

# Vascular Anatomy Of The Upper Limb

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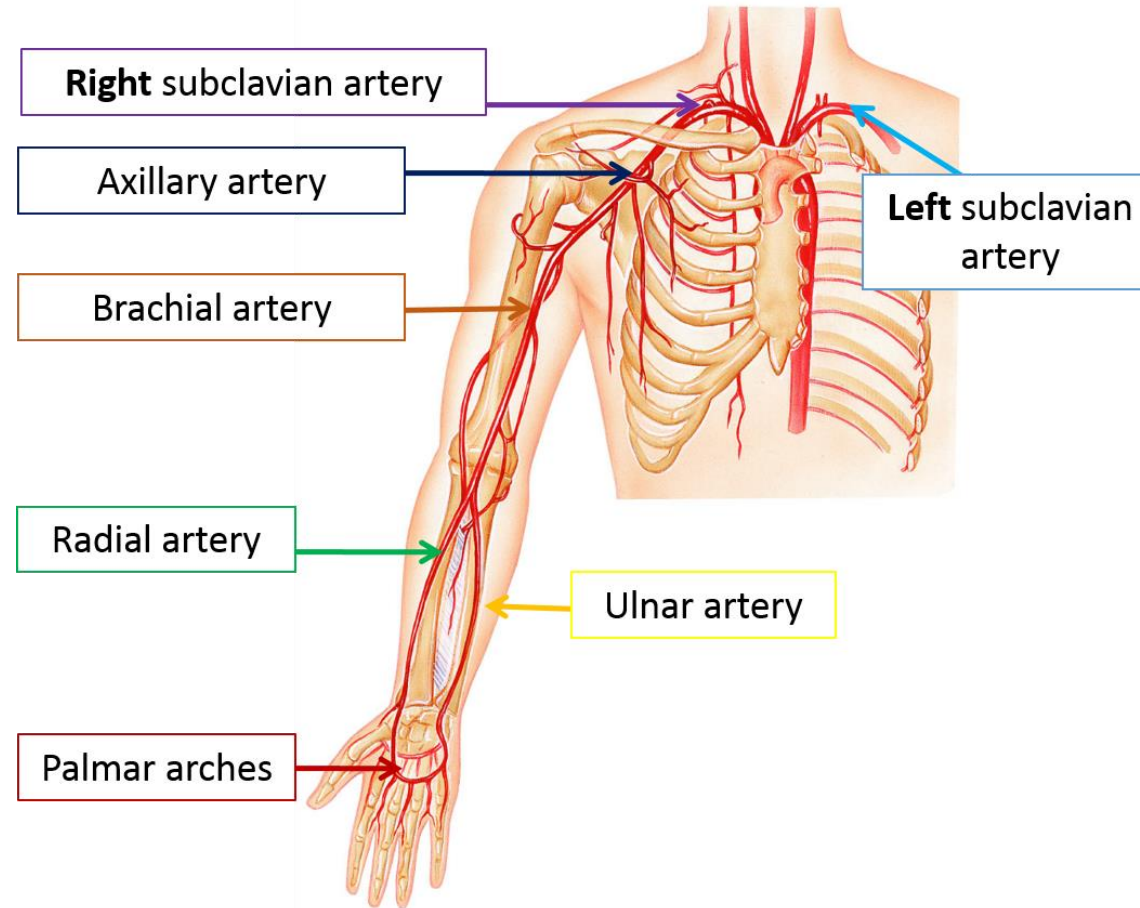
**Color Code**

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

# Objectives

- ✓ At the end of the lecture, the students should be able to:
- ✓ Identify the origin of the vascular supply for the upper limb.
- ✓ Describe the main arteries and their branches of the arm, forearm & hand.
- ✓ Describe the vascular arches for the hand.
- ✓ Describe the superficial and deep veins of the upper limb

# First: Arteries Of The Upper Limb :



Please take note that the left and right is mirrored so Your Right is His left and so on..

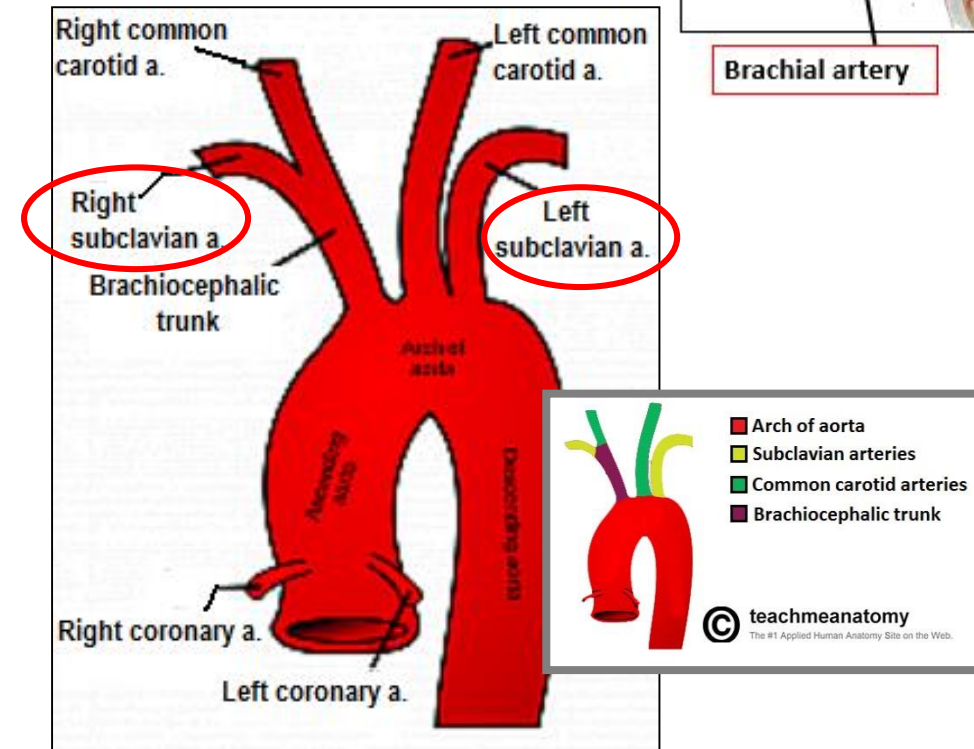
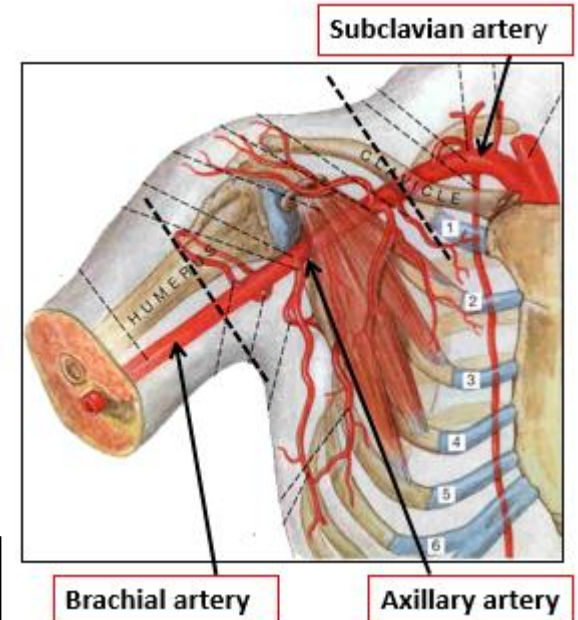
# Arteries Of The Upper Limb

## 1) The Subclavian Artery:

\*The **right subclavian artery** originates from the **brachiocephalic artery**.

\*The **left subclavian artery** originates from the **arch of the aorta**.

\*both Continue as **Axillary artery** at the **lateral(outer) border of the 1st rib**



# Arteries Of The Upper Limb

## 2) The Axillary Artery :

- \*Begins at the **lateral border** of the 1st rib as continuation of the **subclavian artery**.
- \*It's closely related: to the cords of **brachial plexus** and their branches
- \* It's enclosed (with axillary vein) within the **axillary sheath**.
- \*It's crossed anteriorly by the **pectoralis minor muscle**, and is divided into three parts; **1st, 2nd & 3rd**.
- \*Continues as **brachial artery** at **lower border** of **teres major muscle**.

### The *1st* part of the axillary artery

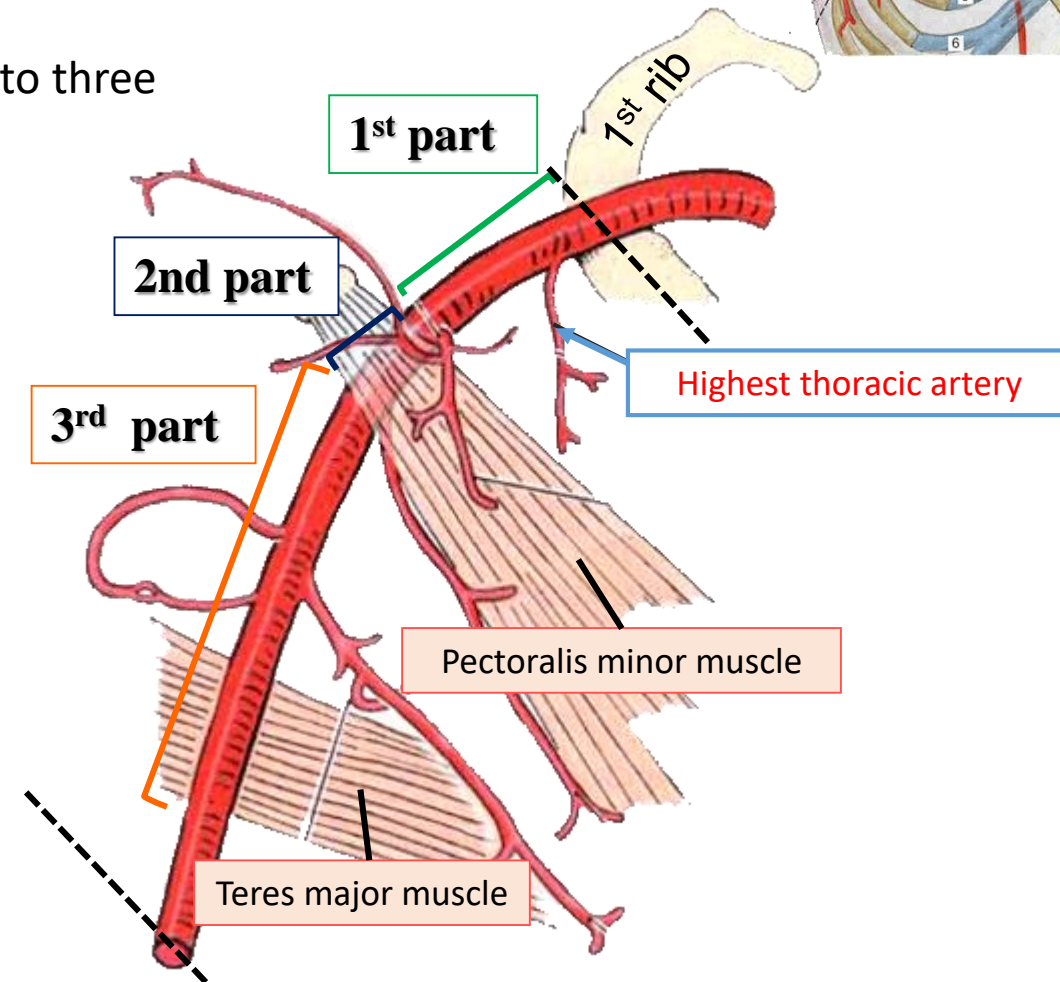
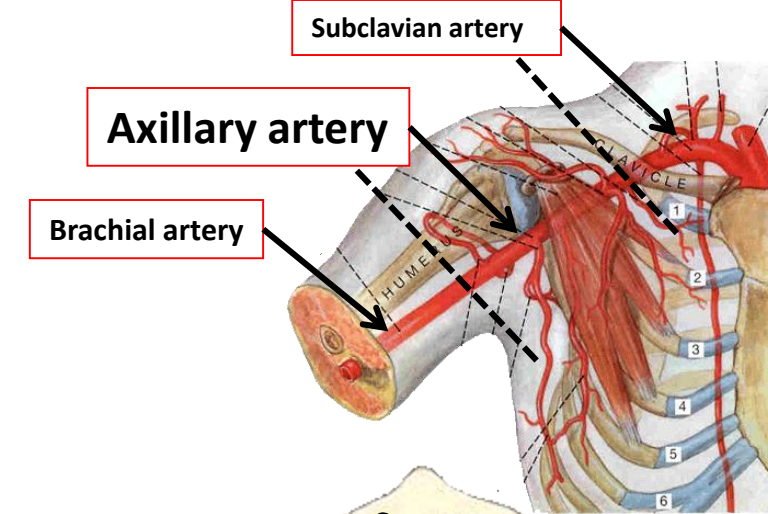
\*Extends from **the lateral border of 1st rib** to **upper border of the pectoralis minor** muscle.

