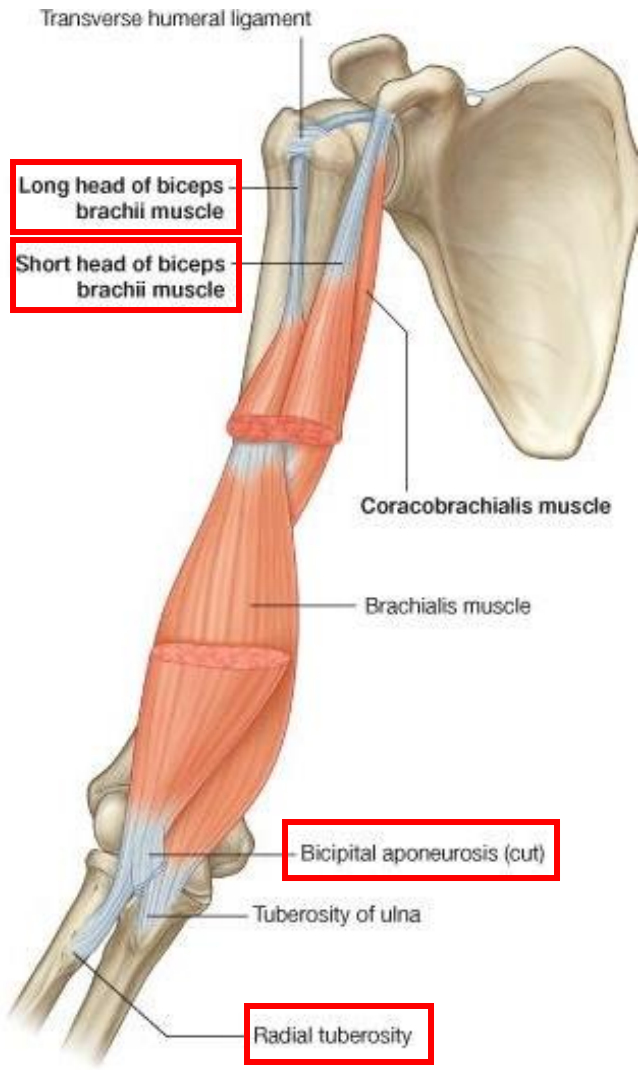
Biceps brachii ~it has 2 heads

- **Long head** passes through the glenohumeral joint (shoulder joint) and originates as a tendon from the supraglenoid tubercle of scapula.
- **Short head** originating from the coracoid process of scapula.
- Insertion: Tuberosity of radius (in the cubital fossa) and bicipital aponeurosis into deep fascia of forearm.
- Musculocutaneous nerve C5, 6.

  Action of the muscle: the screwing motion (flexion and supination simultaneously).

  Supinator of forearm and flexor of elbow joint; weak flexor of shoulder joint due to its long head origin.

  That's why carpenters have large biceps, usually.

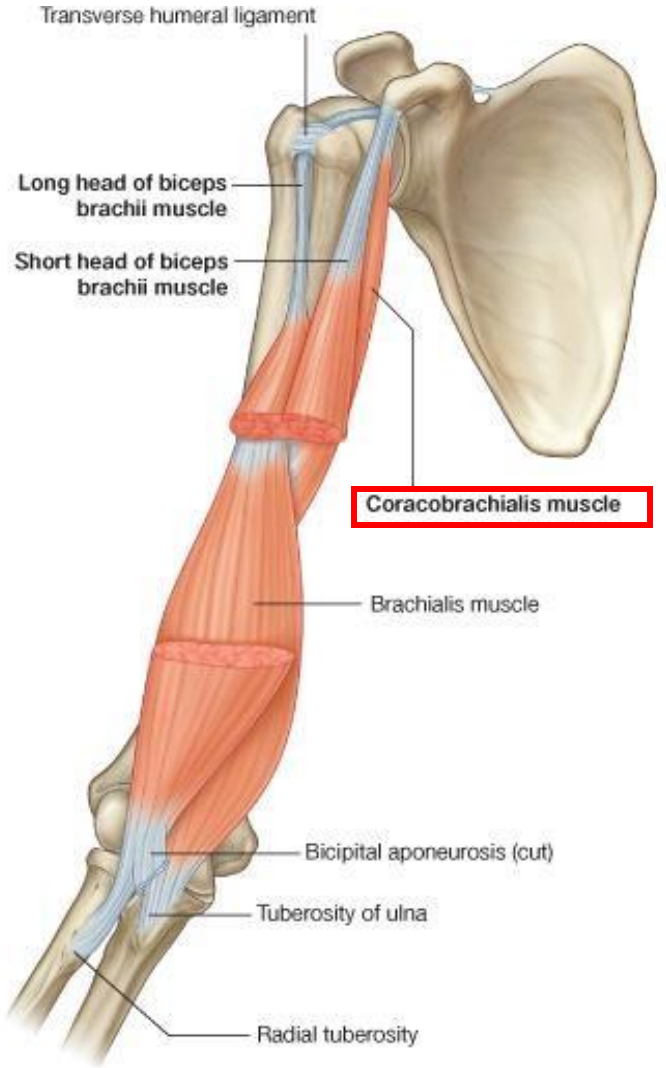


The supinators of the forearm

N.B.: it is important to differentiate between supination alone and supination during flexion. The muscle responsible for supination in the anatomical position is the supinator muscle, while the muscle that supinates the forearm when the elbow joint is flexed is the biceps brachii.

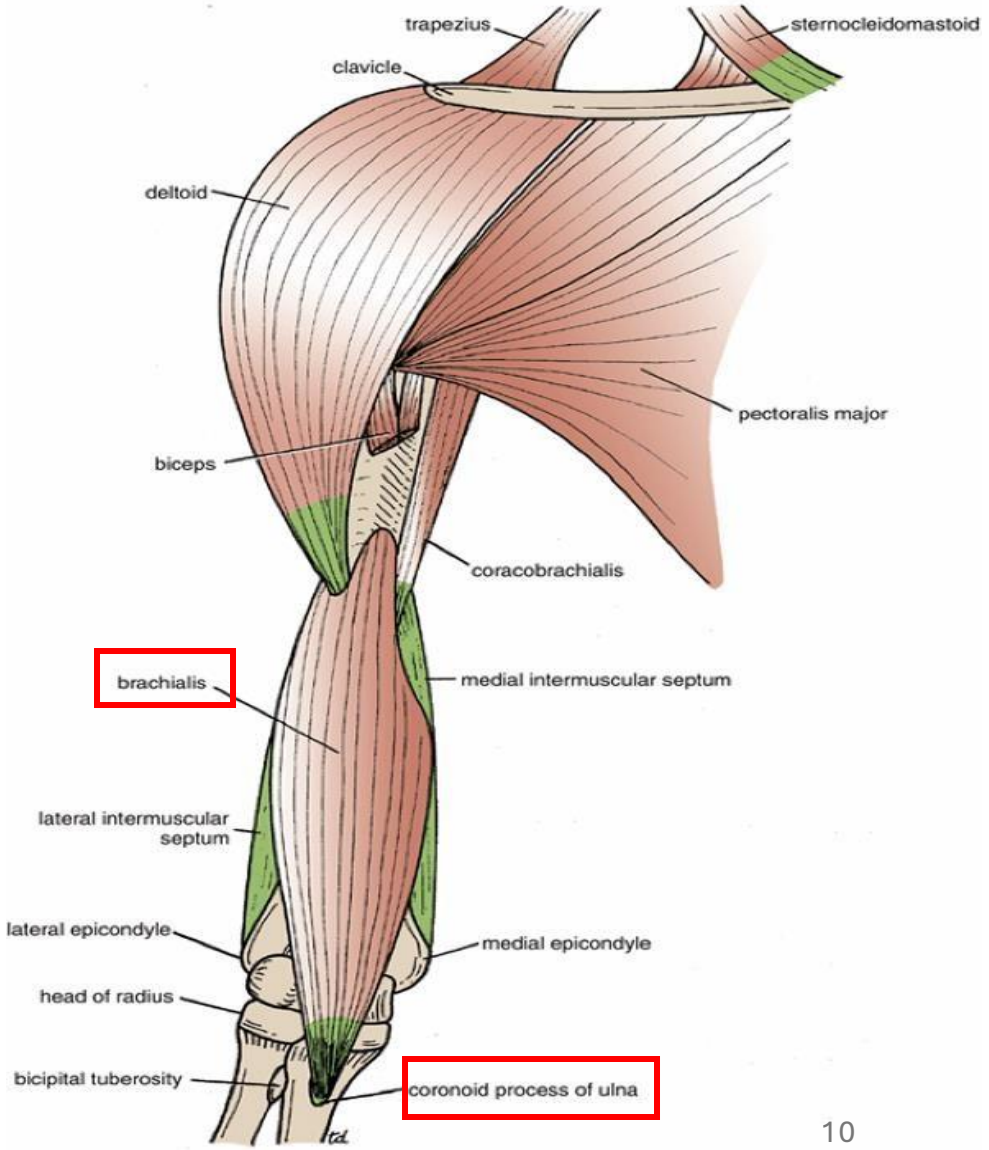
Coracobrachialis ~it's a small muscle

- Origin: Coracoid process of scapula.
- Insertion: Medial aspect of shaft of Humerus.
- Innervation: Musculocutaneous nerve C5, 6,7.
- Action: **Weak** flexion of the arm and also process of weak adductor.



