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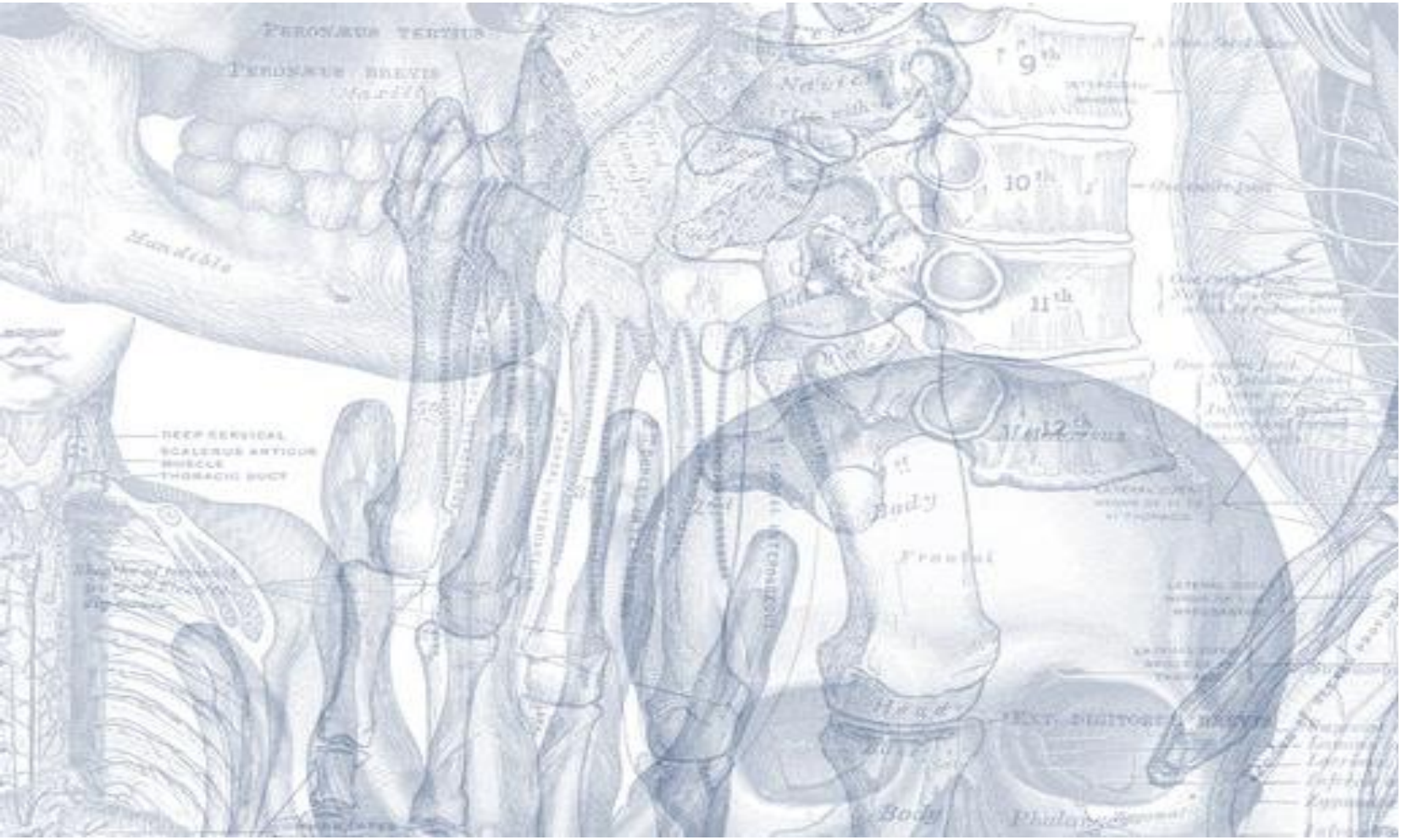


ANATOMY
TEAM 436

436
MEDICINE
KING SAUD UNIVERSITY

Revised by
شوق الأحمري & طراد الوكيل

Surface Anatomy of the Upper and Lower Limbs

Editing File

Color Code

- **Important**
- **Doctors Notes**
- **Notes/Extra explanation**

Objectives

By the end of the lecture, students should be able to:

- ✓Palpate and feel the bony the important prominences in the upper and the lower limbs.
- ✓Palpate and feel the different muscles and muscular groups and tendons.
- ✓Perform some movements to see the action of individual muscle or muscular groups in the upper and lower limbs.
- ✓Feel the pulsations of most of the arteries of the upper and lower limbs.
- ✓Locate the site of most of the superficial veins in the upper and lower limbs.

NOTE: most of the information in this lecture is more practical than theoretical. Try to focus on the things that we've taken before.

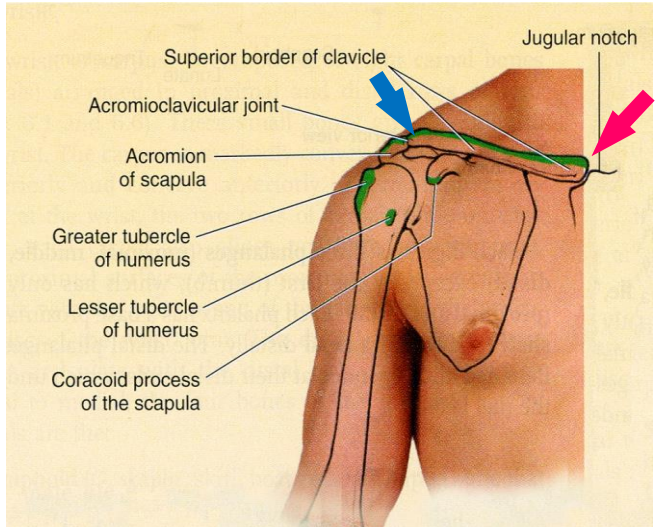
What is Surface Anatomy?

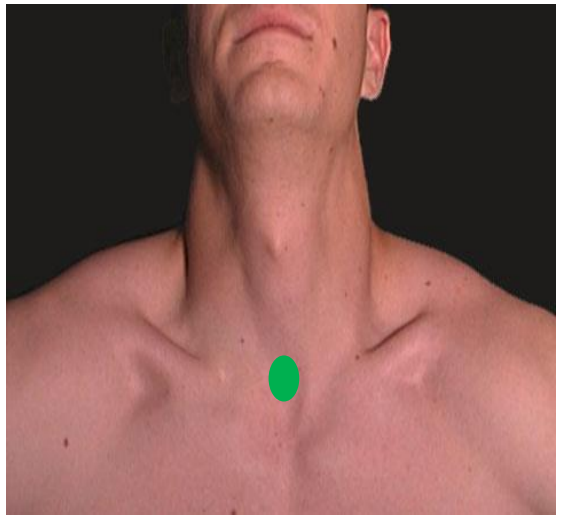
- It is a branch of *gross anatomy* that examines shapes and markings on the surface of the body (on the skin) as they are related to deeper structures.
- It is essential in locating and identifying anatomic structures prior to studying internal gross anatomy.
- It helps to locate the affected organ / structure / region in disease process.

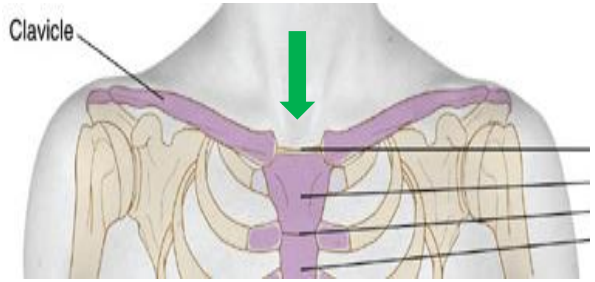
Why do we study surface anatomy?
When we say surface anatomy of the liver, for example, we mean its normal position on the skin, and this is important to know so we can determine if it is normal or not and give a primary diagnosis of the organ before going deeper. Also if there is an injury to a certain area we can predict which organs, vessels, nerves will be affected.

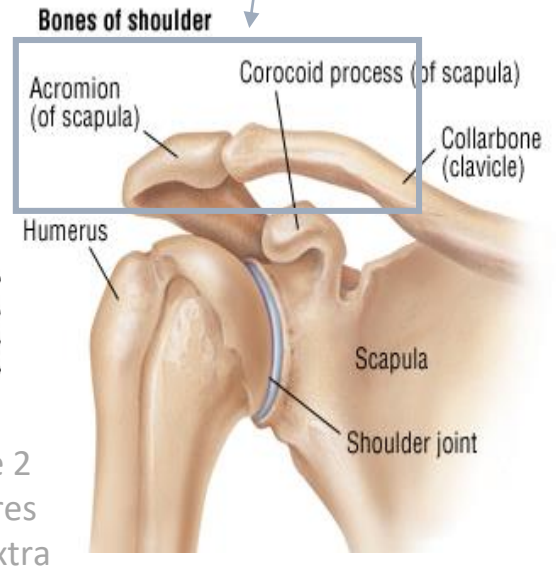
Upper Limb
Bones (Clavicle)

- The **clavicle** is subcutaneous and can be palpated throughout its length.
- Its **sternal end** projects little above the manubrium.
- Between the 2 sternal ends of the 2 clavicles lies the **jugular notch** (suprasternal notch).
- The **acromial** end of the clavicle can be palpated medial to the lateral border of the **acromion,** of the scapula. particularly when the shoulder is alternately raised and depressed.
- The large vessels and nerves to the upper limb pass posterior to the convexity of the **clavicle.**









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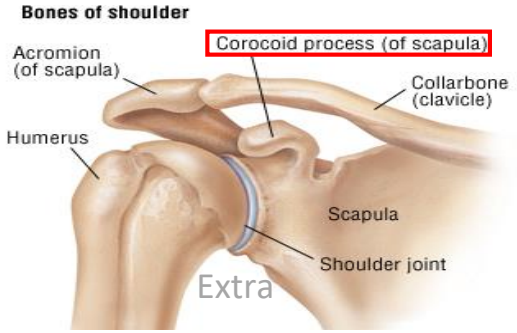
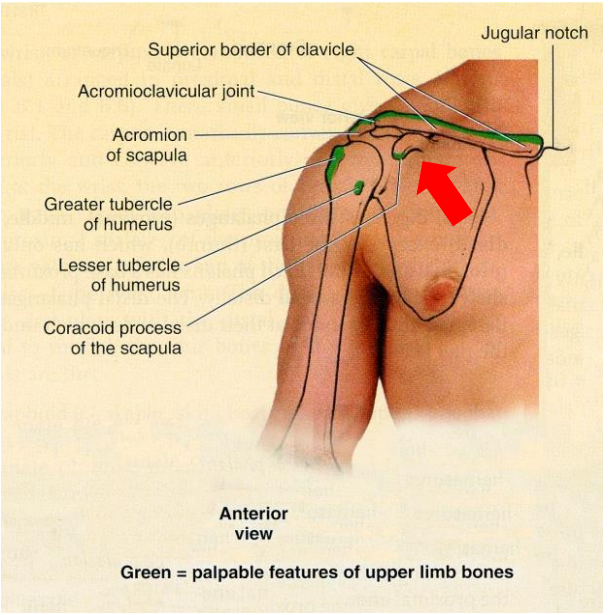
Upper Limb
Bones (Scapula)