\*Related:

**Anteriorly:** to the **pectoralis major** muscle

**Laterally:** to the **cords** of the **brachial plexus**.

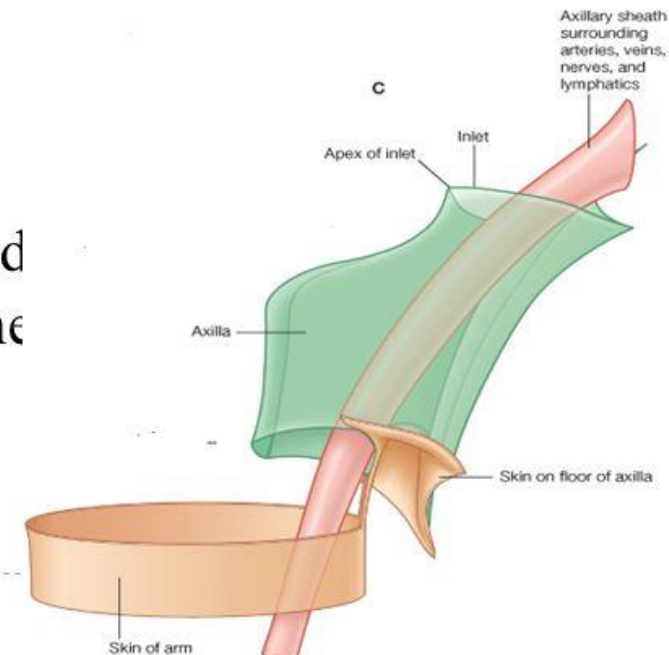
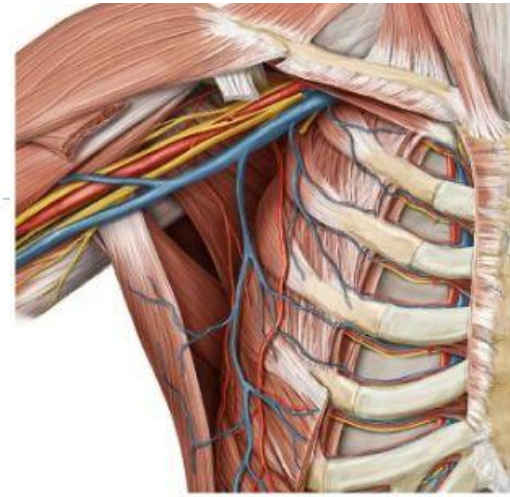
\*It gives; **ONE** branch: **Highest thoracic artery**



This slide is extra

axillary sheath contain:

- ▶ **1. Axillary artery and its branches**
  - ▶ **2. Axillary vein and its tributaries**
  - ▶ **3. Axillary lymph nodes**
  - ▶ **4. Brachial plexus**
- The contents are embedded in fat and ensheathed in the axillary sheath



# The 2nd part of the axillary artery

\*Lies: **behind the pectoralis minor** muscle. تكون تغطيه

\*It is related:

medially, laterally, and posteriorly to the corresponding cord of the brachial plexus. يعني

ميدىل له يكون الميدىل كورد ولترل له يكون اللترل كورد...

\*It gives; **TWO** branches:

Lateral Thoracic artery .

In females it is bigger because it supplies the mammary glands

Thoracoacromial artery.

# The 3rd part of the axillary artery

\*Extends from the **lower border** of pectoralis minor muscle to the **lower border of teres major** muscle.

\*Related:

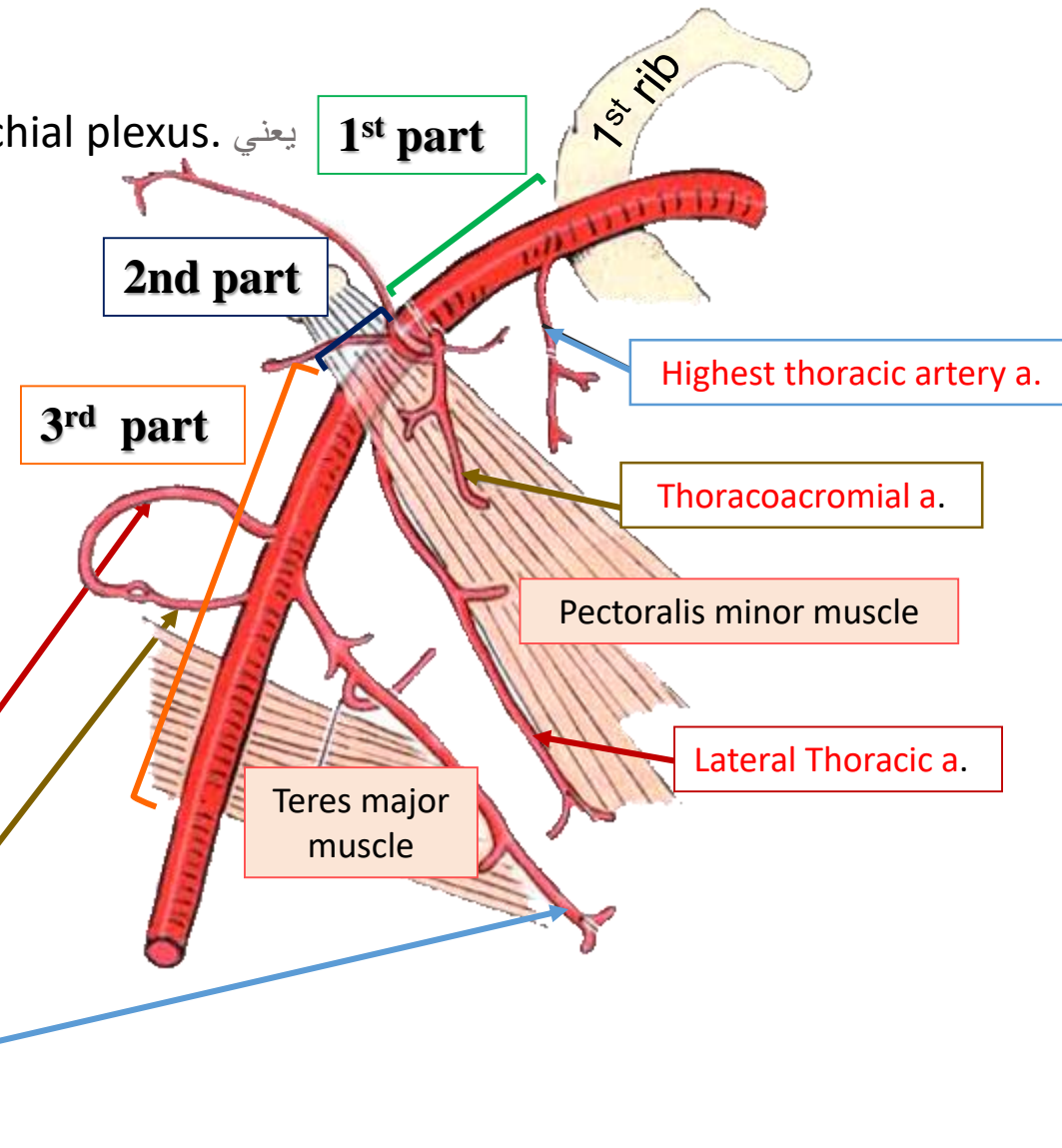
medially, laterally, and posteriorly, to the branches of the **cords** of the brachial plexus

\*It gives; **THREE** Branches:

1- Anterior circumflex humeral artery

2- Posterior circumflex humeral artery

3- Subscapular artery

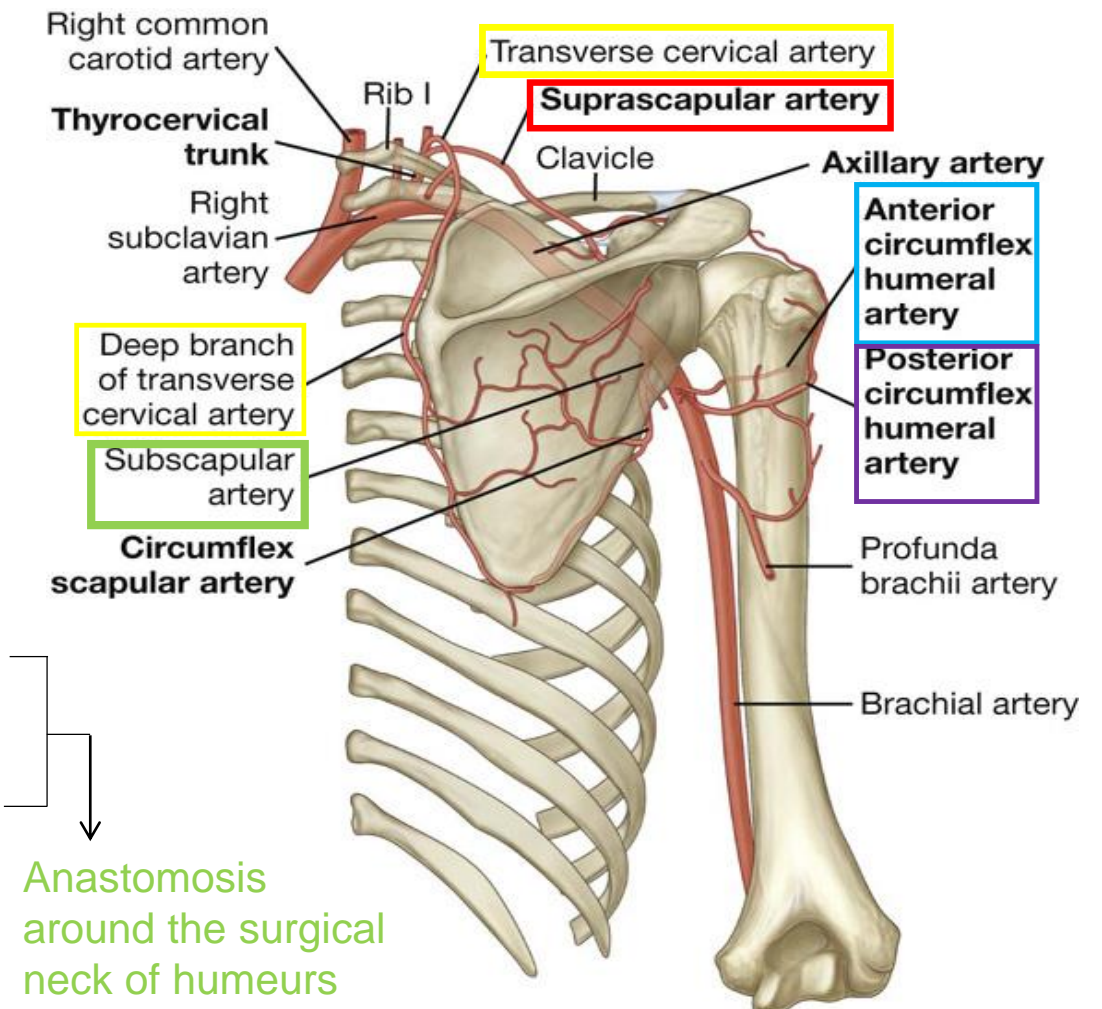
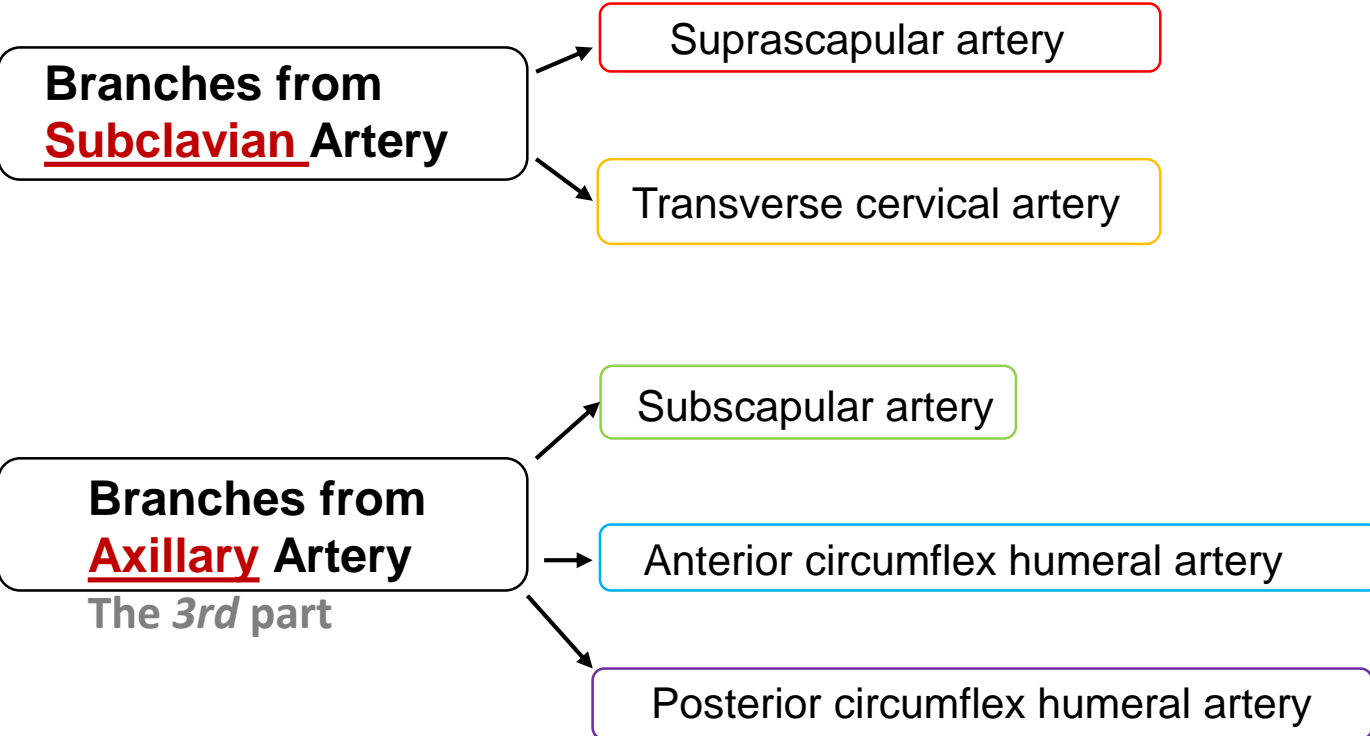


# Anastomosis

Anastomosis occurs between branches of **Subclavian and Axillary arteries:**

- around Shoulder joint (SCAPULA) (the first three)

Anastomosis: is a connection or opening between two things (especially cavities or passages) that are normally diverging or branching, such as between blood vessels.  
وتعني مفاغرة وممكن تكون طبيعية مثل هنا. أو مرضية ...



