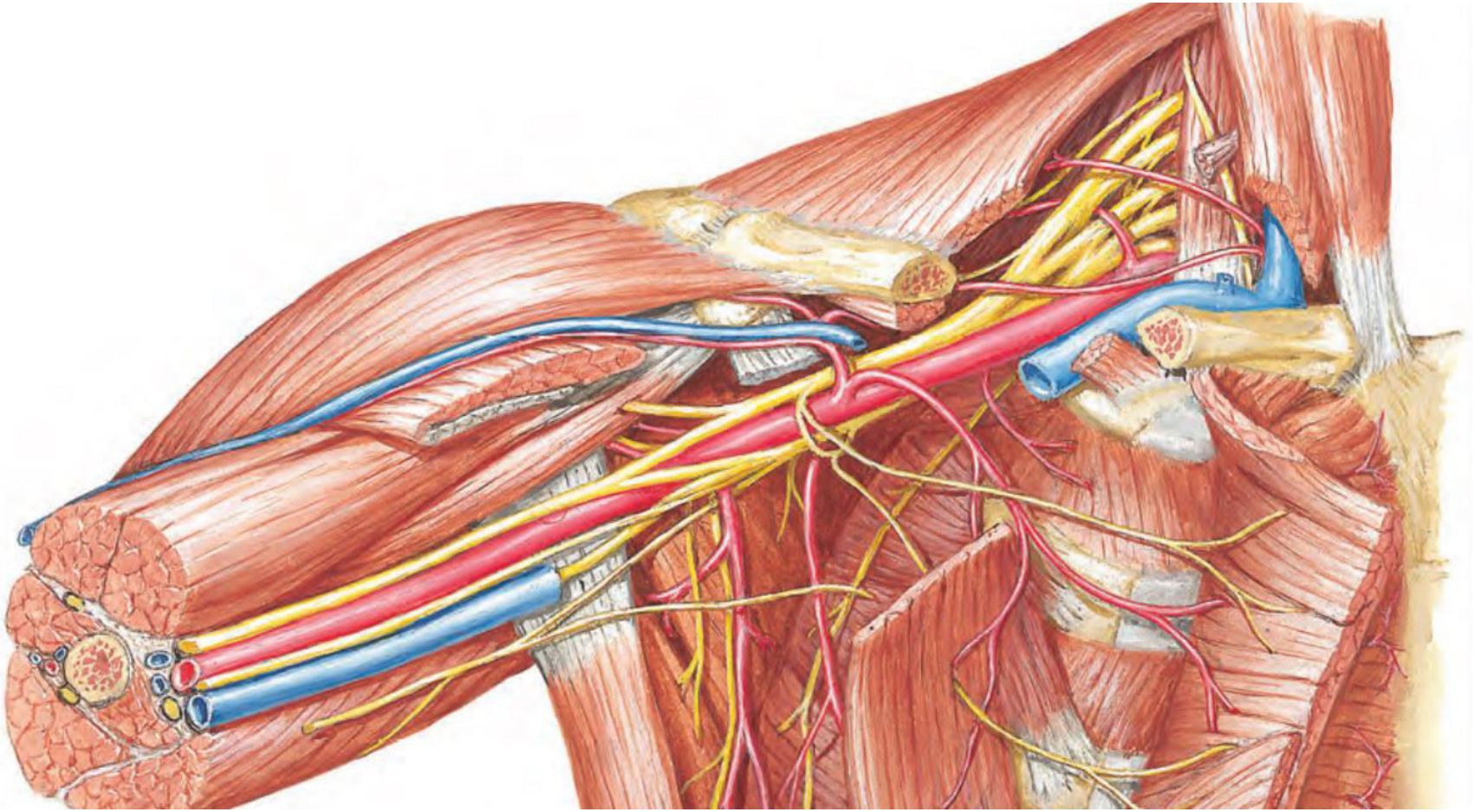

AXILLA & BRACHIAL PLEXUS

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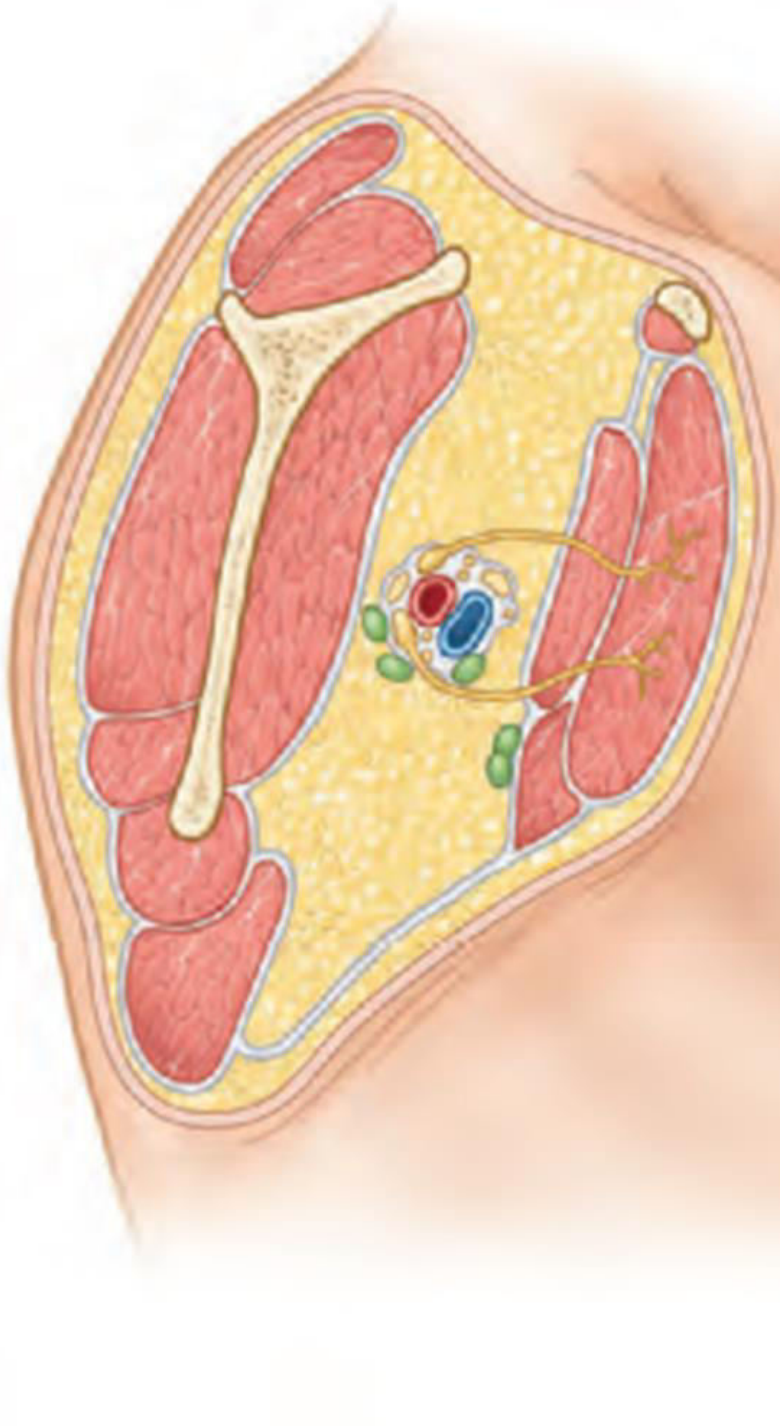
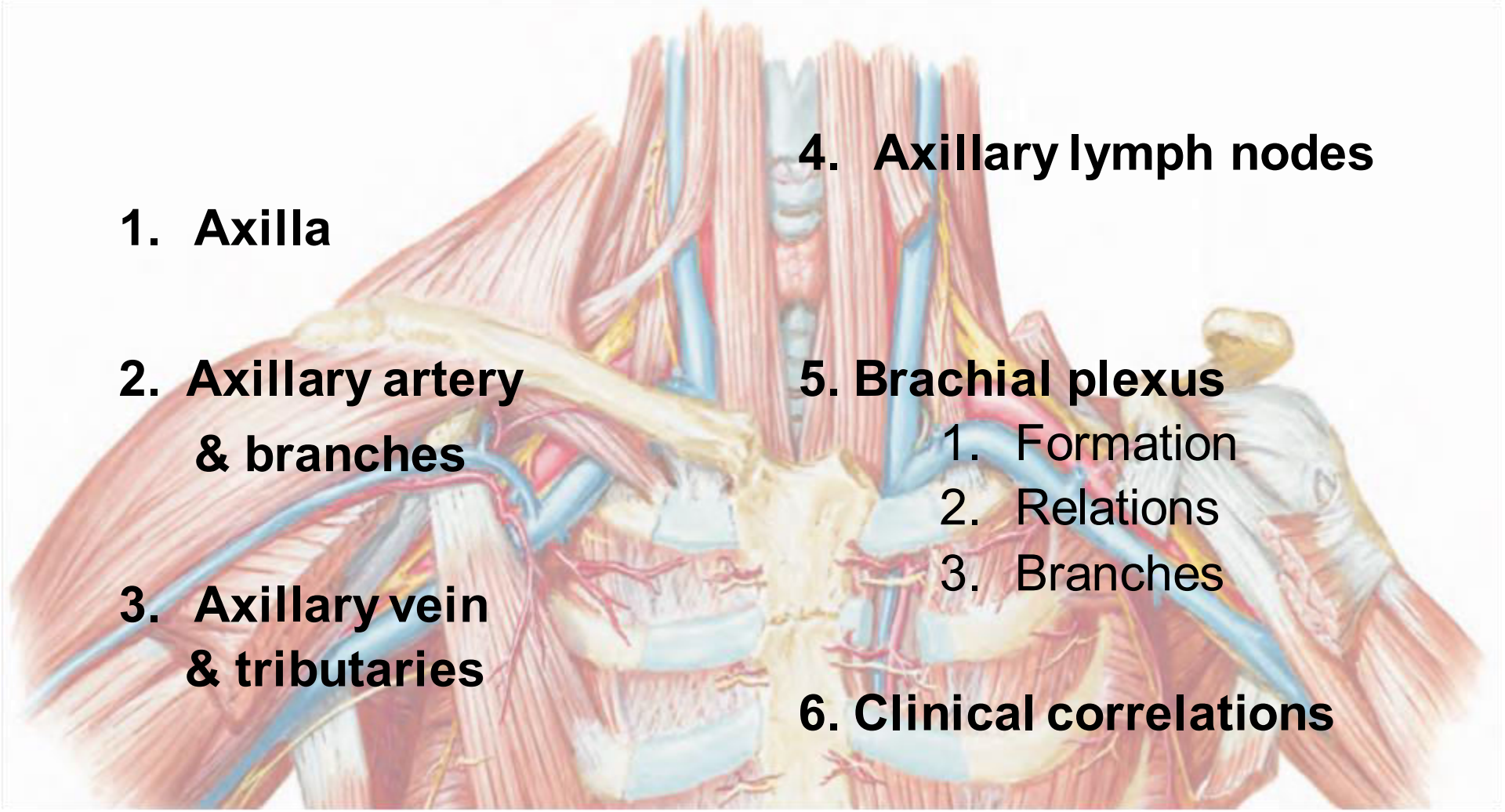
LEARNING OUTCOMES

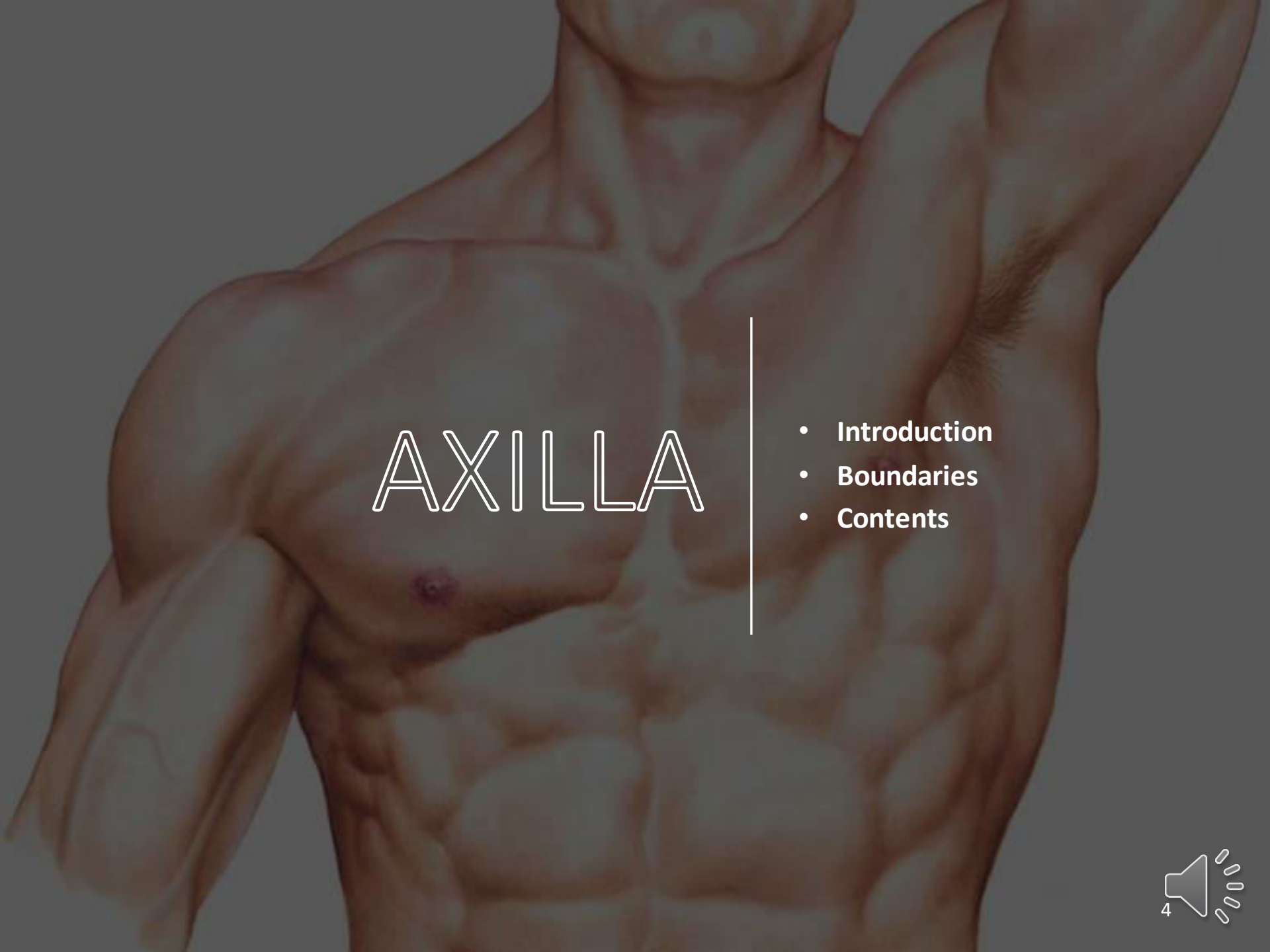
1. Describe the boundaries and contents of the axilla
2. Describe the axillary artery and its branches
3. Describe the axillary vein
4. Describe the axillary lymph nodes and applied anatomy
5. Describe formation, branches and applied anatomy of brachial plexus
6. Describe the course, important relations, motor distribution and sensory distribution and of
    i. Axillary nerve
    ii. Radial nerve
    iii. Musculocutaneous nerve
    iv. Ulnar nerve
    v. Median nerve



OUTLINE



1. **Axilla**
2. **Axillary artery & branches**
3. **Axillary vein & tributaries**
4. **Axillary lymph nodes**
5. **Brachial plexus**
   1. Formation
   2. Relations
   3. Branches
6. **Clinical correlations**



AXILLA

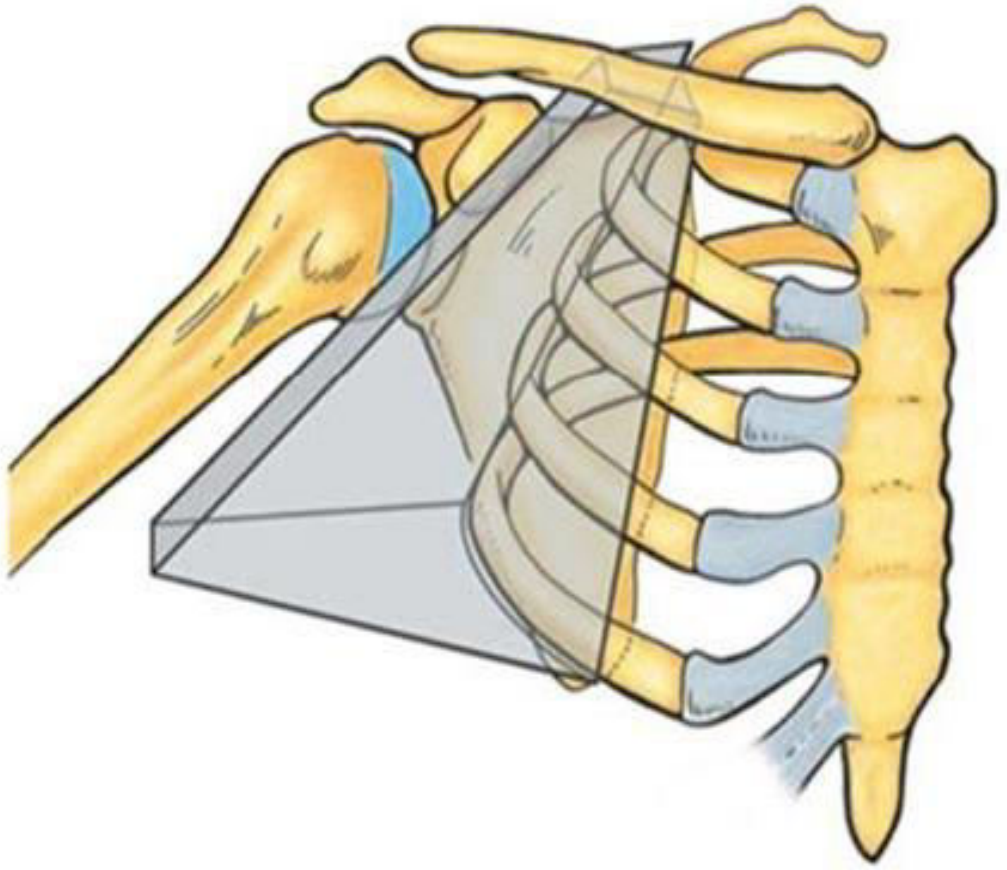
- **Introduction**
- **Boundaries**
- **Contents**

1. What is axilla?
2. What are the muscles that form anterior & posterior axillary folds?
3. Describe the boundaries of the axilla
4. Describe the contents of the axilla

What is axilla ?

Pyramidal-shaped space between the upper part of the arm and the side of the chest

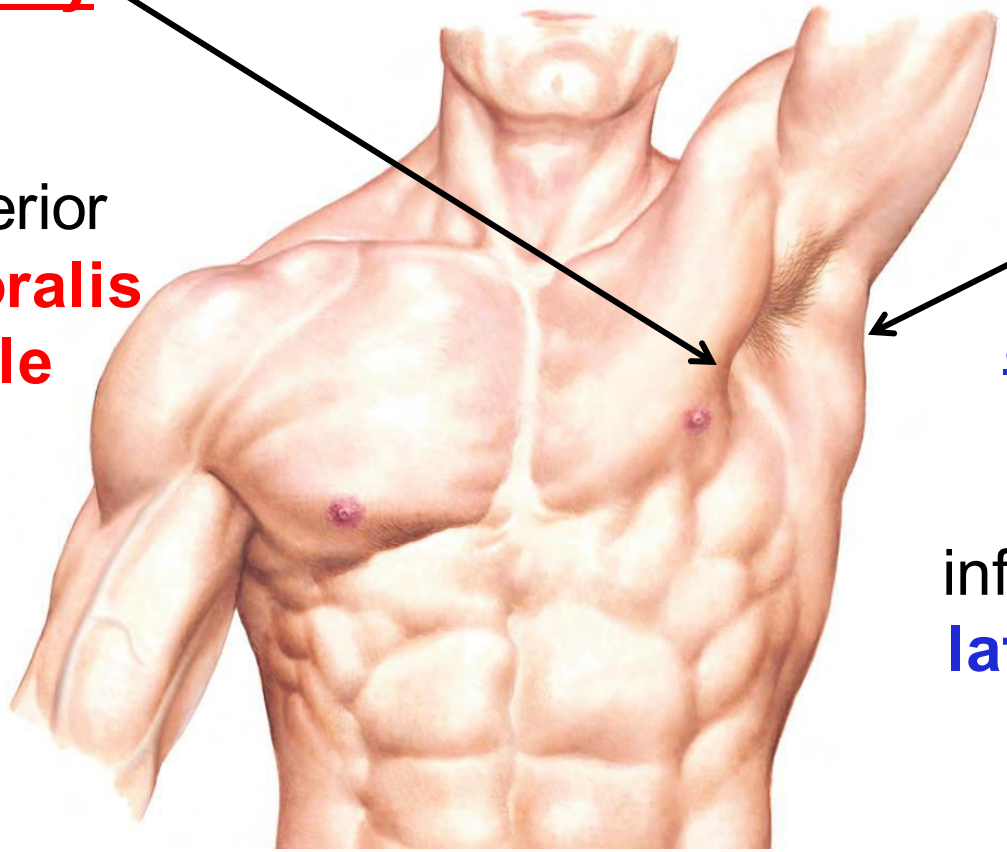
It is a passageway by which neurovascular and muscular structures can enter and leave the upper limb.



What are the muscles that form anterior & posterior axillary folds?