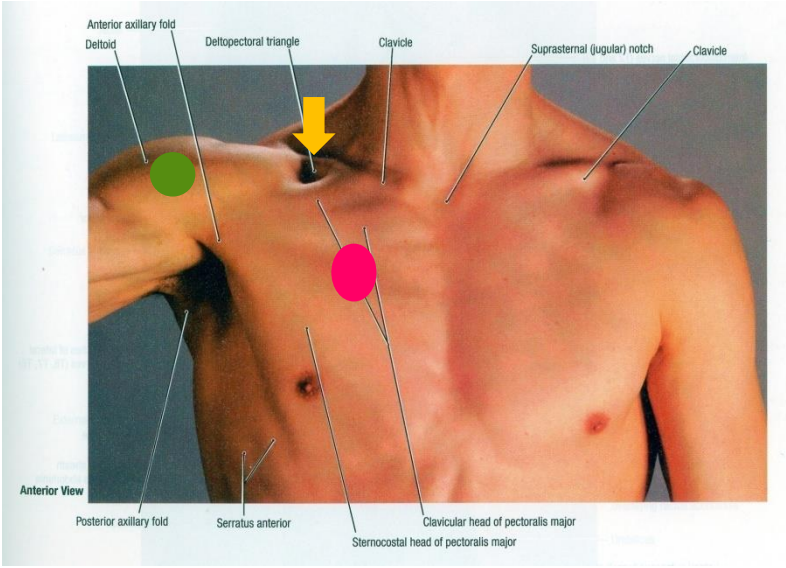
- The **coracoid process** of scapula can be felt deeply below the lateral one third of the clavicle in the **Deltopectoral GROOVE or clavipectoral triangle.**
- The **clavipectoral or the (Deltopectoral) triangle** is the slightly depressed area just inferior to the lateral third of clavicle.

Superiorly: Clavicle

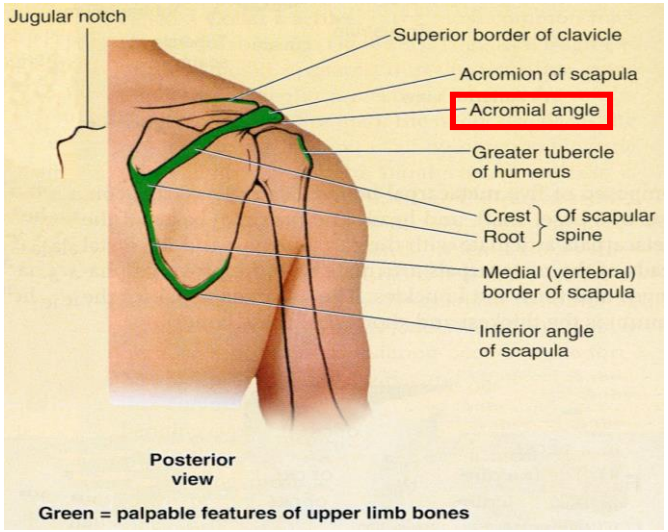
Medially: Pectoralis major

The clavipectoral triangle is bounded by:

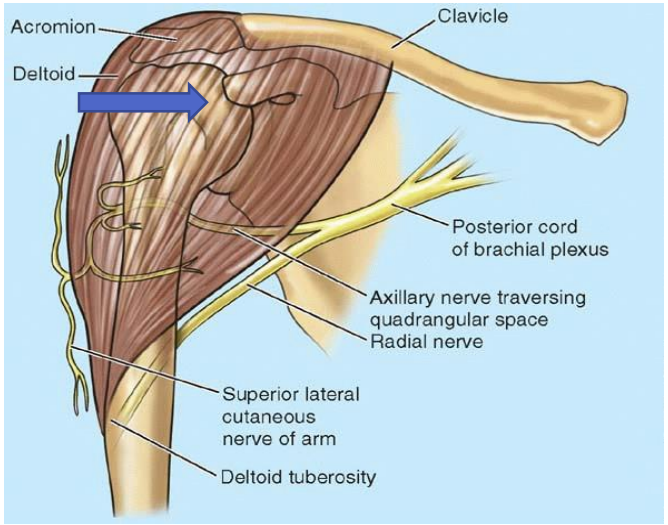
Laterally: Deltoid



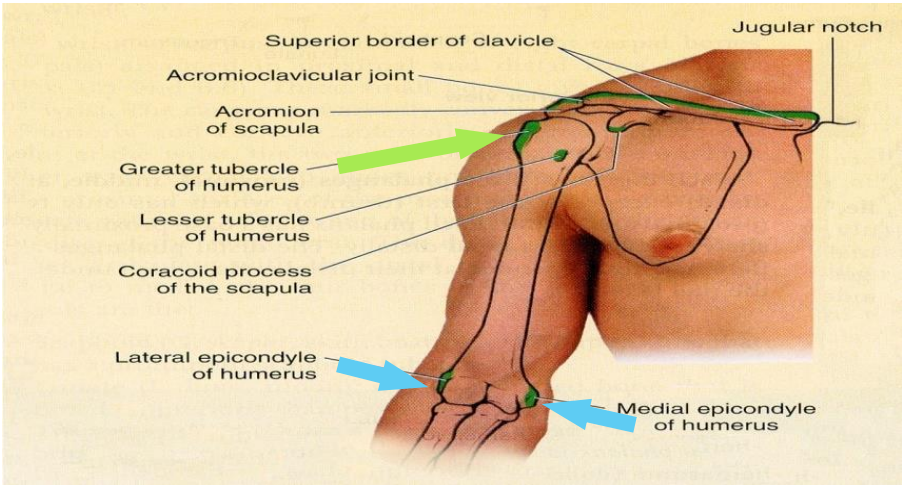
Upper Limb
Bones (Arm)



The lateral and posterior borders of the acromion meet to form the **acromial angle**.



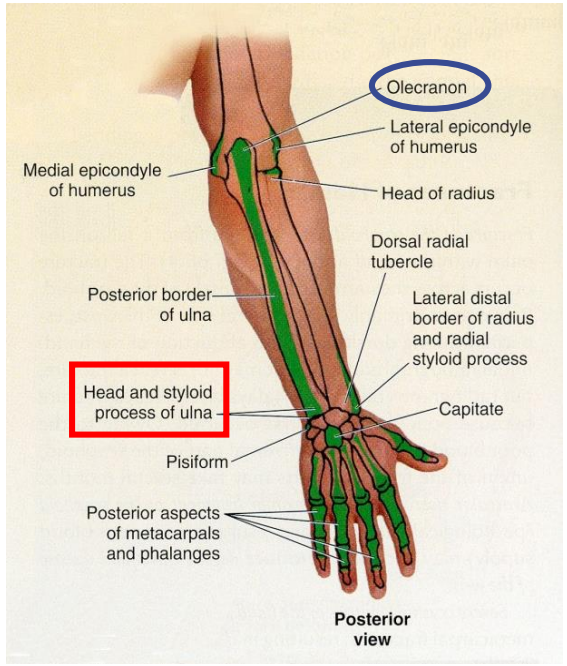
Inferior to the acromion, the **deltoid muscle** forms the rounded contour of the shoulder.

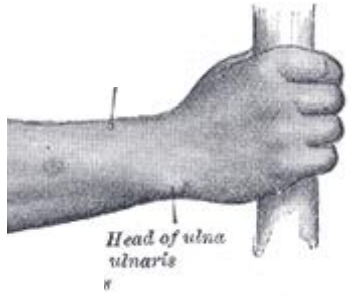


- The **greater tubercle of humerus** can be felt by deep palpation through the deltoid muscle, inferior to the acromion when the arm is by the side.
- In this position, the greater tubercle is the most lateral bony point of the shoulder.
- The **shaft of the humerus** may be felt in different areas through the muscles surrounding it.
- The **medial** and **lateral epicondyles of the humerus** are palpated on the medial & lateral sides of the elbow region.

Upper Limb
Bones (Forearm)

- The **head of ulna** forms a rounded subcutaneous prominence that can be easily seen and palpated **on the medial side of the dorsal aspect of the wrist.**
- The pointed subcutaneous **ulnar styloid process** may be felt slightly distal to the ulnar head when the hand is supinated.
- The **olecranon** and **posterior border of the ulna lie subcutaneously** and can be palpated easily.





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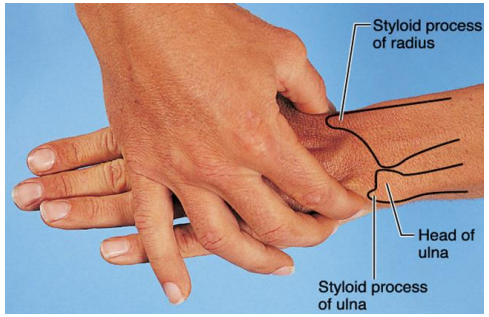
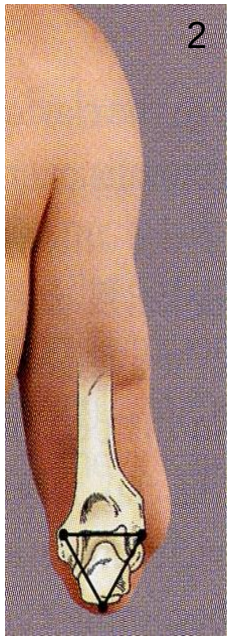
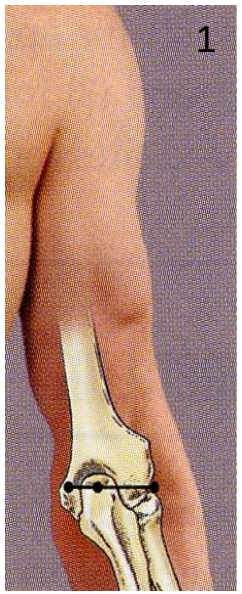