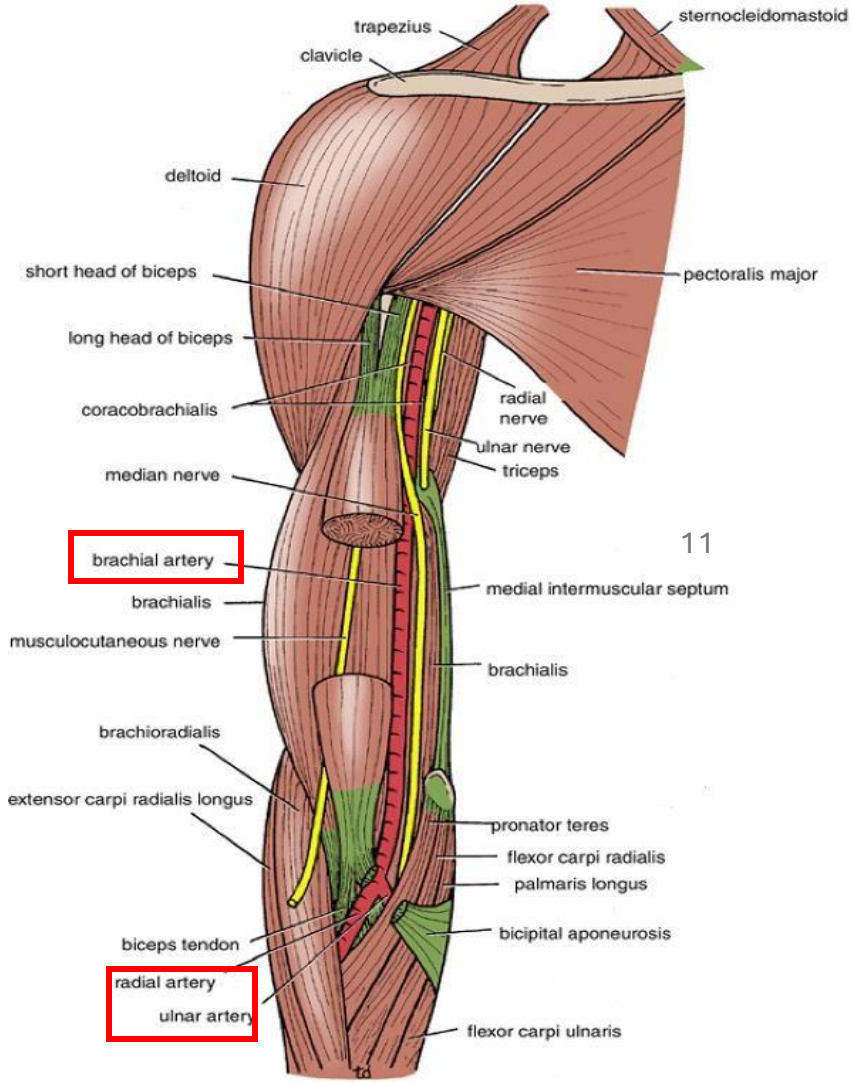
Brachialis

- The prime mover of flexion of the forearm.
- Origin: Front of lower half of humerus.
- Insertion: Coronoid process of ulna.
- Innervation: Musculocutaneous nerve C5, 6, 7 supplies the medial half , while the Radial Nerve supplies the lateral half (dual nerve supply).
- Action: Flexor of elbow joint.



Brachial Artery

- Runs medial to the arm subcutaneously .
- Lies between the biceps brachii in the anterior compartment and the triceps brachii in the posterior compartment .
- **Begins** at the lower border of the teres major muscle as a **continuation** of the axillary artery.
- It **terminates** in the cubital fossa opposite neck of the radius by dividing into the radial and ulnar arteries.
- It provides the main arterial supply to the arm.



Triple relation between the median nerve and the brachial artery

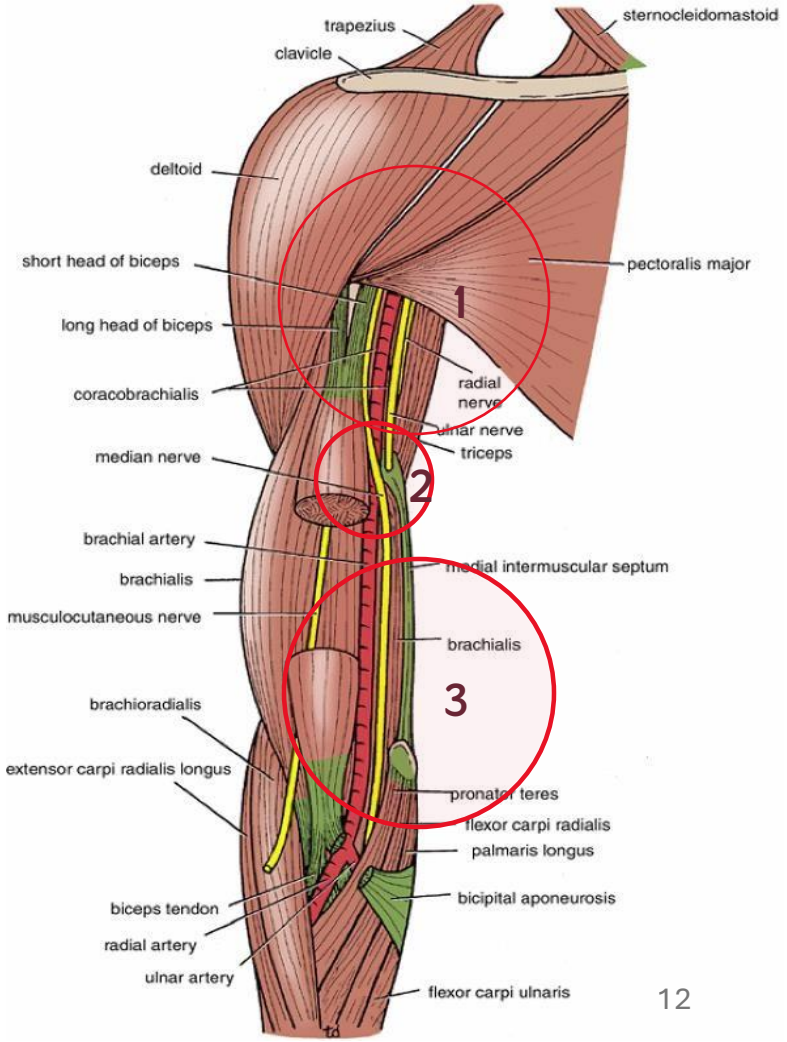
- It runs downward on the lateral side of the brachial artery , Halfway down the upper arm, it crosses the brachial artery and continues downward on its medial side.

1-In the upper part of the arm, ulnar nerve lies medial to the brachial artery, while the median nerve lies laterally

2-The median nerve crosses the artery from lateral to medial at the level of the insertion of the deltoid/coracobrachialis.

3-The median nerve is medial to the artery

This is called the Triple relation between the median nerve and the brachial artery.

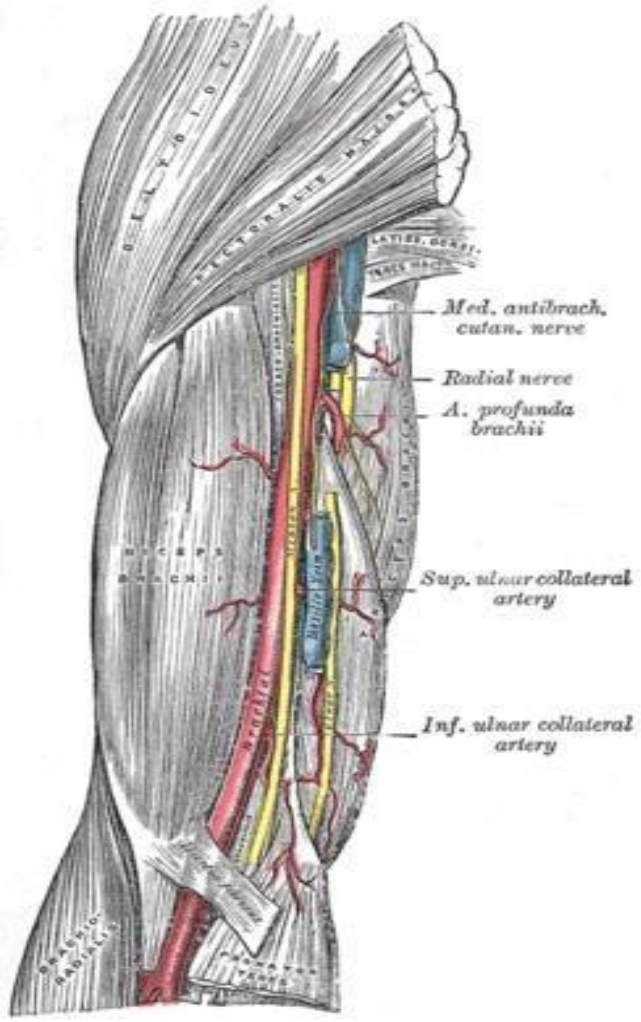


For more information about the musculocutaneous nerve, go slide 15.

Brachial Artery

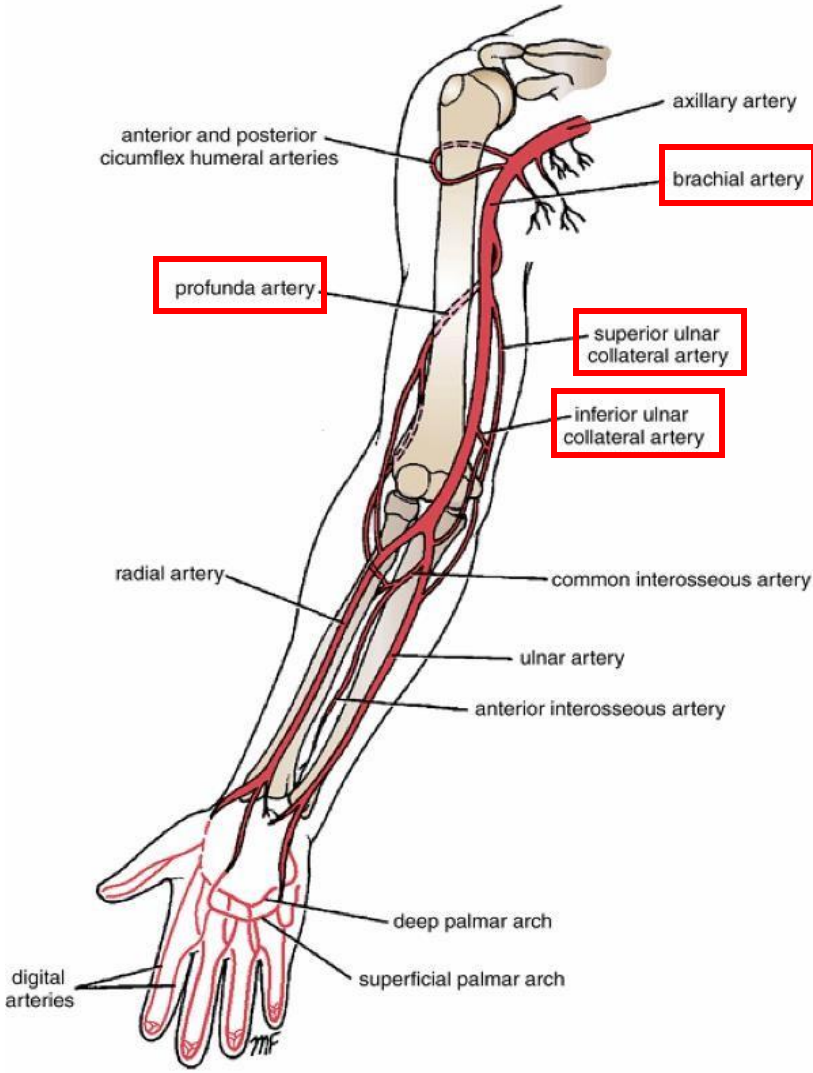
Relations:

- Anteriorly:
  - The vessel is superficial and is overlapped from the lateral side by the coracobrachialis and biceps.
  - The medial cutaneous nerve of the forearm lies in front of the upper part.
  - The median nerve crosses its middle part and the bicipital aponeurosis crosses its lower part.
- Posteriorly:
  - The artery lies on the triceps, the coracobrachialis insertion, and the brachialis.
- Medially:
  - The ulnar nerve and the basilic vein in the upper part of the arm.
  - In the lower part of the arm, the median nerve lies on its medial side.
- Laterally:
  - The median nerve and the coracobrachialis and biceps muscles above.
  - The tendon of the biceps lies lateral to the artery in the lower part of its course.



Branches of the Brachial artery

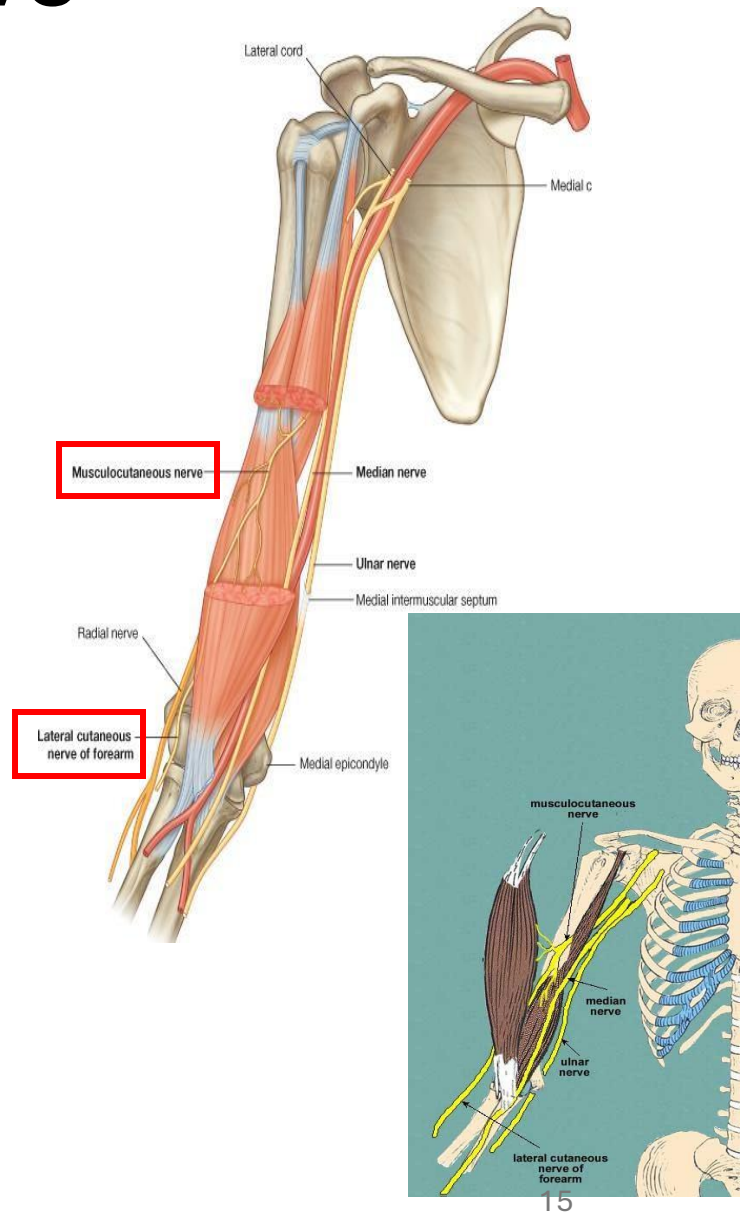
- **Muscular branches** to the muscles of the anterior compartment of the upper arm.
- The nutrient artery to the humerus.
- **The profunda brachii artery** arises near the beginning of the brachial artery at the medial side of the arm and follows the radial nerve laterally into the spiral groove of the humerus, where it divides into anterior and posterior branches.
- Medially, we can notice:
  - **The superior ulnar collateral artery** arises near the middle of the upper arm and follows the ulnar nerve.
  - **The inferior ulnar collateral artery** arises near the termination of the artery and takes part in the anastomosis around the elbow joint
  - Both of the ulnar collateral arteries descend towards the elbow joint.
- The brachial artery terminates just distal to the elbow joint where it divides into the radial and ulnar arteries. These radial and ulnar arteries eventually form the superficial and deep palmar arches of the hand. These arches gives the blood supply for the digits (digital arteries).
- The brachial artery gives the blood supply for the whole Upper limb .
- How many branches arise from the Brachial artery? 3 Branches.
- You can place your fingers under the biceps to sense the brachial artery pulse. (Same artery is used to measure blood pressure)



FYI: profunda is a Latin word meaning deep.

Musculocutaneous Nerve

- The origin of the musculocutaneous nerve from the lateral cord of the brachial plexus (C5, 6, and 7) in the axilla.
- It runs downward and laterally, pierces the coracobrachialis muscle, and then passes downward between the biceps and brachialis muscles, **piercing the biceps as well. Recall that it supplies all three muscles.**
- It appears at the lateral margin of the biceps tendon and pierces the deep fascia just above the elbow.
- It **then** runs down the lateral aspect of the forearm **superficially in front of the cubital fossa** as the lateral cutaneous nerve of the forearm.
- Branches:
  - Muscular **"musculo"** branches to the biceps, coracobrachialis, and brachialis.
  - Cutaneous branches; the lateral cutaneous nerve of the forearm supplies the skin of the front and lateral aspects of the forearm down as far as the root of the thumb.
  - Articular branches to the elbow joint.

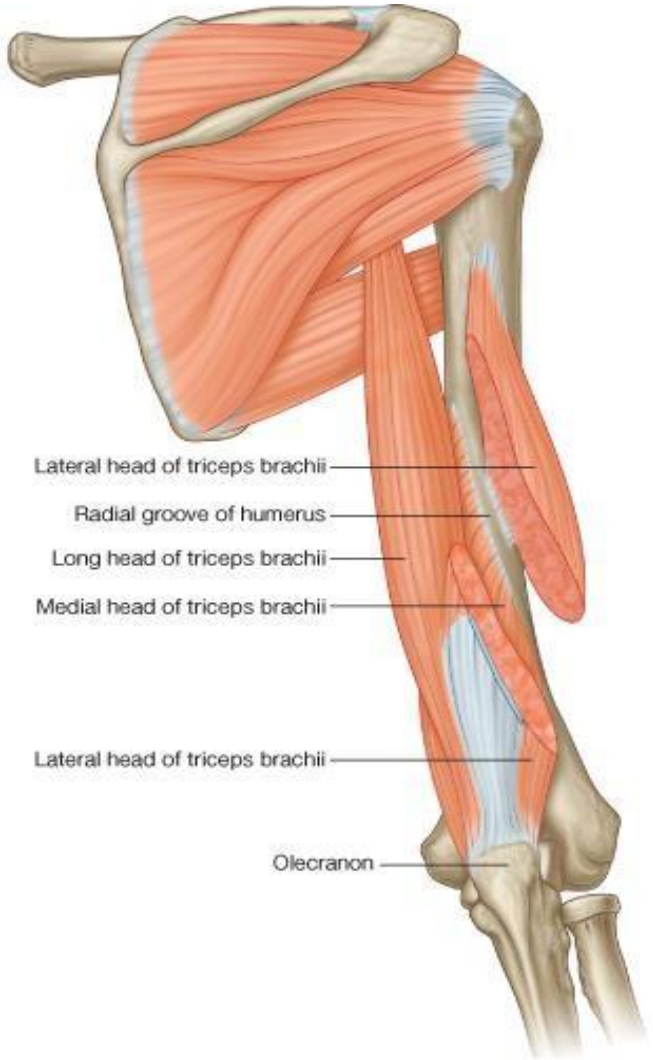


Contents of the Posterior Fascial Compartment of the Upper Arm

- Muscle: The three heads of the triceps muscle (lateral, medial and long heads).
- Nerve supply to the muscle: Radial nerve.
- Blood supply: Profunda brachii and ulnar collateral arteries (posterior and medial branches of the brachial artery, respectively).
- Structures passing through the compartment: Radial nerve and ulnar nerve.