Anastomosis around the surgical neck of humerus



# Arteries Of The Upper Limb

## 3)The Brachial Artery

- Provides main arterial supply to the arm.
- Is a continuation of the **axillary artery** at the lower border of teres major muscle.
- **Terminates** opposite Neck of Radius by dividing into **Radial & Ulnar arteries**.

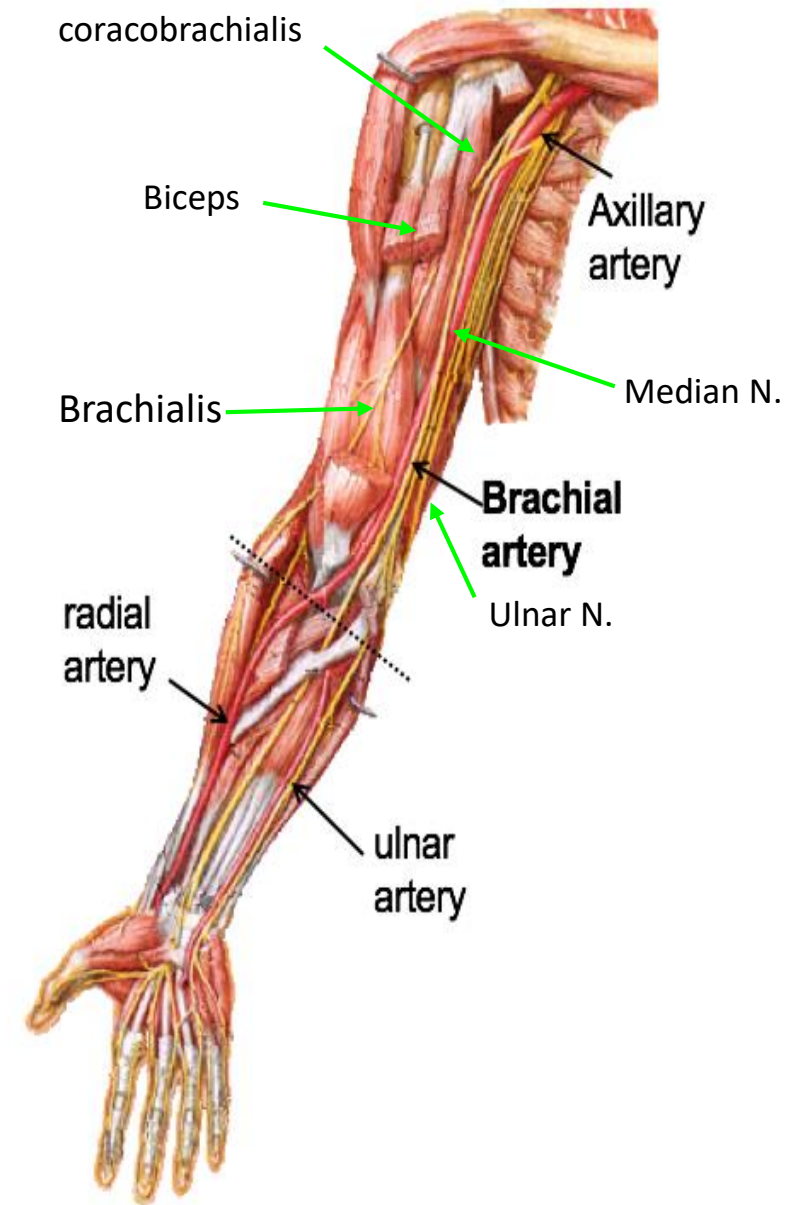
Relations of brachial artery

**Anteriorly:** crossed from above downward by medial cutaneous nerve of the forearm (يكون انتيرير له في البروكسميل بارت له), median nerve (يكون انتيرير له في الميديا بارت له), and bicipital aponeurosis (يكون انتيرير له في الدستل بارت له).

**Posteriorly:** triceps, coraco-brachialis and brachialis.

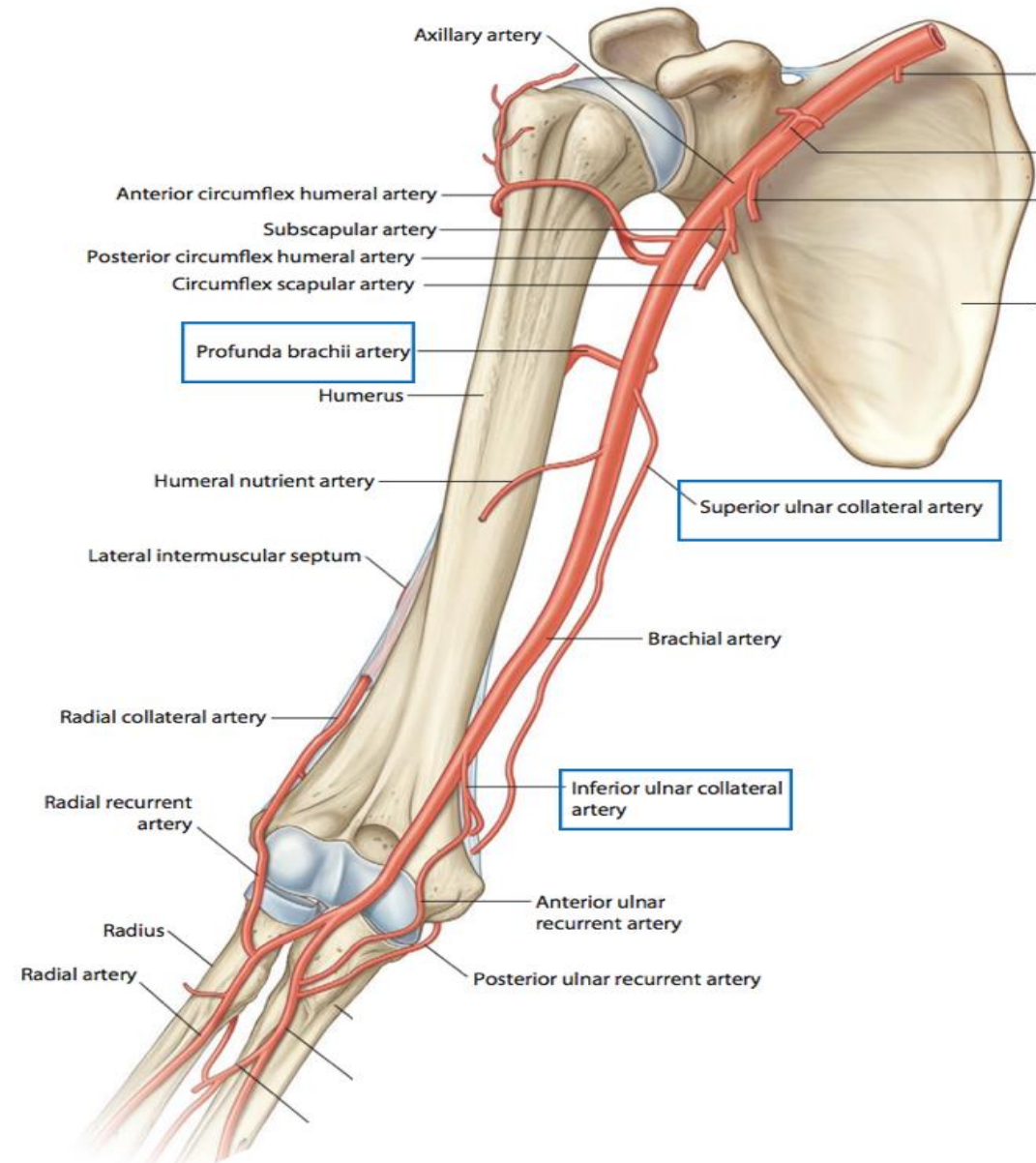
**Medially:** basilic vein, ulnar and median nerves (في اللور بارت له).

**Laterally:** coracobrachialis and biceps muscles.



# Branches of Brachial Artery

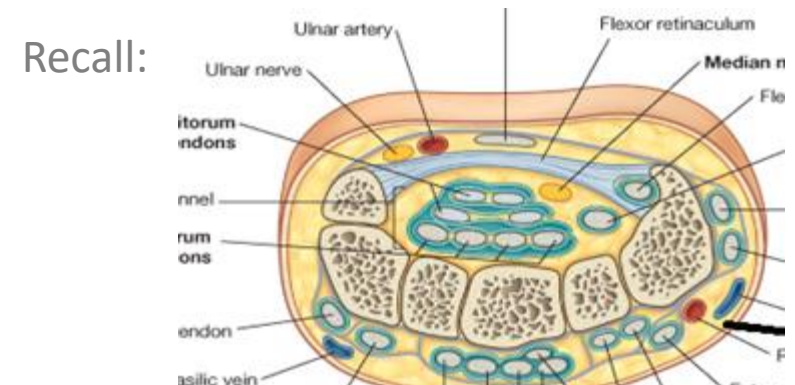
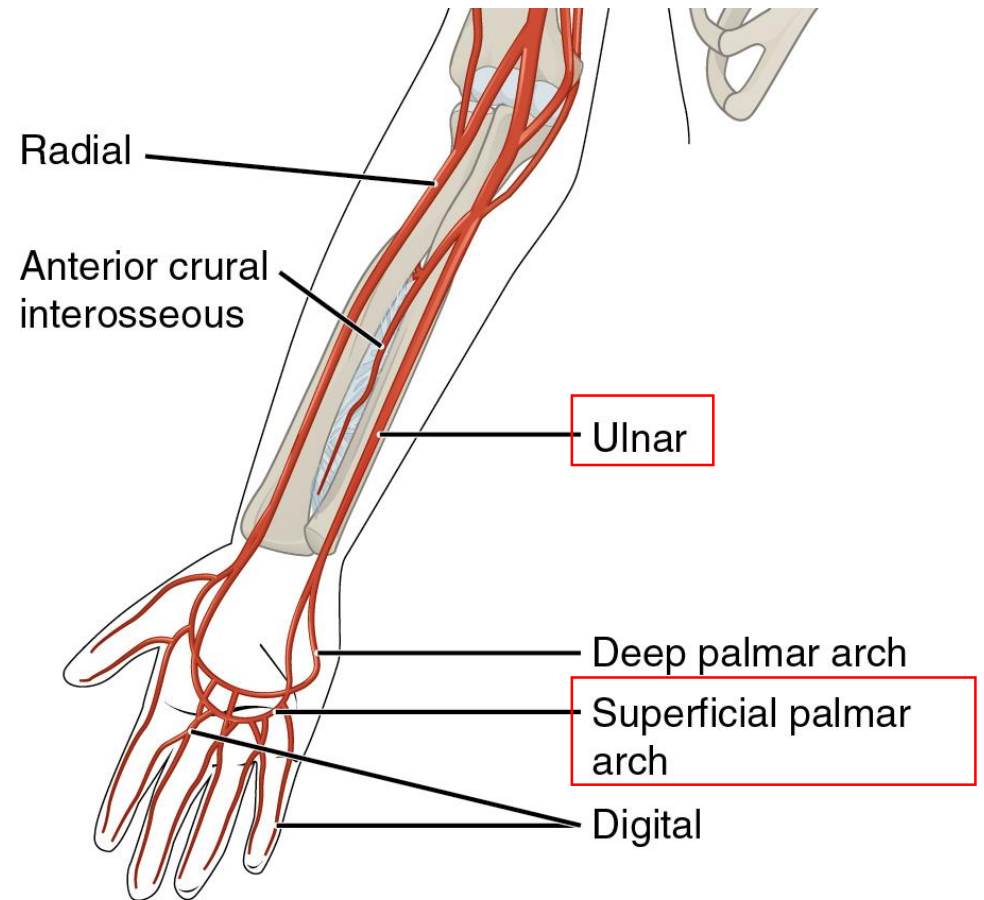
- Muscular.
- Nutrient to humerus.
- They are three:
- **Profunda brachii** along with the radial nerve in the spiral groove
- **Superior ulnar collateral.**
- **Inferior ulnar collateral.**
- All share in anastomosis in elbow joint



# Arteries Of The Upper Limb

## 4) The Ulnar Artery

- The **larger** of the two terminal branches of the brachial artery.
- The radial artery is small but **superficial** so we can feel its pulse, while the ulnar artery is big but **deep** so we can't feel its pulse.
- Begins in the cubital fossa at the level of neck of radius.
- Descends through **the anterior compartment** of the forearm.
- Enters the palm, **in front** of the flexor retinaculum, with the **ulnar nerve**.
- Ends by forming **the superficial palmar arch**, by anastomosing with superficial palmar branch of radial artery.