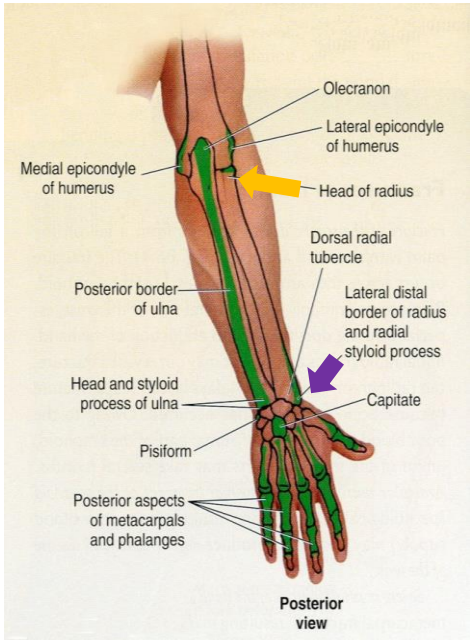


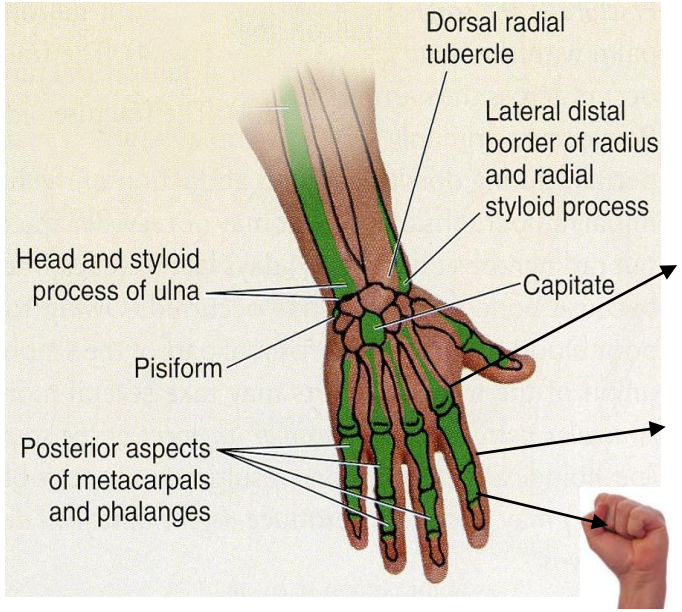
- **When the elbow joint is extended** (1), the tip of the olecranon process, the medial and the lateral epicondyles lie in a **straight line.**
- **When the elbow is flexed** (2), the olecranon forms the apex of an equilateral **triangle** (مثلث متساوي الاضلاع), of which the epicondyles form the angles at its base.
- Fractures of any of these structures will disturb this arrangement. (so when we take an xray we wont be able to see the triangle)

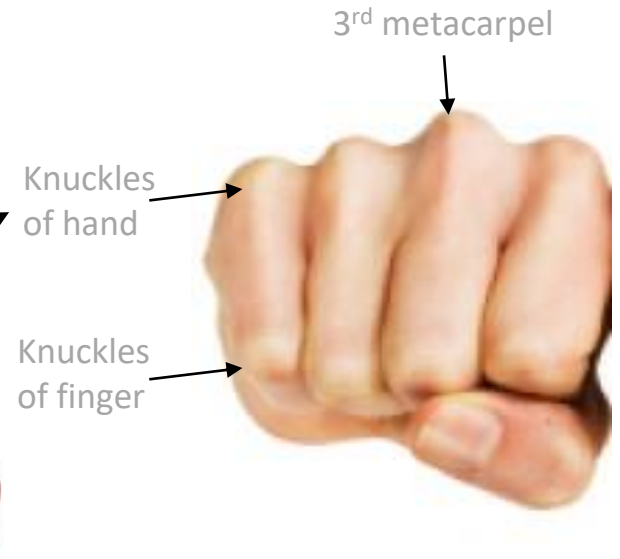
Upper Limb

Bones (Wrist and Hand)

- The **head of radius** can be palpated and felt to rotate in the depression on the posterolateral aspect of the extended elbow, just distal to the lateral epicondyle of the humerus with supination and pronation.
- The **radial styloid process** can be palpated on the lateral side of the wrist in the anatomical snuff box.
- It is approximately 1 cm distal to that of the ulna.







- The **metacarpals,** although they overlapped by the long extensor tendons of the fingers, they can be palpated on the dorsum of the hand.
- The **heads of the metacarpals** form the knuckles of the hand.
- Notice that the **3rd metacarpal** head is the most prominent.
- The dorsal aspects of the **phalanges** can be easily palpated.
- The knuckles of the fingers are formed by the **heads of** the proximal and middle **phalanges.**

Upper Limb

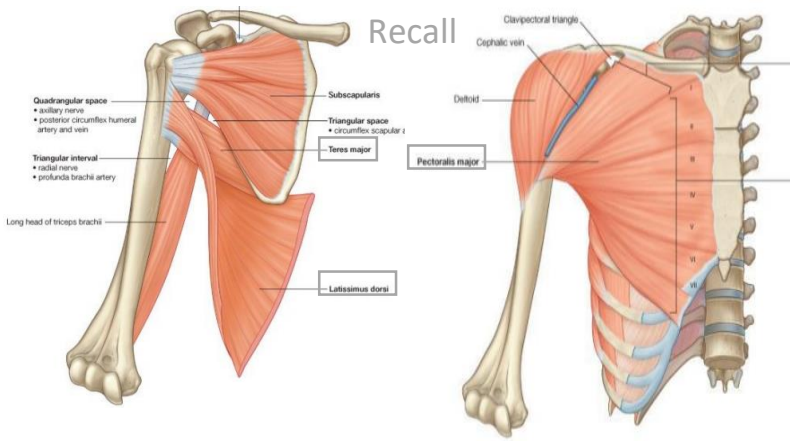
Axillary Folds

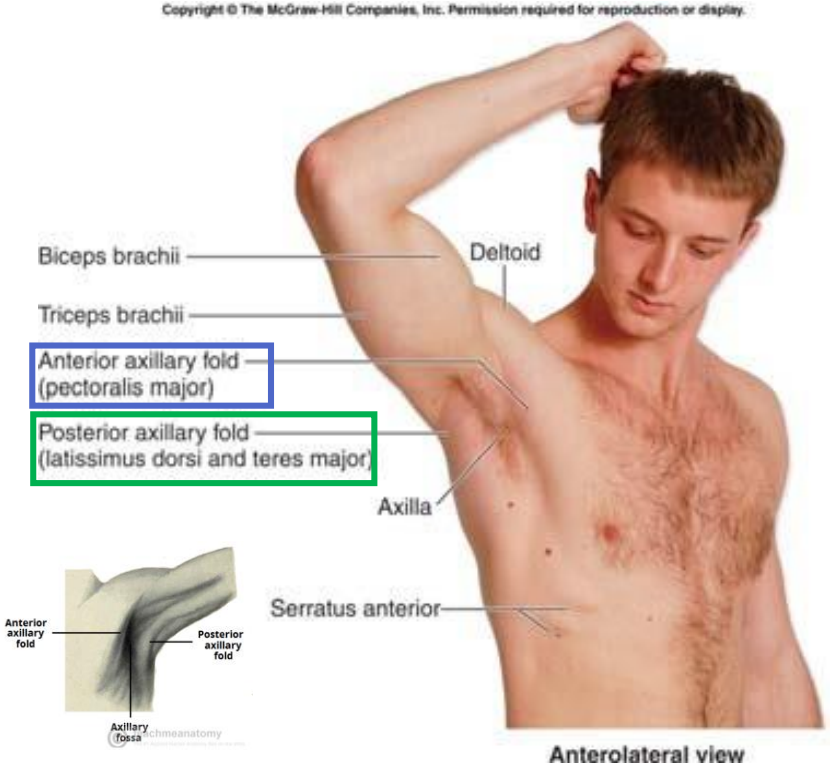
- The **anterior axillary fold** is formed by the lower margin of the *pectoralis major*, and can be palpated by the finger.
- This can be made by asking the patient to press his or her hand against the ipsilateral hip.
- The **posterior axillary fold** is formed by the tendons of *latissimus dorsi* and *teres major muscles.*

Axilla

- The axilla should be examined with the forearm supported and the pectoral muscles relaxed. The patient will relax their hand and you will carry and hold the arm and examine the axilla.
- When the arm is by the side, the inferior part of the head of the humerus can be easily palpated through the floor of the axilla.
- The pulsations of the **axillary artery** can be felt high up in the axilla, and around the artery are the cords of the brachial plexus.
- The medial wall of the axilla is formed by the upper ribs covered by the *serratus anterior*.
- The lateral wall is formed by the *coracobrachialis* and *biceps brachii* and the bicipital groove.

Recall





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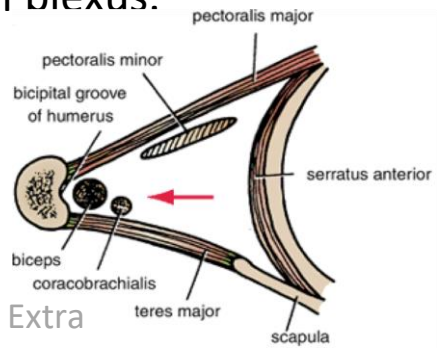
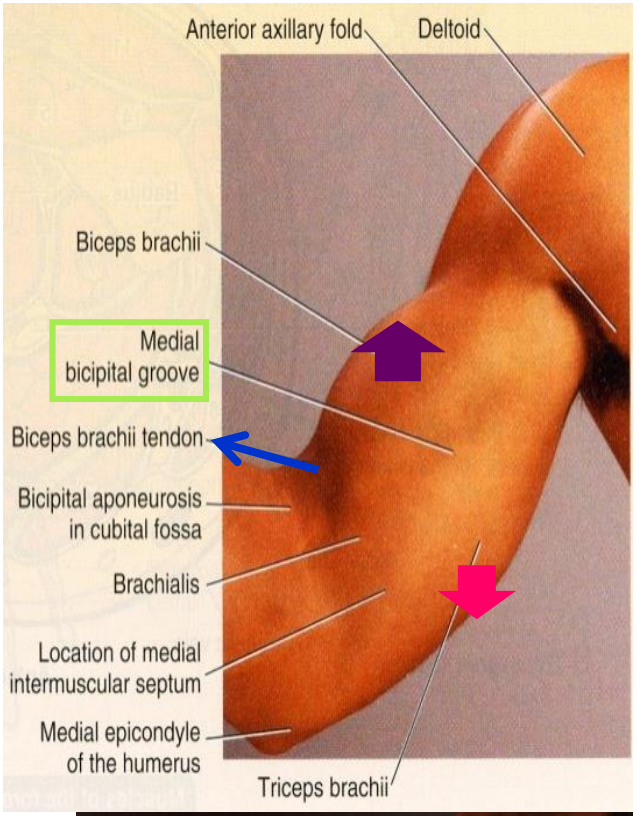


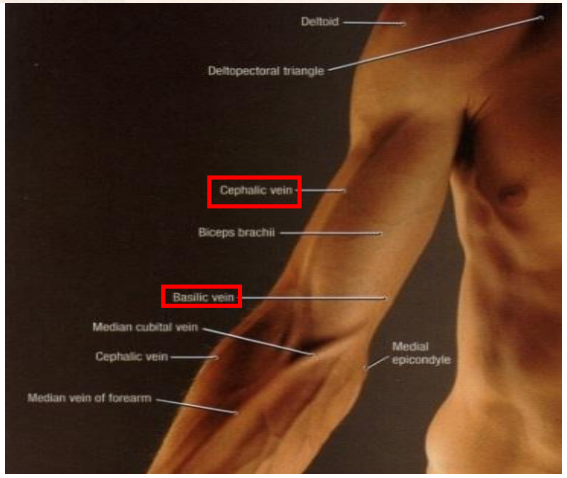
Upper Limb

- The borders of the **deltoid** are visible when the arm is abducted against resistance.
- The **distal attachment of the deltoid** can be palpated on the lateral surface of the humerus (deltiod tuberosity of the humerus).