Anterior axillary fold

Formed by inferior margin of **pectoralis major muscle**

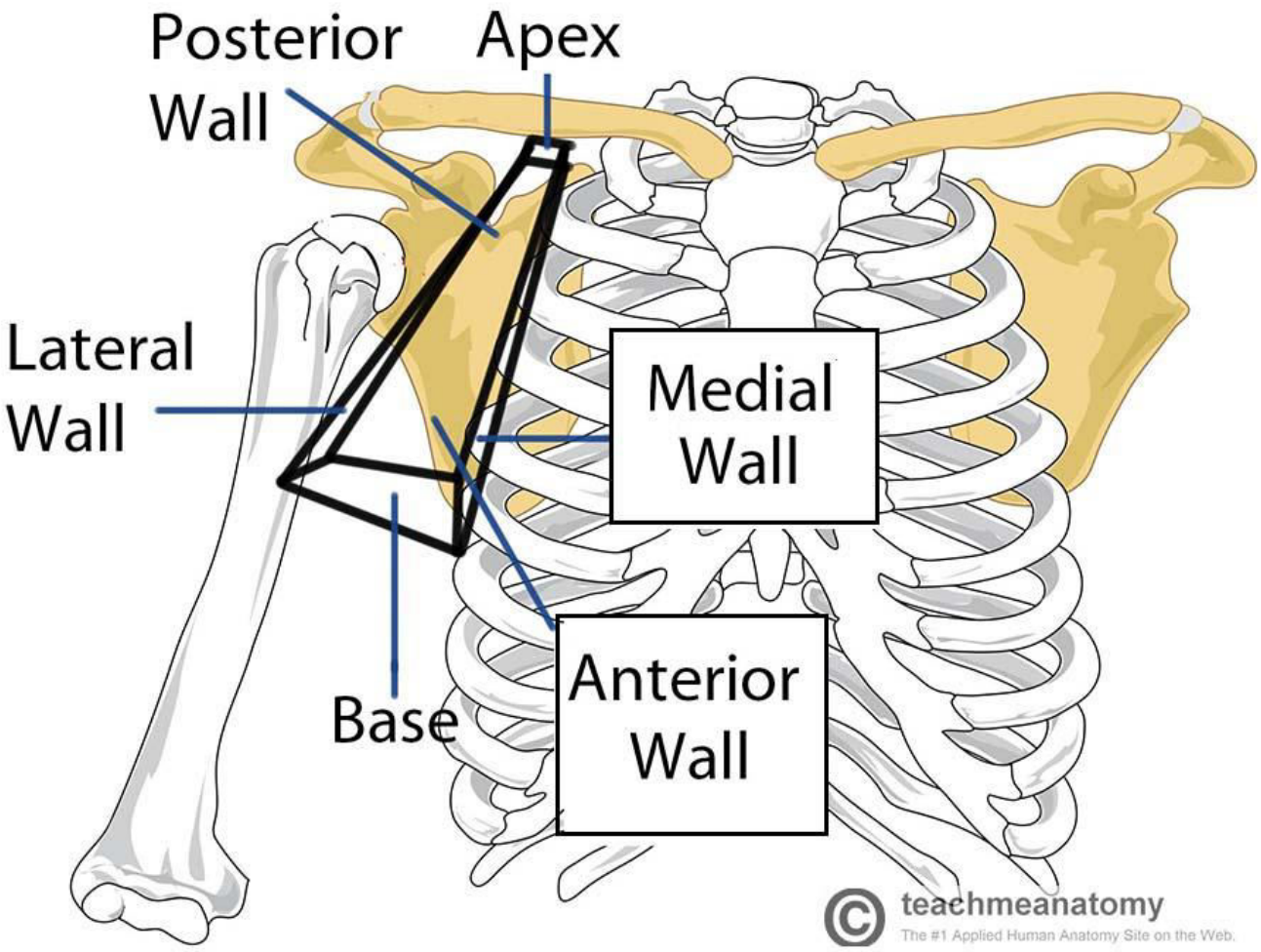


Posterior axillary fold

Formed by inferior margin of **lattisimus dorsi muscle**

Describe the boundaries of the axilla

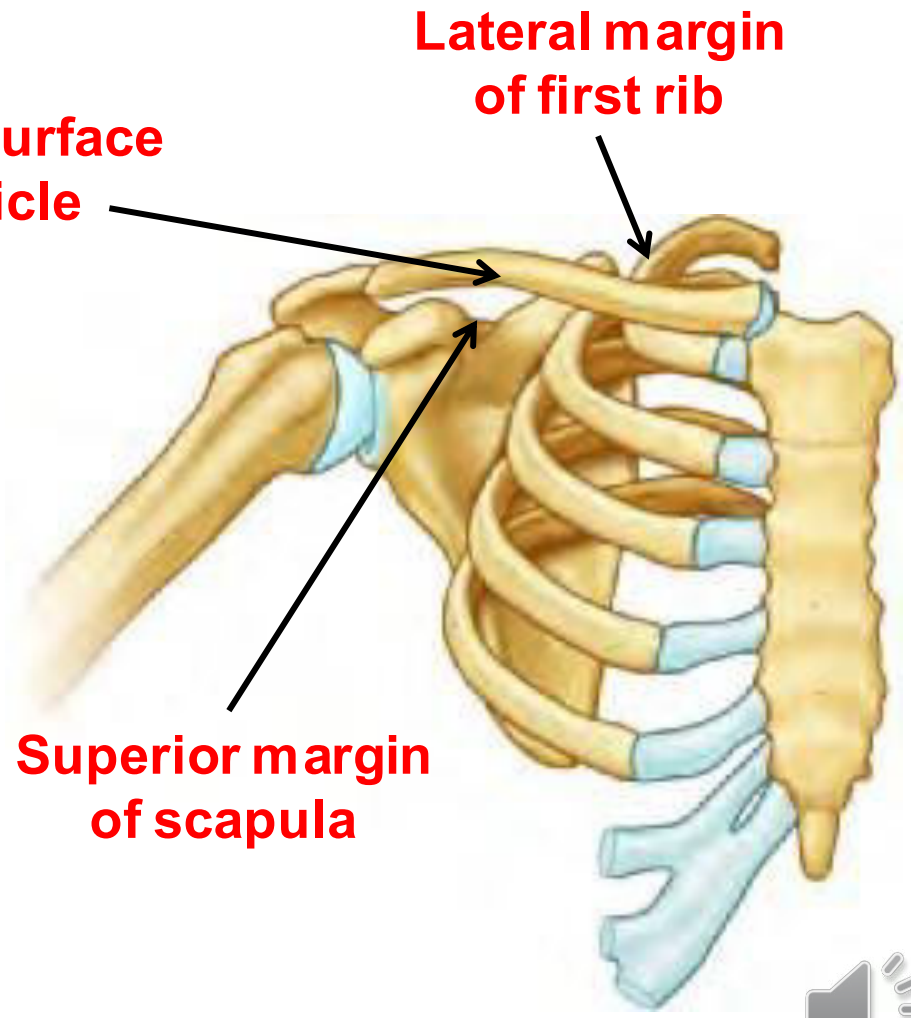
- Truncated pyramidal space



(i) Apex (cervicoaxillary canal)

Formed by :

1. Lateral margin of 1st rib
2. Posterior surface of clavicle
3. Superior margin of scapula

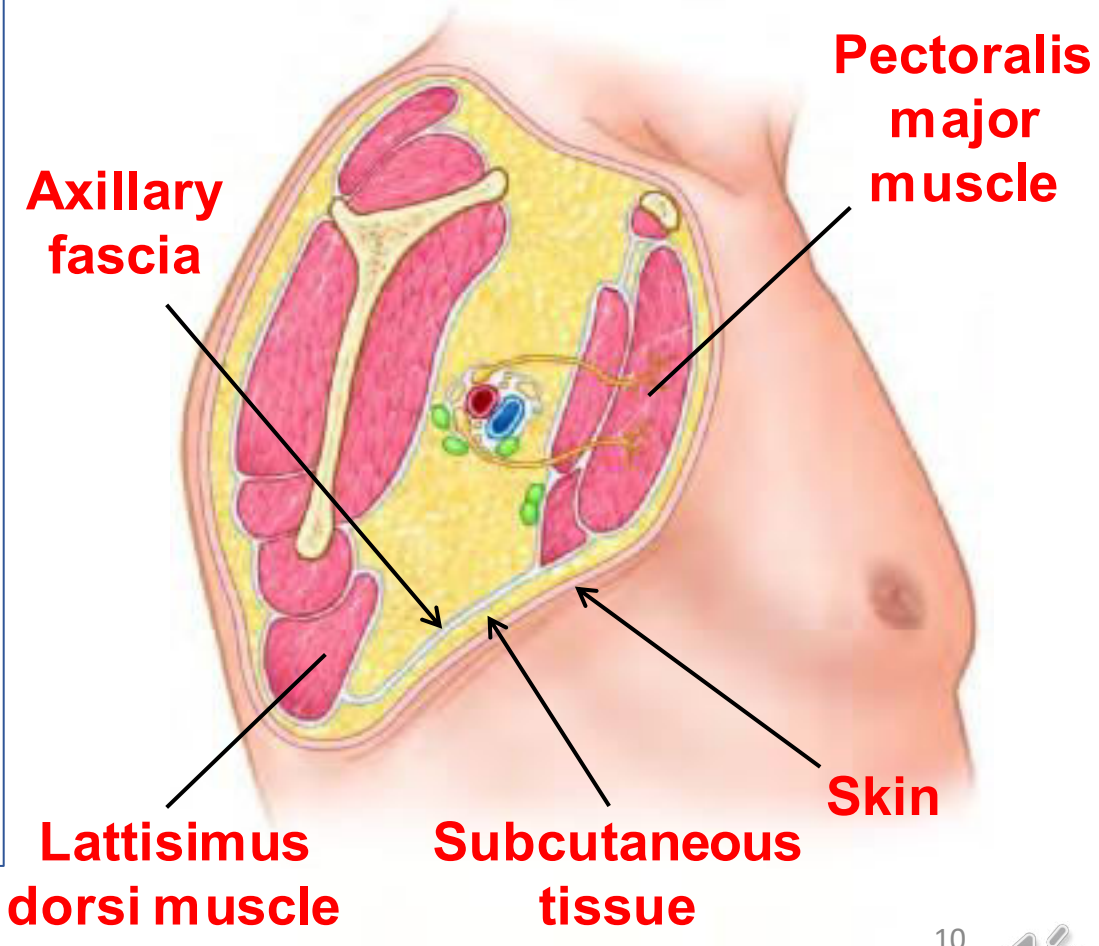


(ii) Floor (base)

Formed by :

1. Skin
2. Subcutaneous tissue
3. Axillary fascia

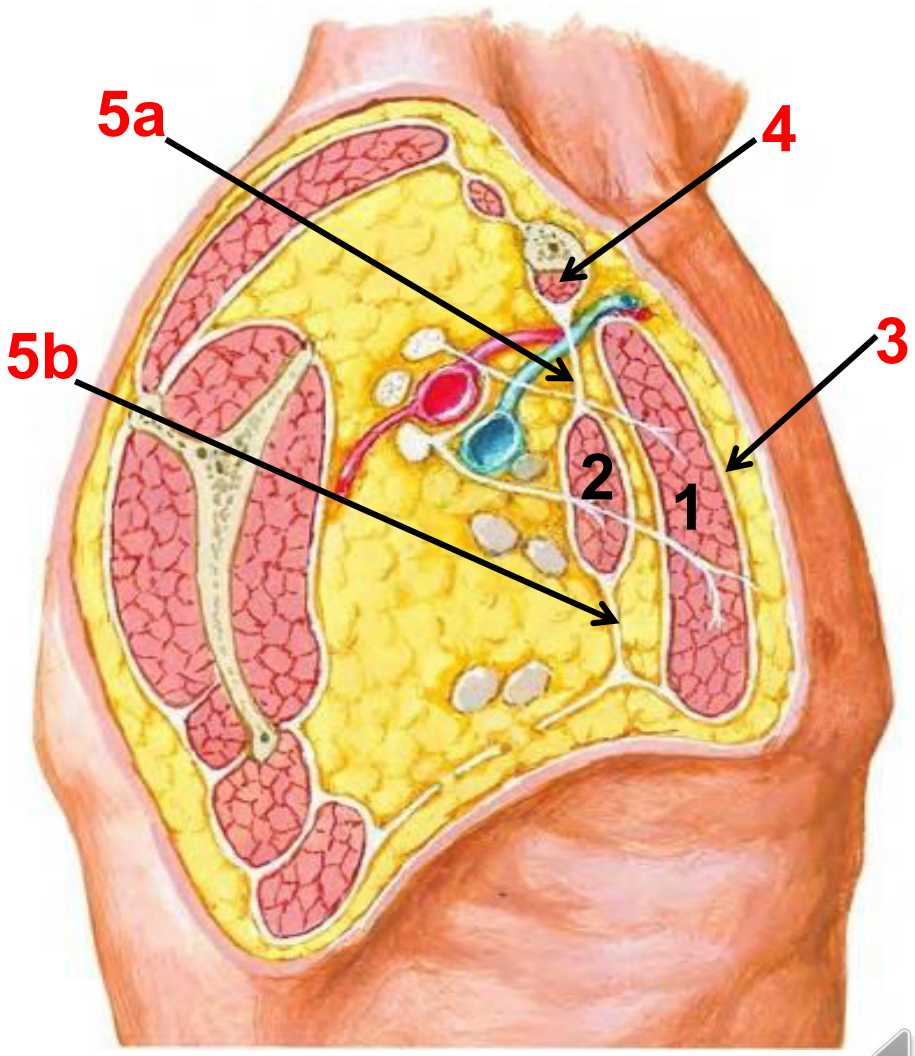
   - Fascia extending from lower edge of lattisimus dorsi to pectoralis major muscle



(iii) Anterior wall

Formed by :

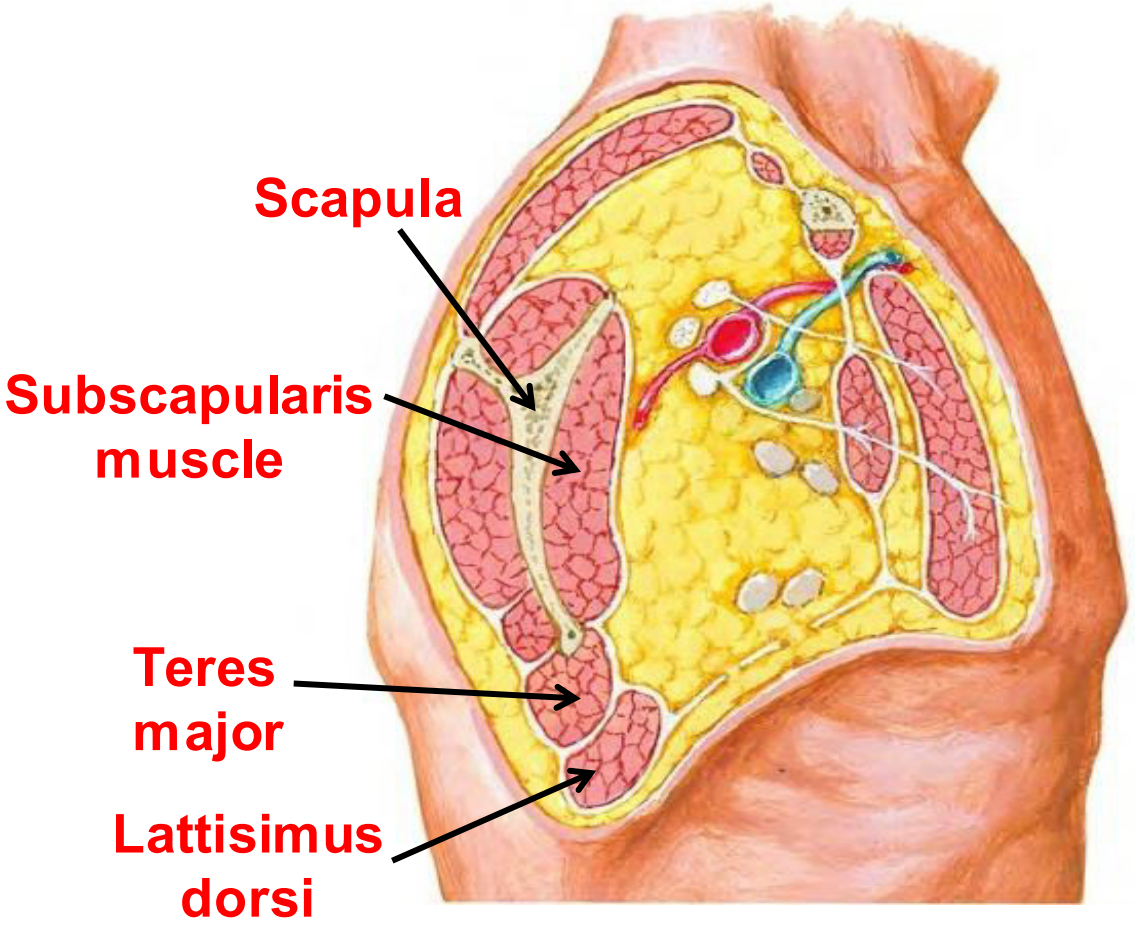
1. Pectoralis major
2. Pectoralis minor
3. Pectoral fascia
4. Subclavius muscle
5. Clavipectoral fascia
   a. Costocoracoid ligament
   b. Suspensory ligament of axilla



(iv) Posterior wall

Formed by :

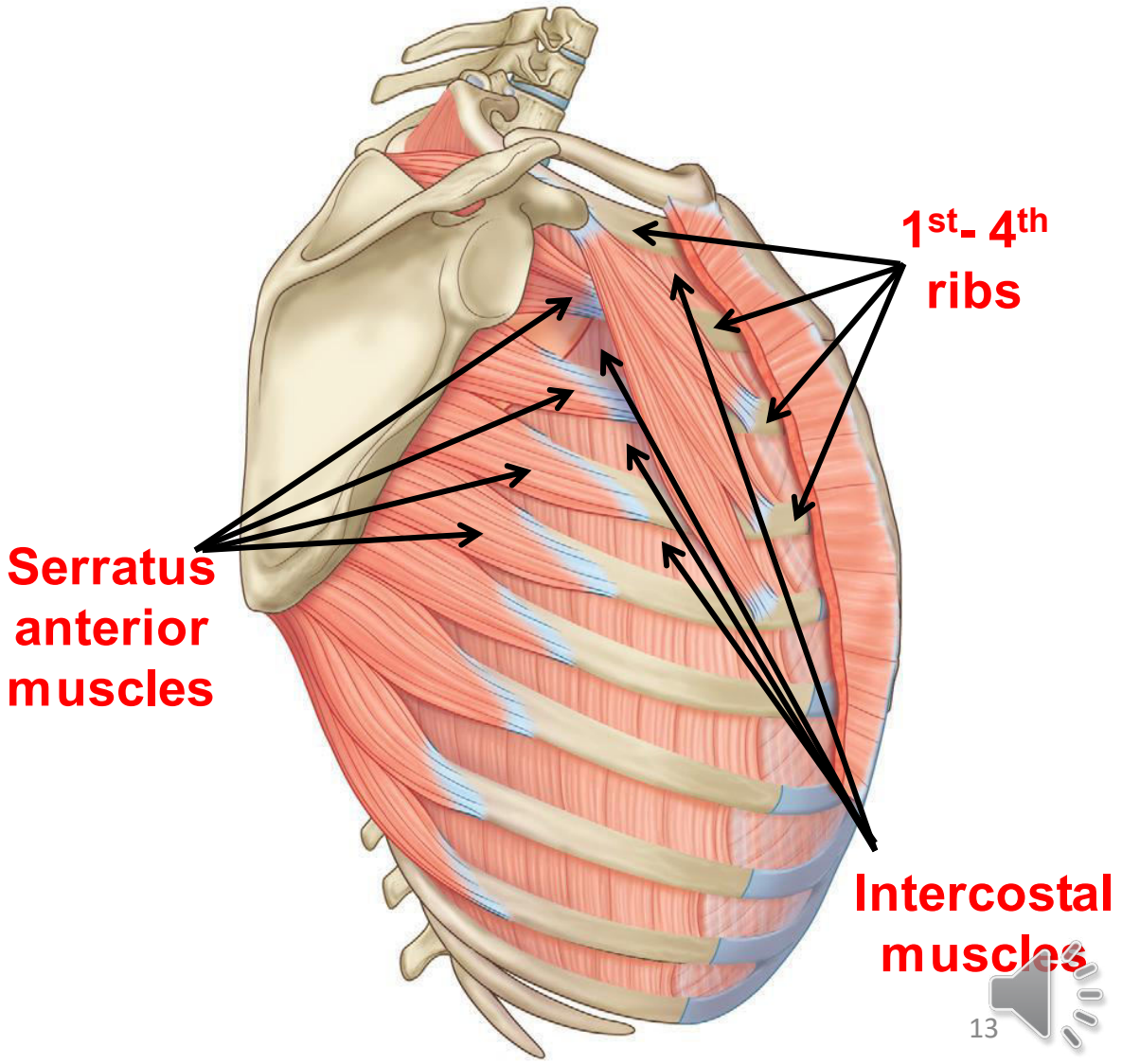
1. Scapula
2. Subscapularis muscle
3. Teres major
4. Lattisimus dorsi



(v) Medial wall

Formed by :