# Branches of Ulnar Artery

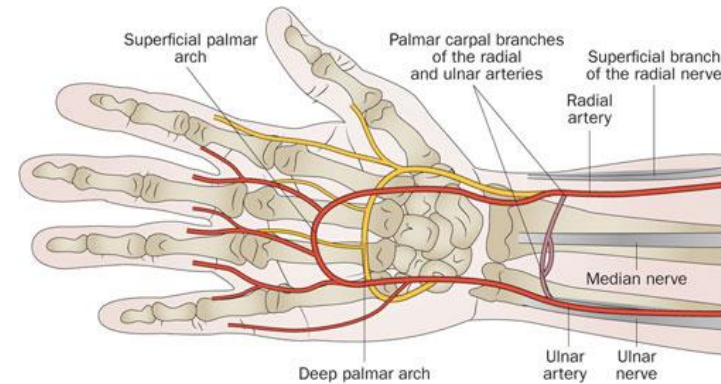
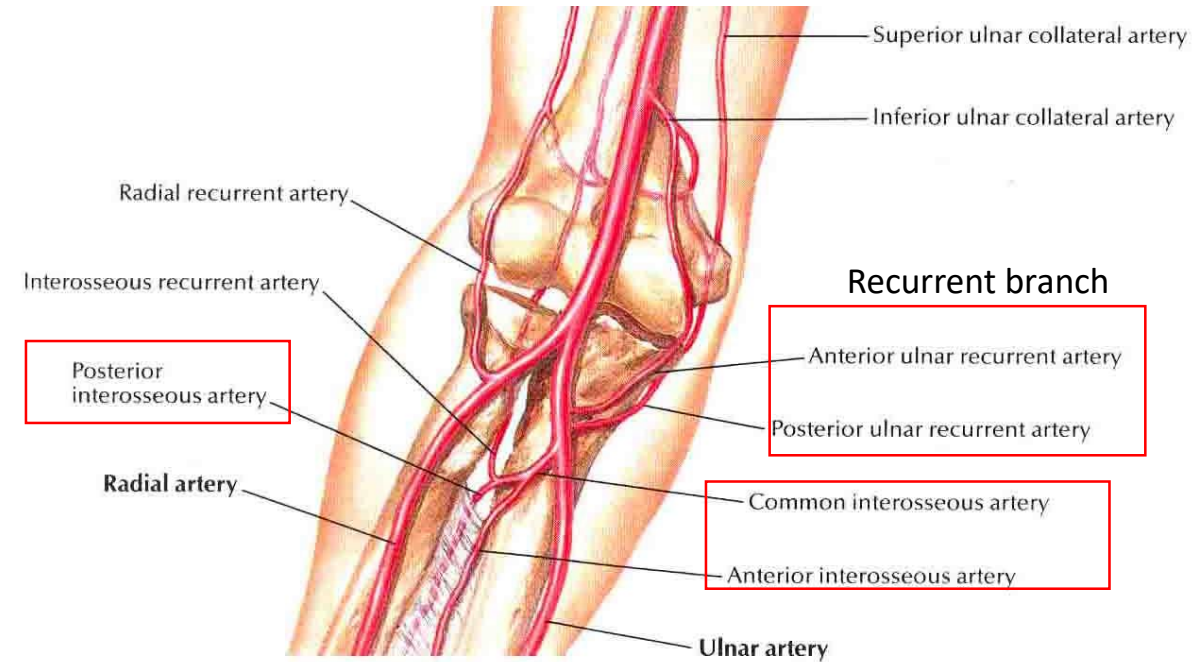
- Muscular.

1- **Recurrent** branch (for anastomosis around the elbow joint). Around the medial epicondyle, to anastomose with the inferior and superior ulnar collateral arteries

2- **Common Interosseous artery**, which gives:

- Anterior Interosseous arteries
- Posterior Interosseous arteries.

3- Branch to anastomoses around the wrist joint.

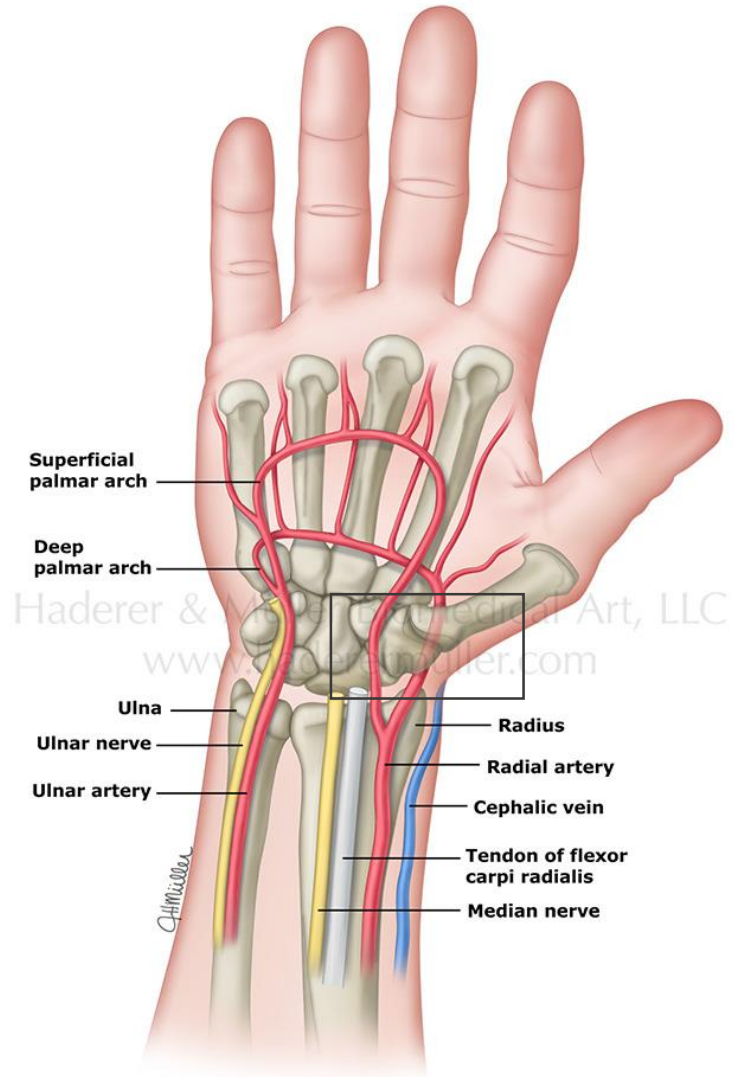


Ulnar Recurrent : branch of Ulnar Artery  
ulnar collateral : branch of brachial Artery

# Arteries Of The Upper Limb

## 5) The Radial Artery

- The **smaller** of the two terminal branches of the brachial artery.
- Begins in the cubital fossa at the level of neck of radius.
- Descends downward and **laterally**.
- Leaves the forearm by **winding** around the **lateral** aspect of the wrist to reach the dorsum of the hand.

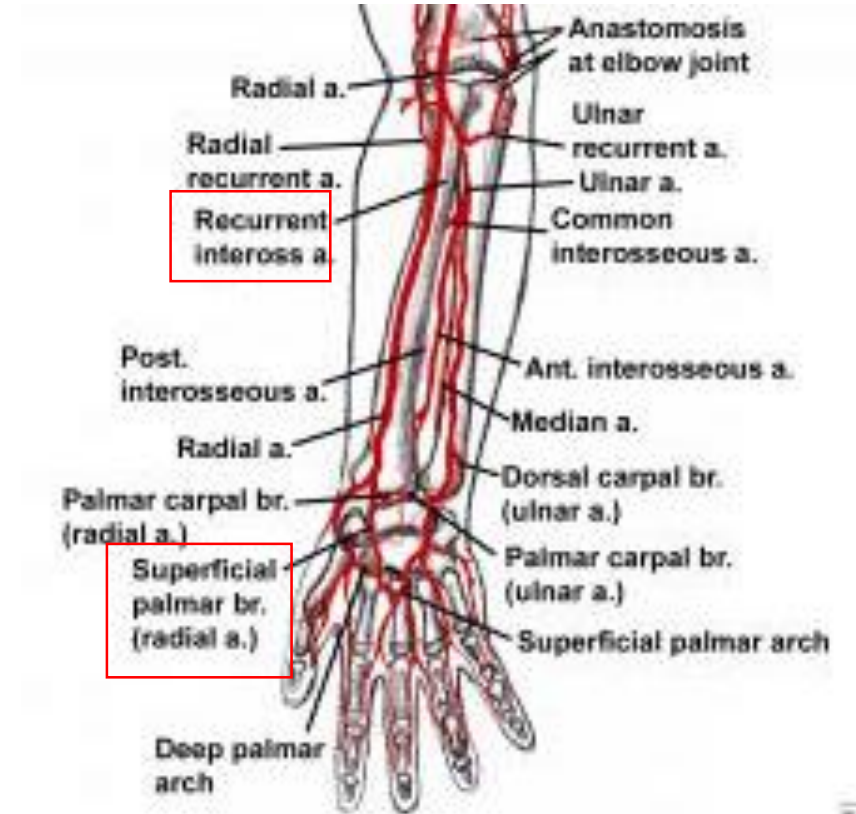


# Branches of Radial Artery

- Muscular

1- **Recurrent branch** (for anastomosis around the elbow joint).

2- **Superficial palmar branch**, joins the ulnar artery to form the superficial palmar arch.



# Anastomosis around Elbow Joint

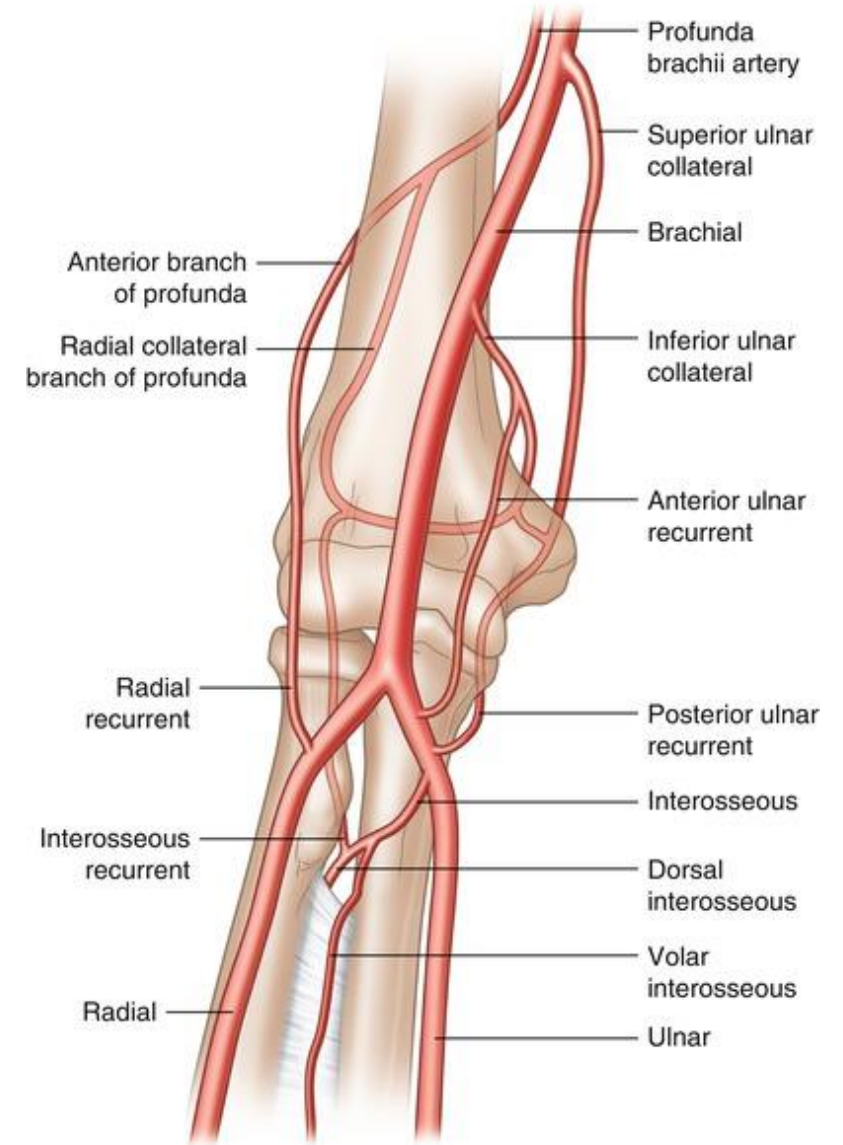
Anastomosis occurs between branches of Brachial, Radial and Ulnar arteries  
Around the epicondyle of humerus (medial & lateral) :

- **Branches from Brachial Artery:**
  - Profunda Brachii artery
  - Superior ulnar collateral artery
  - Inferior ulnar collateral artery
- **Branches from Ulnar and Radial Arteries:**
  - Radial & ulnar recurrent arteries
  - Interosseous recurrent artery (from ulnar)

Around the **lateral epicondyle** The profunda brachii branches anastomose with the radial recurrent artery and the interosseous recurrent artery.