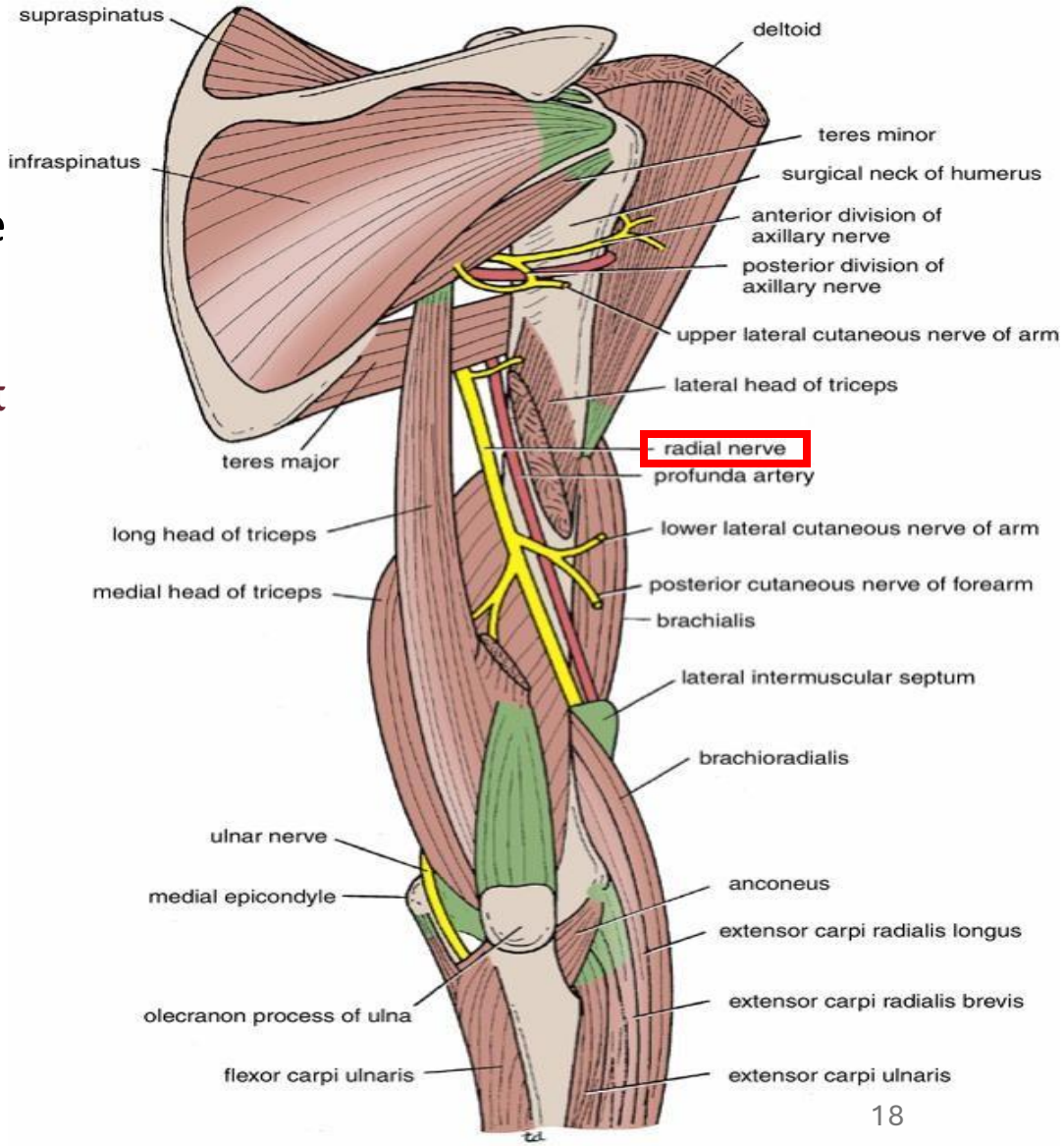
Triceps

- Origin :
  - Long head originates from the Infraglenoid tubercle of scapula .
  - Lateral head Upper half of posterior surface of shaft of humerus above the radial groove.
  - Medial head Lower half of posterior surface of shaft of humerus below the radial (spiral) groove.
- Insertion:
  - Olecranon process of ulna.
- Innervation:
  - Radial nerve C6, 7, 8 (note that the radial nerve also has branches to the forearm and the dorsum of the hand, facilitating the extension of the forearm and the hand respectively. Therefore, a cut in the radial nerve results in an inability to perform extension, and causes the wrist/hand to drop).
- Action :
  - Extensor of elbow joint.



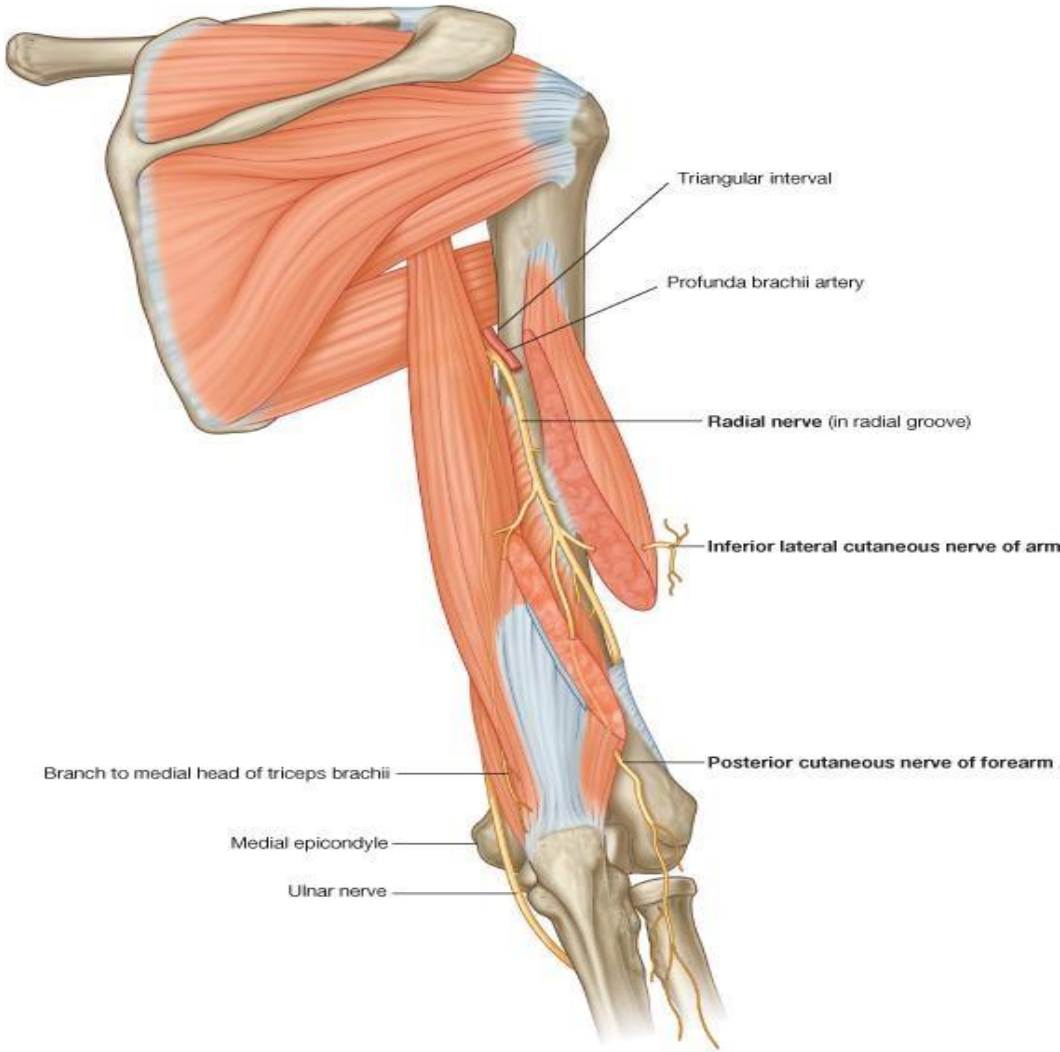
Radial Nerve

- The origin of the radial nerve from the posterior cord of the brachial plexus in the axilla.
- The nerve winds around the back of the arm in the spiral groove on the back of the humerus between the heads of the triceps, going from medial to lateral.
- Then, at the lateral epicondyle, it leaves the posterior compartment and enters the anterior compartment, where it becomes part of the content of the cubital fossa. It is the most lateral structure passing the cubital fossa.
- Once it reaches the cubital fossa, it divides into deep and superficial branches.
- It pierces the lateral fascial septum above the elbow and continues downward into the cubital fossa in front of the elbow, between the brachialis and the brachioradialis muscles.
- In the spiral groove, the nerve is accompanied by the profunda vessels, and it lies directly in contact with the shaft of the humerus.
- It provides branches to each of the three heads of the triceps.



Branches

- **The radial nerve provides branches to the triceps muscle as previously mentioned, in addition to three cutaneous branches to the following areas: the posterior surface of the arm, the posterior surface of the forearm, and the lateral surface of the lower part of the arm (emphasis on lower, as the lateral surface of the upper part of the arm is innervated by the axillary nerve).**
- In the axilla, branches are given to the long and medial heads of the triceps, and the posterior cutaneous nerve of the arm is given off.
- In the spiral groove branches are given to the lateral and medial heads of the triceps and to the anconeus.
- The lower lateral cutaneous nerve of the arm supplies the skin over the lateral and anterior aspects of the lower part of the arm
- The posterior cutaneous nerve of the forearm runs down the middle of the back of the forearm as far as the wrist.
- In the anterior compartment of the arm, after the nerve has pierced the lateral fascial septum, it gives branches to the brachialis **(recall that the brachialis is innervated by both the Musculocutaneous and the radial nerves).**
- It also gives articular branches to the elbow joint.