1. Upper 4 ribs with their intercostal muscles
2. Upper part of Serratus anterior



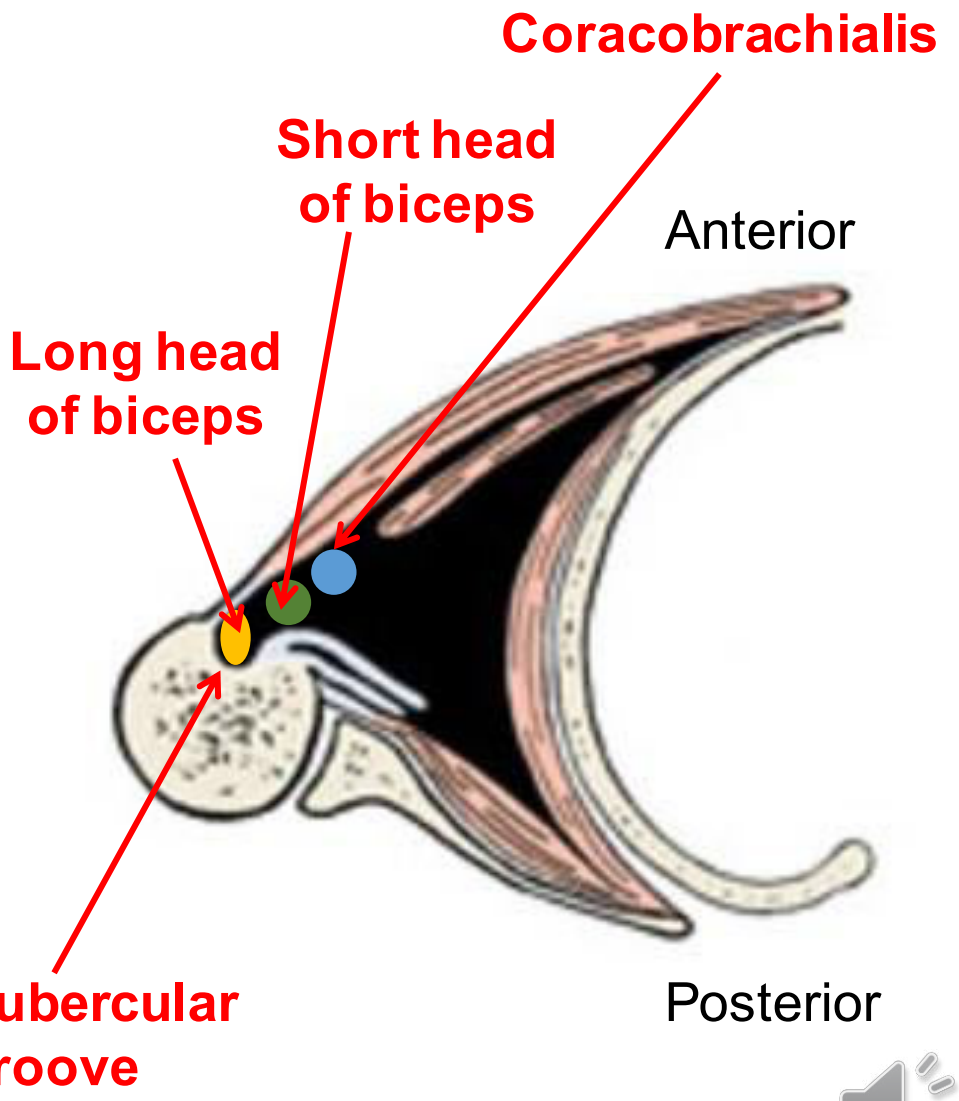
(vi) Lateral wall

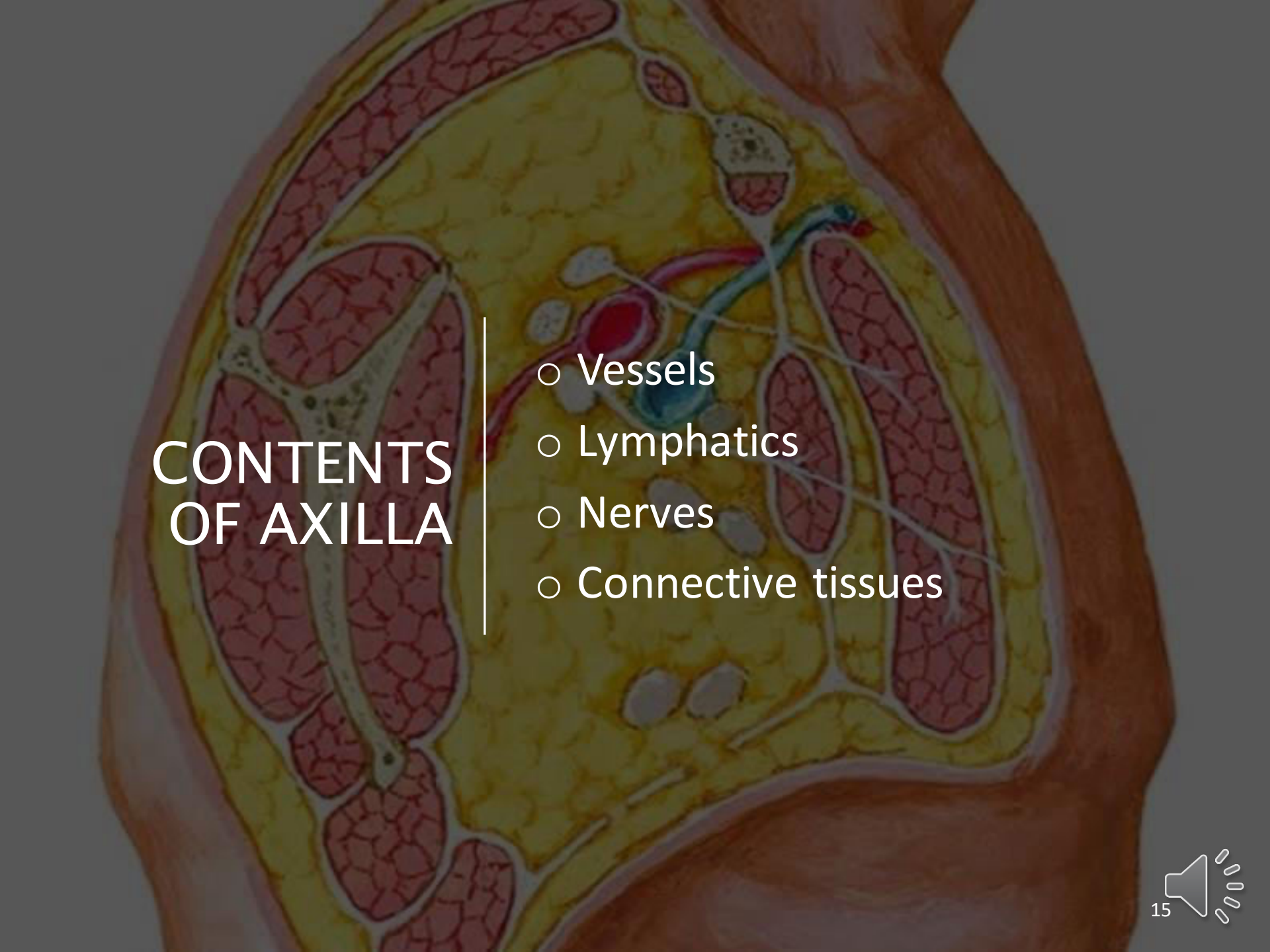
Formed by :

1. Intertubercular groove of humerus

2. Biceps brachii muscles (short & long head)

3. Coracobrachialis

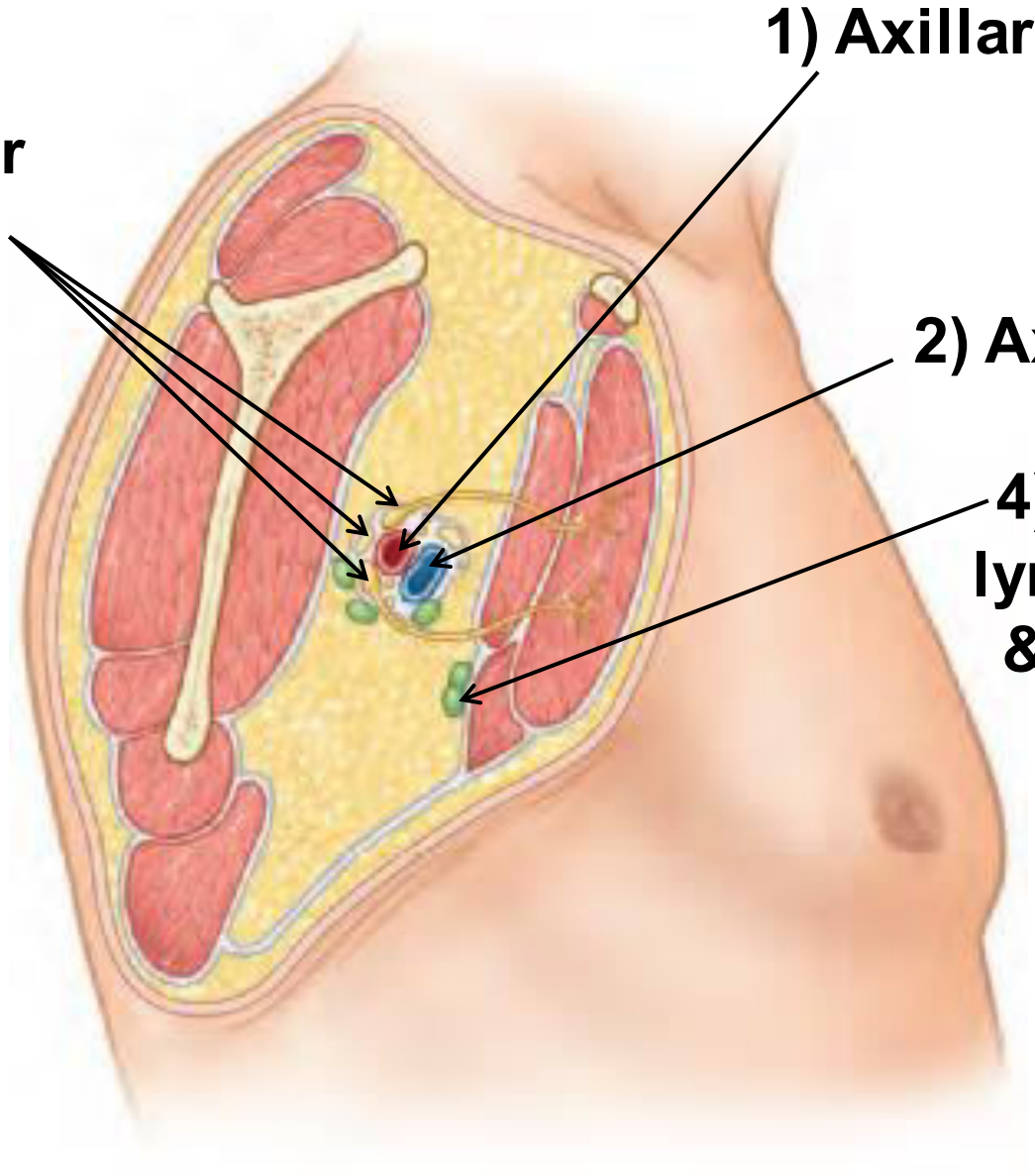




CONTENTS OF AXILLA

- Vessels
- Lymphatics
- Nerves
- Connective tissues

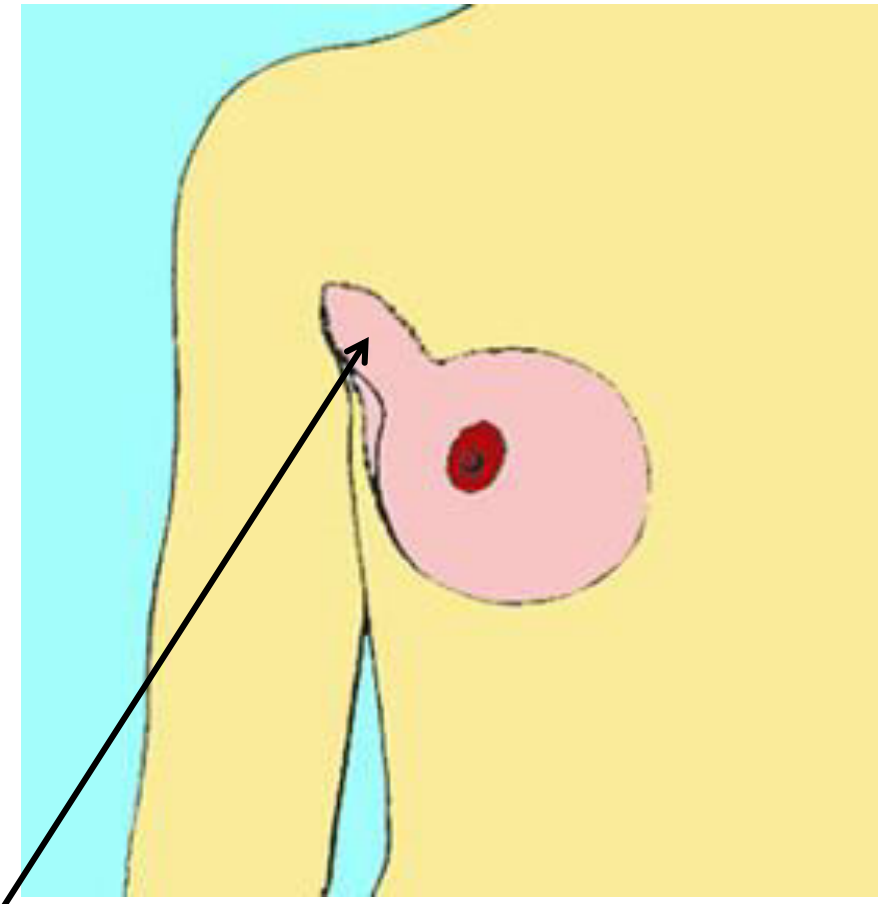
(i) Vessels



The neurovascular bundle is enclosed in connective tissue sheath – **Axillary sheath**

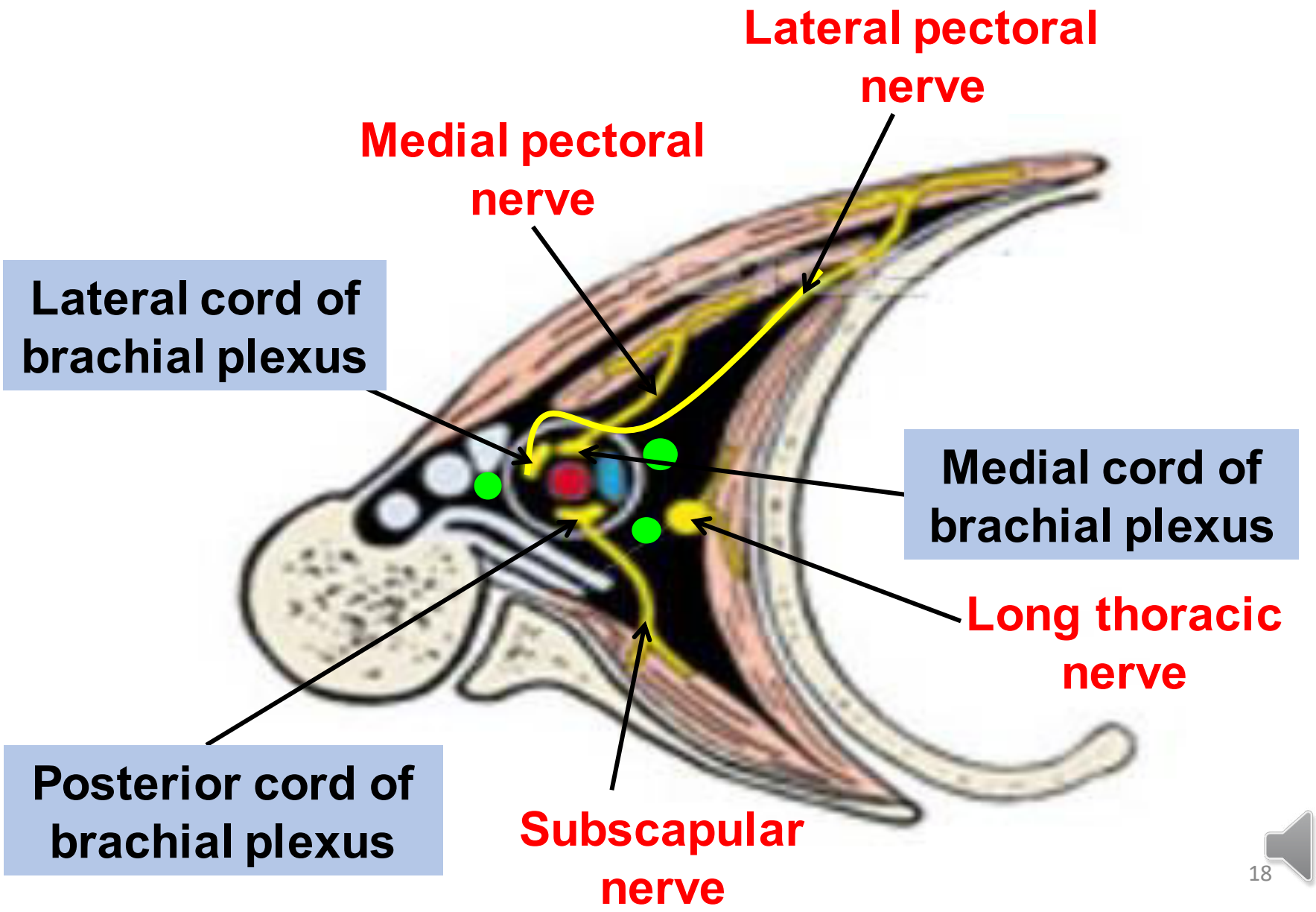
(iii) Connective tissue

1. Axillary sheath
2. Axillary tail of Spence
3. Loose areolar connective tissue

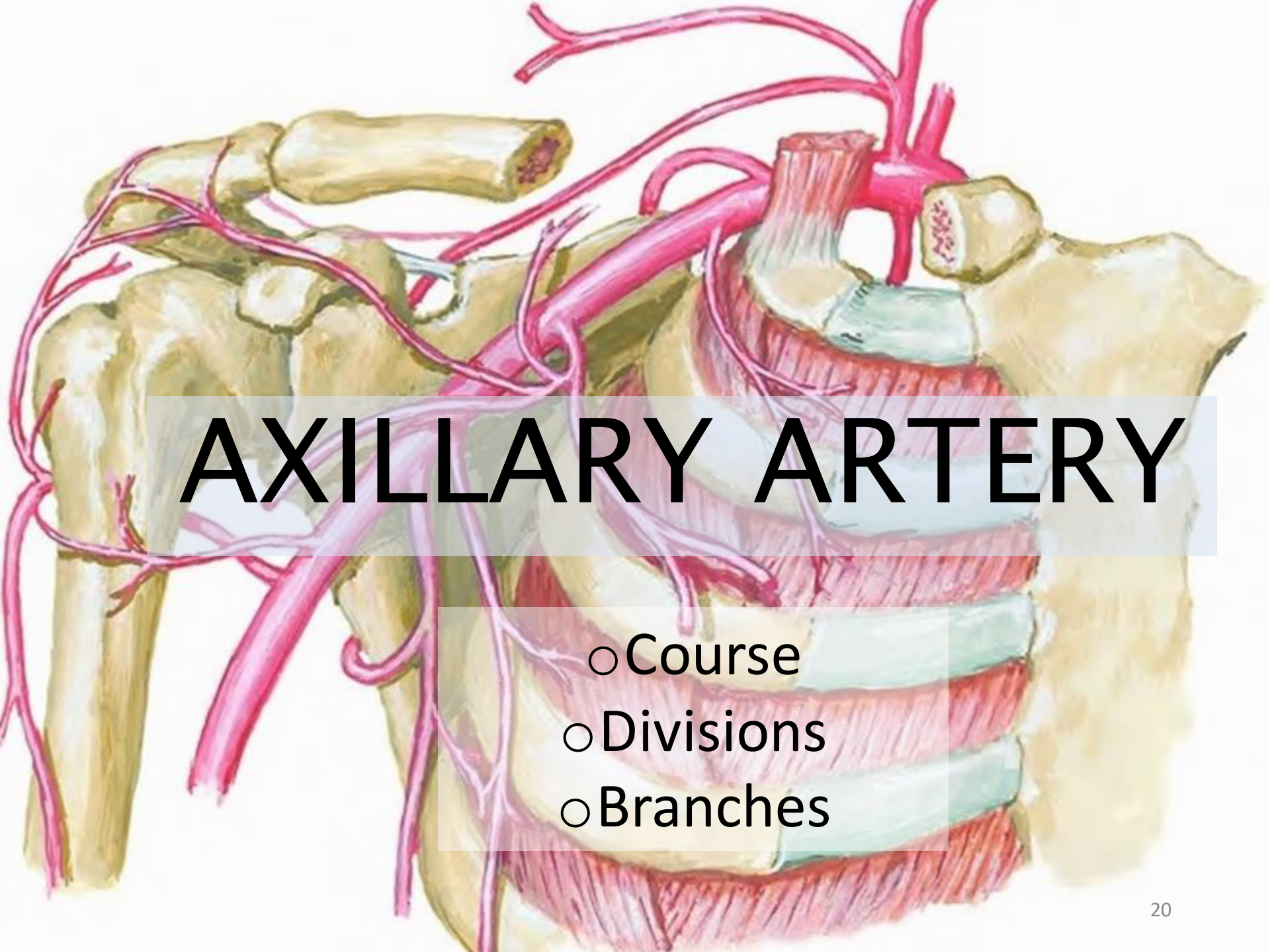


Axillary tail of Spence

(ii) Nerves


Lateral pectoral nerve
Medial pectoral nerve
Lateral cord of brachial plexus
Medial cord of brachial plexus
Long thoracic nerve
Posterior cord of brachial plexus
Subscapular nerve


Kahoot!



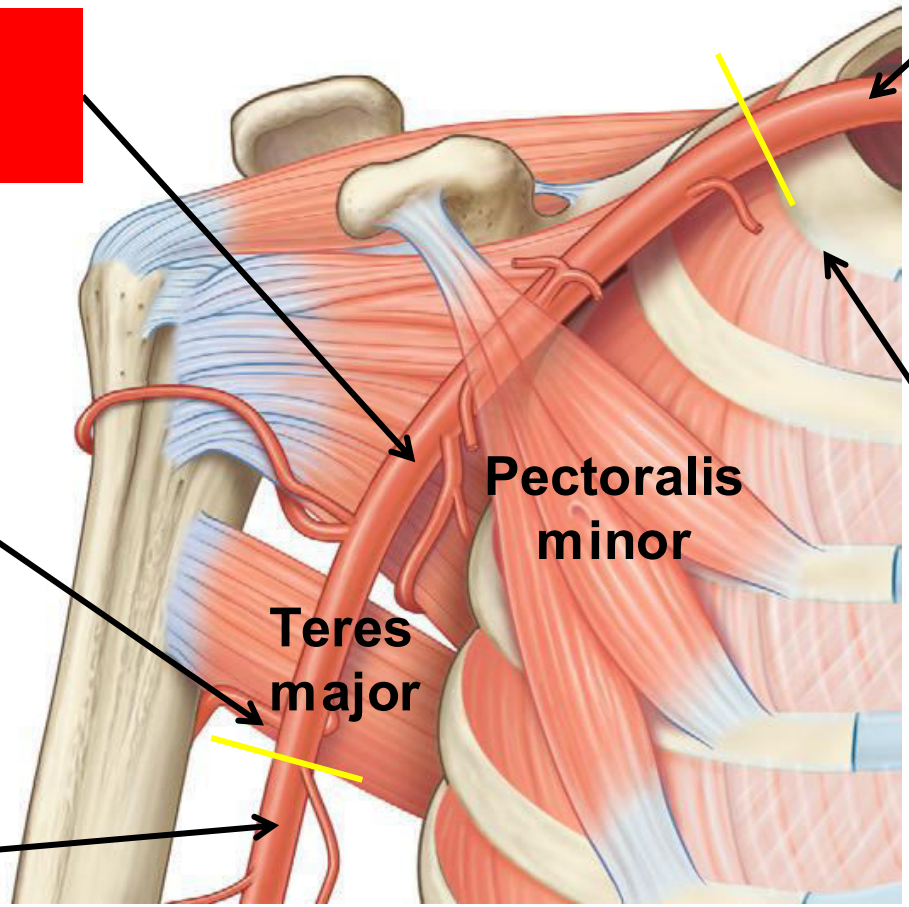
AXILLARY ARTERY

- Course
- Divisions
- Branches

AXILLARY ARTERY : COURSE

Subclavian artery

Axillary artery



ENDS : Inferior border of teres major muscle

BEGINS : lateral border of 1st rib

Brachial artery

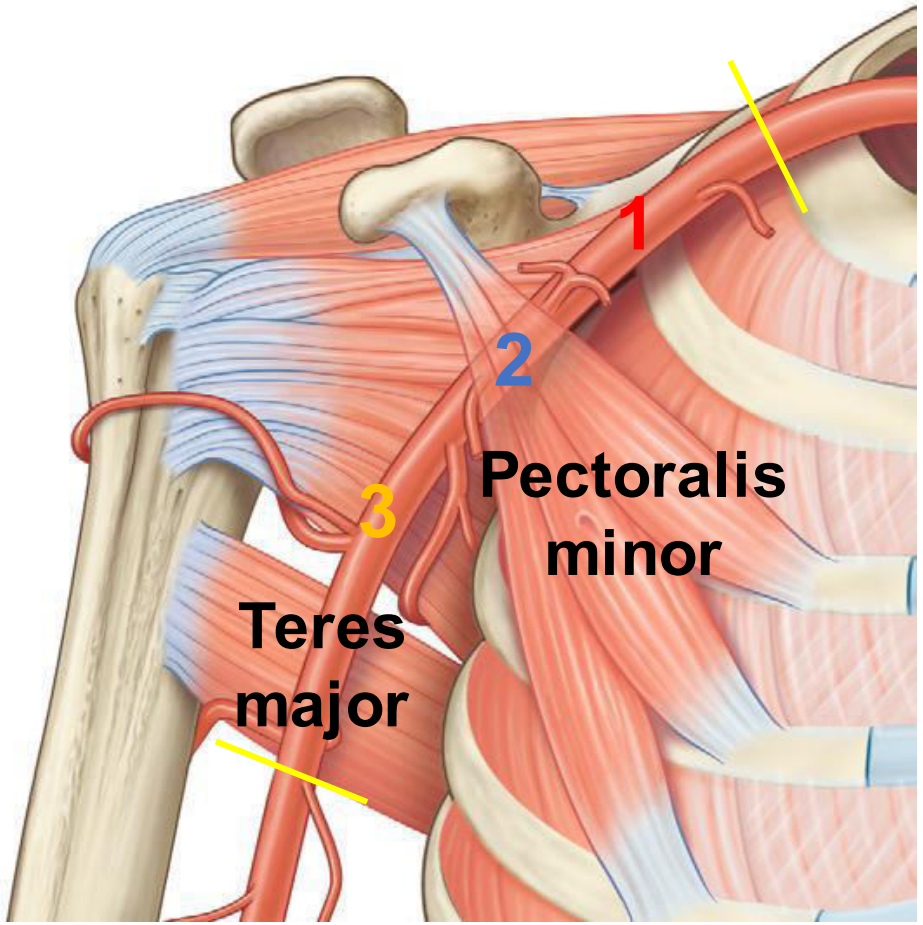
AXILLARY ARTERY : COURSE

- Begins at the lateral border of the 1st rib as the continuation of the subclavian artery
- It passes posterior to the pectoralis minor into the arm
- Ends at inferior border of the teres major and becomes the brachial artery