Around the **medial epicondyle**, the superior ulnar collateral artery anastomoses with the posterior ulnar recurrent. The inferior ulnar collateral artery anastomoses with the anterior ulnar recurrent

هذا كله شرحته الدكتورة<sup>٨</sup>



Lateral

Medial

# Arteries of the palm

## Ulnar artery :

Enters the hand:

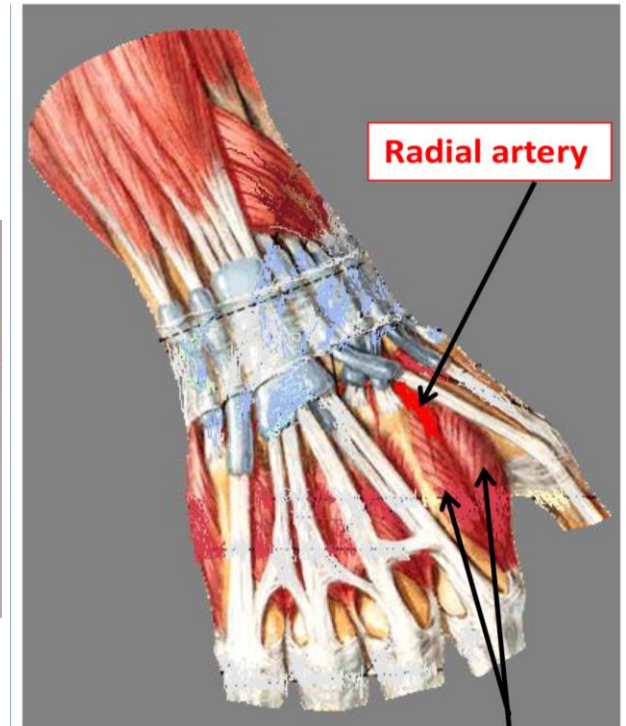
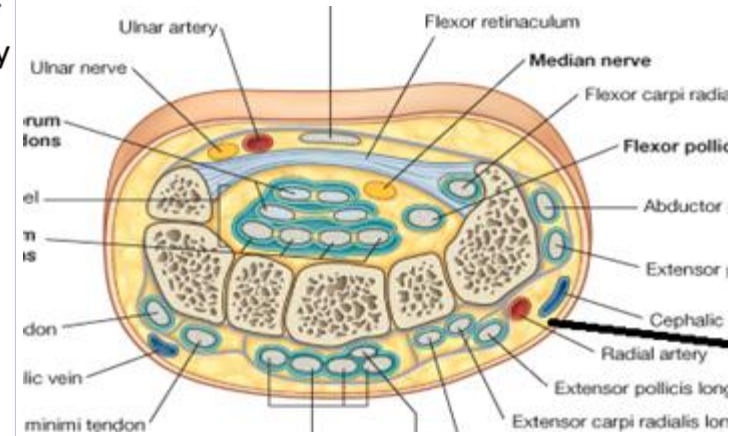
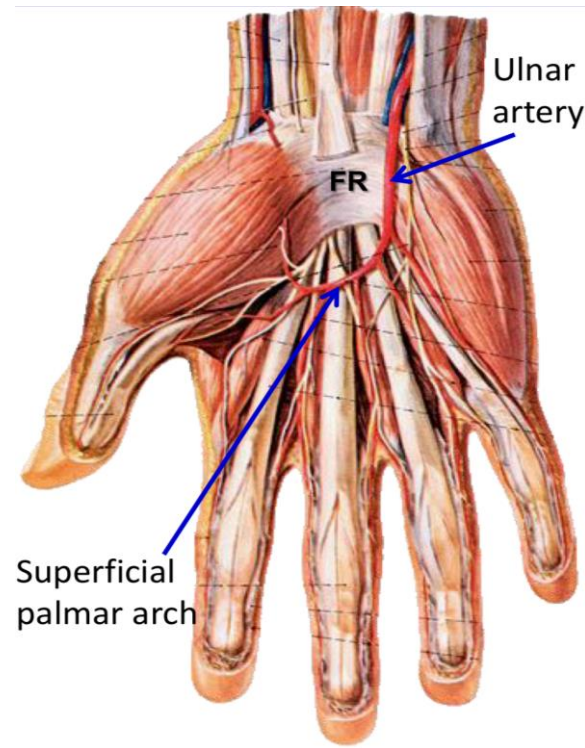
- anterior to the flexor retinaculum,
- on the lateral side of the ulnar nerve and pisiform bone.
  - Continue as the **superficial palmar arch**.
  - Gives a **deep branch**.

## Radial artery:

- Leaves dorsum of the hand by turning forward between the proximal ends of the 1st and 2nd metacarpal bones, and between **two heads of the 1st dorsal interosseous muscle**. This place called anatomical snuff box.
- On entering the palm it continues as **deep palmar arch**.
- gives; arteria **radialis indices** and arteria **princeps polices**.

Policis = thumb

Indecis = index (السبابة)



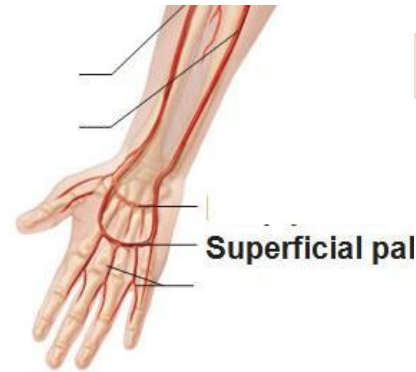
**1<sup>st</sup> dorsal interosseous muscle**



# Arteries of the palm

## - The Superficial Palmar Arch

90% ulnar 10% radial

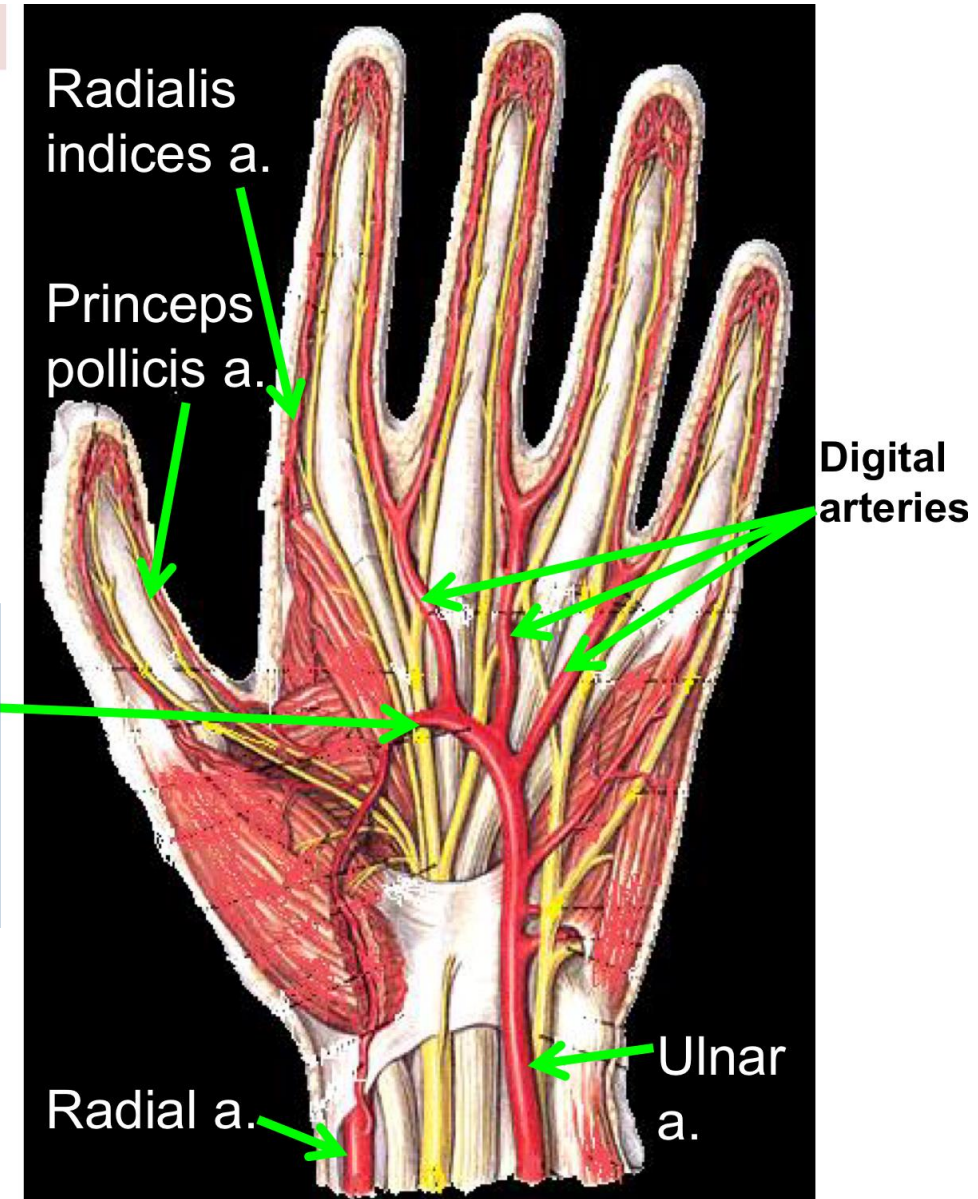


- Is the direct continuation of the ulnar artery, as it curves laterally behind the palmar aponeurosis.
- Is completed by branch from the radial artery (only 10%).
- Lies approximately at the level of the **Distal Border of the Extended Thumb**.
- Gives: **digital arteries** from its convexity to supply the fingers.

^only the later 3 and half of the index because the thumb and other half are supplied by the radial artery

**\*The superficial palmar arch is more distal than the deep palmar arch.**

The Superficial Palmar Arch



# Arteries of the palm

## - The deep Palmar Arch

90% ulnar 10% radial

Is a continuation of the radial artery as it curves medially beneath long flexor tendons, in front of the metacarpal bones and interosseous muscles.

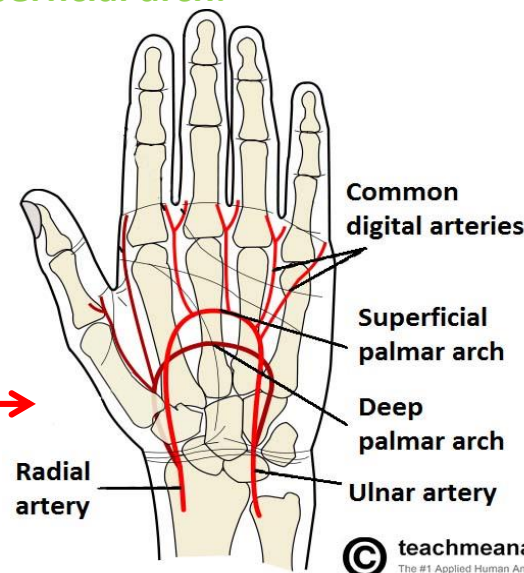
- Is completed on the medial side by **deep branch of ulnar artery** (only 10%).
- Lies at a level of the **Proximal Border of Extended thumb.**

When the thumb is extended and I draw a line from the proximal border I get the deep arch and when I draw a line from the distal border I get the superficial arch.

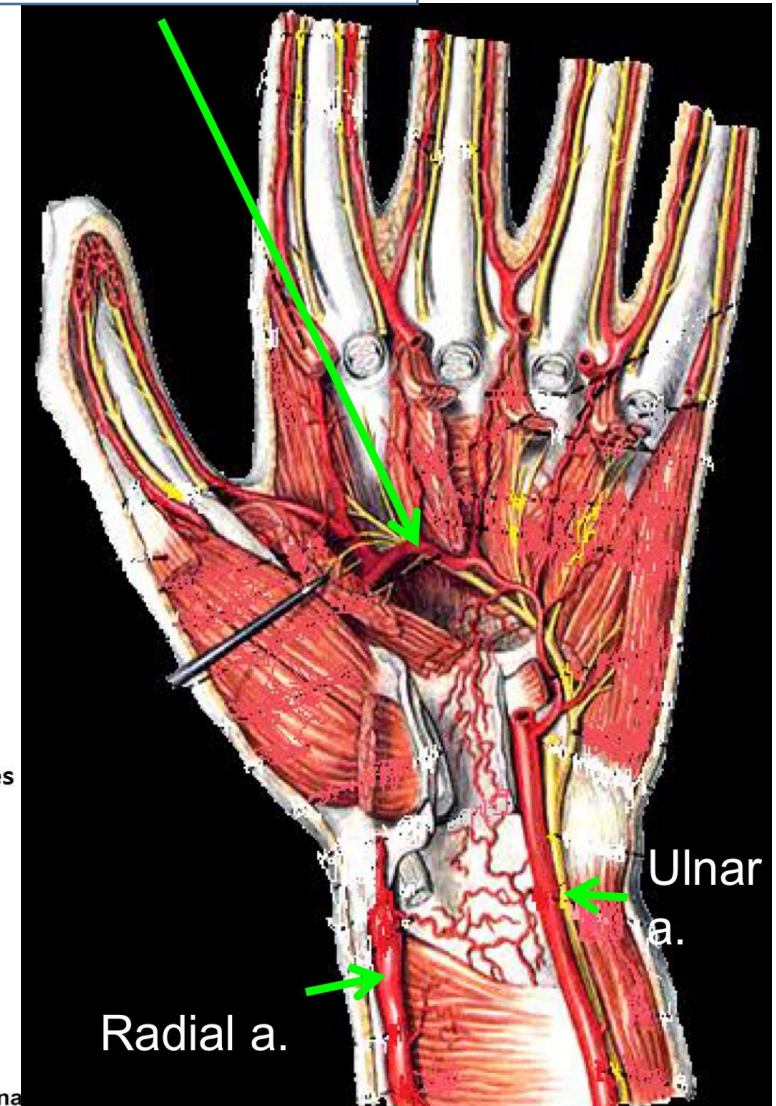
➤ It sends branches:

- 1- superiorly to share in anastomosis around the wrist joint
- 2- inferiorly to join branches of the superficial palmar arch.