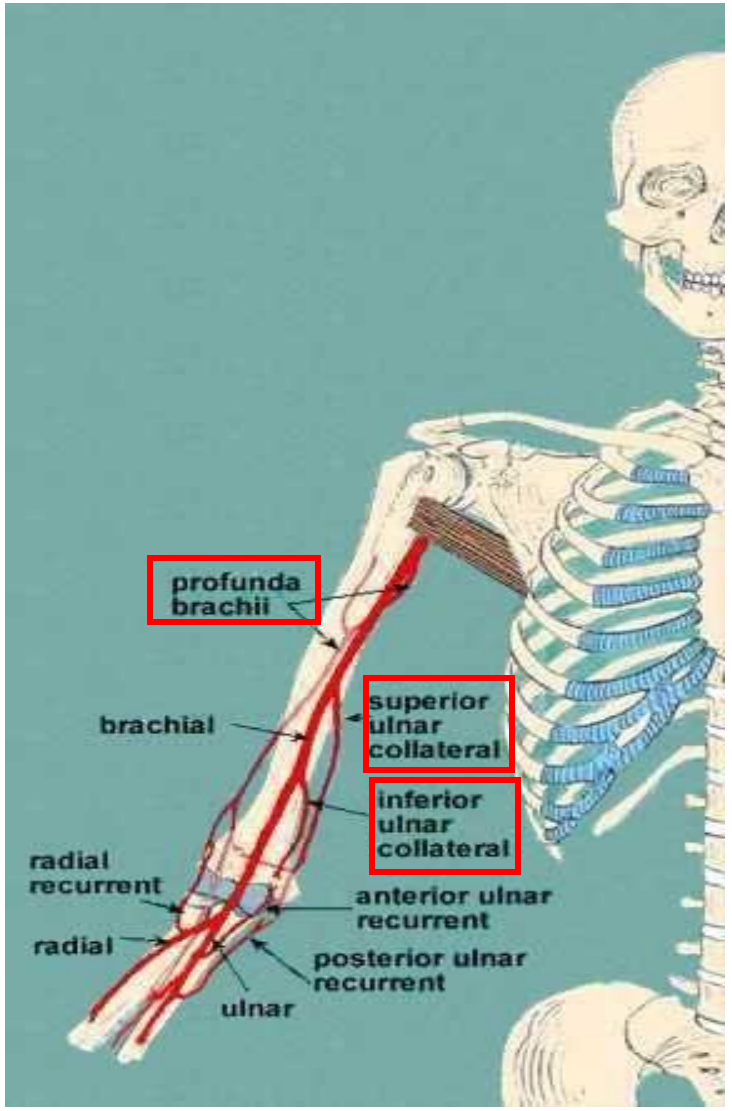
Ulnar Nerve

- The ulnar nerve arises from the medial cord and runs in the arm medially to the brachial artery. It does not provide any branches in the arm.
- Having pierced the medial fascial septum (intermuscular septum) halfway down the upper arm*, the ulnar nerve descends behind the septum, covered posteriorly by the medial head of the triceps.
- The nerve is accompanied by the superior ulnar collateral vessels. At the elbow, it lies behind the medial epicondyle of the humerus, from which it extends downwards towards the forearm and runs between the flexor carpi ulnaris and the flexor digitorum profundus.
- The distinct, painful feeling you get when you hit your elbow is the result of an injury to the ulnar nerve.

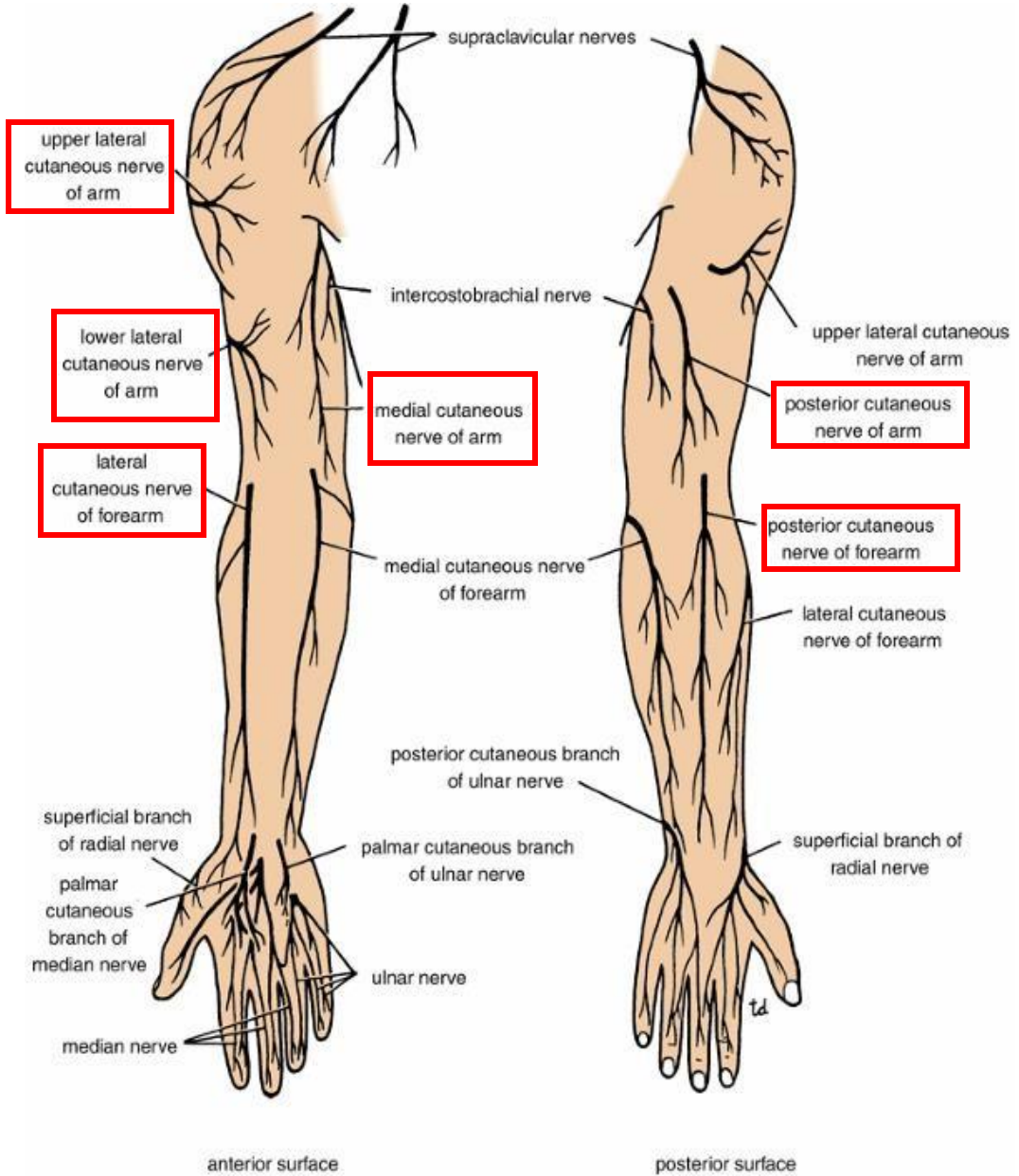
* by "halfway down the upper arm", we mean the level of the insertion of the deltoid (coracobrachialis

Profunda Brachii Artery

- The profunda brachii artery arises from the brachial artery near its origin.
- It accompanies the radial nerve through the spiral groove, heading towards the lateral side.
- supplies the triceps muscle, and takes part in the anastomosis around the elbow joint.
- The Superior and Inferior Ulnar Collateral Arteries run *medially*.
- The superior and inferior ulnar collateral arteries arise from the brachial artery and take part in the anastomosis around the elbow joint.



Superficial Sensory Nerves



Explanation on next slide.

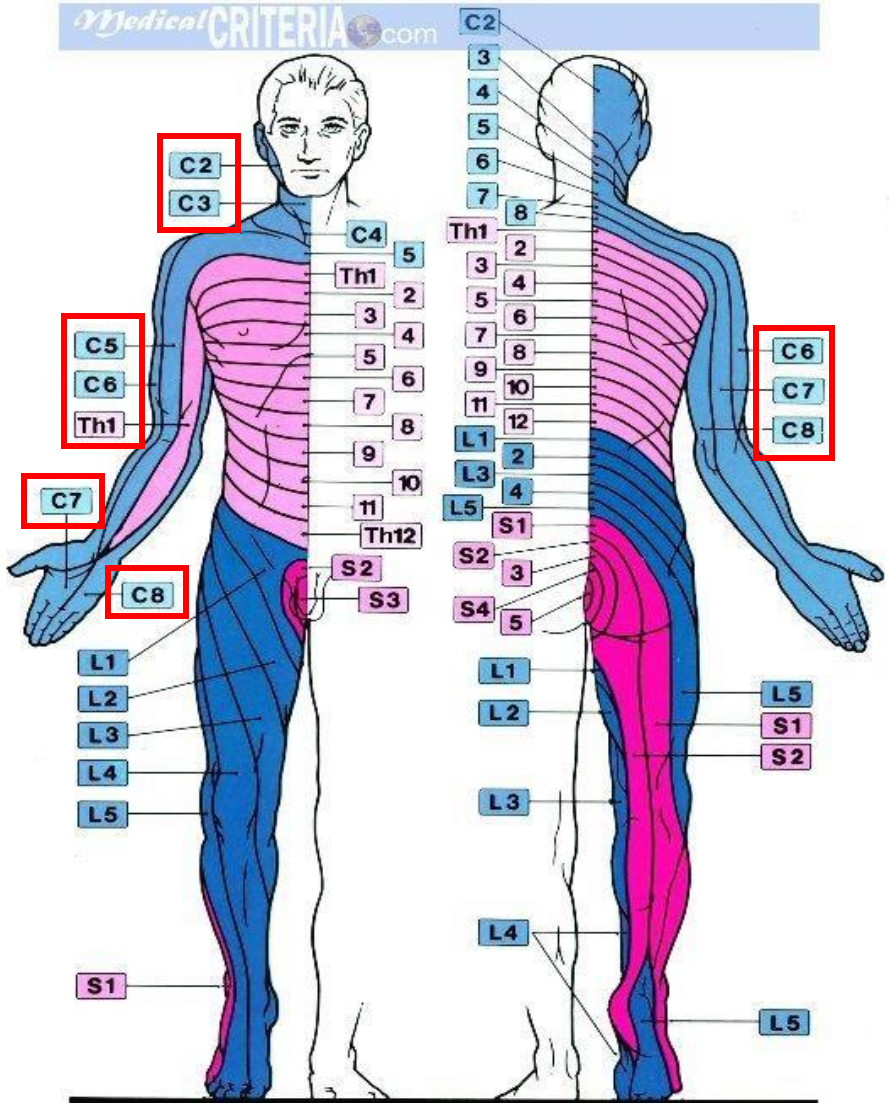
Note: the Professor has rementioned the cutaneous nerves and their origins from previous slides for emphasis, so make sure you memorize them very well. Make sure you also know which nerves are cervical (C) and which are thoracic (T).