- Biceps brachii & triceps brachii form bulge on the anterior and posterior surfaces of the arm.
- The **biceps tendon** can be palpated in the cubital fossa, immediately lateral to the midline.
- The triceps tendon can be palpated where it is attached to the olecranon process.

- **There are 2 grooves: Medial and lateral grooves** separate the bulges formed by the **biceps** and **triceps.**
- The **cephalic vein** ascends superiorly in the lateral groove and
- The **basilic vein** ascends in the medial groove.





Upper Limb

Brachial Artery

The **brachial artery** can be felt pulsating deep to the medial border of the biceps.

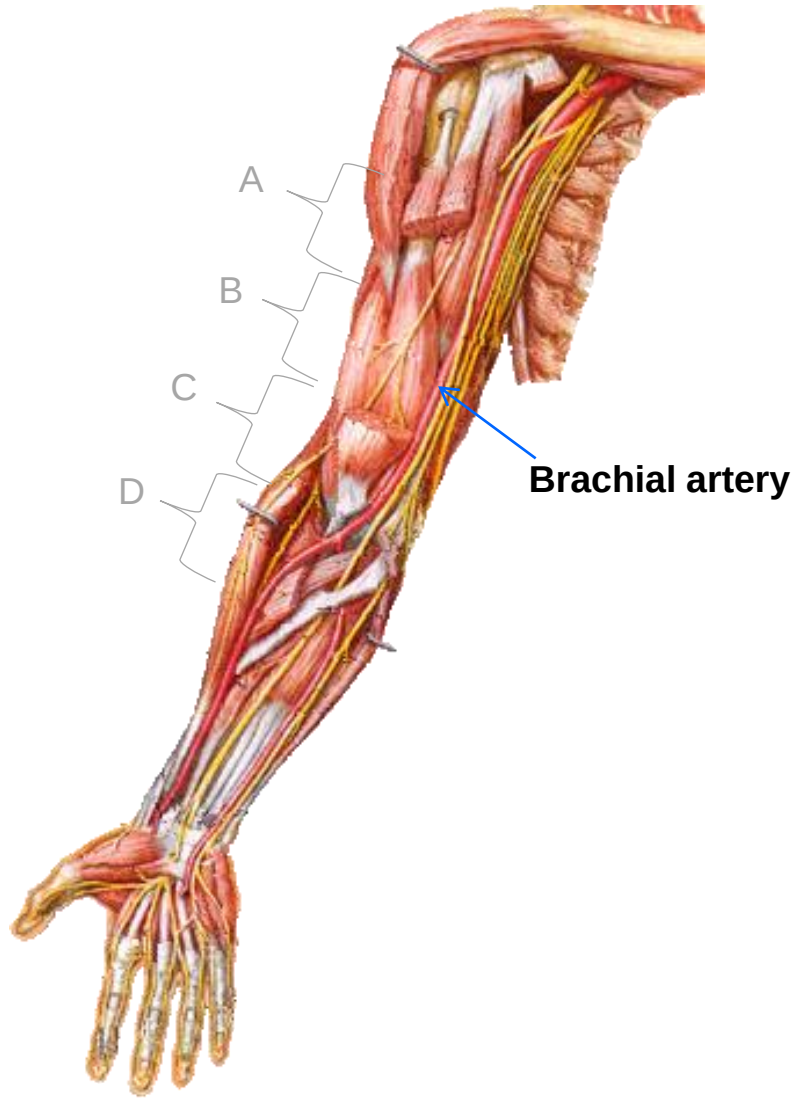
To stop bleeding by pressure on the artery in the upper half of the arm it is pushed **laterally** against the humerus (A).

In the lower half it is pushed **posteriorly** (B).

In the cubital fossa, it lies beneath the bicipital aponeurosis (C).

At the level of the neck of the radius, it divides into radial and ulnar arteries (D).

To stop an artery from bleeding we have to press it against a bone. So depending on the position of the artery on the bone we decide how to push/apply pressure



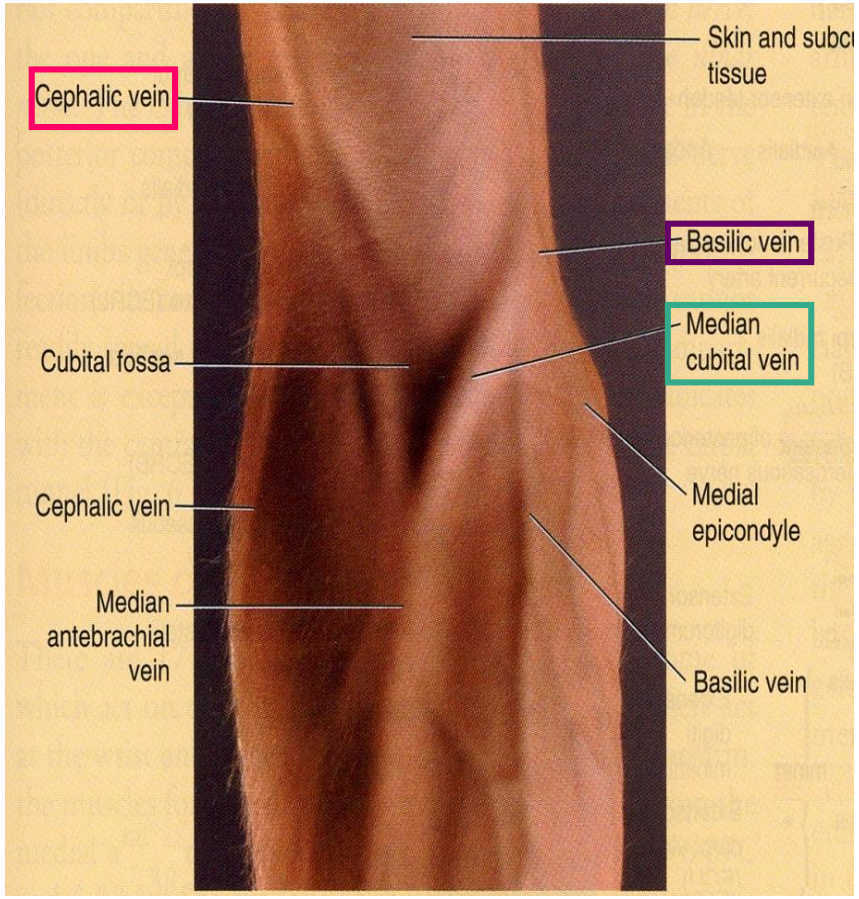
Upper Limb

Cubital Fossa

In the cubital fossa, try to locate:

- **Cephalic vein**
- **Basilic vein** and
- **Median cubital vein** are clearly visible.
- The median cubital vein connects the cephalic and the basilic veins .
- **It crosses over the bicipital aponeurosis.**
- It is the vein of choice for IV line, WHY?

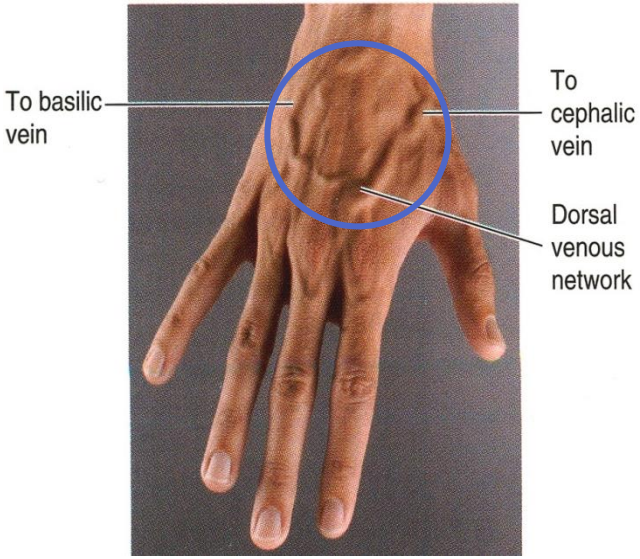
Because it is very superficial and its position is fixed



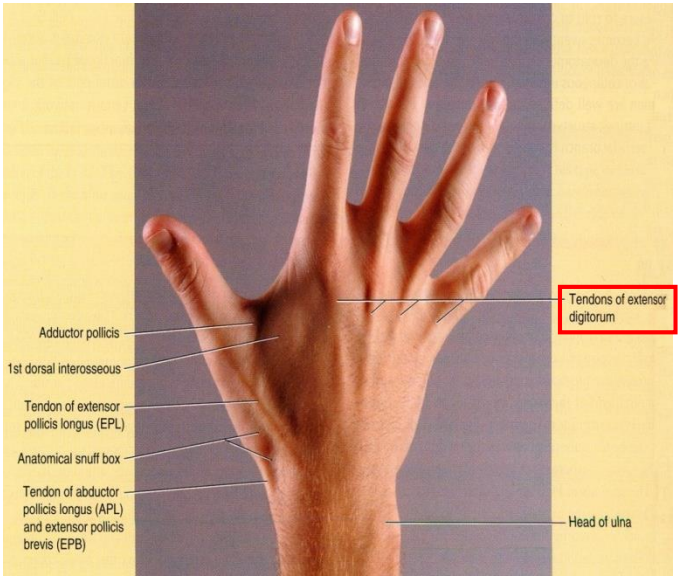
Upper Limb
Dorsum of Hand

<u>The dorsal venous network:</u>
The network of superficial veins can be seen on the dorsum of the hand.
The network drains upward into the **cephalic vein** *laterally*, and the **basilic vein** *medially*.