The superficial palmer arch is **more distal** than the deep palmer arch



The deep palmar arch



# Arterial Innervation And Raynaud's Disease

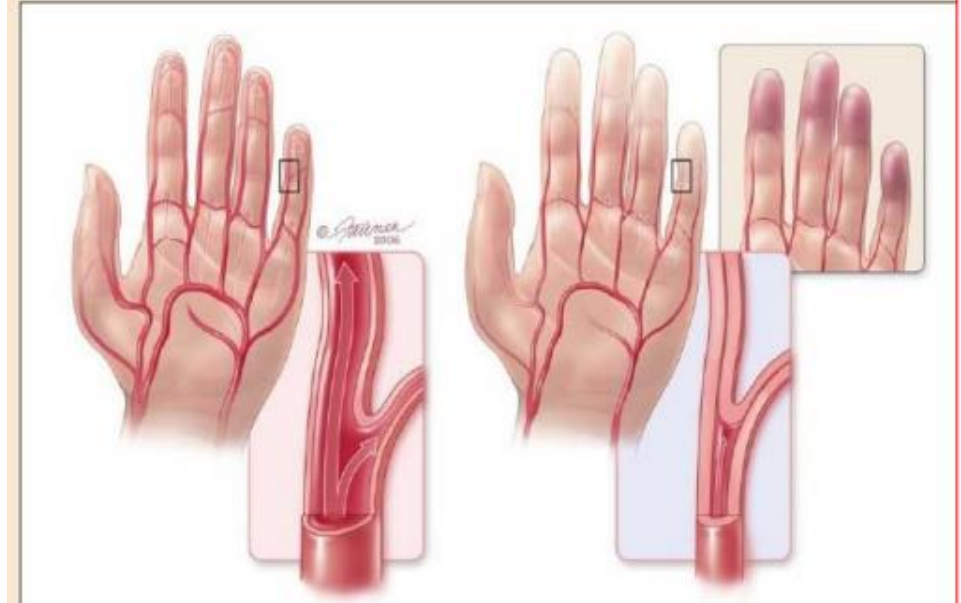
- Raynaud's disease is a vasospastic disease involves digital arteries.
- It may require Cervicodorsal رقبتي ظهري preganglionic sympathectomy , to prevent necrosis of the fingers.

The artery gets its nerve supply from the sympathetic. If it is over stimulated they will be vasoconstriction if too little vasodilatation. People who have over sympathetic supply in the digital artery they become vasoconstricted so there is a decrease in the arterial supply so the ends of their fingers become cold and blue. If the prescribed drugs cannot produce vasodilatation they will have to surgically remove sympathetic fibers/ganglion because if the problem is not resolved it can lead to dry gangrene due to ischemia. Symptoms: cold and blue fingers all the time (whether the temperature is cold or hot).

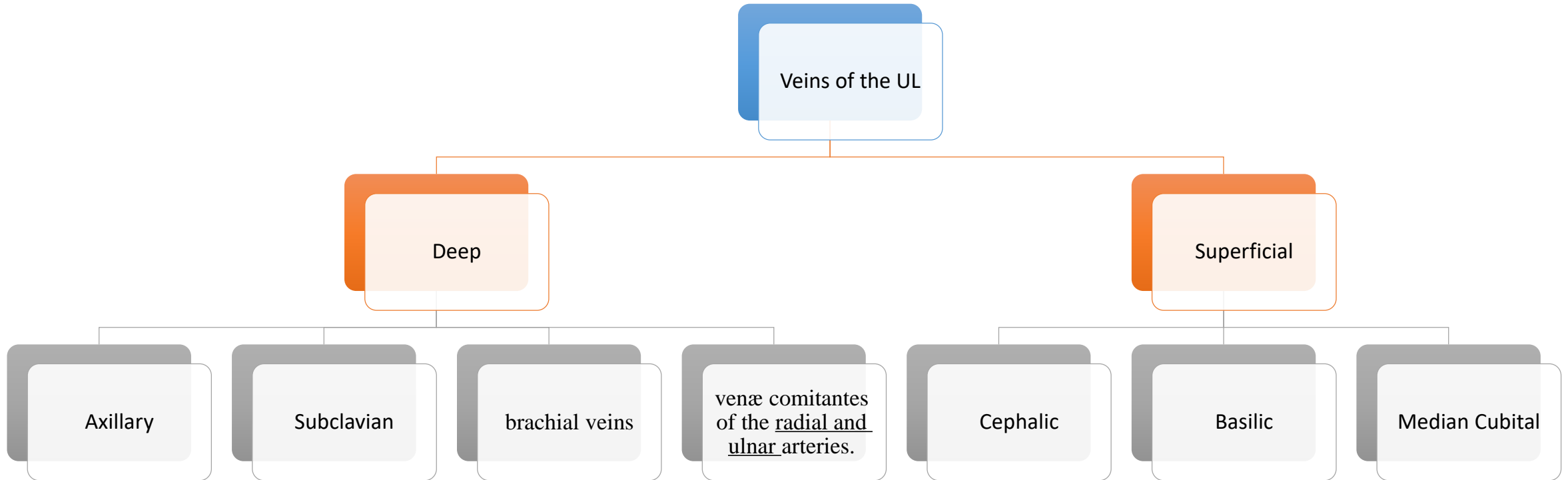
A **sympathectomy** is an irreversible procedure during which at least one sympathetic ganglion is removed.

FIGURE 1

Vascular changes that occur during acute Raynaud's disease



# second: Veins Of The Upper Limb :



# Veins of the Upper Limb

- The veins of the upper limb are divided into two sets\*:  
**Superficial and Deep**

1- The **superficial veins**: are placed immediately beneath the skin\*\*, in the superficial fascia.

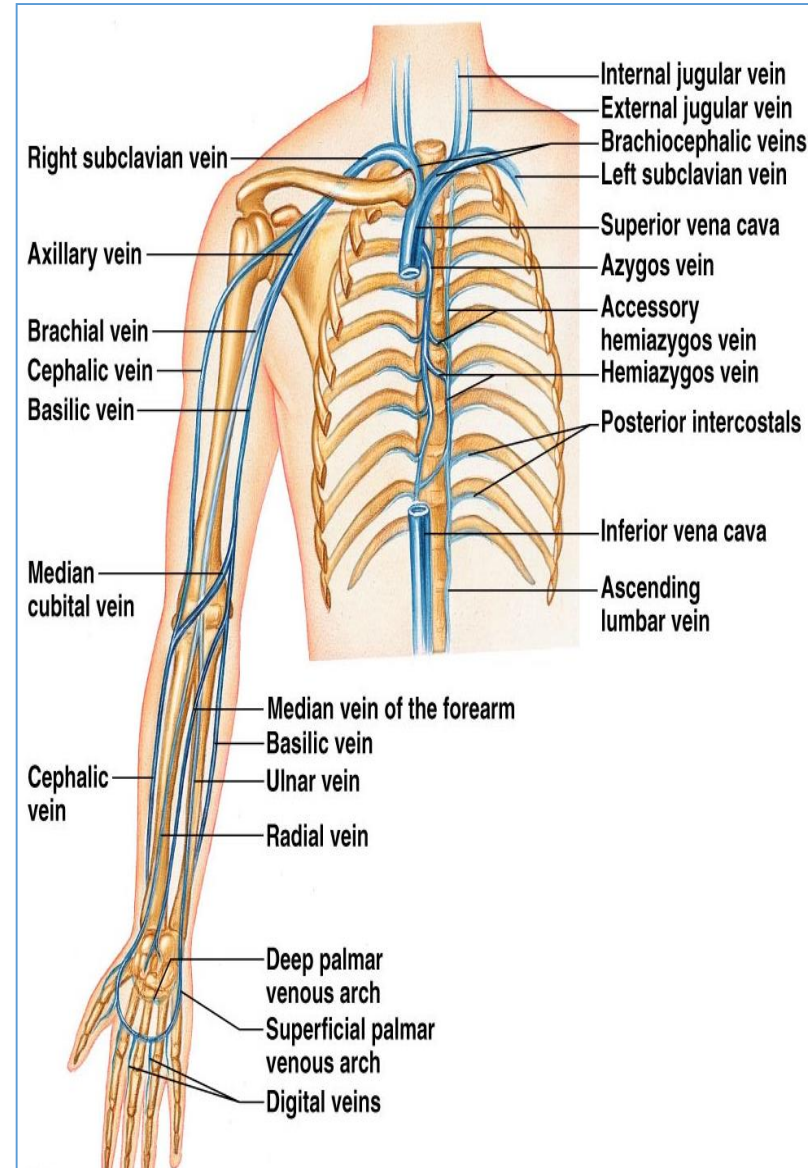
2- The **deep veins**:

a. **accompany** the arteries<sup>^</sup>. b. constitute the **venæ comitantes** of those vessels.

(The two sets **anastomose** frequently with each other)

\*according to there position. \*\*in the subcutaneous tissue.  
<sup>^</sup>accompanying large or medium size arteries.

عادةً الديق فينز اللي مالها أسماء وتكون مرتبطة بكل الجانبيين للآرتري الكبير  
تسمى الأوردة المصاحبة (venae comitantes)  
مثل البراكياي آر تري معاه بكل الجهتين أوردة مصاحبة.  
فمثلاً في براكياي آر تري بس مافيه براكياي فين

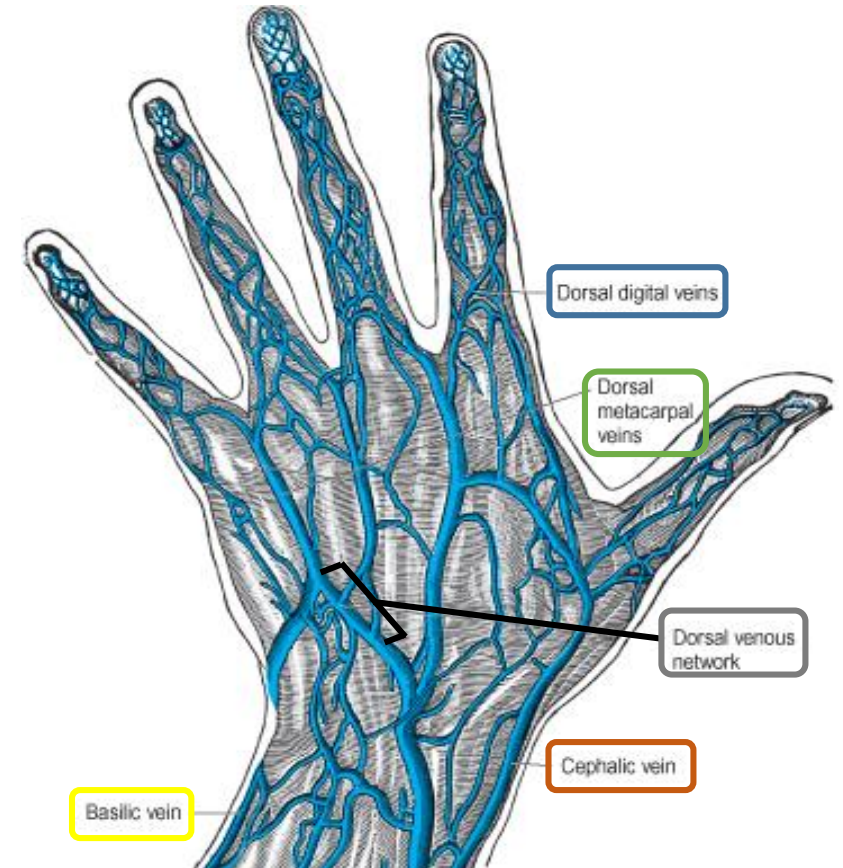


# Veins of the Upper Limb

## 1- Superficial Veins

### Dorsal Venous Arch (network)

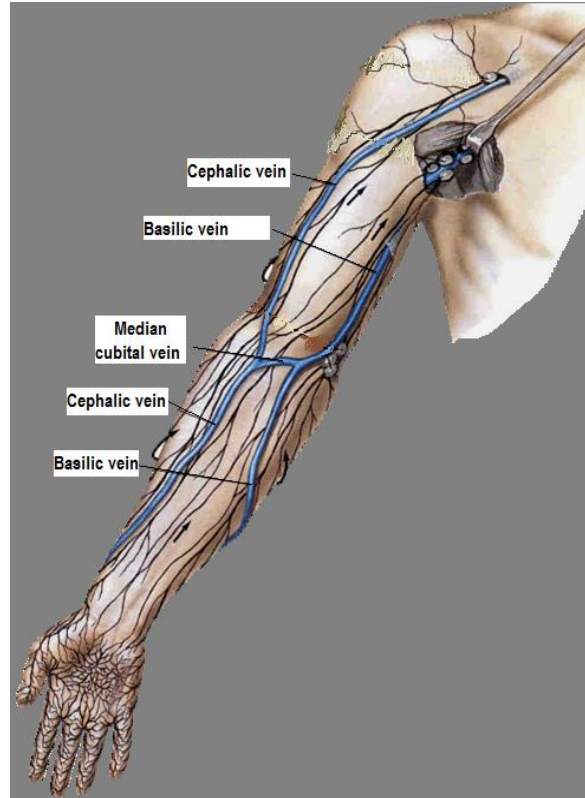
- The **dorsal digital veins** drain into **dorsal metacarpal veins**, which unite to form a **dorsal venous arch or network**.
- **Dorsal venous network** lies on the **dorsum of the hand**, in the **subcutaneous tissue**, **proximal** to the **metacarpophalangeal joints**.
- Drains into the **Cephalic** vein laterally, and **Basilic** vein medially.