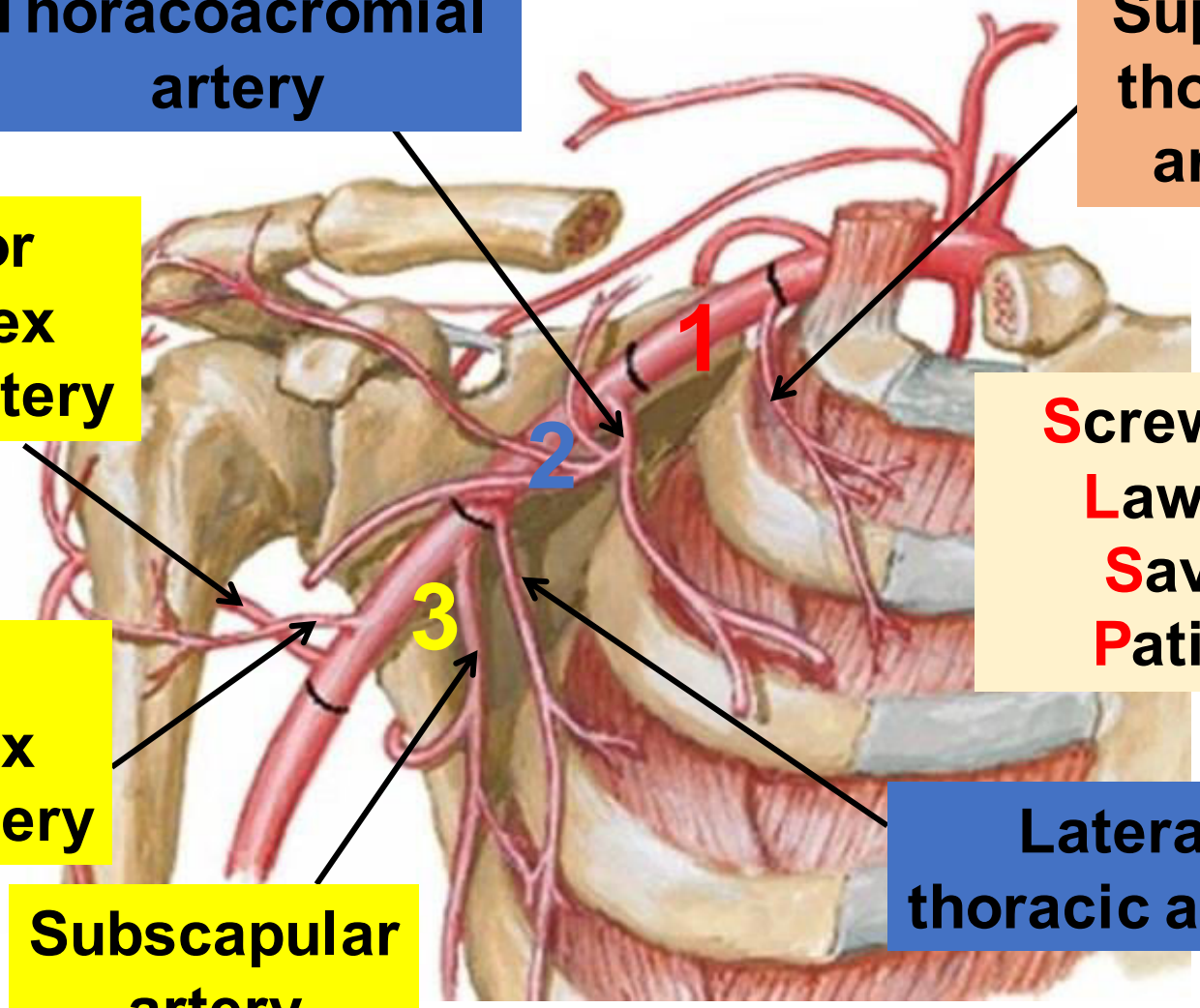
AXILLARY ARTERY : DIVISION

Axillary artery is divided into three parts by the pectoralis minor muscle

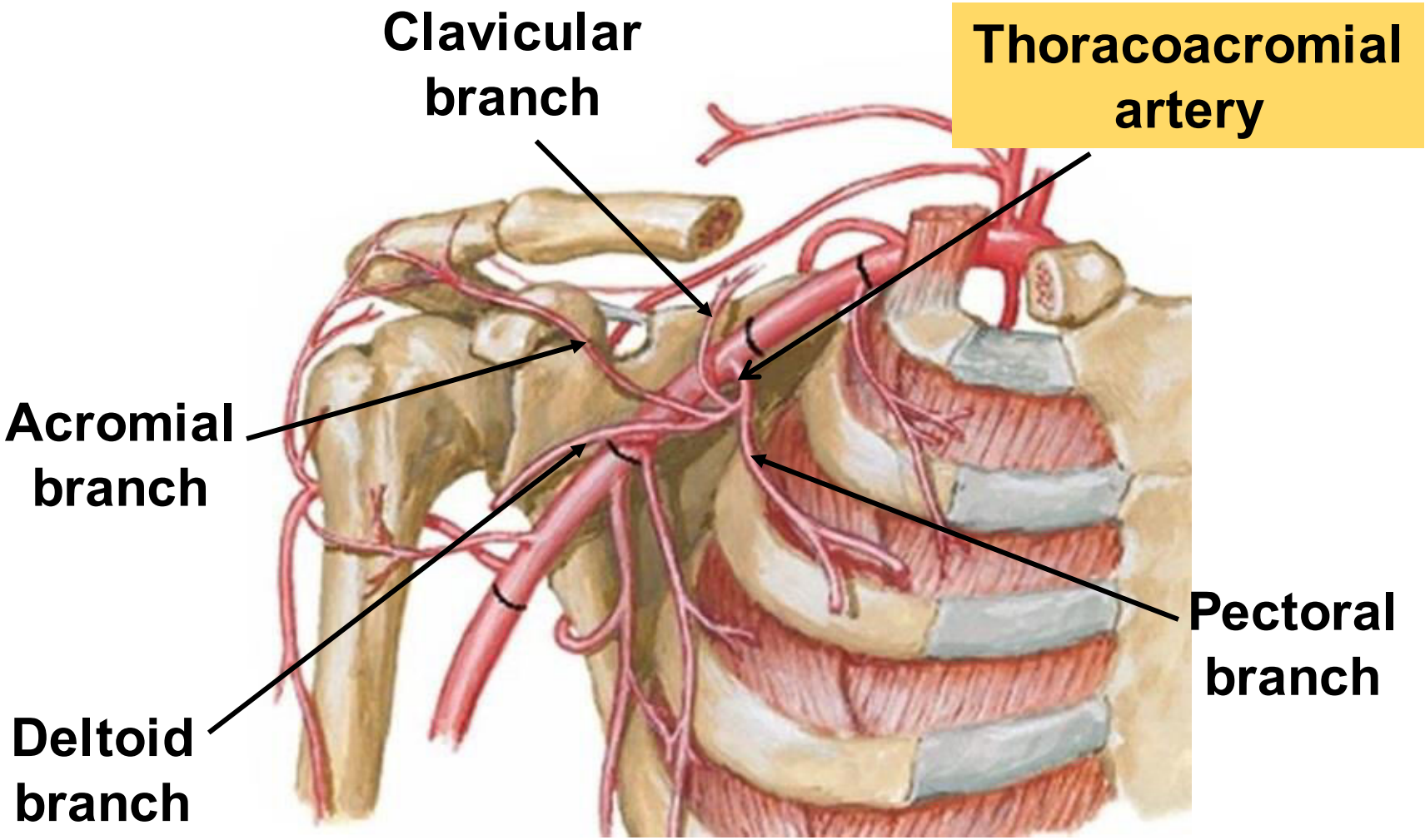
- **1st part**
  - Proximal to the muscle
- **2nd part**
  - Deep to the muscle
- **3rd part**
  - Distal to the muscle



AXILLARY ARTERY : BRANCHES



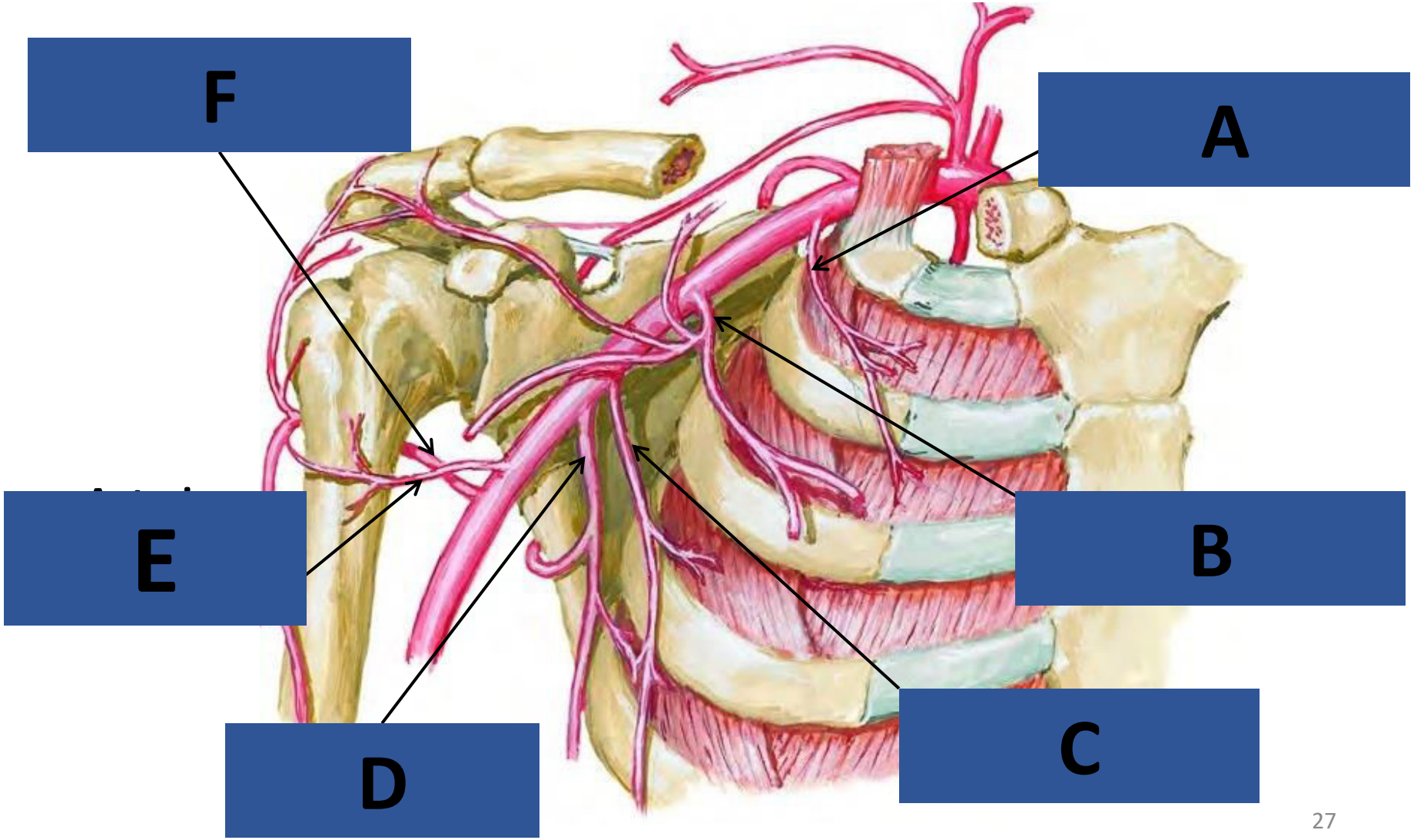
AXILLARY ARTERY : BRANCHES OF THORACOACROMIAL ARTERY

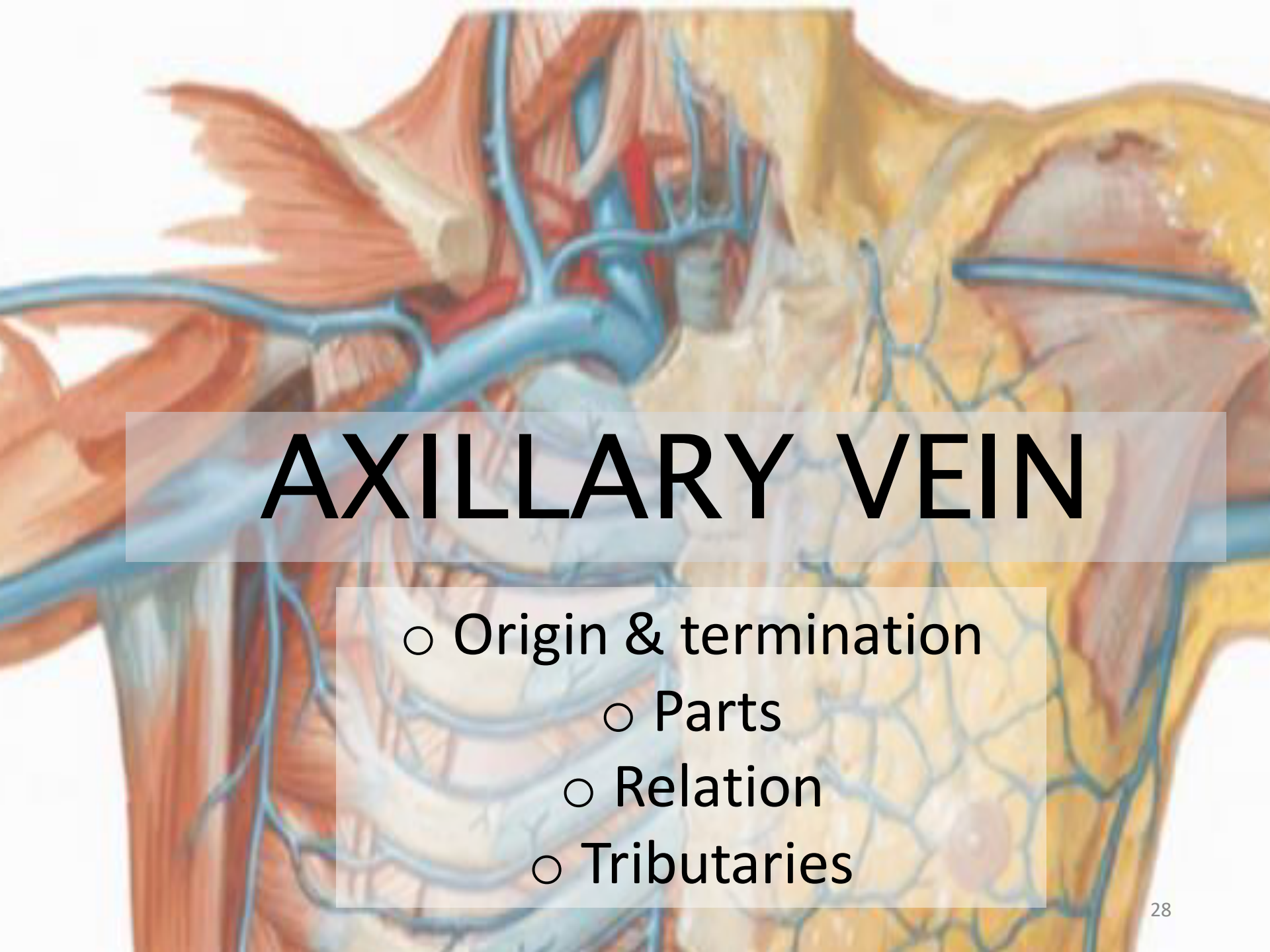


AXILLARY ARTERY : BRANCHES

ARTERY	ORIGIN	COURSE	SUPPLY
Superior thoracic	First part	Runs anteromedially along superior border of pectoralis minor, then passes between it and pectoralis major to thoracic wall	
Thoraco-acromial	Second part	Curls around superomedial border of pectoralis minor, pierces costocoracoid membrane (clavipectoral fascia) and divides into 4 branches (pectoral, deltoid, acromial and clavicular)	
Lateral thoracic		Descends along axillary border of pectoralis minor , follows it onto thoracic wall	
Circumflex humeral (anterior & posterior)	Third part	Encircle surgical neck of humerus, anastomosing with each other laterally Larger posterior branch traverses quadrangular space	
Subscapular		Descends from level of inferior border of subscapularis along lateral border of scapula Divides into 2 terminal branches ; circumflex scapular & thoracodorsal arteries	

QUIZ : NAME THE LABELLED STRUCTURE





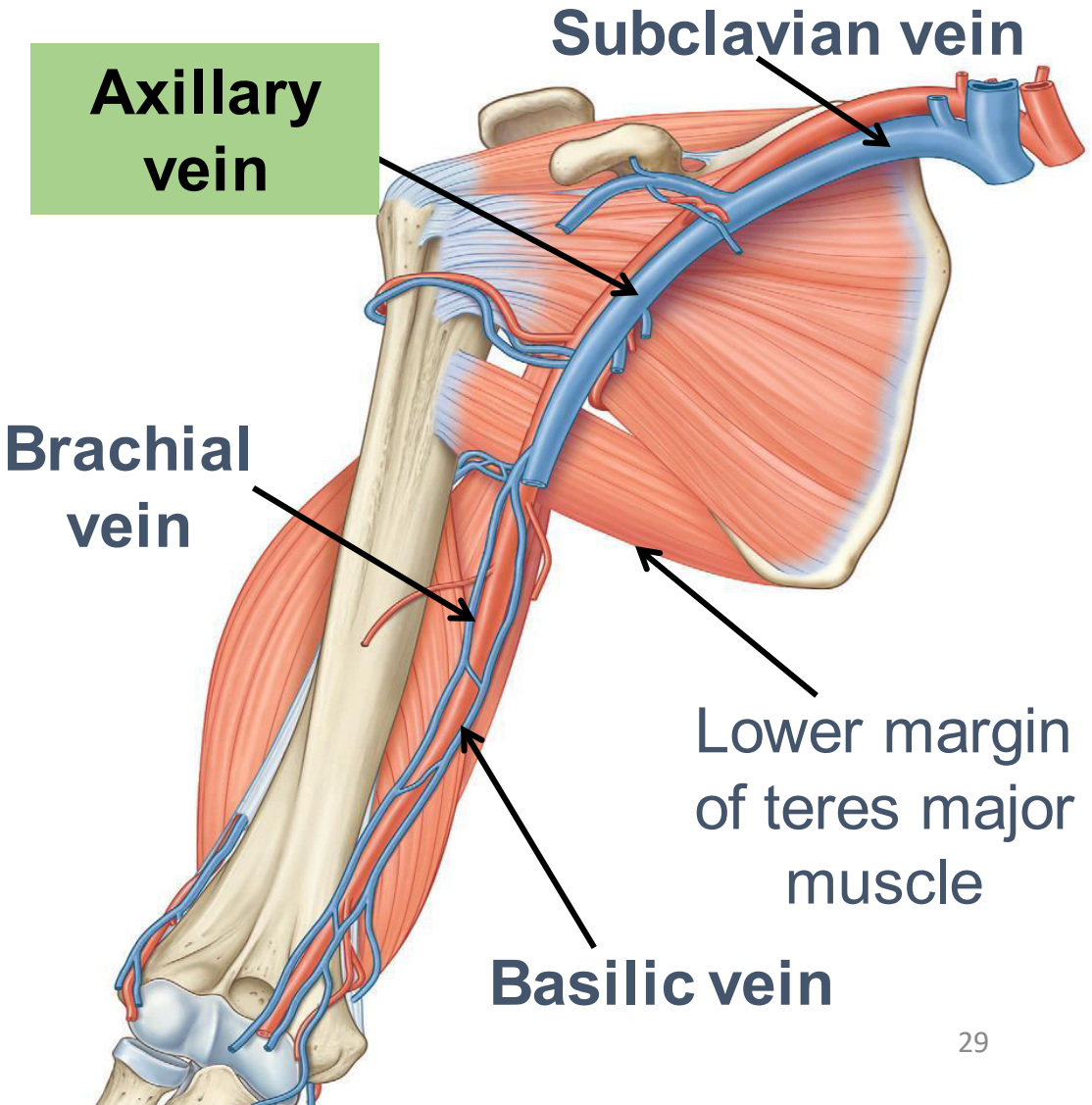
AXILLARY VEIN

- Origin & termination
- Parts
- Relation
- Tributaries

AXILLARY VEIN : ORIGIN & TERMINATION

- Begins at the lower margin of the teres major muscle as the union of the basilic vein & brachial vein.

- Ends at the lateral border of 1st rib and continues as subclavian vein.