Keep in mind this description is in the anatomical position and in the picture we are looking at the hand posteriorly



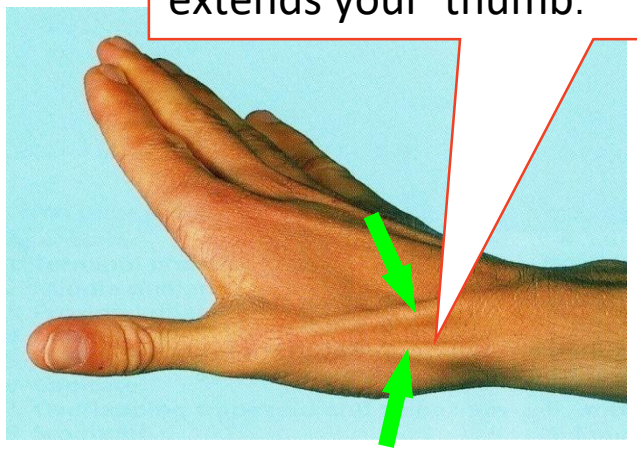
The **tendons** of *extensor digitorum*, *extensor indicis*, and *extensor digiti minimi* can be <u>seen</u> and <u>felt</u> as you extends your fingers.

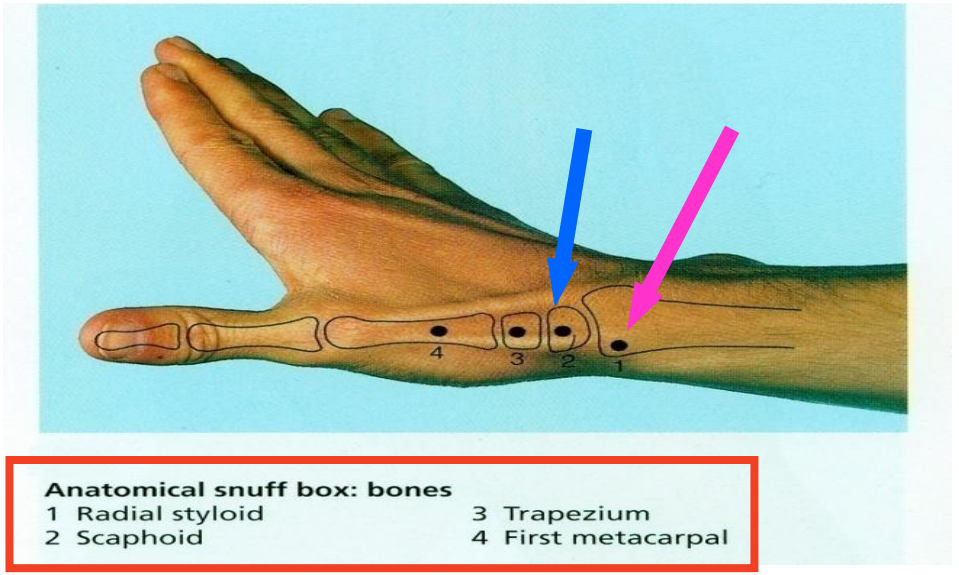


Upper Limb

Anatomical Snuff Box

It is a depression on the lateral aspect of the wrist joint which is accentuated when you extends your thumb.



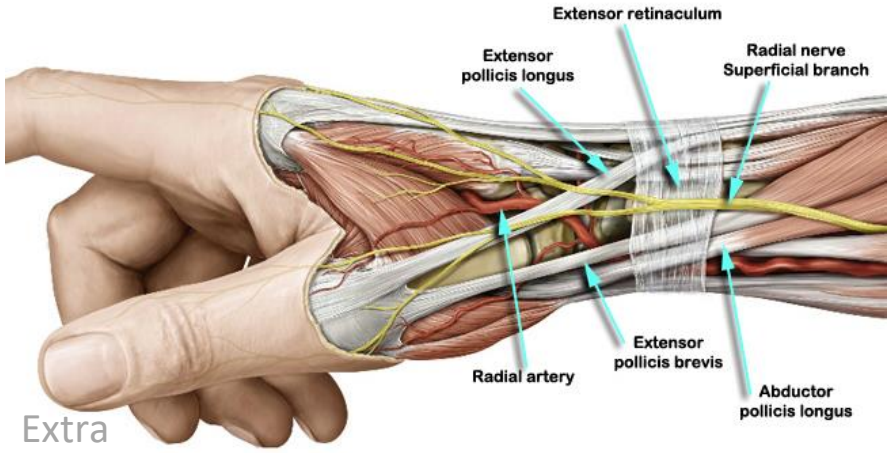


Anatomical snuff box: bones
1 Radial styloid
2 Scaphoid
3 Trapezium
4 First metacarpal

Boundaries

- The snuff box is bounded :
- **Anteriorly** or laterally by 2 tendons:
  - Abductor pollicis longus
  - Extensor pollicis brevis
- **Posteriorly** or medially by extensor pollicis longus

- In its proximal part the **radial styloid process** is palpable.
- The **scaphoid bone** is also palpable in the distal part of the anatomical snuff box.



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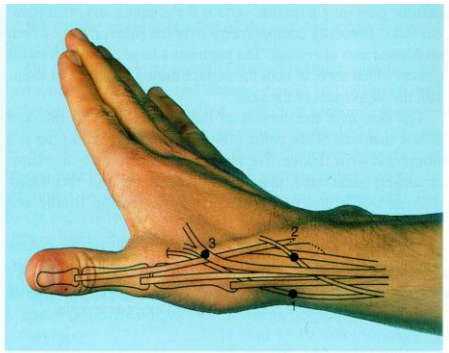
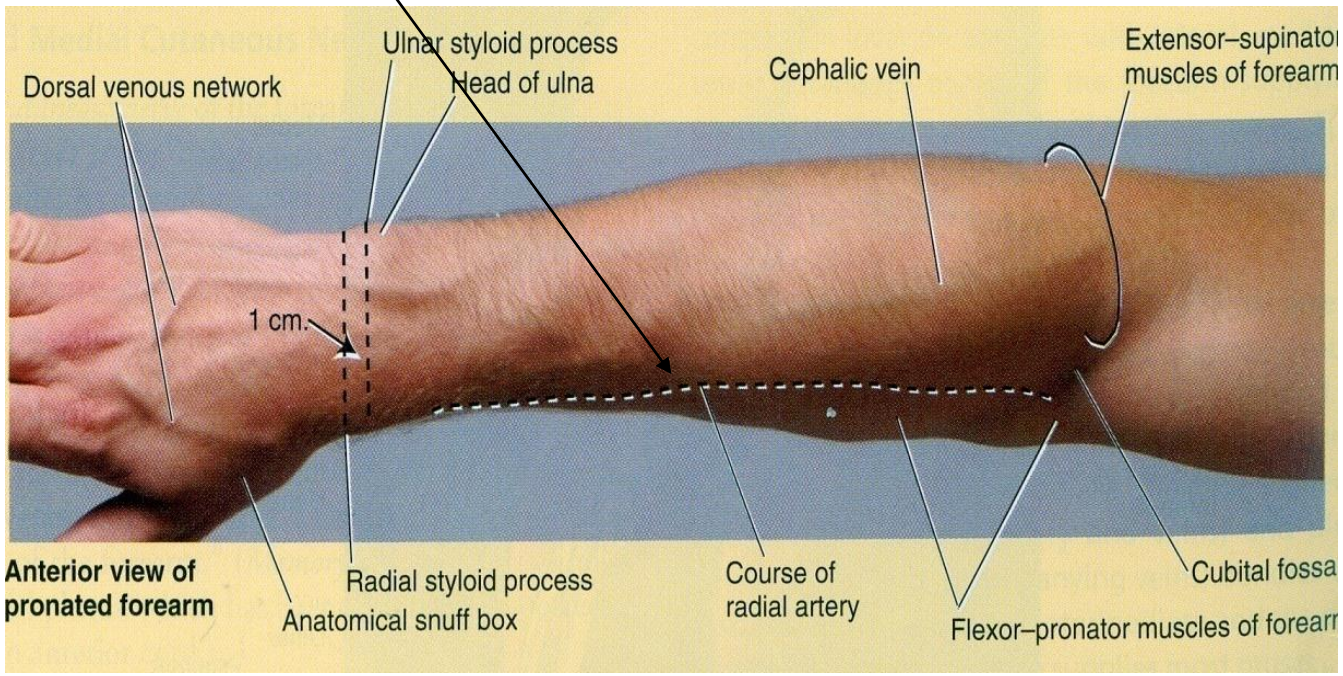


Anatomical snuff box: radial artery and nerve, and cephalic vein
1 Radial artery
2 Radial nerve
3 Cephalic vein

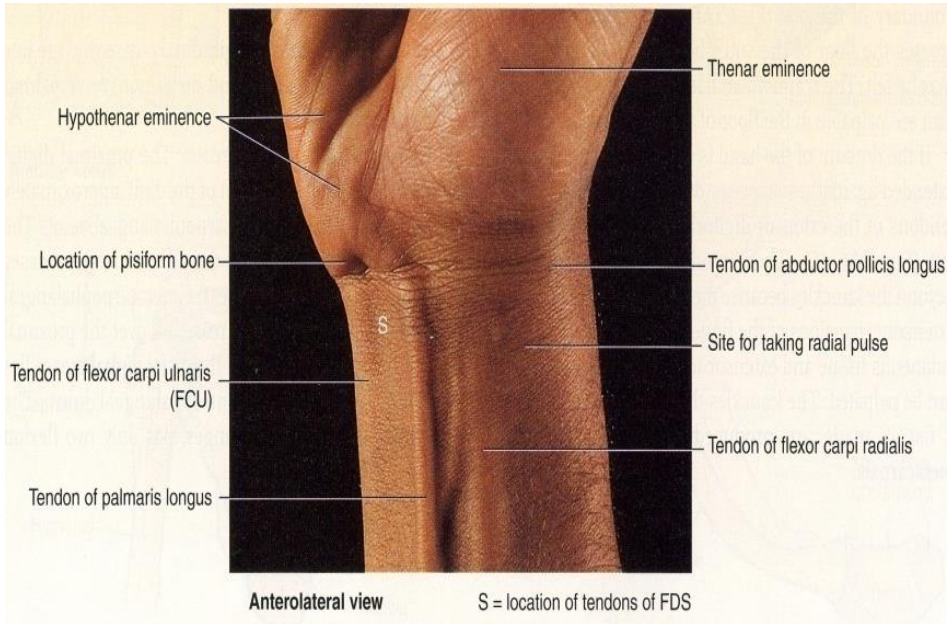
- Also, the **radial artery** pulsation can be felt against the floor of the snuff box.
- More superficially, the anatomical snuff box is crossed by
- The **cephalic vein.**
- The **radial nerve.**

Upper Limb
Radial Artery

The **Radial artery** can be drawn by a line extends from the midpoint of the cubital fossa to the base of the styloid process of radius.