Superficial Sensory Nerves

- The sensory nerve supply to the skin over the point of the shoulder to halfway down the deltoid muscle is from the supraclavicular nerves (C3 and 4).
- the lower half of the deltoid is supplied by the upper lateral cutaneous nerve of the arm, a branch of the axillary nerve (C5 and 6).
- The skin over the lateral surface of the arm below the deltoid is supplied by the lower lateral cutaneous nerve of the arm, a branch of the radial nerve (C5 and 6).
- The lateral cutaneous nerve of the forearm arises from the musculocutaneous nerve and supplies the lateral part of the forearm.
- The skin of the armpit and the medial side of the arm is supplied by the medial cutaneous nerve of the arm (T1) and the intercostobrachial nerves (T1 & T2).
- The medial cutaneous nerve of the arm and the medial cutaneous nerve of the forearm both arise from the medial cord.
- The skin of the back of the arm is supplied by the posterior cutaneous nerve of the arm, a branch of the radial nerve (C8).
- The posterior cutaneous nerve of the forearm also originates from the radial nerve, while the lateral cutaneous nerve of the forearm arises from the musculocutaneous nerve.

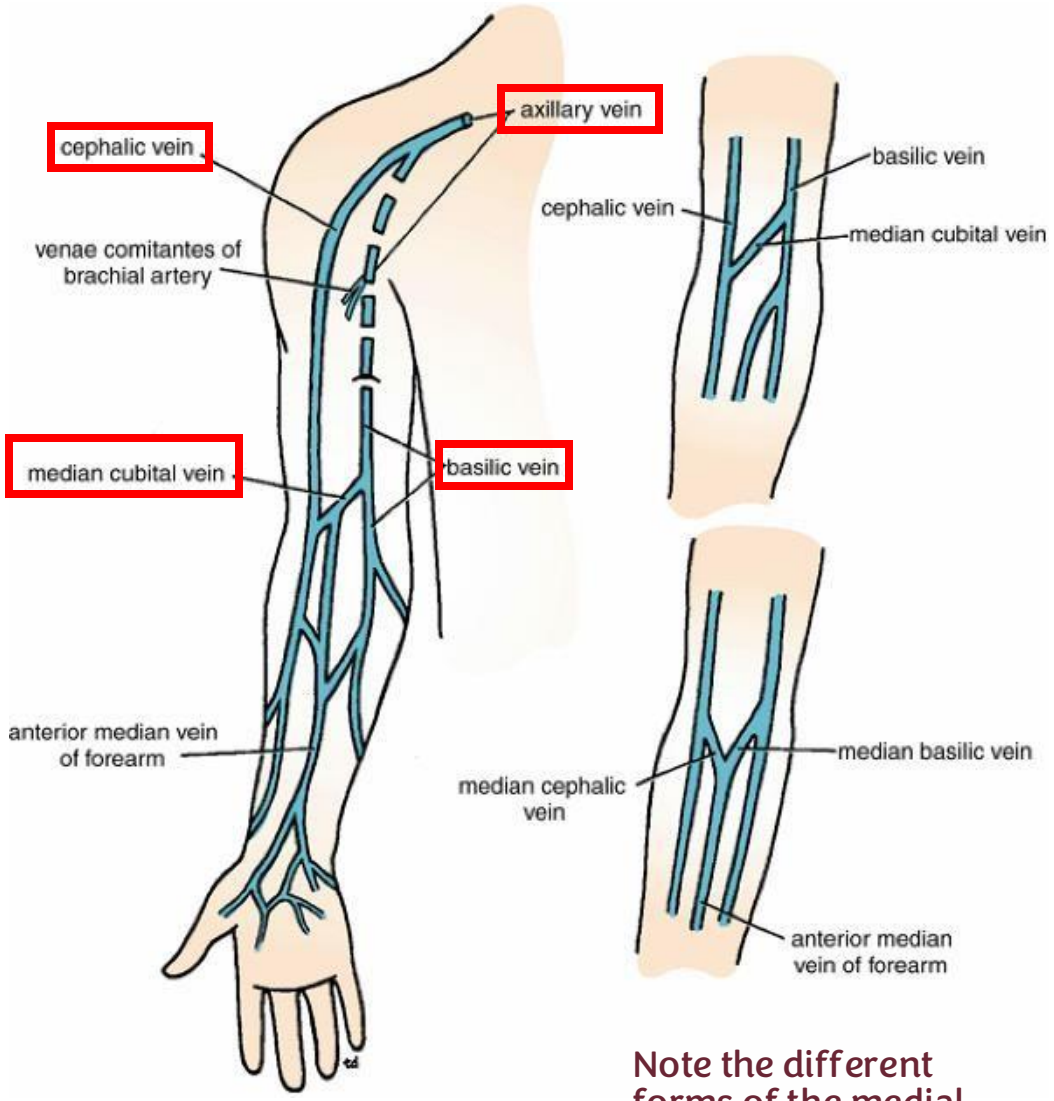
Dermatomes and Cutaneous Nerves

- A dermatome describe the origin of a nerve and the area of the skin it supplies.
- The arm: C5 in the middle, C6 laterally, T1 medially.
- The forearm: C6, C7, C8 and T1.
- The chest: C2, C3, and C4.
- Necessary for a physician to test the integrity of the spinal cord segments of C3 through T1.
- It is seen that the dermatomes for the upper cervical segments C3 to 6 are located along the lateral margin of the upper limb.
- the C7 dermatome is situated on the middle finger; and the dermatomes for C8, T1, and T2 are along the medial margin of the limb.
- The nerve fibers from a particular segment of the spinal cord, although they exit from the cord in a spinal nerve of the same segment, pass to the skin in two or more different cutaneous nerves.



Note: for this particular slide, the Professor asked us to read the written explanation. This could mean that what is written in this slide is required even if not mentioned in the lecture.

Superficial Veins



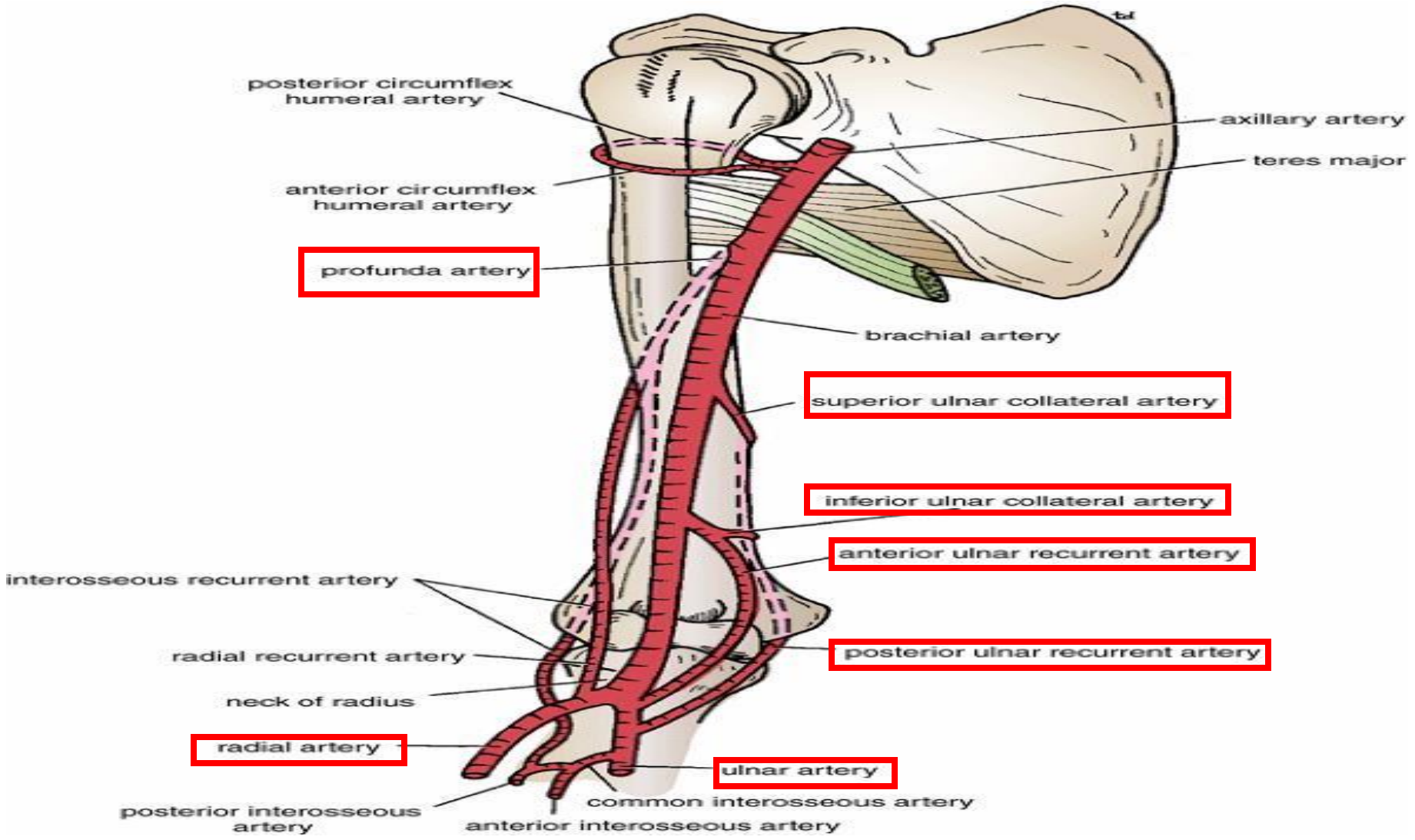
Note the different forms of the medial cephalic veins (see last point on next slide)

Explanation on next slide.