Note: we study the veins from distal to proximal because they return the blood back to the heart from the peripheries and collect at the trunk. (they pour into/join each other so they don't have branches)

## Cephalic Vein

- Arises from the **lateral** end of the dorsal venous arch of hand.
- Ascends on **radial** side of the forearm to the elbow and continues up to the arm in the **deltopectoral groove**.\*
- It pierces **clavipectoral fascia\*\*** to drain into the **axillary vein**.



## Basilic Vein

- Arises from the **medial** side of the dorsal venous arch of hand.
- Ascends on the **ulnar** side of forearm to the elbow.
- In the middle of the arm it pierces the **deep fascia** and joins the **brachial vein or axillary vein**.^

**Median Cubital Vein:** 1- Links cephalic vein and basilic vein in the cubital fossa. ^^  
2- Is a frequent site for venipuncture. (سحب الدم) + for IV injection

\*space between Deltoid and Pectoralis major muscles.

\*\*thick connective tissue filling the space between Clavicle and Pectoralis minor (in deltopectoral groove)

ف الفين يبغى يصير من سوبرفيشيل لديدب لذلك يخترق هذي الفيشيا ويصب بالديب فين دائماً الأوردة السطحية تصب في أوردة عميقة

^ and it continues to the outer border of the first rib and it will called Subclavian vein.

^^most of the blood found in Cephalic vein will drain in Basilic vein by Median Cubital vein. The blood that did not drain in the Basilic vein by the Median Cubital vein will continue to the Axillary vein.

# Veins of the Upper Limb

## 2- deep Veins

They accompany the arteries of the same region and bear similar names.\*

- **Venae comitantes**: They are generally arranged in pairs.

A- situated one on either side of the corresponding artery.

B- connected at intervals by short transverse branches. (بينهم مثل ال channels)

1- The superficial and deep palmar arterial arches are each **accompanied** by a **pair** of **venae comitantes** which:

A- constitute the **superficial** and **deep palmar venous arches**.

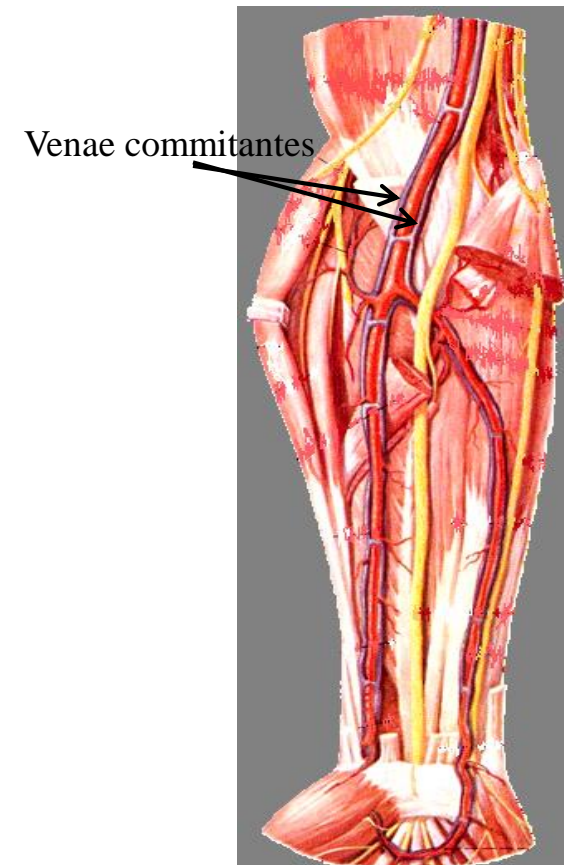
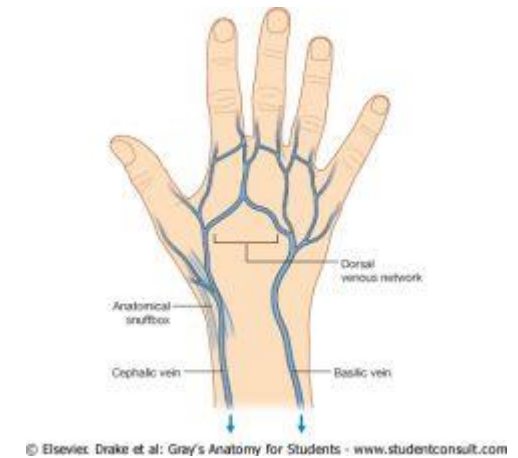
B- receive the veins corresponding to the branches of the arterial arches.

2- The **deep veins of the forearm** are the venae comitantes of the radial and ulnar arteries.

3- The **brachial venae comitantes** are placed one on either side of the brachial artery.

\*For example:

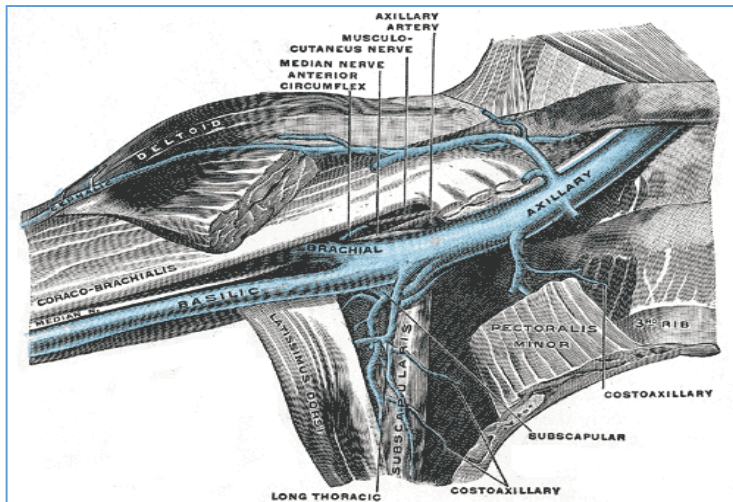
Axillary and Subclavian veins





#### 4- The Axillary vein:

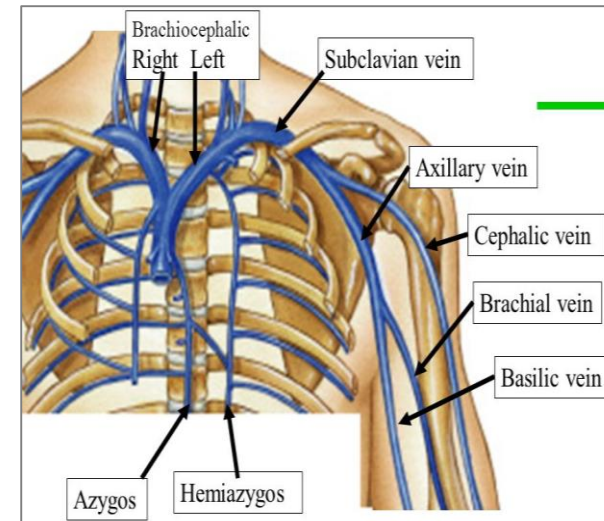
- Begins at the **lower border of the Teres major**, as the continuation of the basilic vein.
- Ends at the **outer border of the first rib** as the subclavian vein.
- Receives: 1- The **brachial veins**.  
2- The **cephalic vein** (close to its termination).



\*بداية ونهاية الفين تكون عكس بداية ونهاية الأرتري مثل:  
Axillary **artery** extends from the lateral border of 1<sup>st</sup> rib to lower border of the Teres major muscle. The axillary **vein** Begins at the lower border of the Teres major Ends at the outer border of the first rib.

#### 5- The Subclavian vein:

- Is the continuation of the axillary vein.
- Extends from the **outer border of the first rib to the sternal end of the clavicle**, where it unites with the internal jugular vein\* to form the **Brachiocephalic (Innominate) vein**.



\*from the skull

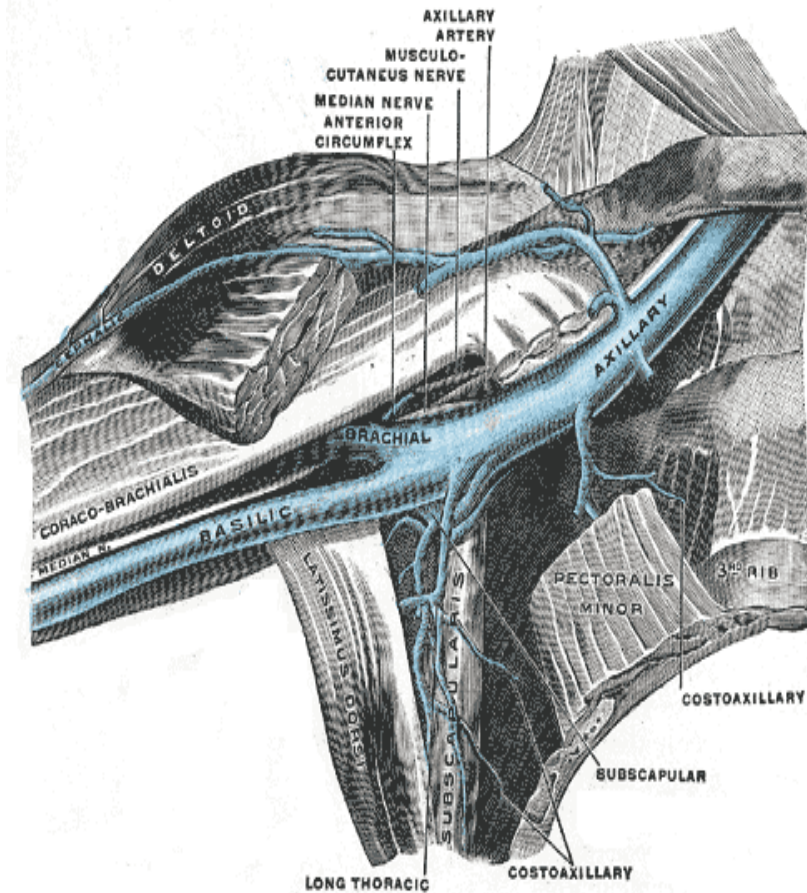
فيه منه R و L  
يتحدون ويصبون  
في القلب

# Vein Catheterization

- The **Basilic vein** is the vein of choice for central venous catheterization.

**Because:** from the cubital fossa until reaching the axillary vein:

- 1- It **increases** in **diameter**.\*
  - 2- **lies** in **direct line** with the **axillary vein**.
- 
- While The **Cephalic vein**:
    - 1- **does not** increase in size as it ascends in the arm.
    - 2- frequently divides into small branches. (يتفرع = يصغر قطره)
    - 3- it joins (opens) the axillary vein at right angle. **So it is difficult to maneuver\*\* the catheter around this angle.**

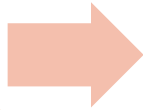


\* لأن كل ما يطلع ل فوق الداياميتر يتوسع.  
\*\* to move in a careful and skillful way.