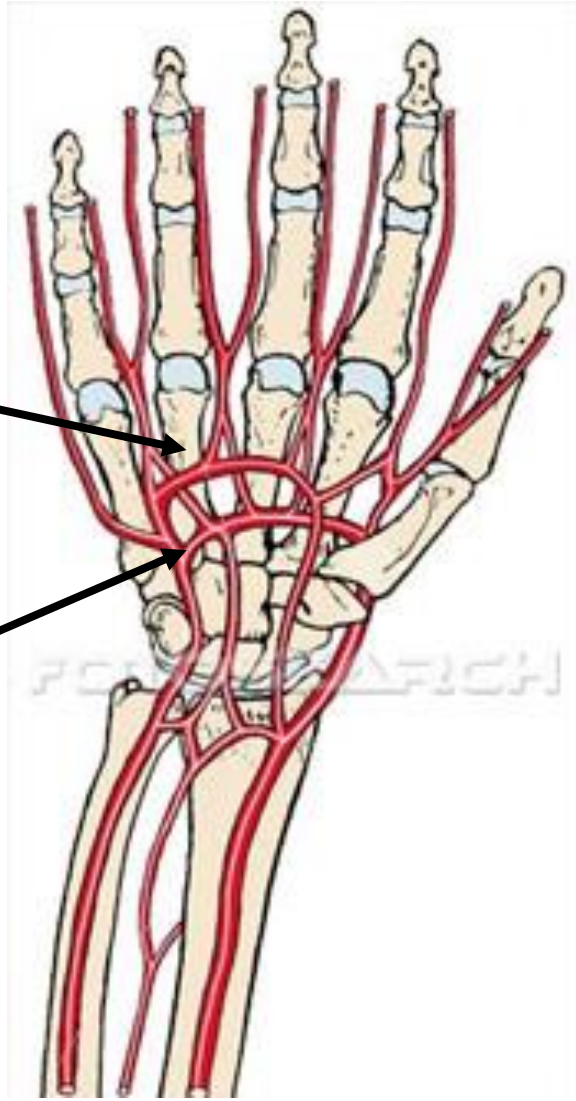
Radial Artery pulsation:
Universally, its pulsations can easily be felt anterior to the distal third of radius.
Here it lies just beneath the skin and fascia lateral to the tendon of **flexor carpi radialis muscle**

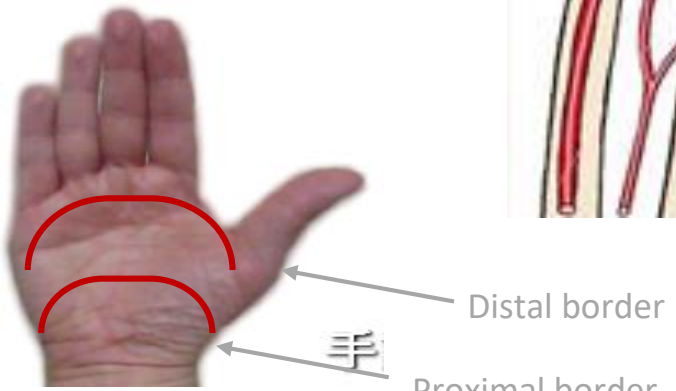


Upper Limb
Palmer Arches

Superficial Palmar Arterial Arch.
The superficial palmar arterial arch is located in the central part of the palm and lies on a line drawn across the palm at the level of the **distal border** of the fully ex-tended thumb.

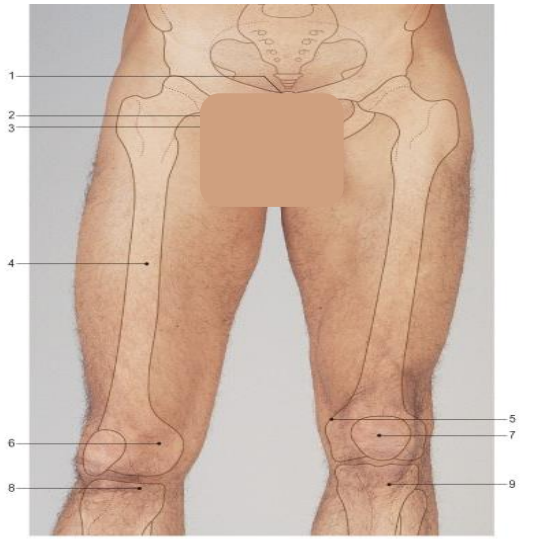
Deep Palmar Arterial Arch.
The deep palmar arterial arch is also located in the central part of the palm (proximal to the superficial one), lies on a line drawn across the palm at the level of the **proximal border** of the fully extended thumb.



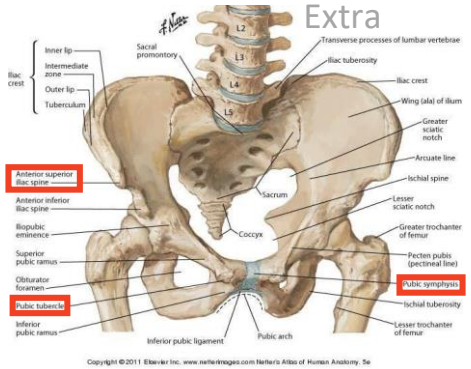


Lower Limb

Inguinal Region



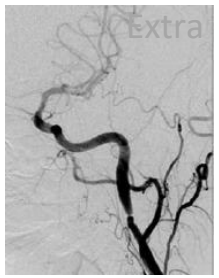
1. Symphysis pubis. 2. Body of pubis. 3. Inferior pubic ramus. 4. Femur. 5. Adductor tubercle. 6. Medial femoral condyle. 7. Patella. 8. Medial tibial plateau. 9. Tibial tuberosity



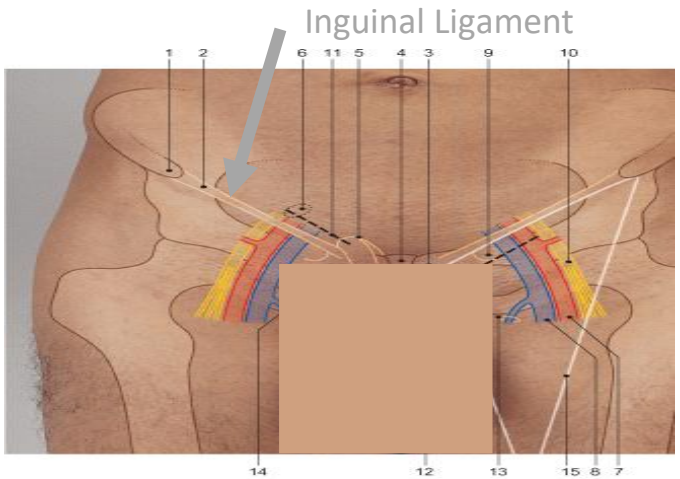
All of the following structures are palpable in the inguinal region:

1. Symphysis pubis
2. Body of pubis
3. Pubic tubercle*
4. ASIS (anterior superior iliac spine)

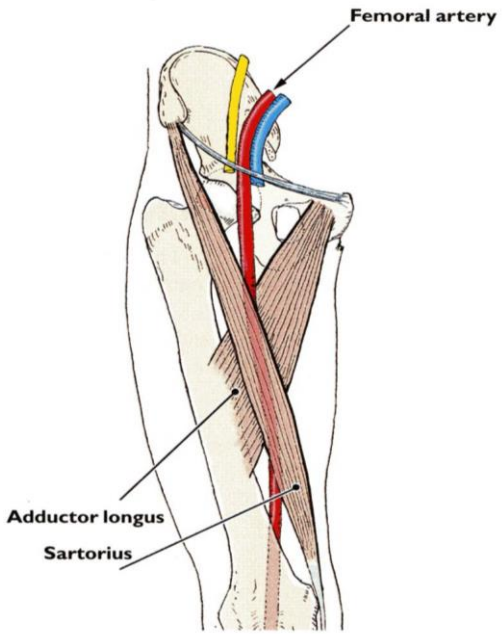
*The pubic tubercle is a land mark for 2 types of hernias



*Radiologic visualization of the arteries following injection of a radiopaque substance.



1. Anterior superior iliac spine. 2. Inguinal ligament. 3. Pubic tubercle. 4. Symphysis pubis. 5. Superficial inguinal ring. 6. Deep inguinal ring. 7. Femoral artery. 8. Femoral vein. 9. Femoral canal. 10. Femoral nerve. 11. Inguinal hernia incision. 12. Femoral hernia incision. 13. Saphenous opening. 14. Long saphenous vein. 15. Femoral triangle.



<u>The inguinal ligament extends between</u>:

The pubic tubercle and

The ASIS (anterior superior iliac spine).

In the **mid-inguinal point** you can feel the pulsations of the **femoral artery.**

The **femoral vein** lies on the medial side of the artery.

While the **femoral nerve** lies lateral to the artery.

Midinguinal point:

- It is a point on the inguinal ligament midway between the symphysis pubis and the ASIS.
- The **femoral artery** is an important site for vascular access as a large number of arteriographic* procedures are undertaken through its percutaneous puncture, (coronary angiography).

Lower Limb

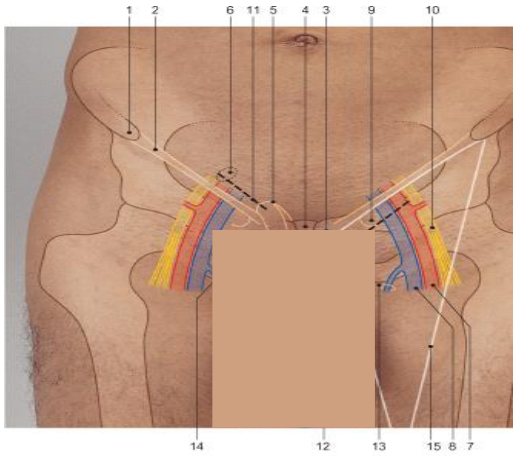
Inguinal Region

Femoral Triangle

- The **femoral triangle** can be seen as a depression below the fold of the groin in the upper part of the thigh.

- In a thin or muscular subject (patient), the boundaries of the triangle can be identified when the thigh is flexed, abducted, and laterally rotated.