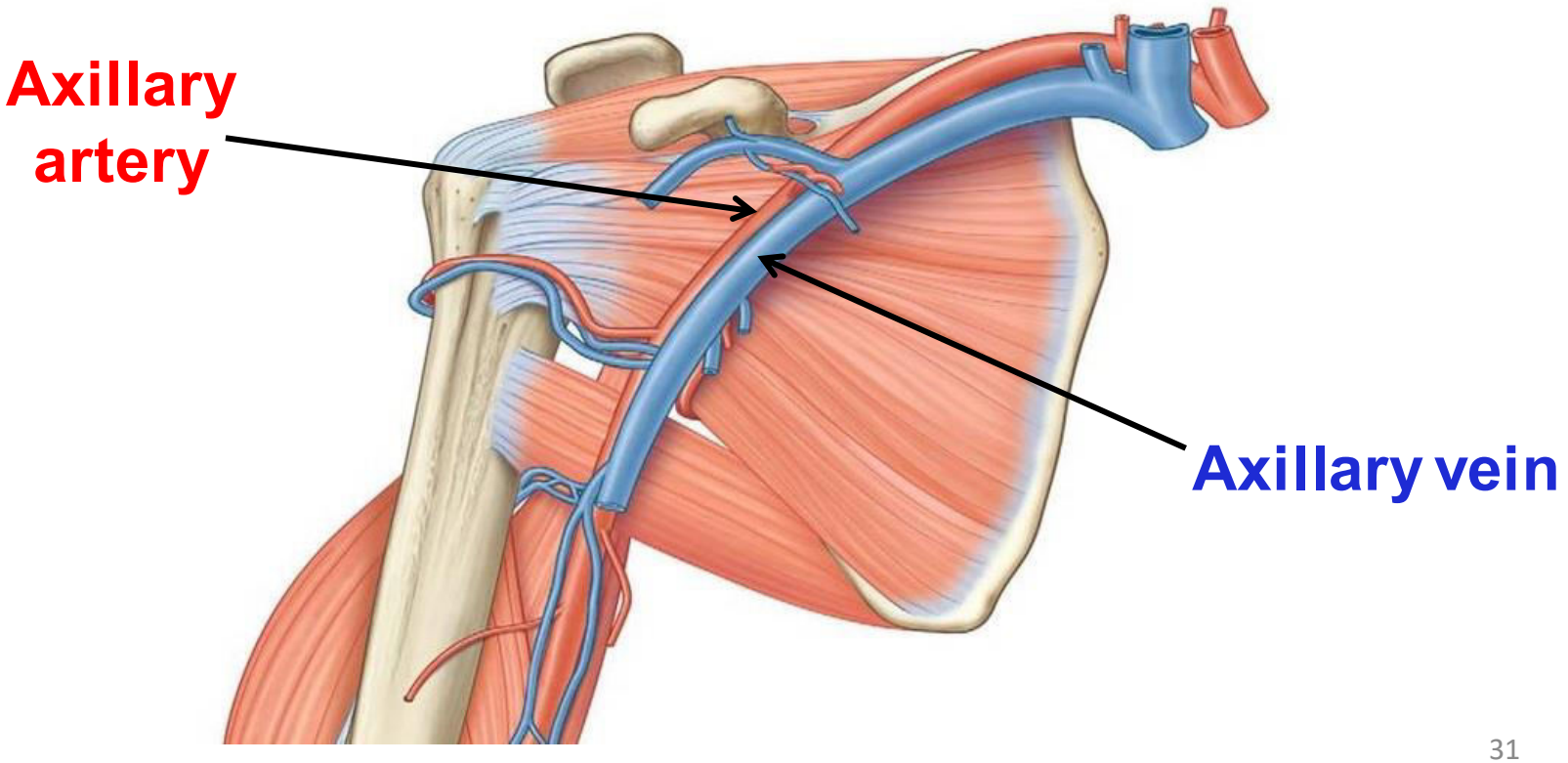


AXILLARY VEIN : PARTS

Axillary vein has three parts (corresponds to the three parts of the axillary artery)

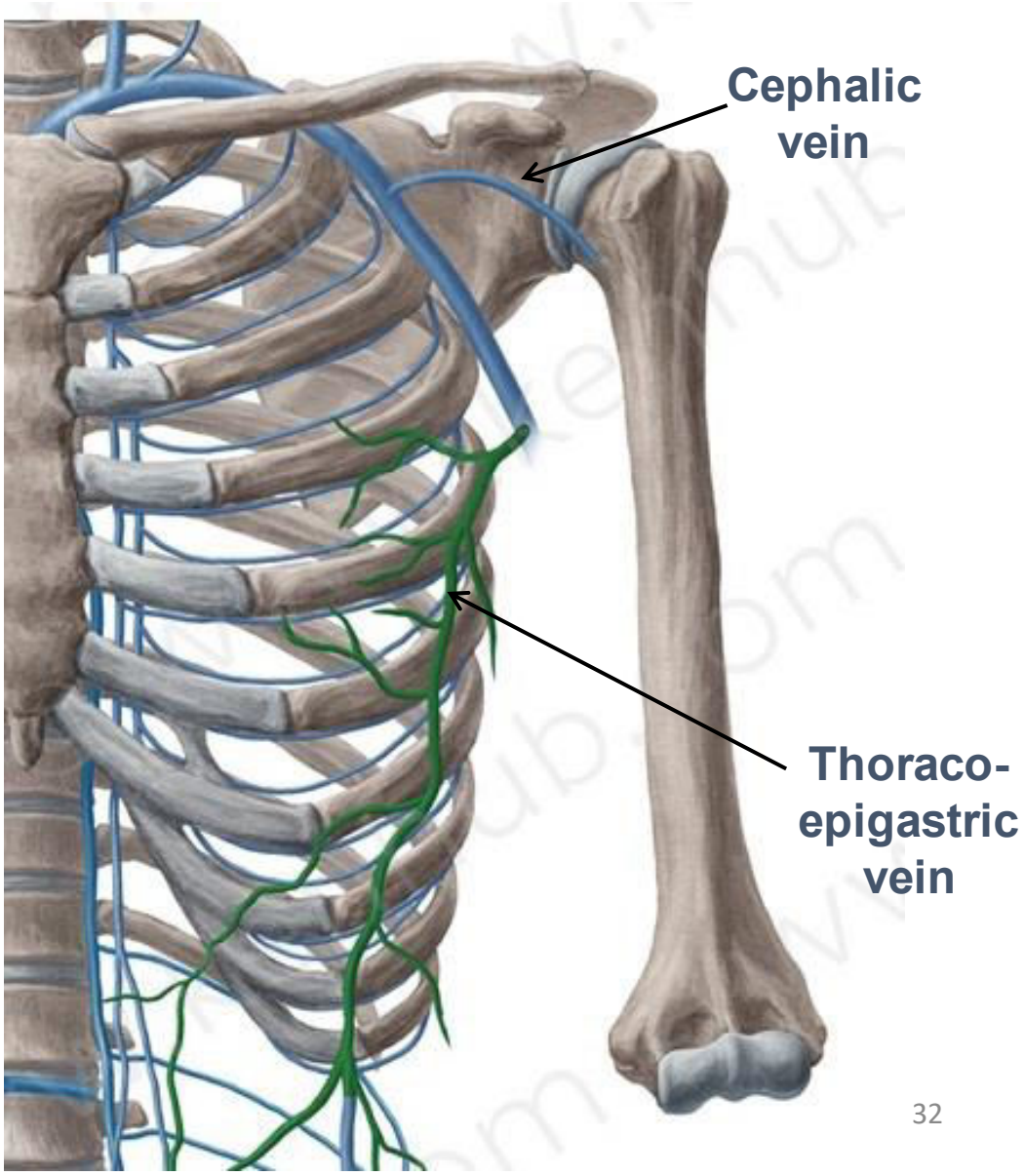
AXILLARY VEIN : RELATION

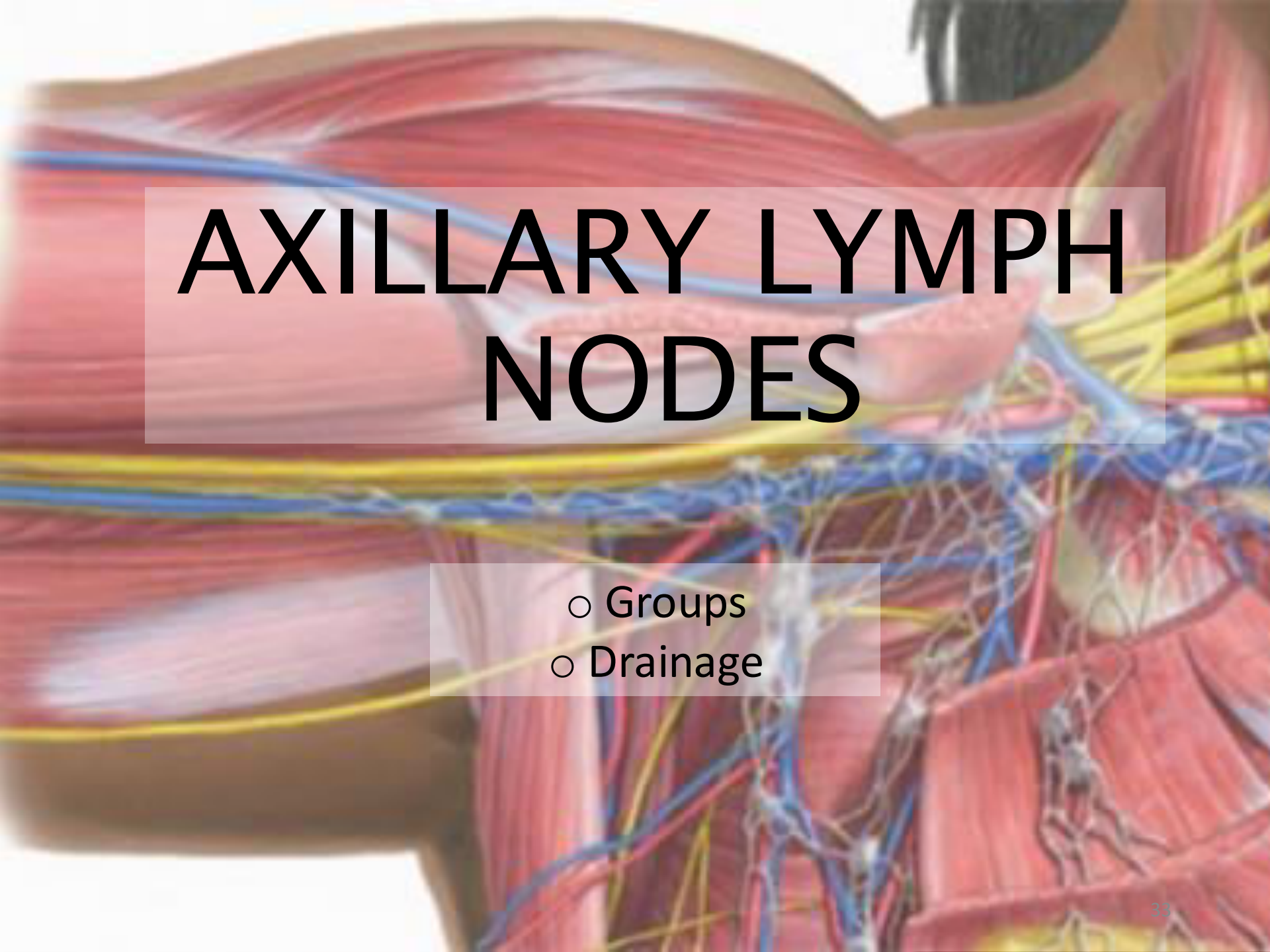
Axillary vein passes anteromedial to the axillary artery



AXILLARY VEIN : TRIBUTARIES

- Cephalic vein
- Thoracoepigastric vein
- Veins that correspond with branches of axillary artery





AXILLARY LYMPH NODES

- Groups
- Drainage

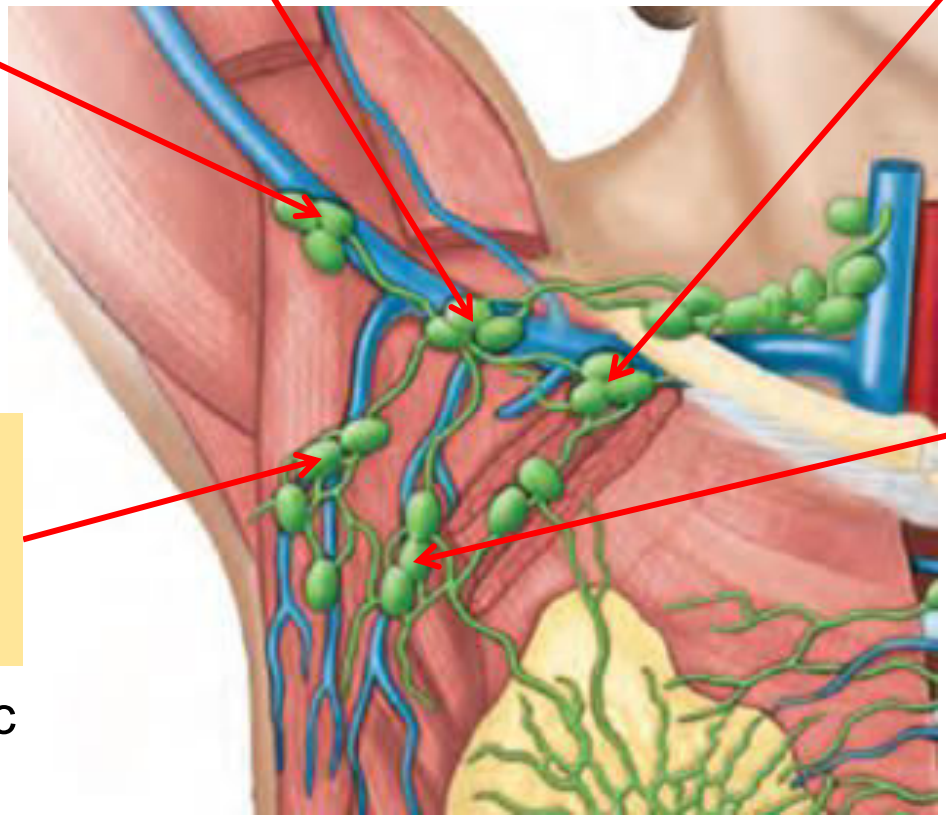
AXILLARY LYMPH NODES

Central nodes

Receive lymphatic from lateral, posterior & anterior nodes

Lateral (humeral) nodes

Receive lymphatic from the upper limbs



Apical nodes

Receive lymphatics from central nodes

Posterior (subscapular) nodes

Receive lymphatic from posterior thoracic wall

Anterior (pectoral) nodes

Receive lymphatics from anterior thoracic wall

AXILLARY LYMPH NODES : DRAINAGE

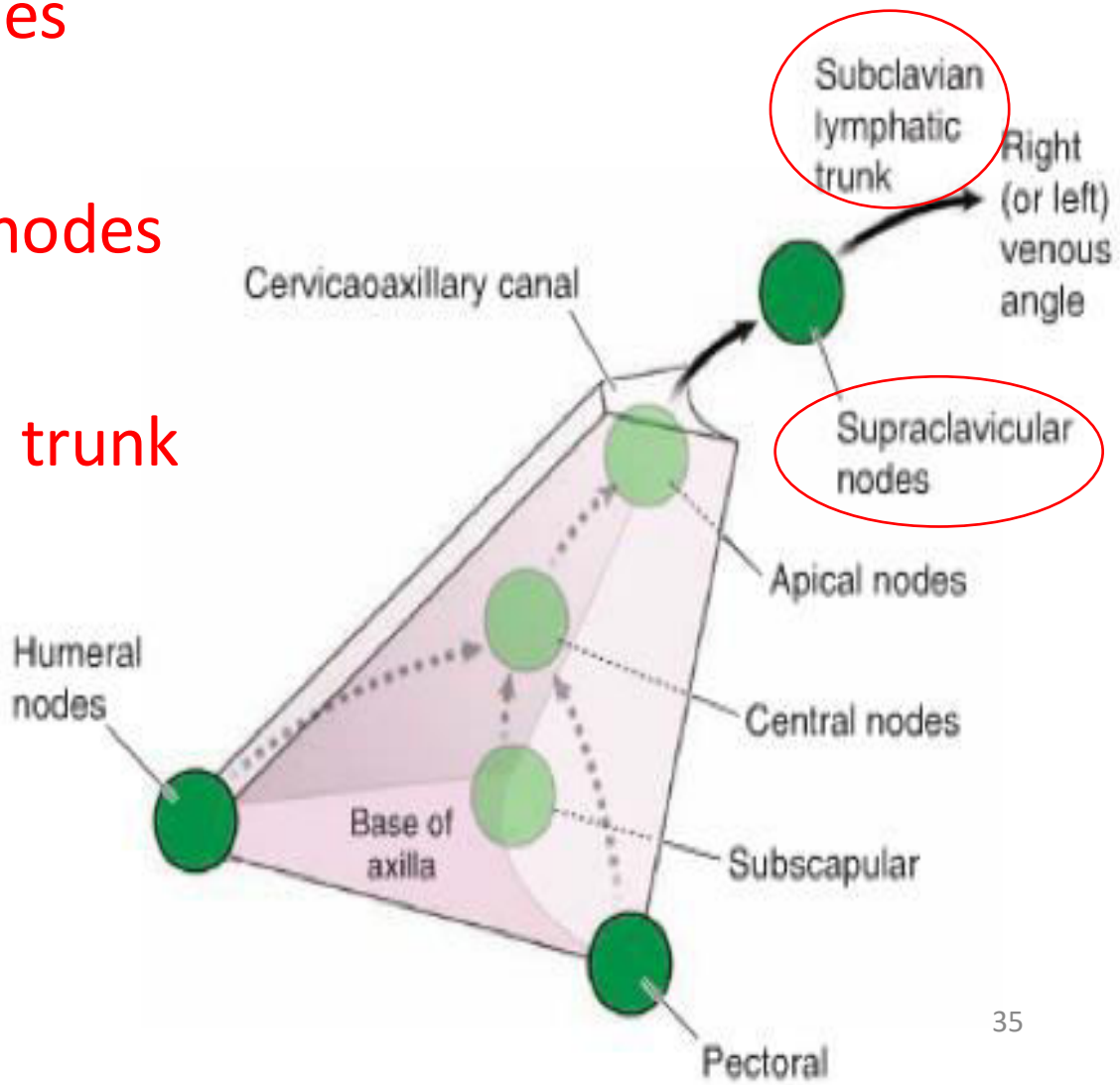
Apical lymph nodes

↓

Supraclavicular lymph nodes

↓

Subclavian lymphatic trunk



AXILLARY LYMPH NODES

GROUPS	LOCATION	AREA DRAINED
Pectoral (anterior) nodes	Medial wall of axilla, around lateral thoracic vein & inferior border of pectoralis minor	- Anterior thoracic wall
Subscapular (posterior) nodes	Posterior axillary fold & subscapular blood vessels	- Posterior aspect of thoracic wall -Scapular region
Humeral (lateral) nodes	Lateral wall of axilla, medial & posterior to axillary vein	- Most of upper limb
Central nodes	Deep to pectoralis minor near the base of axilla	- Receive tributaries from humeral, subscapular & pectoral groups of nodes
Apical nodes	Apex of axilla along the medial side of the axillary vein	-Receive lymph from all othe groups - receive lymphatics accompanying the proximal cephalic vein

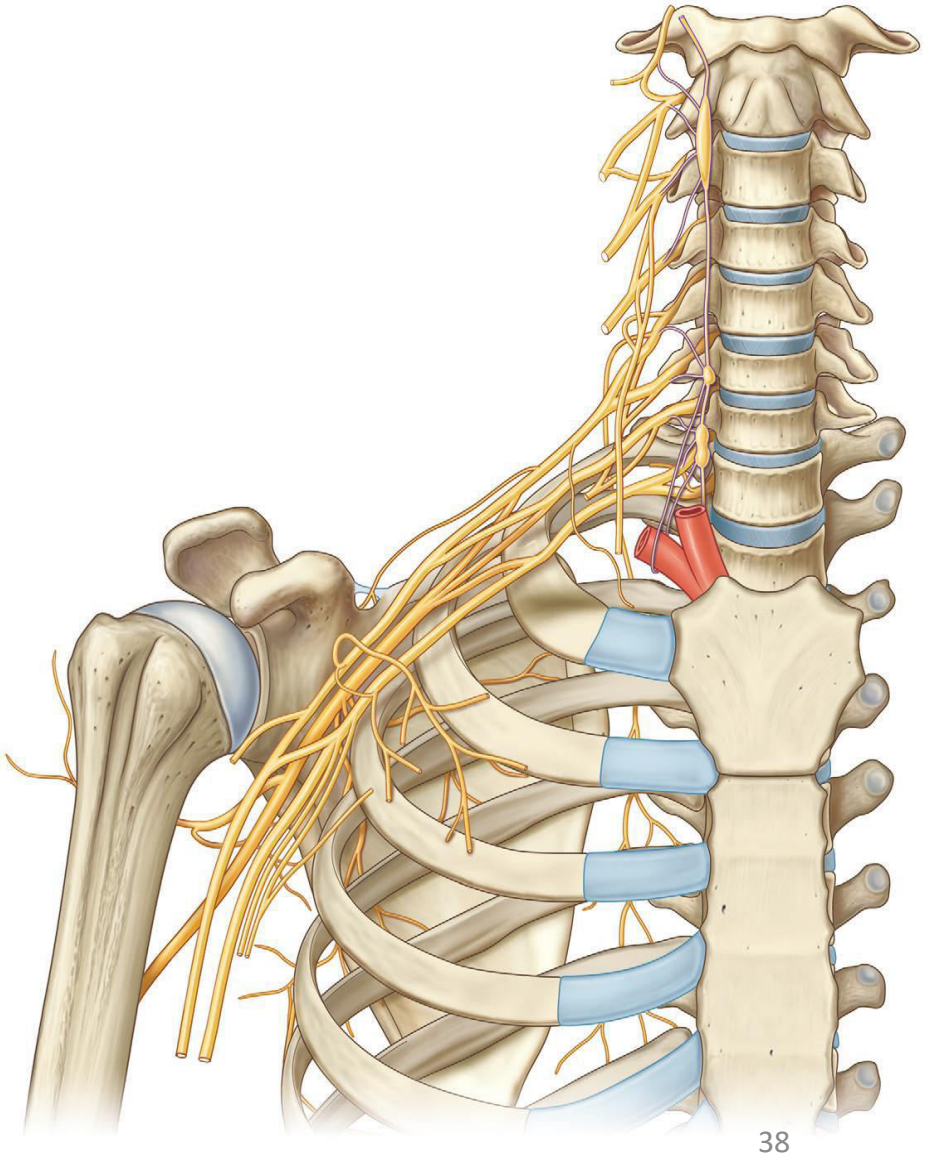
BRACHIAL PLEXUS

- Introduction
- Formation
- Relations
- Branches

BRACHIAL PLEXUS : INTRODUCTION

- A somatic nerve network in the upper limb, formed by the union of the **ventral rami of the last four cervical (C5-C8) and the first thoracic (T1) spinal nerves.**