# Summary

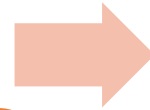
## Subclavian Artery

- originates from
- right> brachiocephalic artery
- left> arch of aorta



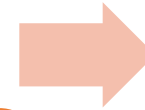
## Axillary Artery

- Begins at lateral border of first rib
- crossed anteriorly by the pectoralis minor
- three parts; 1st, 2nd & 3rd



## Brachial

- Continuation of Axillary at lower border of teres major
- Terminates opposite Neck of Radius by dividing into Radial & Ulnar
- Provides main arterial supply to the arm

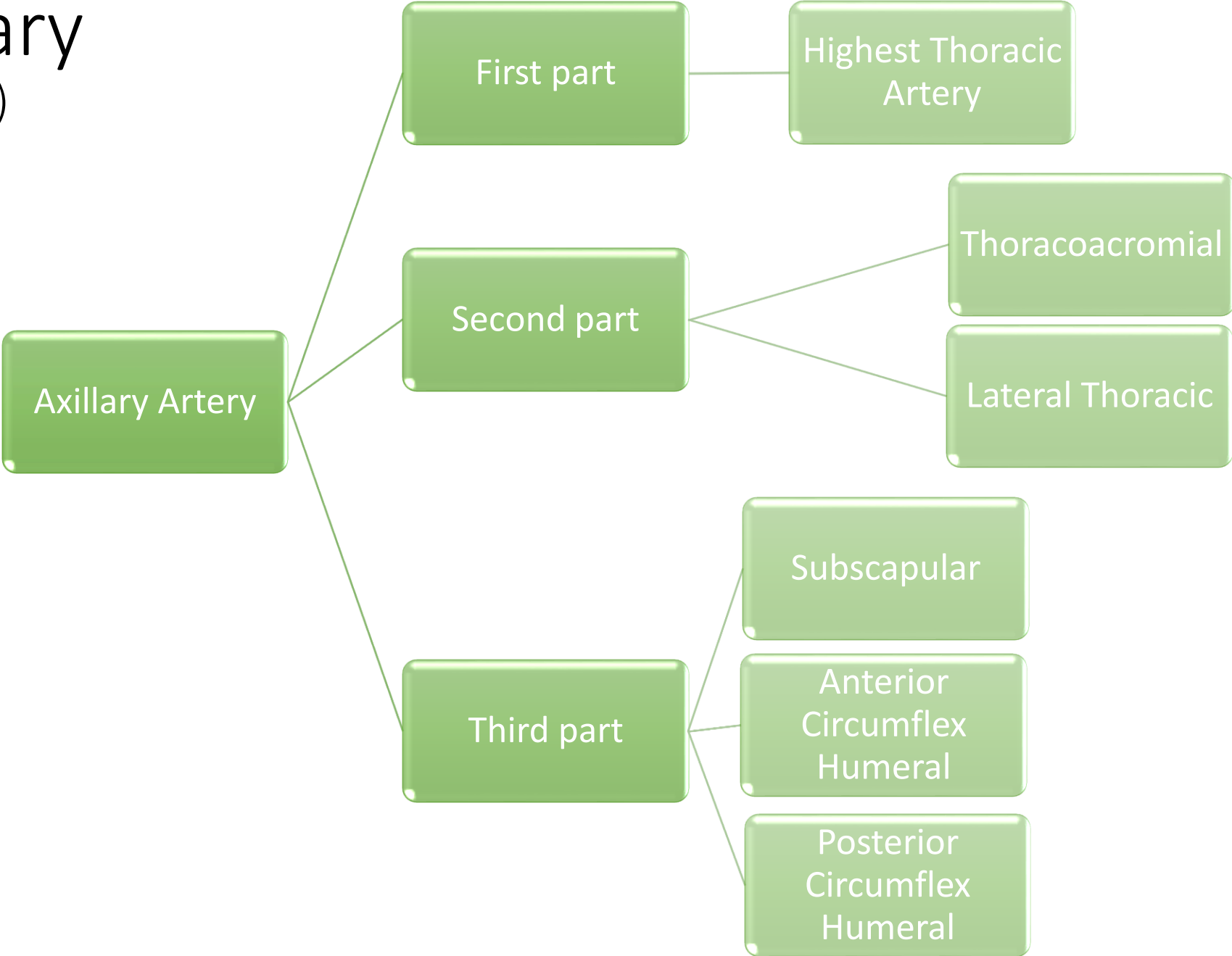


## Ulnar and Radial

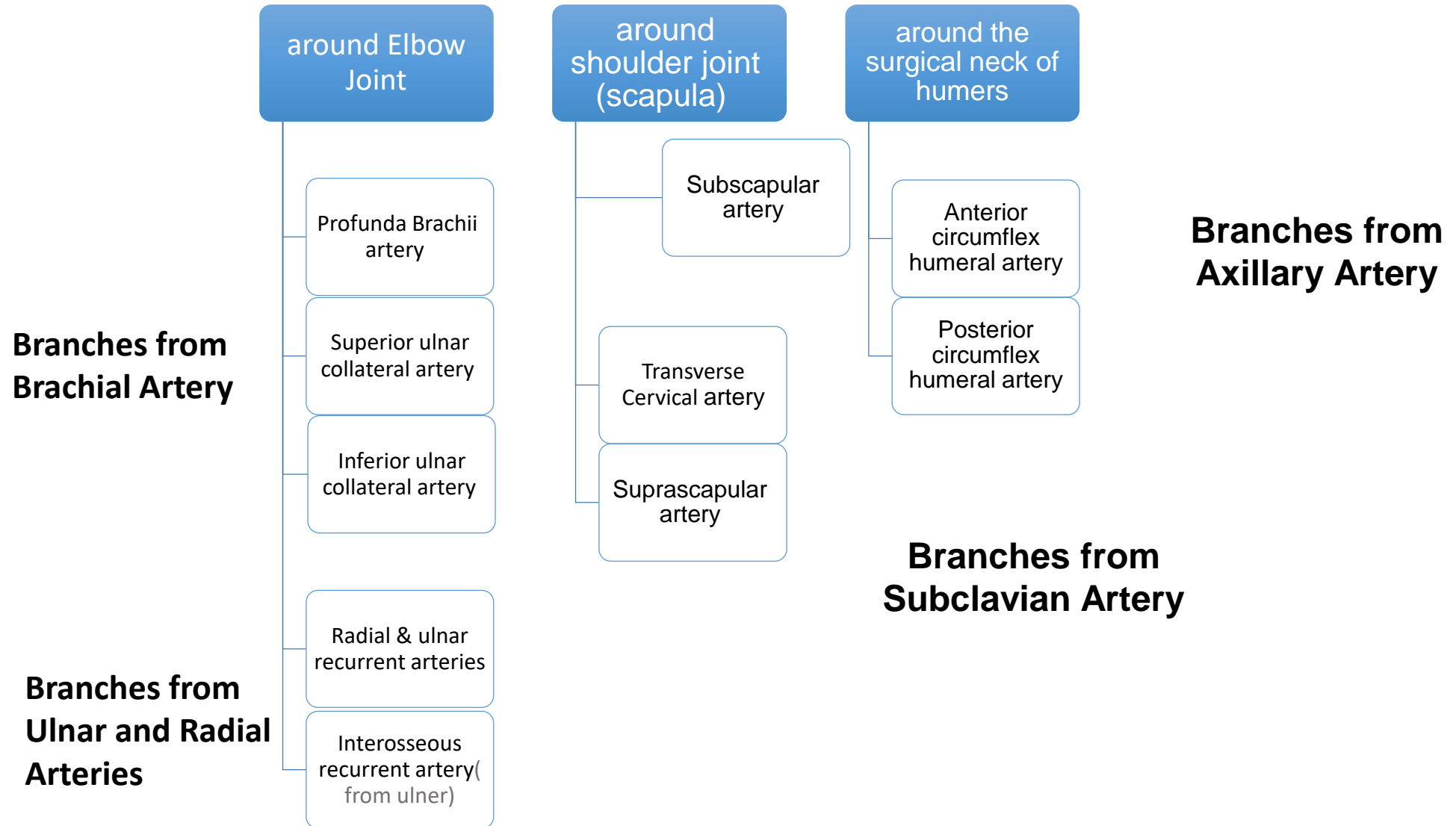
- Begins at Cubital Fossa
- Ulnar is larger than radial

# Summary

(branches)



# Summary : Anastomosis



# Questions:

1)The first part of axillary nerve is related anteriorly to:

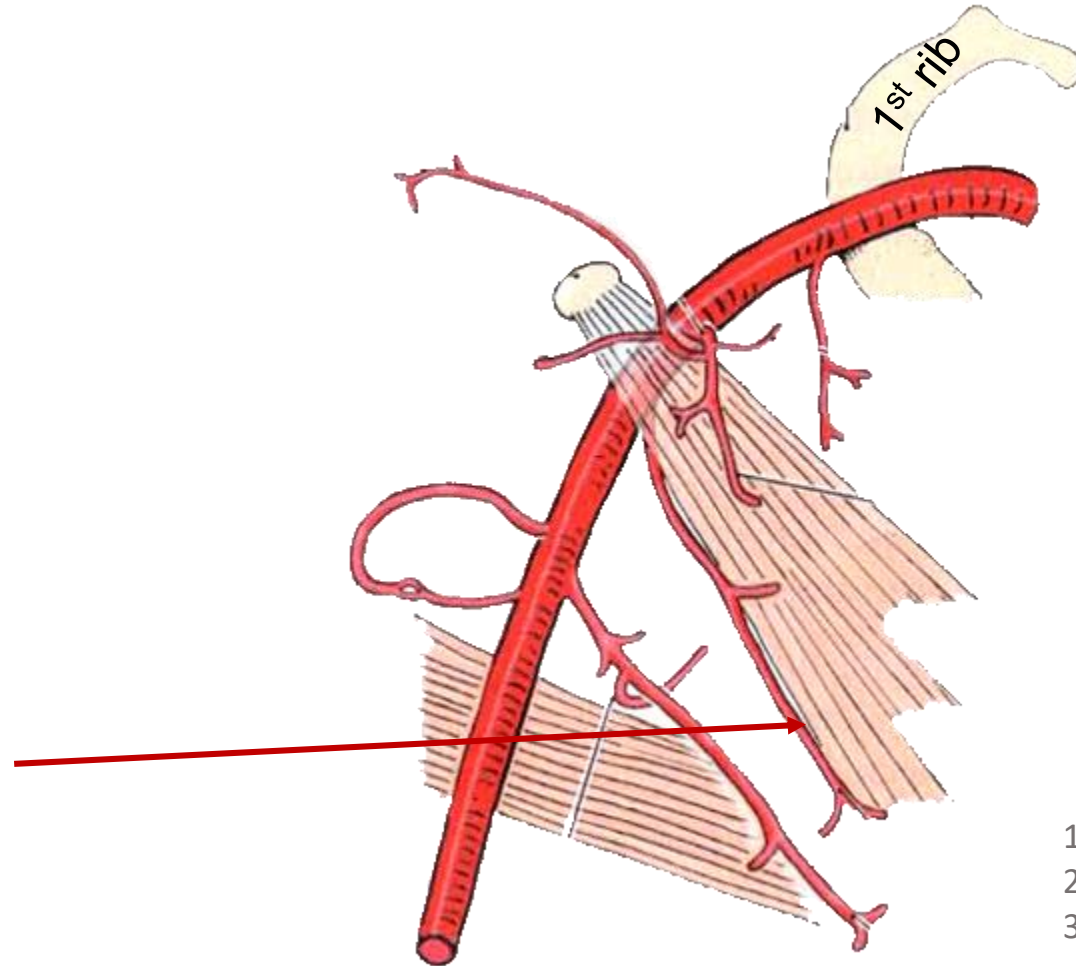
- A-pectoralis major
- B-pectoralis minor
- C-cords of brachial plexus
- D-Branches of cords of brachial plexus

2)the left subclavian artery originates from:

- A-brachial artery
- B-brachiocephalic trunk
- C-common carotid artery
- D-Arch of aorta

3)name the branch pointed on the picture:

.....



- 1)A
- 2)D
- 3) Lateral Thoracic a.

3) The anastomosis in the scapula occurs between branches of ... and ...?

4) Which of the following is a branch of subclavian artery?

A) Subscapular artery.

B) Anterior circumflex humeral artery.

C) Suprascapular artery.

5) Which of the following does not have a posterior relation with the brachial artery ?

A) Triceps.

B) Coraco-brachialis.

C) Biceps.

D) Brachialis.

6) Which of the following is not a branch of brachial artery ?

A) Ulnar artery .

B) Profunda brachii .

C) Superior ulnar collateral.

D) Inferior ulnar collateral.

7) Name two arteries of the palm?

8) What arteries are affected by Raynaud's disease ?

3) Subclavian and Axillary arteries

4) C

5) C

6) A

7) Ulnar and radial

8) Digital arteries

9) which one of the following links cephalic vein and basilic vein in the cubital fossa:

- a. Median vein
- b. Brachial vein
- c. Median cubital vein
- d. Radial vein

10) when ..... drains into ..... which unite to form the Dorsal venous network which lies on the ...:

- a. dorsal digital veins, dorsal metacarpal veins, dorsum of the foot
- b. dorsal metacarpal veins, dorsal digital veins, dorsum of the foot
- c. dorsal metacarpal veins, dorsal digital veins, dorsum of the hand
- d. dorsal digital veins, dorsal metacarpal veins, dorsum of the hand

11) Cephalic vein pierces:

- a. clavipectoral fascia
- b. deep fascia
- c. Deltopectoral groove
- d. venæ comitantes

12) it begins at the lower border of the Teres major, as the continuation of the basilic vein:

- a. Subclavian vein
- b. Axillary vein
- c. Subclavian artery
- d. Axillary artery

13) The Basilic vein is the vein of choice for central venous catheterization. Why?

9) C

10) D

11) A

12) B

13) **Because:** from the cubital fossa until reaching the axillary vein: 1- It increases in diameter. 2- lies in direct line with the axillary vein.





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