- The base of the triangle is formed by the inguinal ligament, the lateral border by the sartorius and the medial border by the adductor longus



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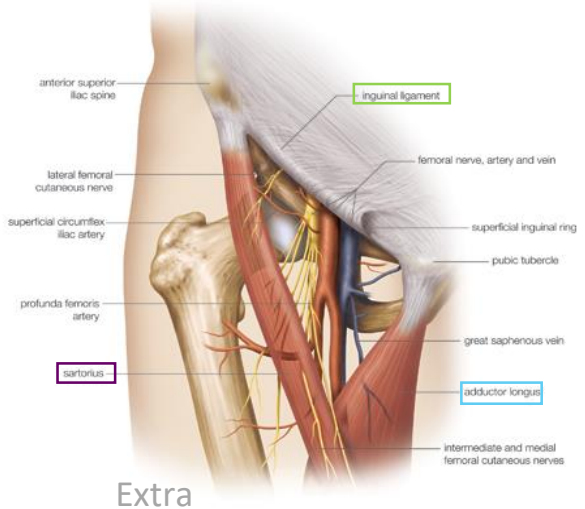
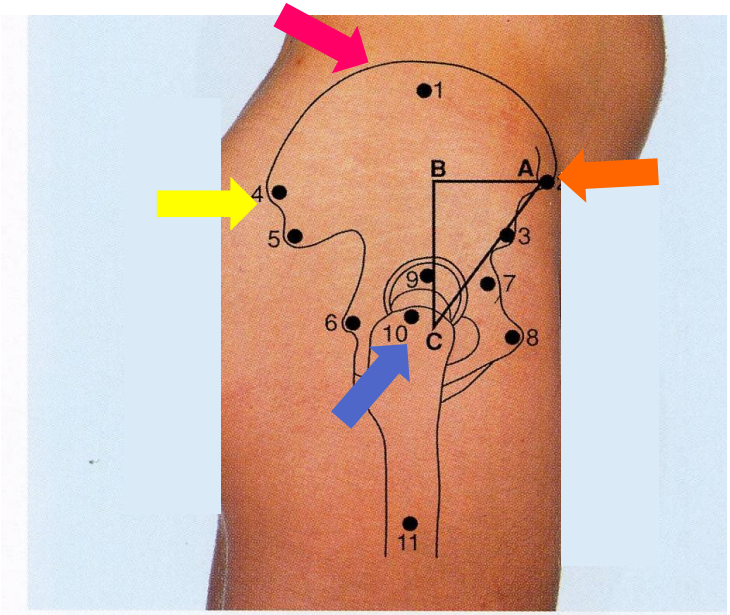


Extra



8.17
Lateral aspect of the hip joint: bones

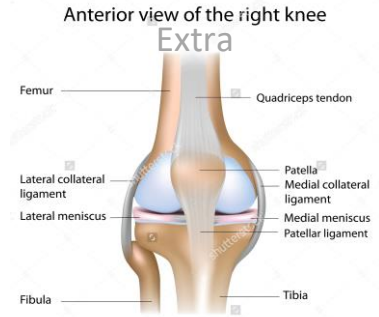
1 Ilium	6 Ischial spine
2 Anterior superior iliac spine	7 Iliopubic eminence
	8 Body of pubis
3 Anterior inferior iliac spine	9 Head of femur
4 Posterior superior iliac spine	10 Greater trochanter
	11 Shaft of femur
5 Posterior inferior iliac spine	ABC, Bryant's triangle

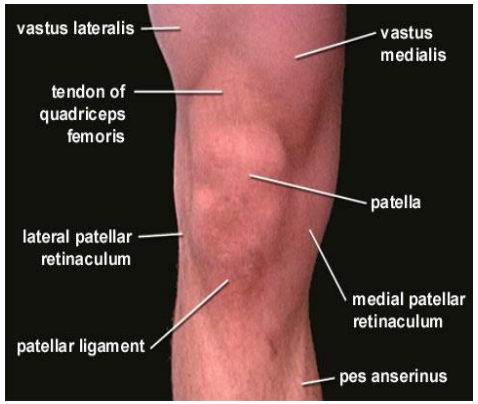
- The **iliac crest** is subcutaneous and can be palpated throughout its length, from the ASIS (anterior superior iliac spine) to the PSIS (posterior superior iliac spine).
- The greater trochanter of the femur is also subcutaneous and can be palpated on the lateral aspect of the hip joint behind and distal to the ASIS.

Lower Limb

Knee Region

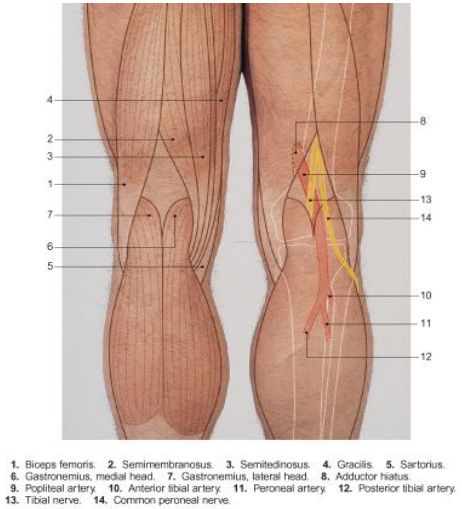
- ***In front of the knee*** joint the **patella** and the **ligamentum patellae** (or patellar ligament) can be easily palpated.
- The ligamentum patellae can be traced downward as it is attached to the tibial **tuberosity.**
- The **condyles of the femur and tibia** can be recognized on the sides of the knee and the joint line can be identified between them.

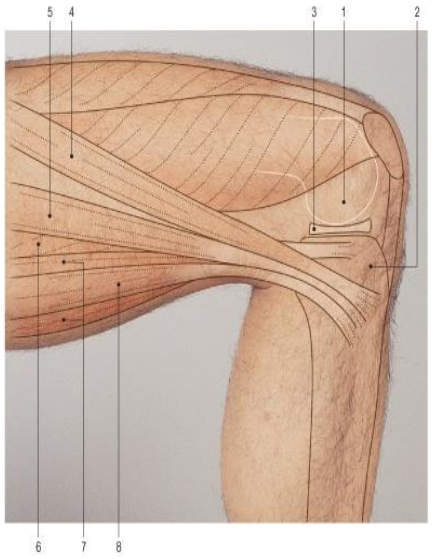




In the ***back of the knee*** and leg try to palpate:

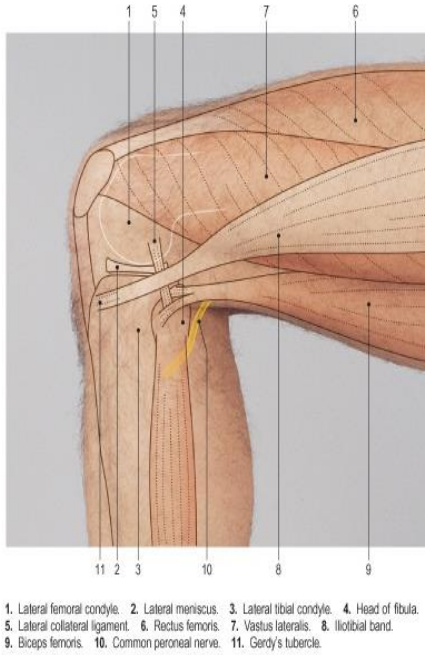
1. The boundaries of the popliteal fossa.
2. The pulsation of the **popliteal artery** which is deeply situated in the fossa.





On the medial aspect of the knee joint try to palpate:

1. **Medial femoral** condyle
2. **Medial tibial** condyle
3. The 3 tendons of (SGS)
   - Sartorius.
   - Gracilis
   - Semitendinosus.

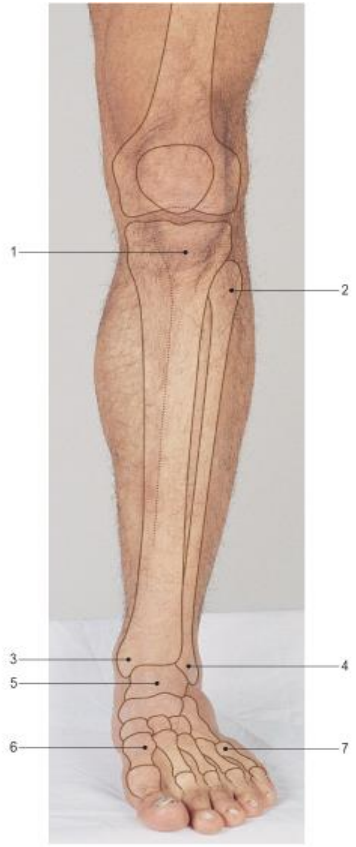


On the lateral aspect of the knee joint try to palpate:

1. **Lateral femoral** condyle
2. **Lateral tibial** condyle
3. Head of the **fibula**
4. Neck of the **fibula**
5. Tendon of biceps femoris.

Lower Limb

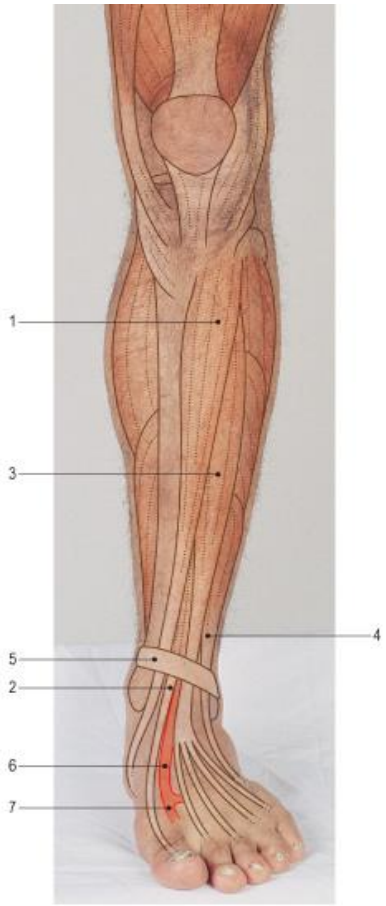
Leg and Foot



1. Tibia.
2. Fibula.
3. Medial malleolus.
4. Lateral malleolus.
5. Talus.
6. First metatarsal.
7. Fifth metatarsal.

On the anterior aspect of the leg and knee joint and try to palpate:

1. The patella.
2. The tibial tuberosity.
3. The anterior border of the tibia, (shine).
4. The medial tibial condyle.
5. The medial surface of the tibia.
6. The medial malleolus.
7. The lateral malleolus.



1. Tibialis anterior.
2. Extensor hallucis longus.
3. Extensor digitorum longus.
4. Peroneus tertius.
5. Superior extensor retinaculum.
6. Dorsalis pedis artery.
7. First dorsal metatarsal artery.