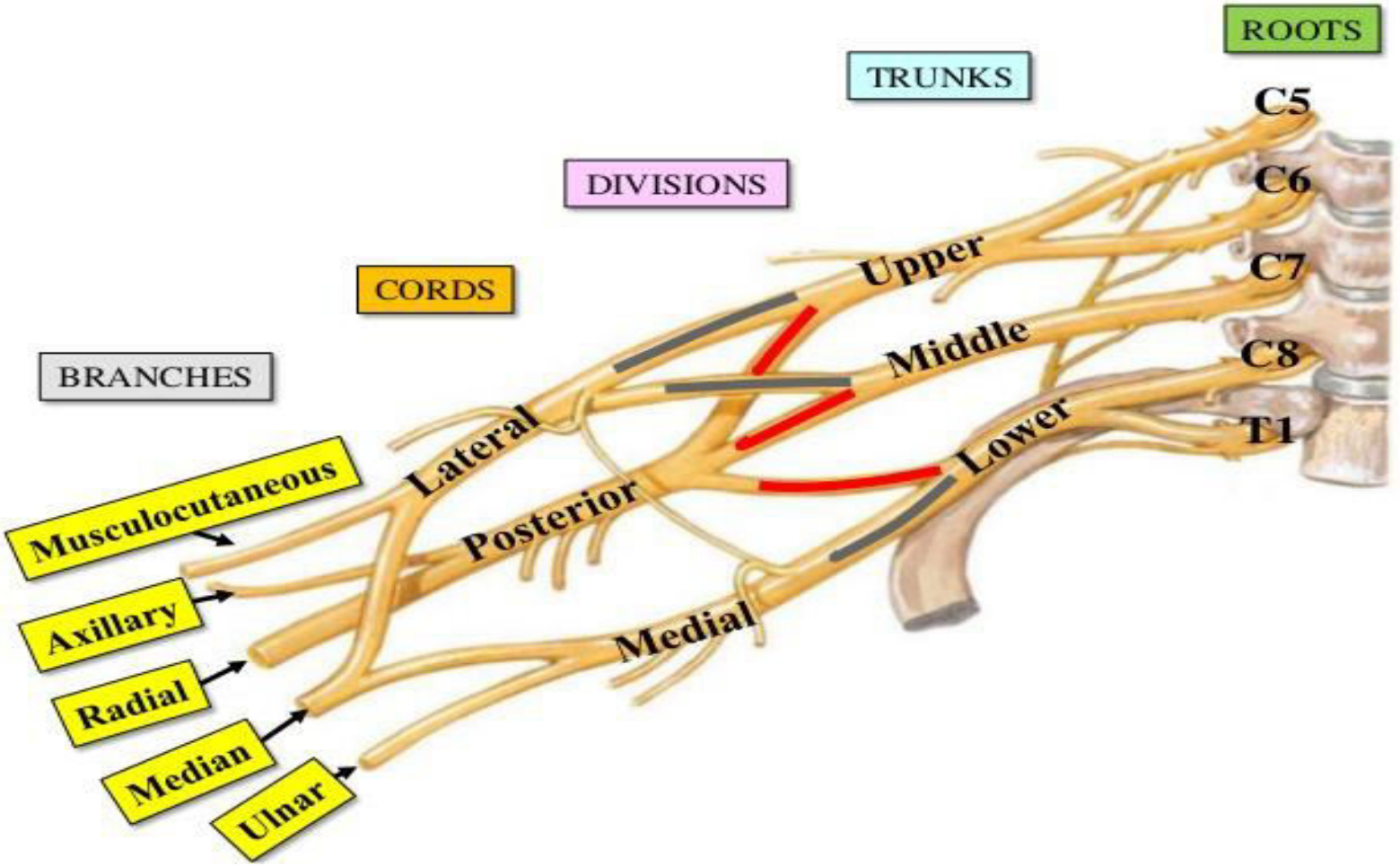
- The plexus begins in the neck, passes laterally and inferiorly over first rib and extends to the axilla



BRACHIAL PLEXUS : FORMATION

The parts of the brachial plexus, from medial to lateral :

Roots → Trunks → Divisions → Cords → Branches



BRACHIAL PLEXUS : FORMATION

ROOTS : anterior rami of C5 – C8 and T1

TRUNKS : the roots unite to form three trunks

- **Superior trunk** : union of C5 and C6 roots
- **Middle trunk** : continuation of C7
- **Inferior trunk** : union of C8 and T1

DIVISIONS : Each trunk divides into anterior & posterior division

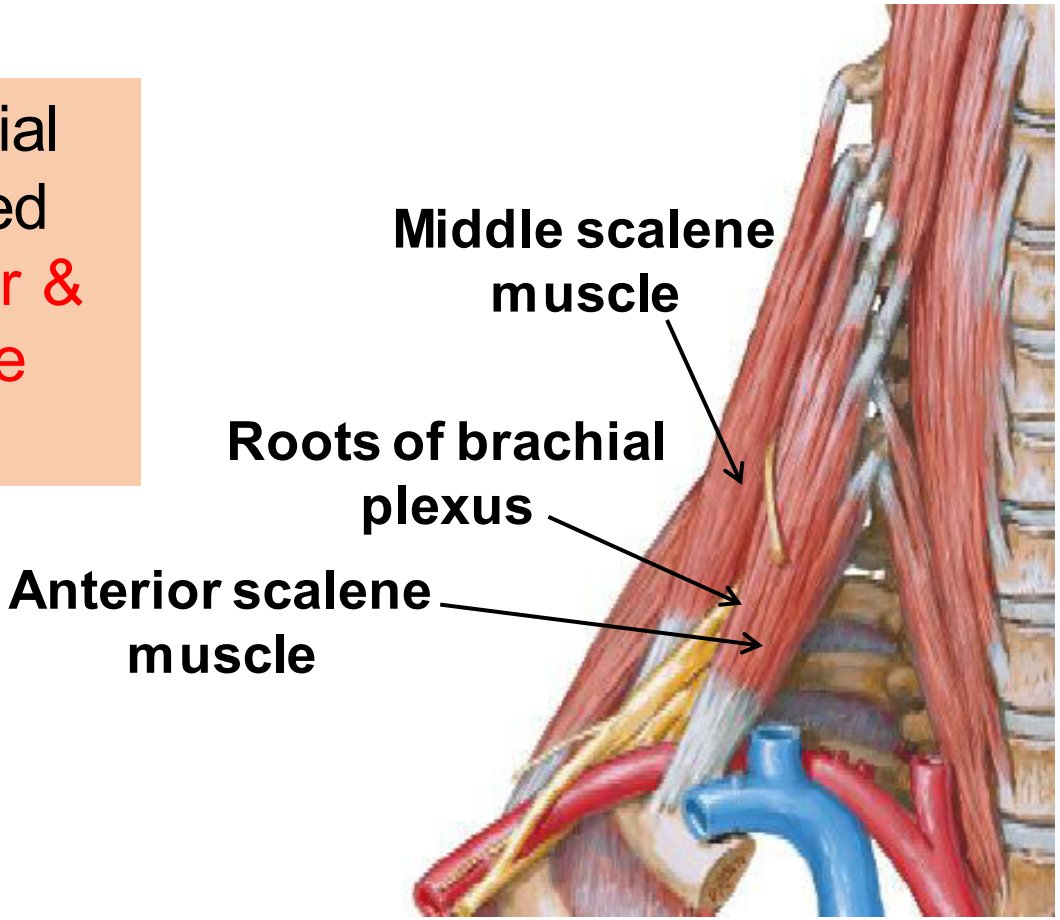
CORDS : The divisions of the trunks form three cords

- **Lateral cord** : union of anterior divisions of the superior and middle trunk
- **Medial cord** : continuation of anterior division of the inferior trunk
- **Posterior cord** : union of posterior divisions of all three trunks

BRACHIAL PLEXUS : RELATIONS

How to locate the parts of brachial plexus in specimen/model ?

Roots of brachial plexus is located between anterior & medial scalene muscles

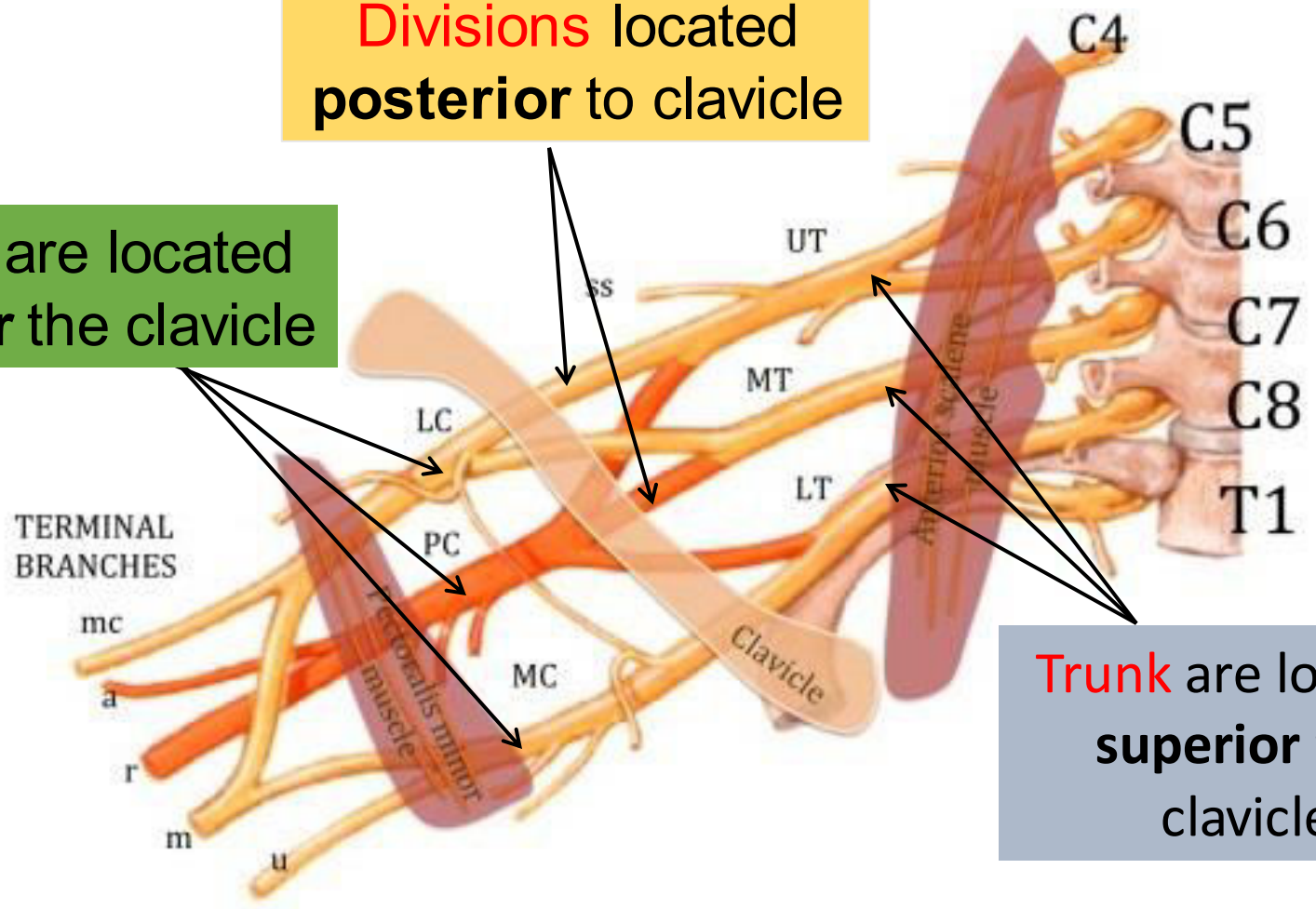


BRACHIAL PLEXUS : RELATIONS

Relations of brachial plexus with the **clavicle**

Divisions located **posterior** to clavicle

Cords are located **inferior** the clavicle



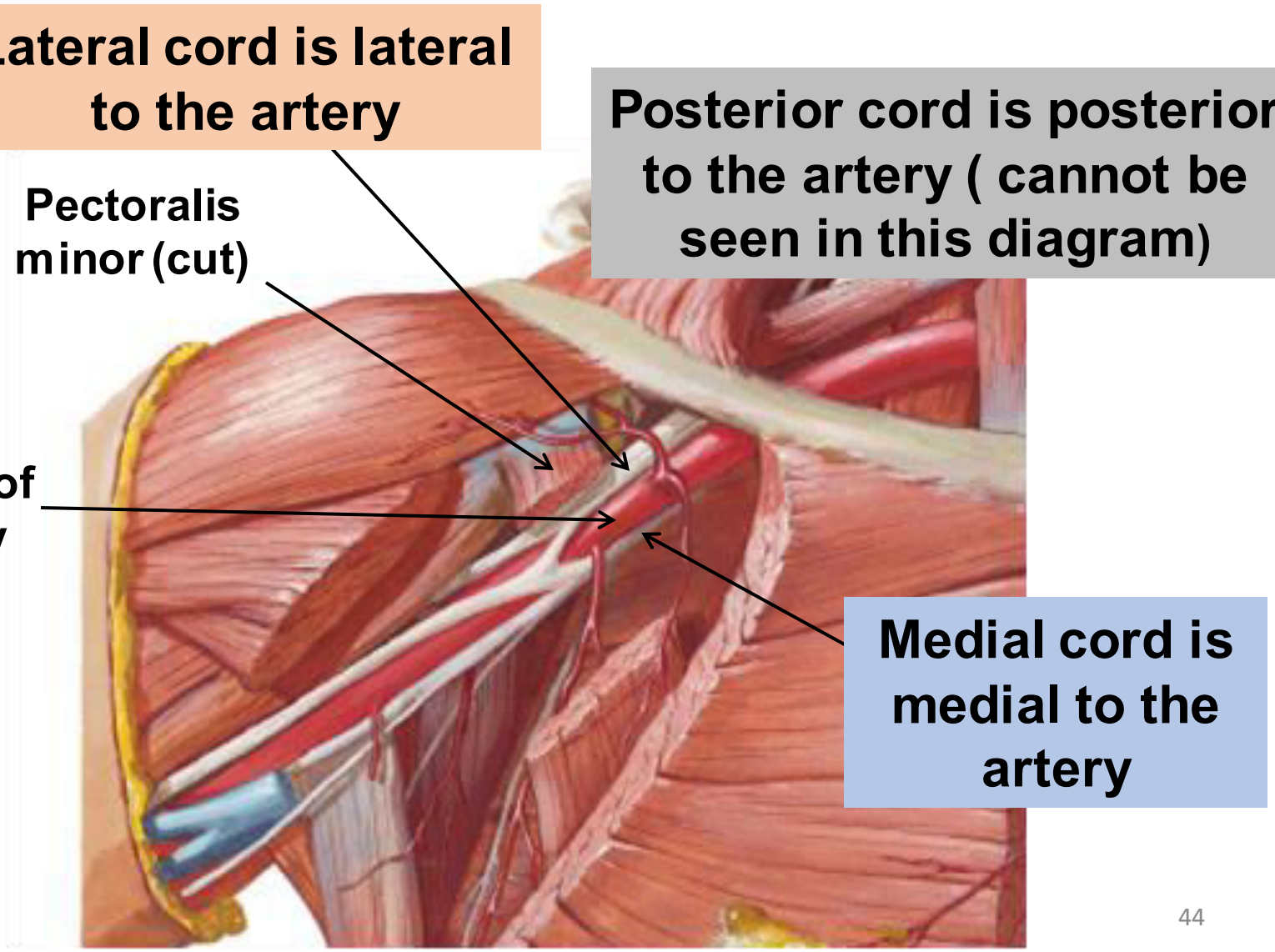
Trunk are located **superior** the clavicle

BRACHIAL PLEXUS : RELATIONS

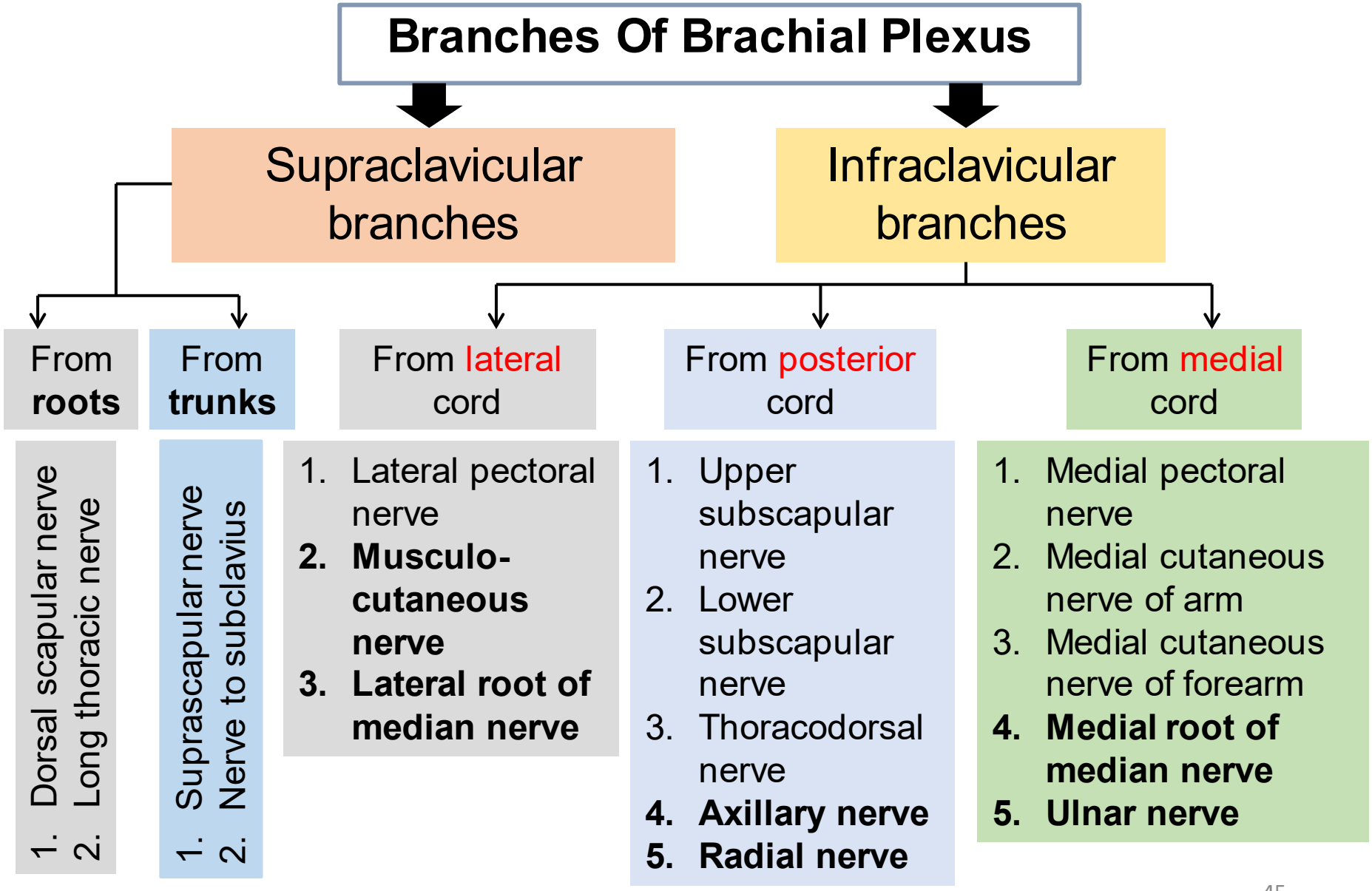
What is the relation of axillary artery with the brachial plexus?