Superficial Veins

- The veins of the upper limb can be divided into two groups: superficial and deep.
- The deep veins comprise the venae comitantes, which accompany all the large arteries (such as the ulnar, radial, and brachial arteries), usually in pairs, and the axillary vein.
- The superficial veins of the arm lie in the superficial fascia.
- Starting from the dorsum of the hand, the vein that lies towards the thumb is known as the cephalic vein, while the vein that lies towards the pinky (little finger) is the basilic vein.
- These two veins ascend from the dorsum of the hand and meet in front of the cubital fossa, where they are connected by the median cubital vein. This is a common site of injection and of drawing blood.
- The cephalic vein ascends in the superficial fascia on the lateral side of the biceps and,
- on reaching the infraclavicular fossa, drains into the axillary vein.
- The basilic vein ascends in the superficial fascia on the medial side of the biceps.
- Halfway up the arm, it pierces the deep fascia and at the lower border of the teres major joins the venae comitantes of the brachial artery to form the axillary vein.
- Note how the median cubital vein can have several shapes, as demonstrated on the right of the diagram. Regardless, it connects the cephalic and basilic veins in front of the cubital fossa and serves as an important superficial site for injection and blood sampling.

the arterial anastomosis around the elbow joint



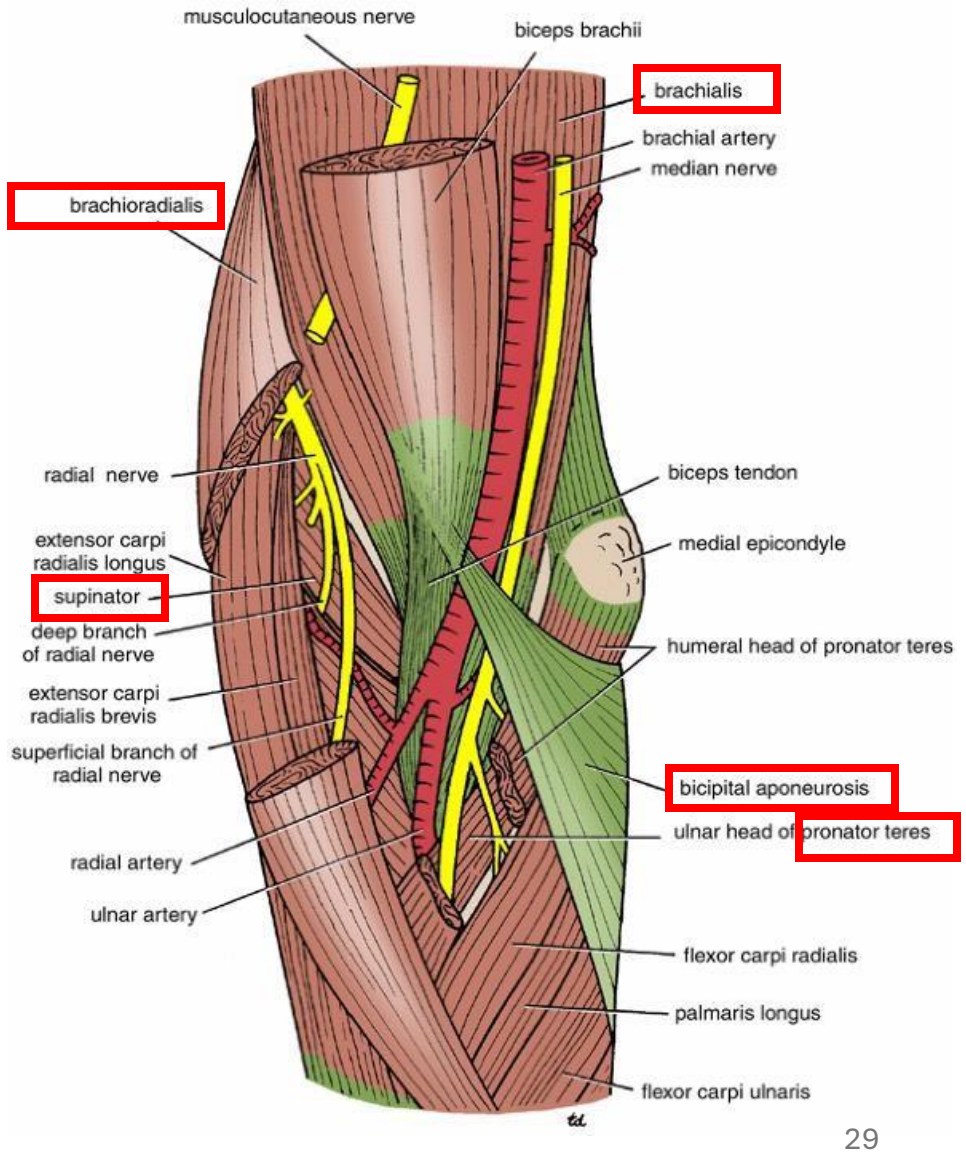
Explanation on next slide.

the arterial anastomosis around the elbow joint

- Recall that, above the elbow joint, the profunda brachii artery lies laterally, while the superior and inferior ulnar collateral arteries lie medially.
- Each of these arteries will anastomose (cross-connect) with a branch of either the radial or the ulnar arteries, as follows:
  - The ulnar artery gives rise to the anterior and posterior ulnar recurrent arteries, which anastomose with the superior and inferior ulnar collateral arteries. The ulnar artery also gives rise to the common interosseus artery, but this artery is not involved in any anastomoses around the elbow joint.
  - The radial artery gives rise to the radial recurrent artery, which anastomoses with branches of the profunda brachii artery.

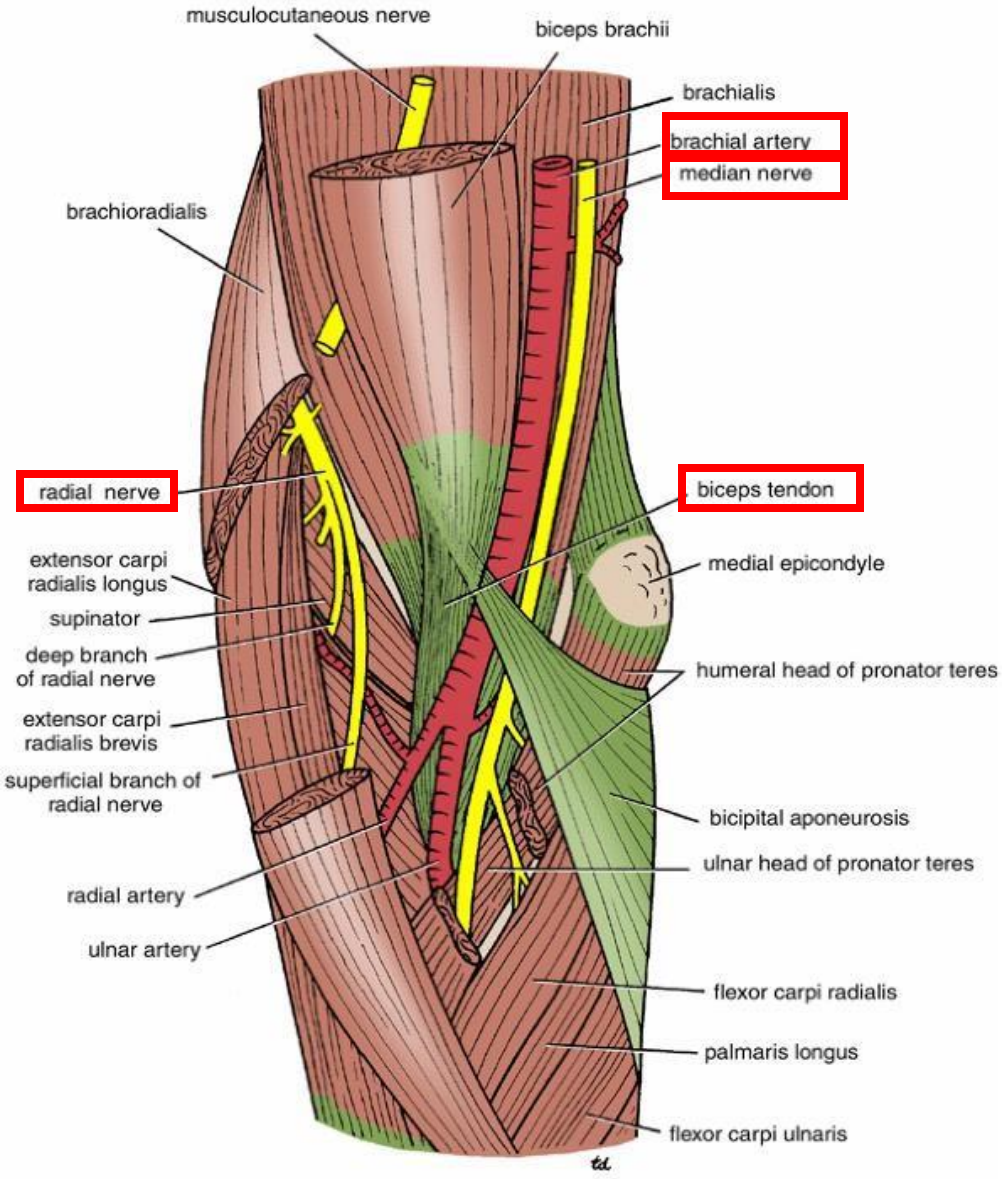
The Cubital Fossa

- The cubital fossa is a triangular depression that lies in front of the elbow.
- Boundaries:
  - Laterally: The brachioradialis muscle.
  - Medially: The pronator teres muscle.
  - The base of the triangle is formed by an imaginary line drawn between the two epicondyles (medial and lateral) of the humerus.
  - The apex of the triangle is formed by the crossing of the pronator teres muscle with the brachioradialis.
  - The floor of the fossa is formed by the supinator muscle laterally and the brachialis muscle medially.
  - The roof is formed by skin and superficial fascia and is reinforced by the bicipital aponeurosis. There are also two veins in the roof: the basilic and cephalic veins, which are connected by the median cubital, as well as two cutaneous nerves: the medial and lateral cutaneous nerves of the forearm.