On the dorsum of the foot try to palpate:

1. The tuberosity of the 5th metatarsal
2. The tubercle of navicular.
3. The metatarsals.

The long extensor tendons:

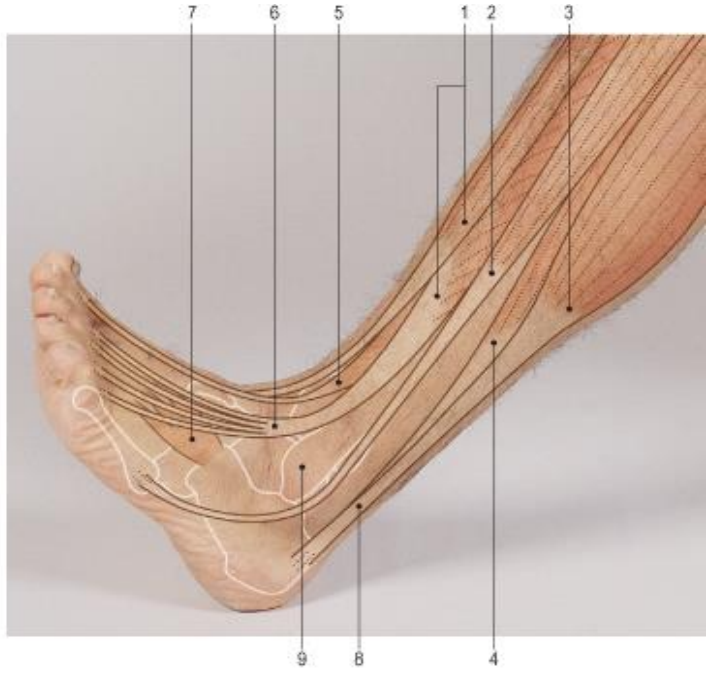
4. Tibialis anterior
5. Extensor hallucis longus.
6. Extensor digitorum longus.
7. Peroneus tertius.
8. Also, try to feel the pulsation of the **dorsalis pedis artery** between the tendons of extensor hallucis longus & extensor digitorum longus.

Lower Limb

Leg and Foot

On the lateral aspect of the leg try to palpate:

1. The tendons of peroneus longus and brevis.
2. The tendon Achilles.
3. The lateral malleolus.

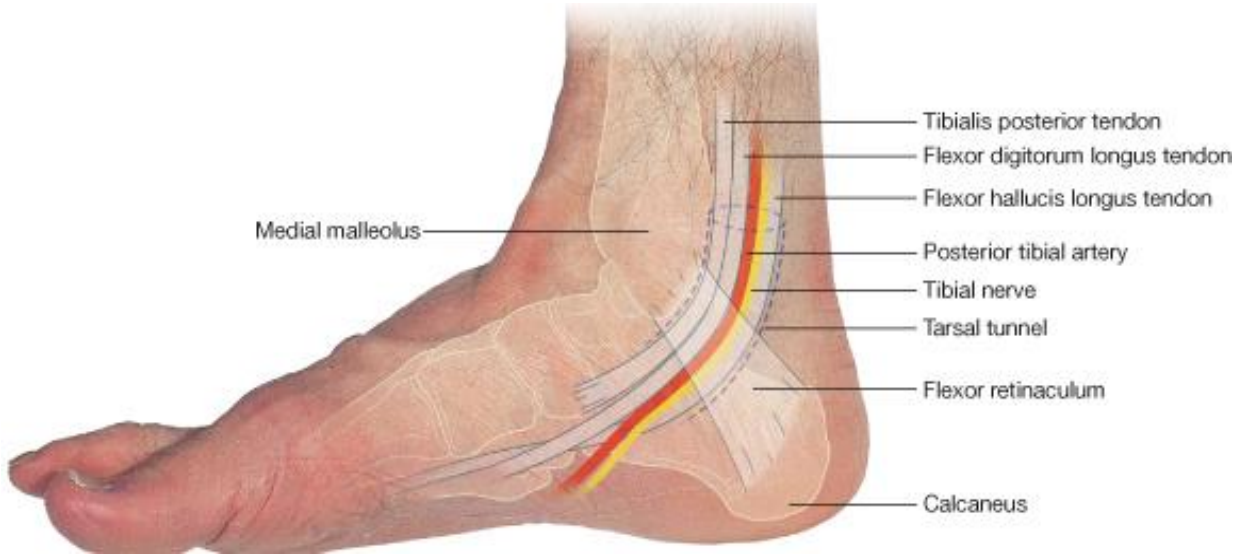


1. Tibialis anterior. 2. Peroneus longus. 3. Gastrocnemius 4. Soleus.
5. Tendon of extensor hallucis longus. 6. Tendons of extensor digitorum longus.
7. Extensor digitorum brevis. 8. Calcaneus tendon (Achilles tendon) 9. Lateral malleolus.

On the Medial aspect of the ankle try to palpate and feel:

1. The medial malleolus.
2. The tendons of tibialis posterior
3. The tendon of flexor digitorum longus.
4. The posterior tibial artery*
5. The calcaneus.

* To palpate the pulse of the artery we ask the patient to invert their foot (to relax the flexor retinaculum).



Questions

1.The clavipectoral triangle is medially bound by:
   A.Clavicle
   B.Deltoid
   C.Pectoralis Major
   D.Pectoralis Minor

2. An x-ray was taken of patient's arm posteriorly while it was flexed. The normal equilateral triangle was disturbed. Which of the following structures is most likely affected?
   A.Olecranon process
   B.Radial styloid process
   C.Head of femur
   D.Head of fibula

3. Which of the following structures make up the knuckle of the hand?
   A.Head of proximal phalanges
   B.Head of distal phalanges
   C.Head of metacarpals
   D.Base of metacarpals

4. Which tendon of the following muscles makes the anterior axillary fold?
   A.Teres major
   B.Pectoralis major
   C.Teres minor
   D.Pectoralis minor

5. Which of the following descends in the lateral bicipital groove?
   A.Cephalic vein
   B.Basilic vein
   C.Saphenous vein
   D.Median cubital vein

6. A patient arrived in the ER suffering from dehydration. The doctor requested that he have a saline drip. Which of the following veins should we use to start the I.V. line?
   A.Cephalic vein
   B.Basilic vein
   C.Saphenous vein
   D.Median cubital vein

Answers:
1. C
2. A
3. C
4. B
5. A
6. D

Questions

7. The pulsation of which of the following arteries can be felt in the snuff box?
   A.Brachial artery
   B.Femoral artery
   C.Radial artery
   D.Ulnar artery

8. The inguinal ligament extends between the pubic tubercle and _____.
   A.Anterior superior iliac spine
   B.Anterior inferior iliac spine
   C.Posterior superior iliac spine
   D.Posterior inferior iliac spine

9. A patient suffering from a myocardial infarction underwent a coronary angiography. Which of the following arteries was used to gain vascular access?
   A.Axillary artery
   B.Femoral artery
   C.Brachial artery
   D.Radial artery

Answers:
7. C
8. A
9. B

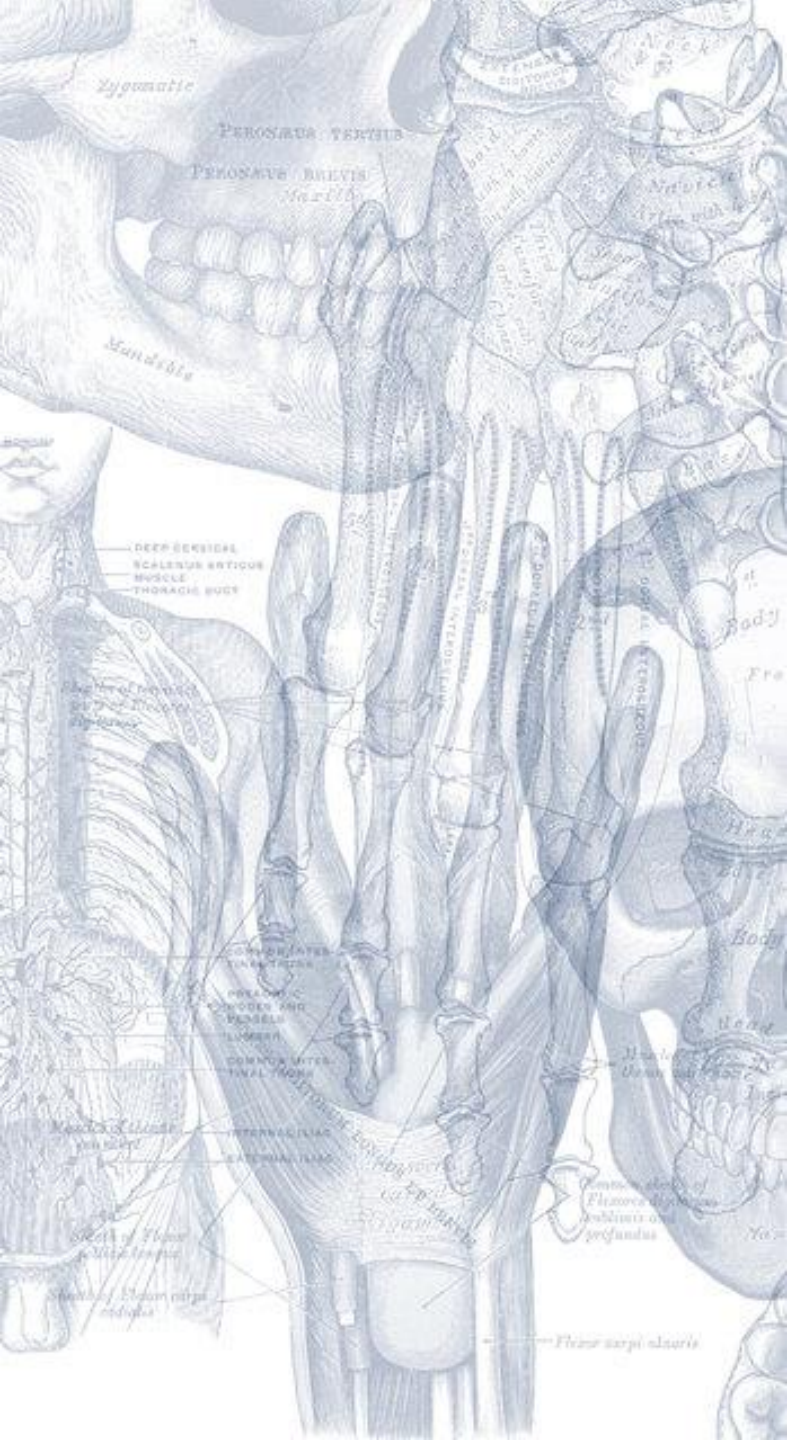
10. What are the boundaries of the femoral triangle?

11. List 3 major structures passing through the femoral triangle.

12. While palpating the medial aspect of the knee what 3 tendons can we feel?

13. What are the boundaries of the anatomical snuff box?

Answers:
10. The base of the triangle is formed by the inguinal ligament, the lateral border by the sartorius and the medial border by the adductor longus.
11. Femoral artery, femoral nerve, and femoral vein.
12. We can feel the tendons of **(SGS)**
    1.Sartorius.
    2.Gracilis
    3.Semitendinosus.
13. The anatomical snuff box is bound anteriorly by tendons of Abductor pollicis longus and Extensor pollicis brevis and posteriorly by extensor pollicis longus tendon.



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