2nd part of axillary artery is related to the **cords** of brachial plexus

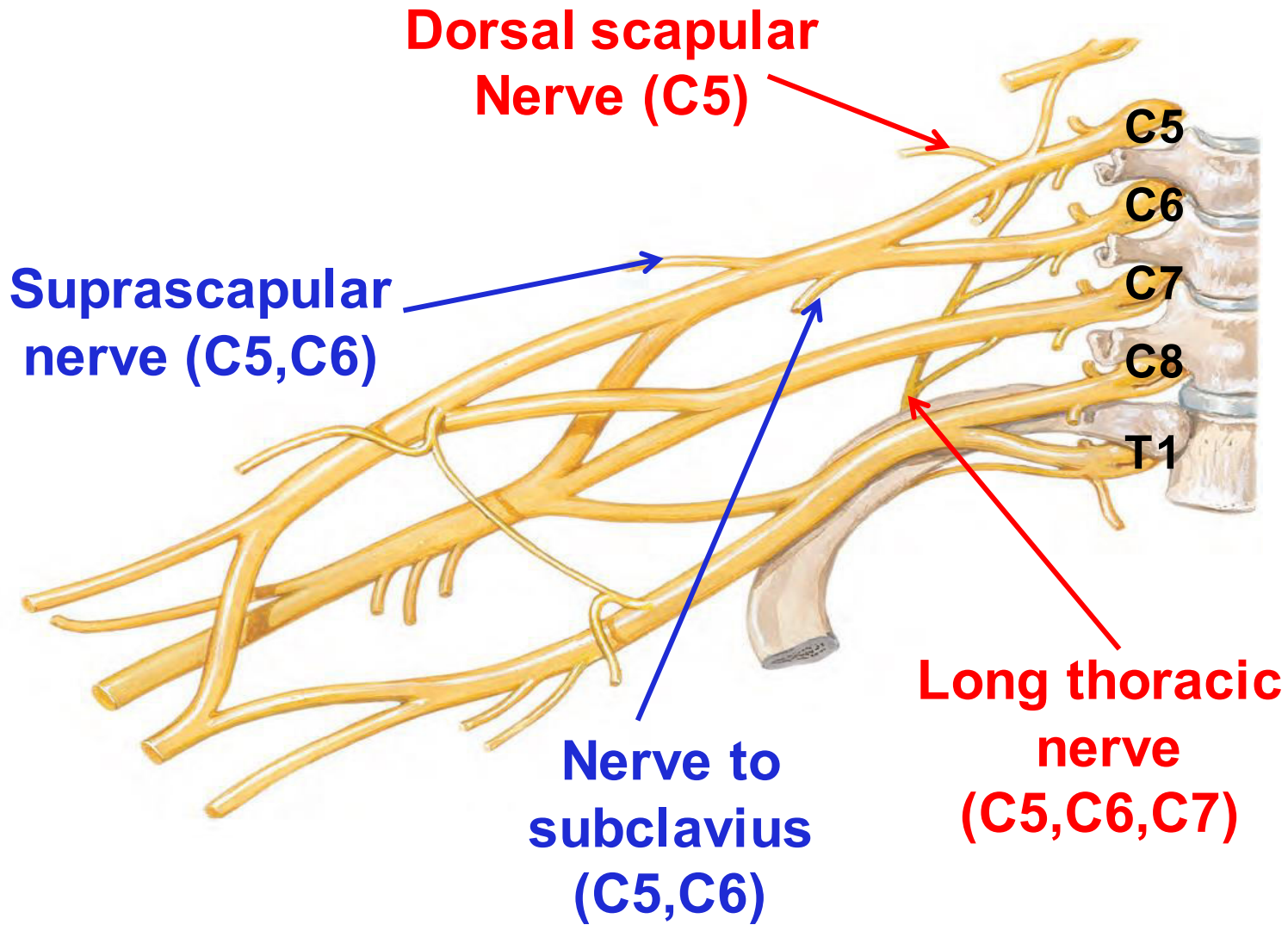
BRACHIAL PLEXUS : RELATIONS



BRACHIAL PLEXUS : BRANCHES

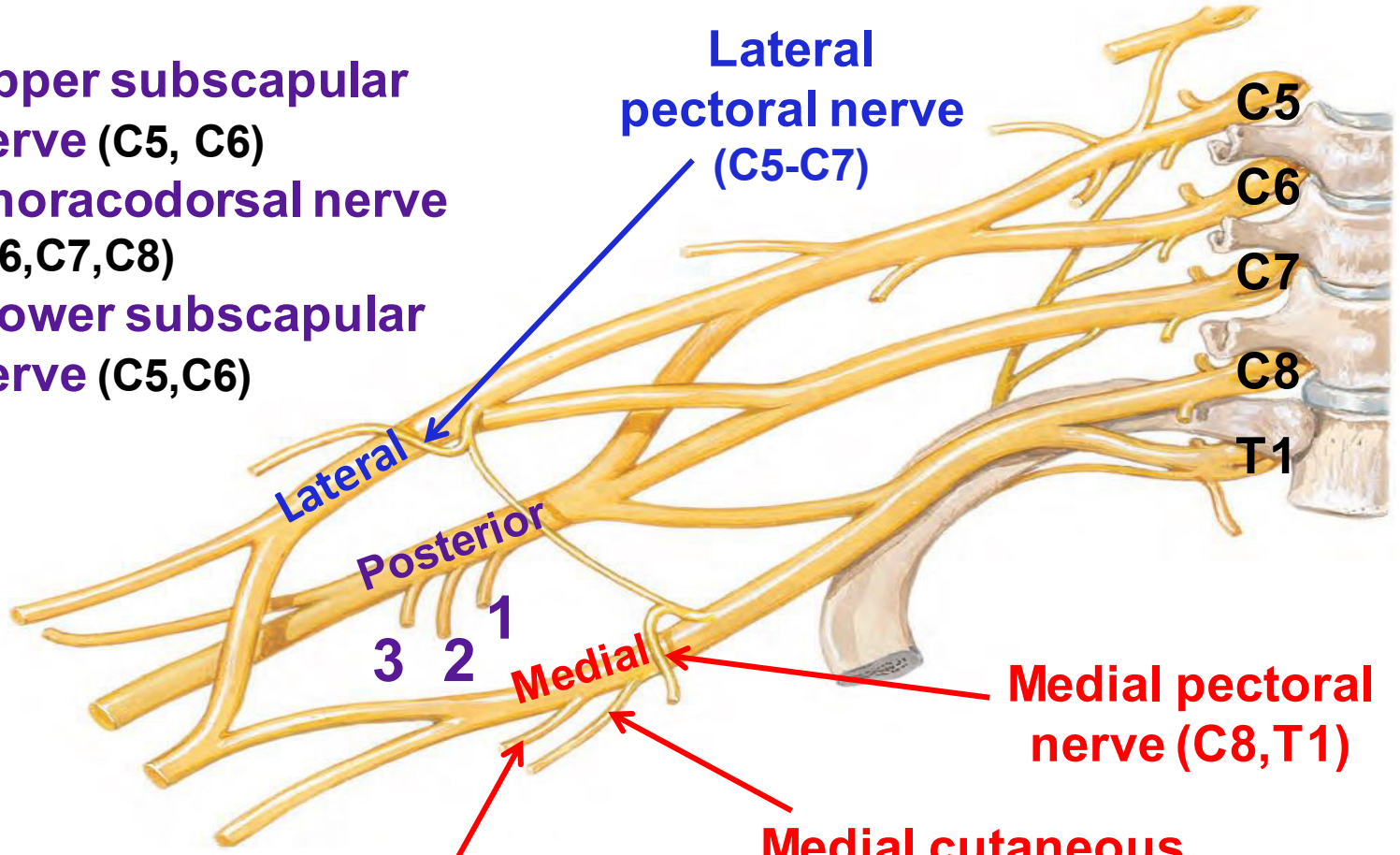


BRACHIAL PLEXUS : SUPRACLAVICULAR BRANCHES

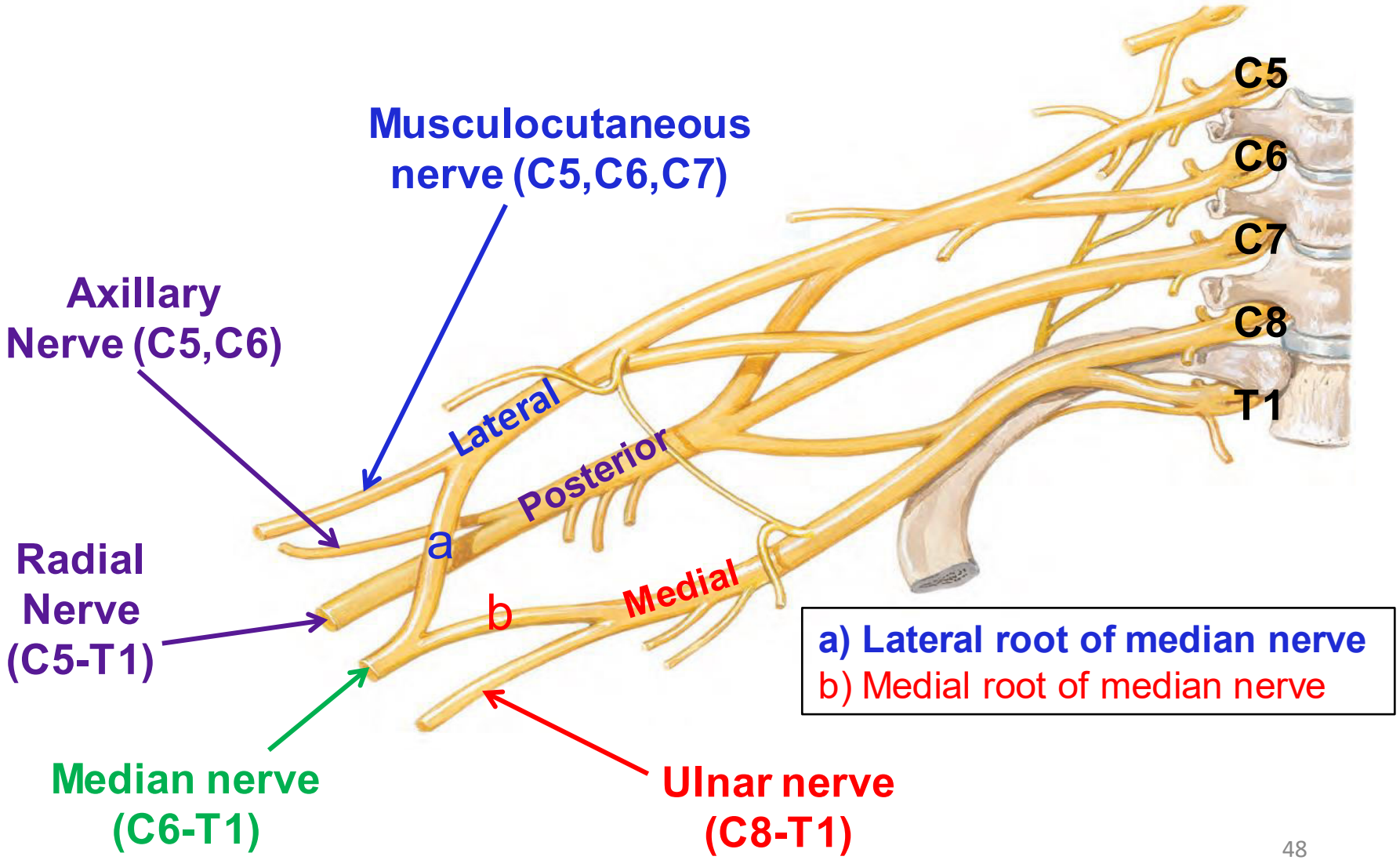


BRACHIAL PLEXUS : INFRACLAVICULAR BRANCHES (SIDE BRANCHES)

1) **Upper subscapular nerve** (C5, C6)
2) **Thoracodorsal nerve** (C6,C7,C8)
3) **Lower subscapular nerve** (C5,C6)



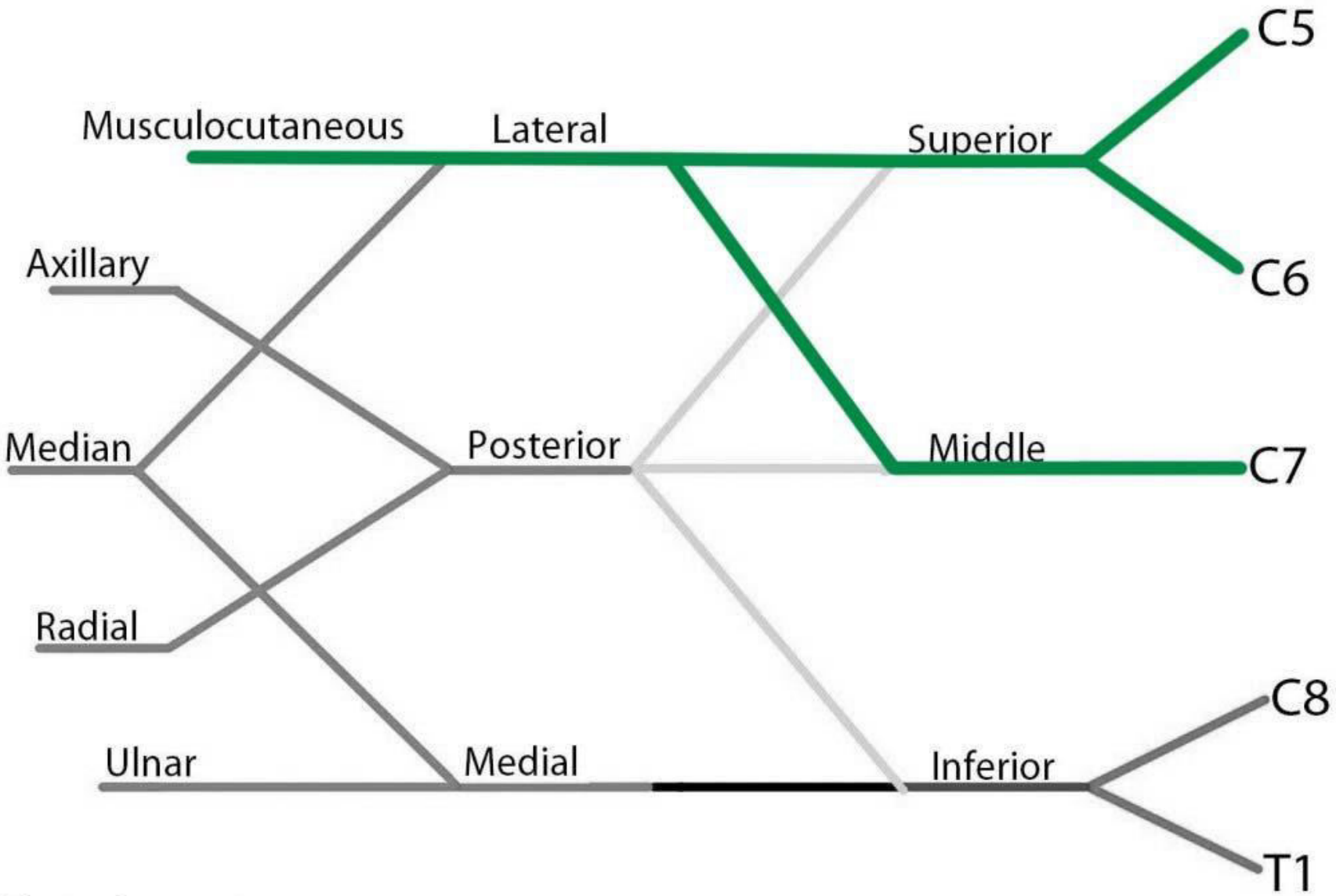
BRACHIAL PLEXUS : INFRACLAVICULAR BRANCHES (TERMINAL BRANCHES)



TERMINAL BRANCHES OF BRACHIAL PLEXUS

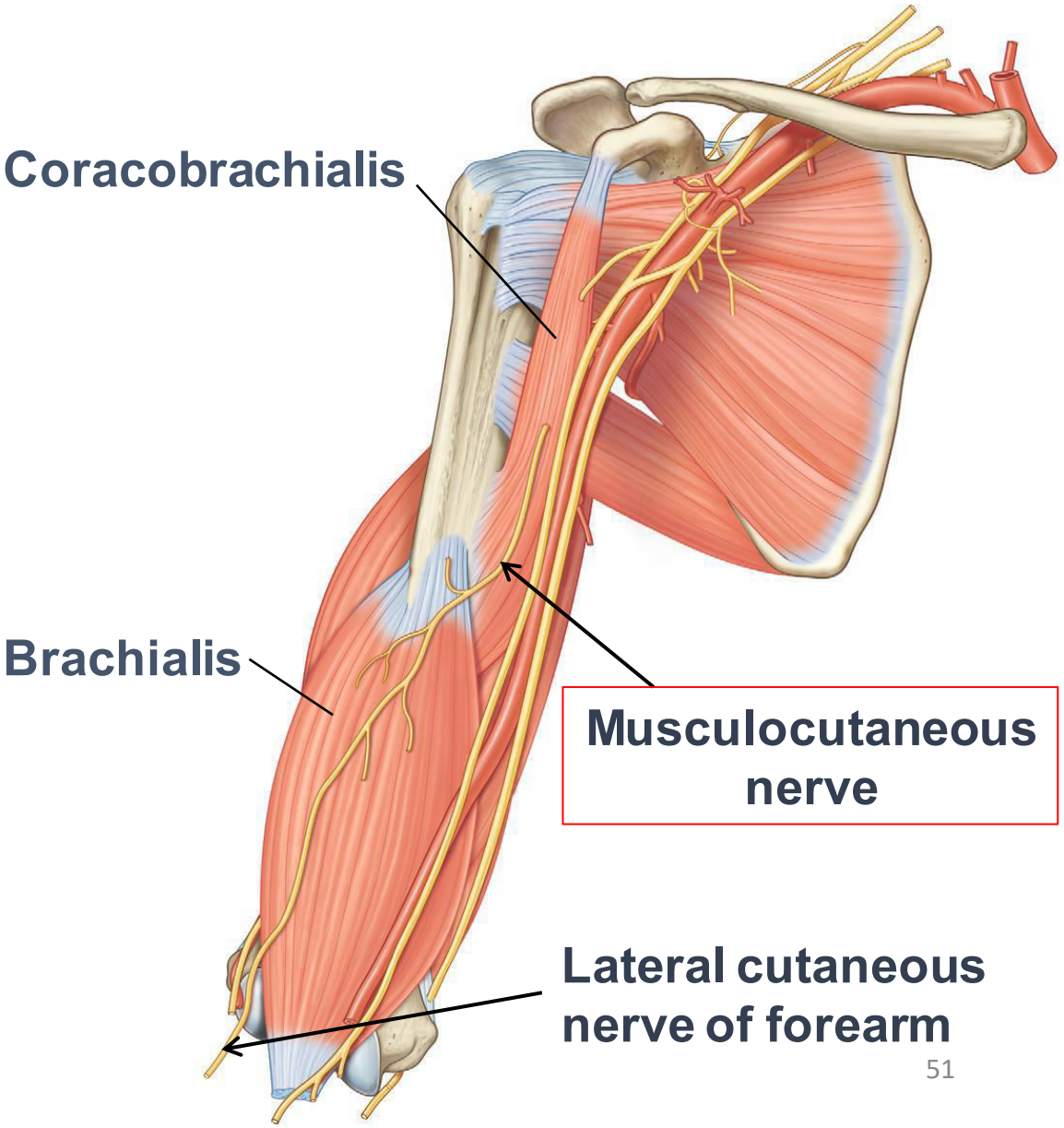
- Course
- Important relations
- Motor distribution
- Sensory distribution

MUSCULOCUTANEOUS NERVE (C5,C6,C7)

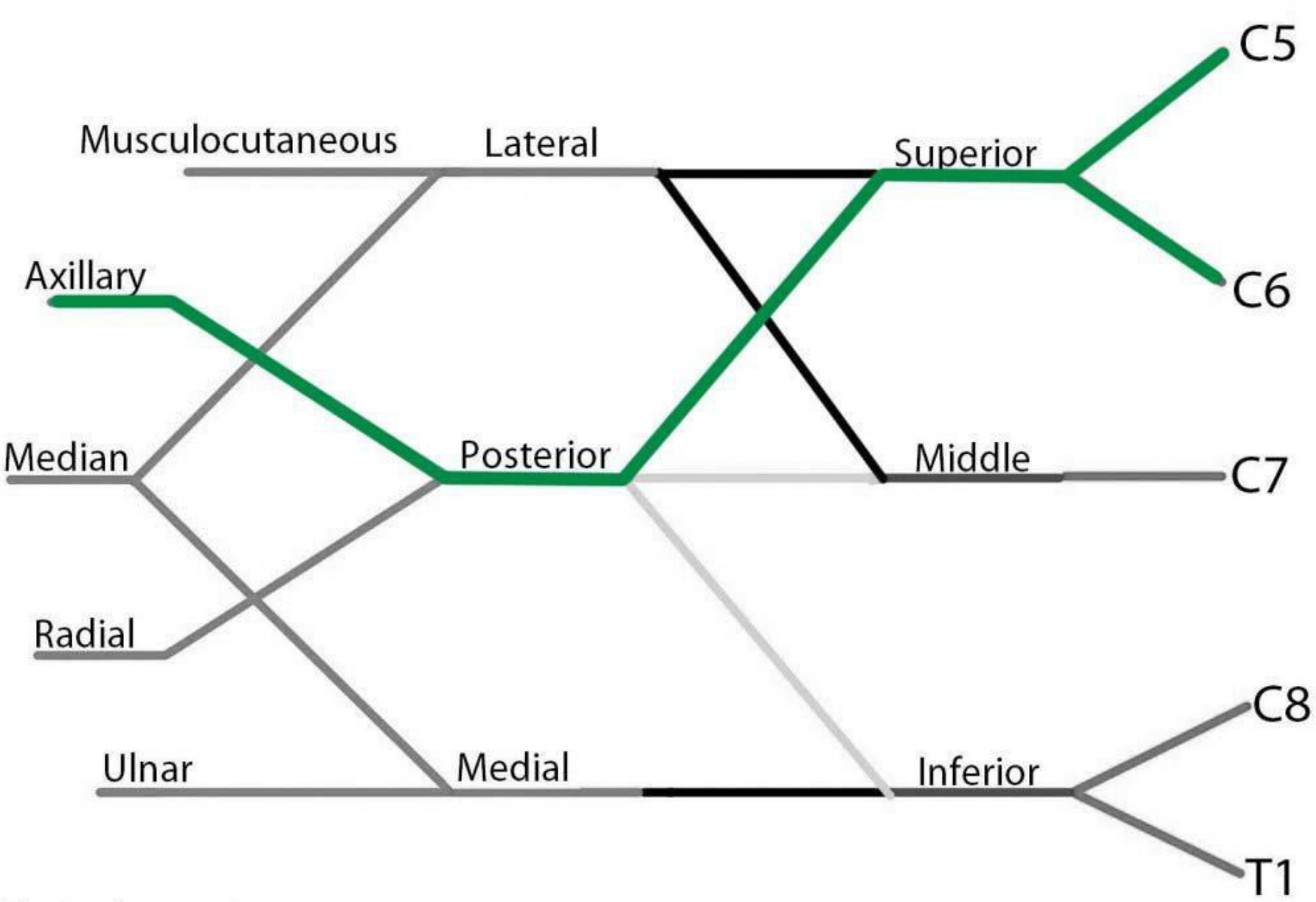


MUSCULOCUTANEOUS NERVE (C5,C6,C7)

- Exits axilla by piercing coracobrachialis
- Descend between biceps brachii & brachialis and supplying them
- Continues as lateral cutaneous nerve of forearm

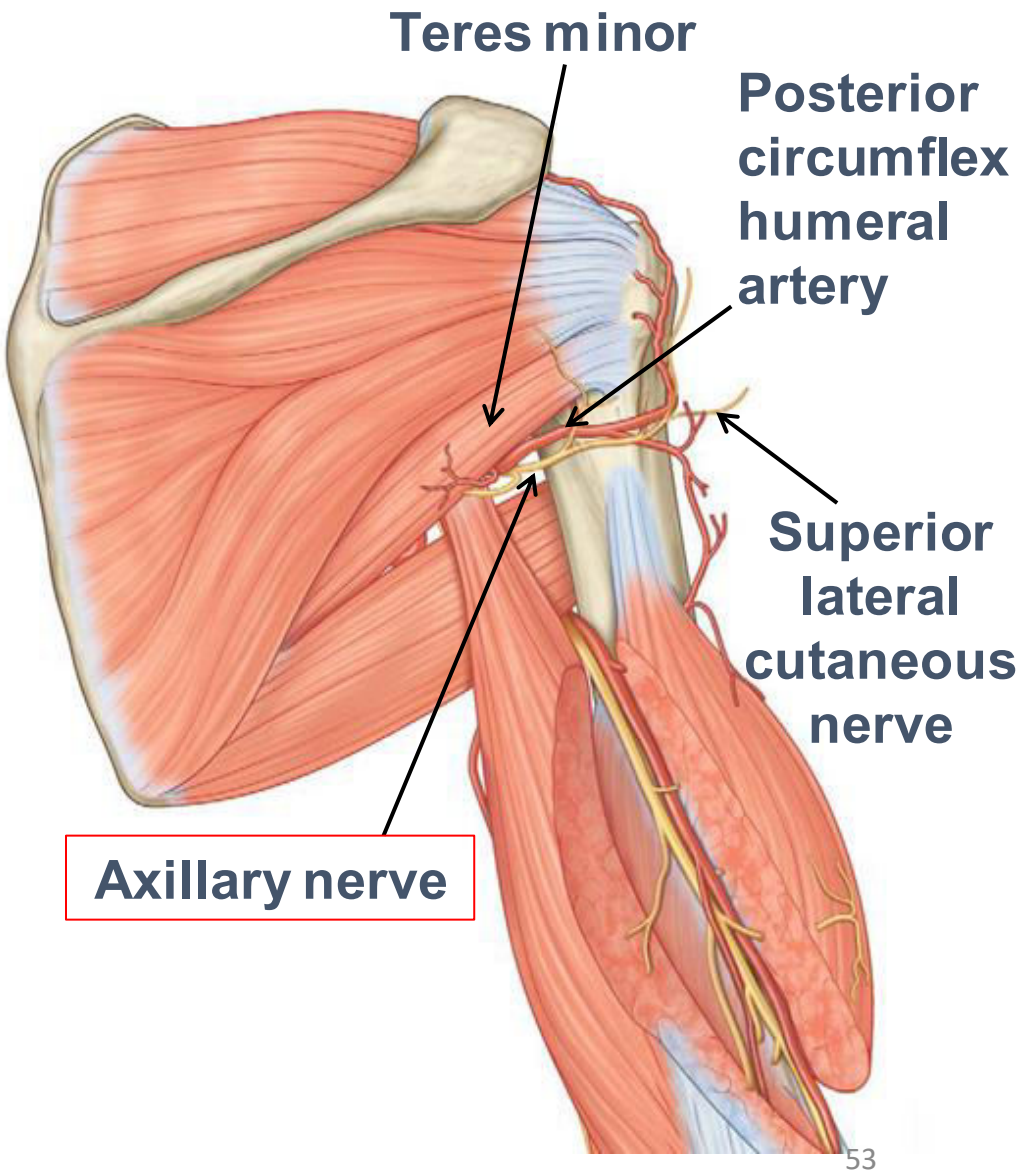


AXILLARY NERVE (C5,C6)