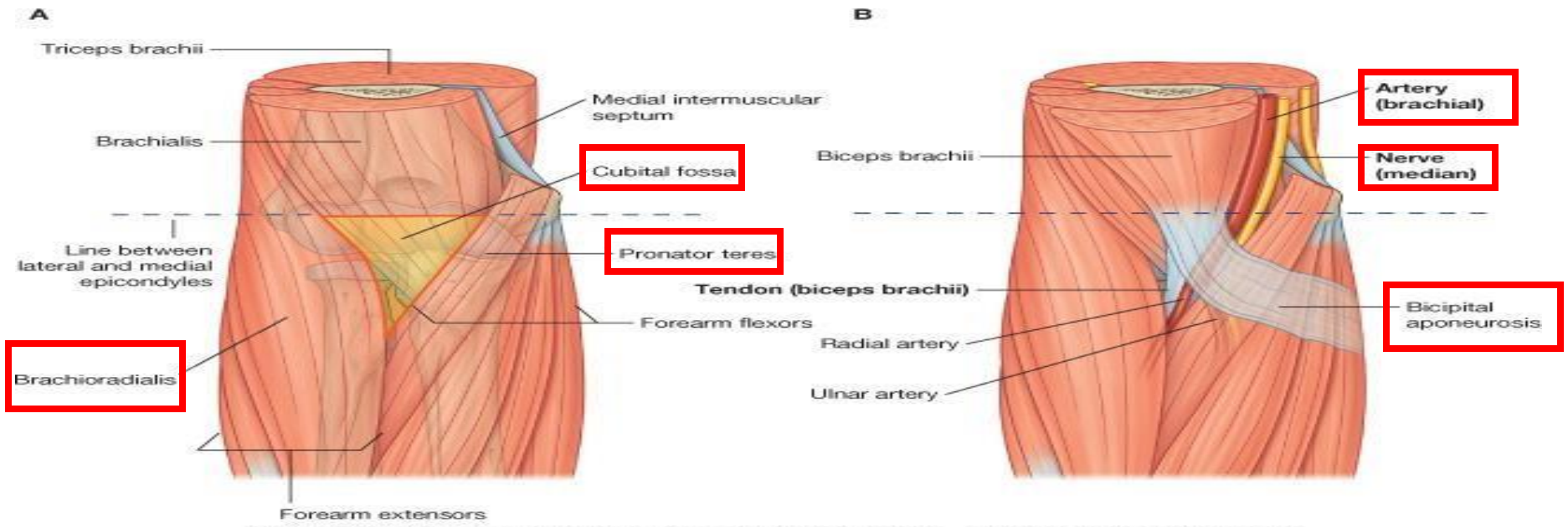
Contents

- The cubital fossa contains the following structures, from the medial to the lateral side.
- the **median nerve**, the bifurcation of the **brachial artery** into the ulnar and radial arteries, the tendon of the **biceps muscle**, and the **radial nerve** and its deep branch.
- **This sequence is clinically important, as measuring the blood pressure at the cubital fossa must be done medially to the biceps tendon in order to feel the pulsation of the brachial artery. The biceps tendon is prominent and can be felt easily during flexion.**
- The supratrochlear lymph node lies in the superficial fascia over the upper part of the fossa.
- receives afferent lymph vessels from the third, fourth, and fifth fingers; the medial part of the hand; and the medial side of the forearm.
- The efferent lymph vessels pass up to the axilla and enter the lateral axillary group of nodes.

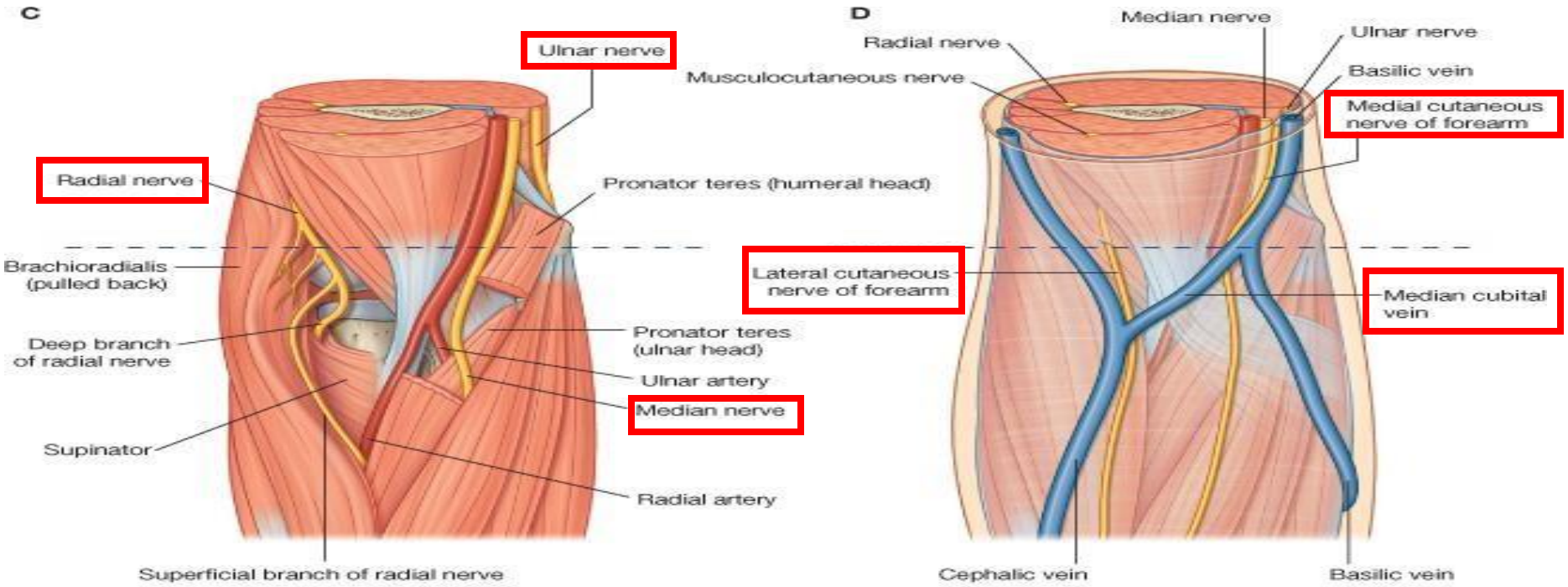


More illustrations

The cubital fossa and its boundaries



Tendon of the biceps brachii



The nerves and veins in this bottom right diagram are all found in the superficial fascia

Summary table

Table 7.8 Muscles of the anterior compartment of the arm (spinal segments in bold are the major segments innervating the muscle)

Muscle	Origin	Insertion	Innervation	Function
Coracobrachialis	Apex of coracoid process	Linear roughening on midshaft of humerus on medial side	Musculocutaneous nerve (**C5, C6, C7**)	Flexor of the arm at the glenohumeral joint
Biceps brachii	Long head—supraglenoid tubercle of scapula; short head—apex of coracoid process	Radial tuberosity	Musculocutaneous nerve (**C5, C6**)	Powerful flexor of the forearm at the elbow joint and supinator of the forearm; accessory flexor of the arm at the glenohumeral joint
Brachialis	Anterior aspect of humerus (medial and lateral surfaces) and adjacent intermuscular septae	Tuberosity of the ulna	Musculocutaneous nerve (C5, **C6**); small contribution by the radial nerve (C7) to lateral part of muscle	Powerful flexor of the forearm at the elbow joint

Table 7.9 Muscle of the posterior compartment of the arm (spinal segment indicated in bold is the major segment innervating the muscle)

Muscle	Origin	Insertion	Innervation	Function
Triceps brachii	Long head—infraglenoid tubercle of scapula; medial head—posterior surface of humerus; lateral head—posterior surface of humerus	Olecranon	Radial nerve (C6, **C7**, C8)	Extension of the forearm at the elbow joint; long head can also extend and adduct the arm at the shoulder joint

Test your knowledge

A 32-year-old woman is admitted to the emergency department after an automobile collision. Radiographic examination reveals multiple fractures of the humerus. Flexion and supination of the forearm are severely weakened. She also has loss of sensation on the lateral surface of the forearm. Which of the following nerves has most likely been injured?

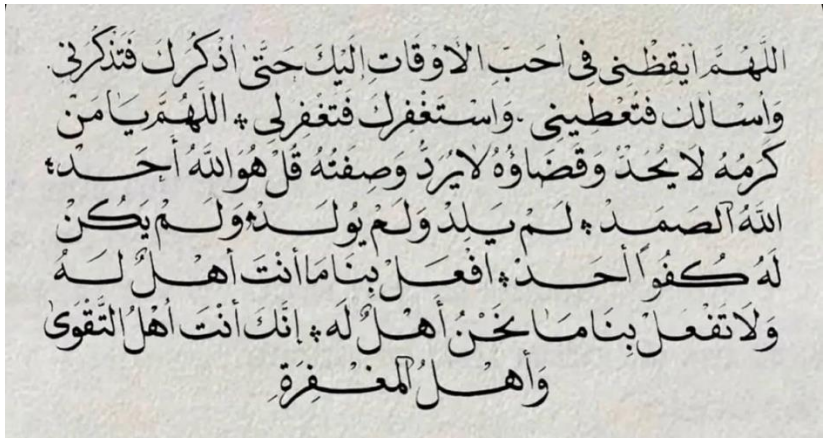
a) Radial

b) Musculocutaneous

c) Median

d) Lateral cord of brachial plexus

e) Lateral cutaneous nerve of the forearm



Answer: B

For any feedback, scan the code or click on it.

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1	7 19	Tuberosity of radius (or the cubital fossa) (recall that the brachialis is innervated by both the subcutaneous and the radial nerves).	Tuberosity of radius (in the cubital fossa) (recall that the brachialis is innervated by both the Musculocutaneous and the radial nerves).
V1 → V2			

رسالة من الفريق العلمي:

1. Arm, Anterior compartment

2. Arm , Posterior compartment

3. cubital fossa

عن عائشة رضي الله عنها فقالت: يا رسول الله: إن وافقت ليلة القدر فما أقول فيها، قال: قولي: اللهم إنك عفو تحب العفو فاعف عني