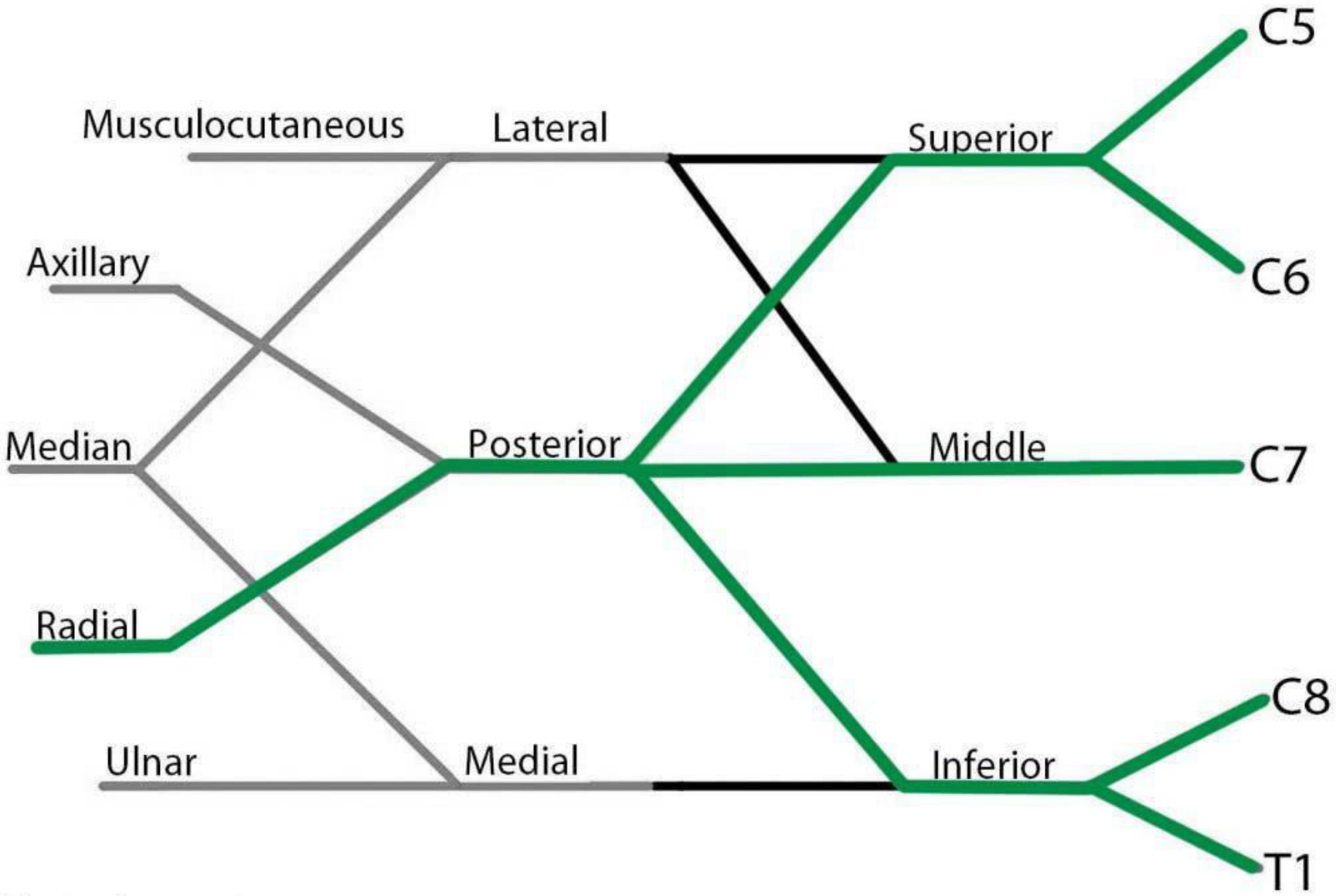


AXILLARY NERVE (C5,C6)

- Exits axillary fossa posteriorly, passing through the quadrangular space with posterior circumflex humeral artery
- Innervates the deltoid & teres minor muscles
- Continues as superior lateral cutaneous nerve

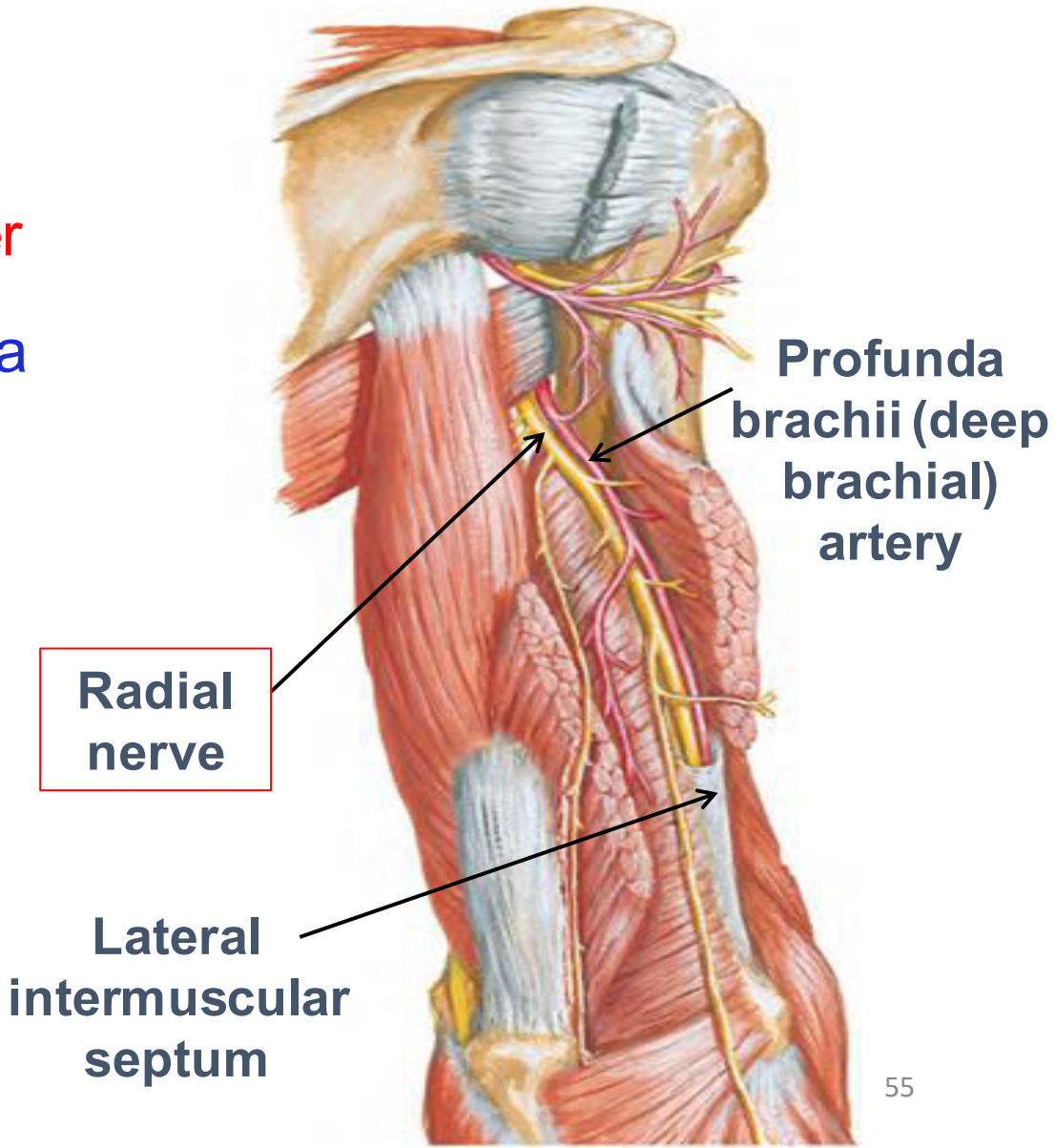


RADIAL NERVE (C5,C6,C7,C8,T1)



RADIAL NERVE (C5,C6,C7,C8,T1)

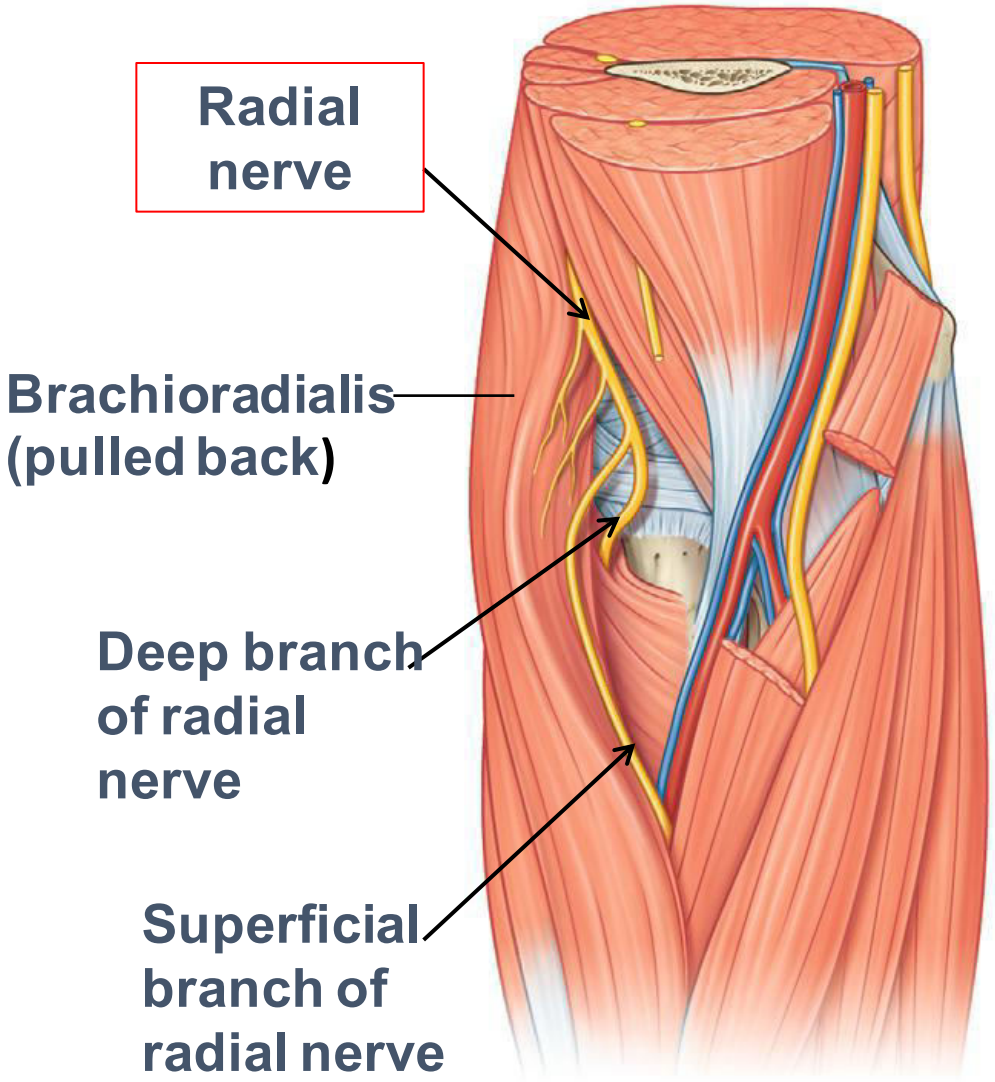
- Enters the posterior compartment of arm by passing through the lower triangular space accompanied by profunda brachii artery
- Descend in the radial groove of humerus
- On the lateral border of humerus, it pierces the lateral intermuscular septum



RADIAL NERVE (C5,C6,C7,C8,T1)

- It enters the anterior compartment where it lies between the brachialis & brachioradialis

- Enters the forearm anterior to the lateral epicondyle of the humerus & divides into deep & superficial branches



RADIAL NERVE (C5,C6,C7,C8,T1)

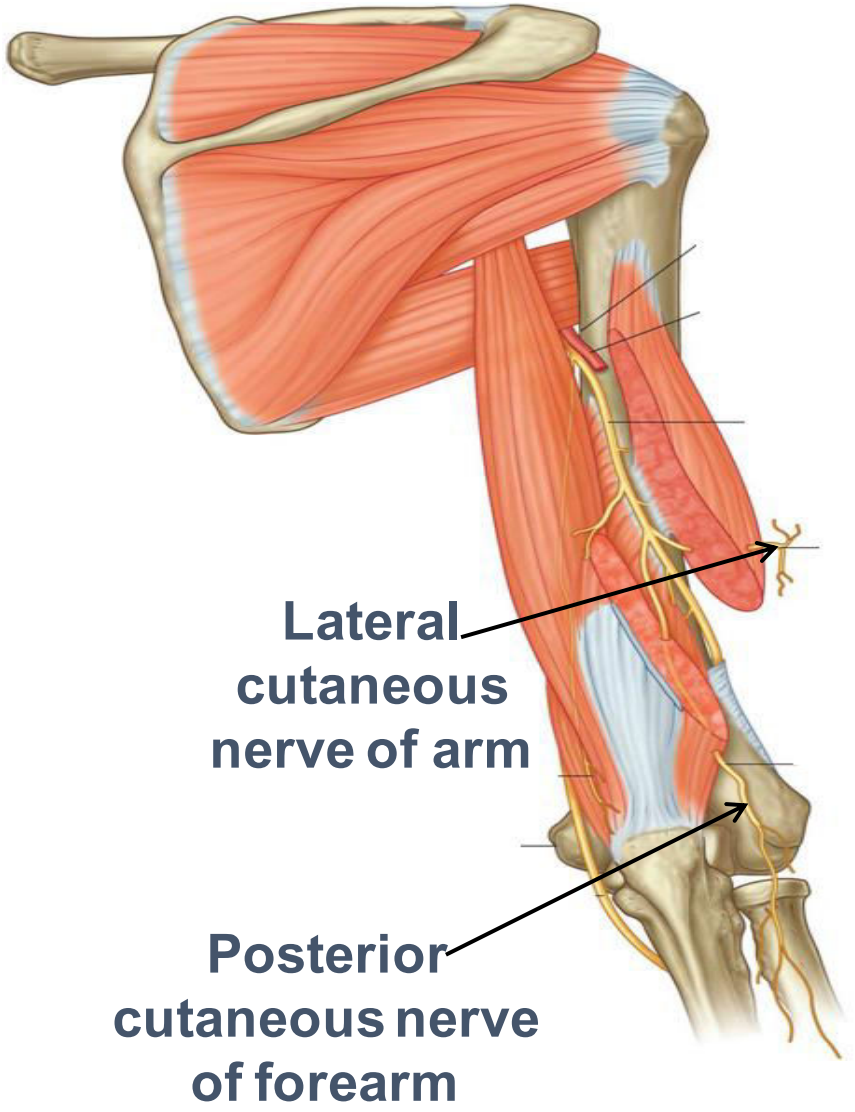
- **Gives out these branches :**

- **Deep (muscular) branches**

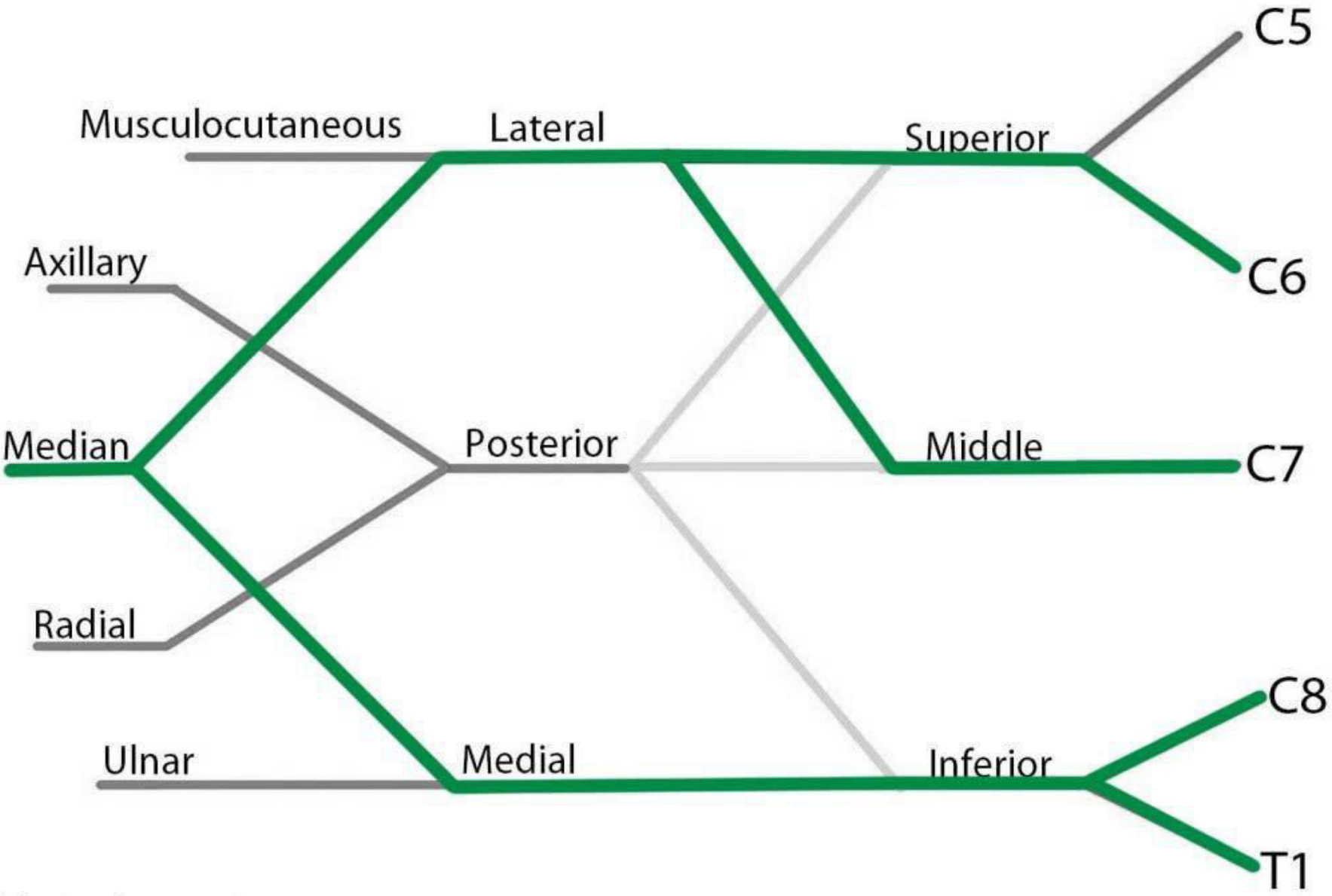
1. Triceps brachii
2. Brachioradialis
3. Anconeus
4. Extensor carpi radialis longus

- **Superficial (cutaneous) branches**

1. Posterior cutaneous nerve of arm
2. Lateral cutaneous nerve of arm
3. Posterior cutaneous nerve of forearm

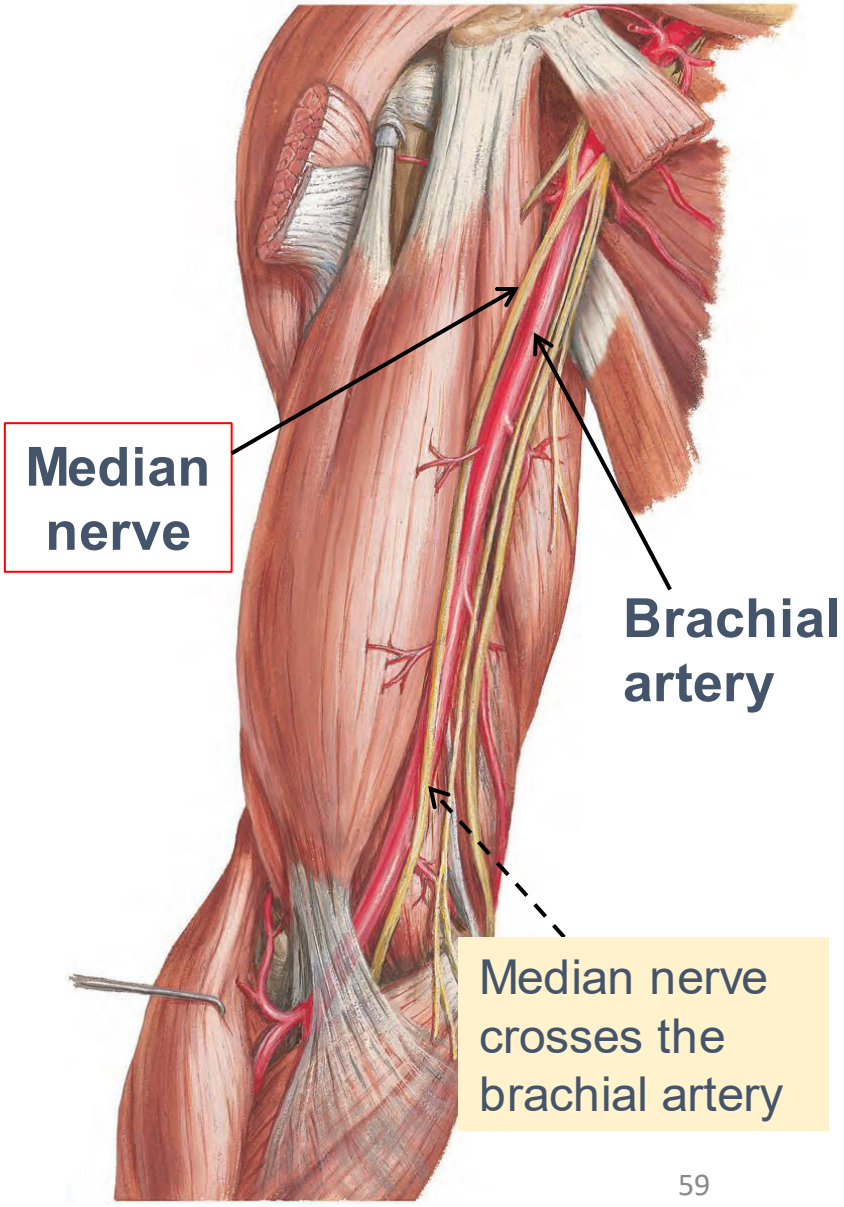


MEDIAN NERVE (C6,C7,C8,T1)



MEDIAN NERVE (C6,C7,C8,T1)

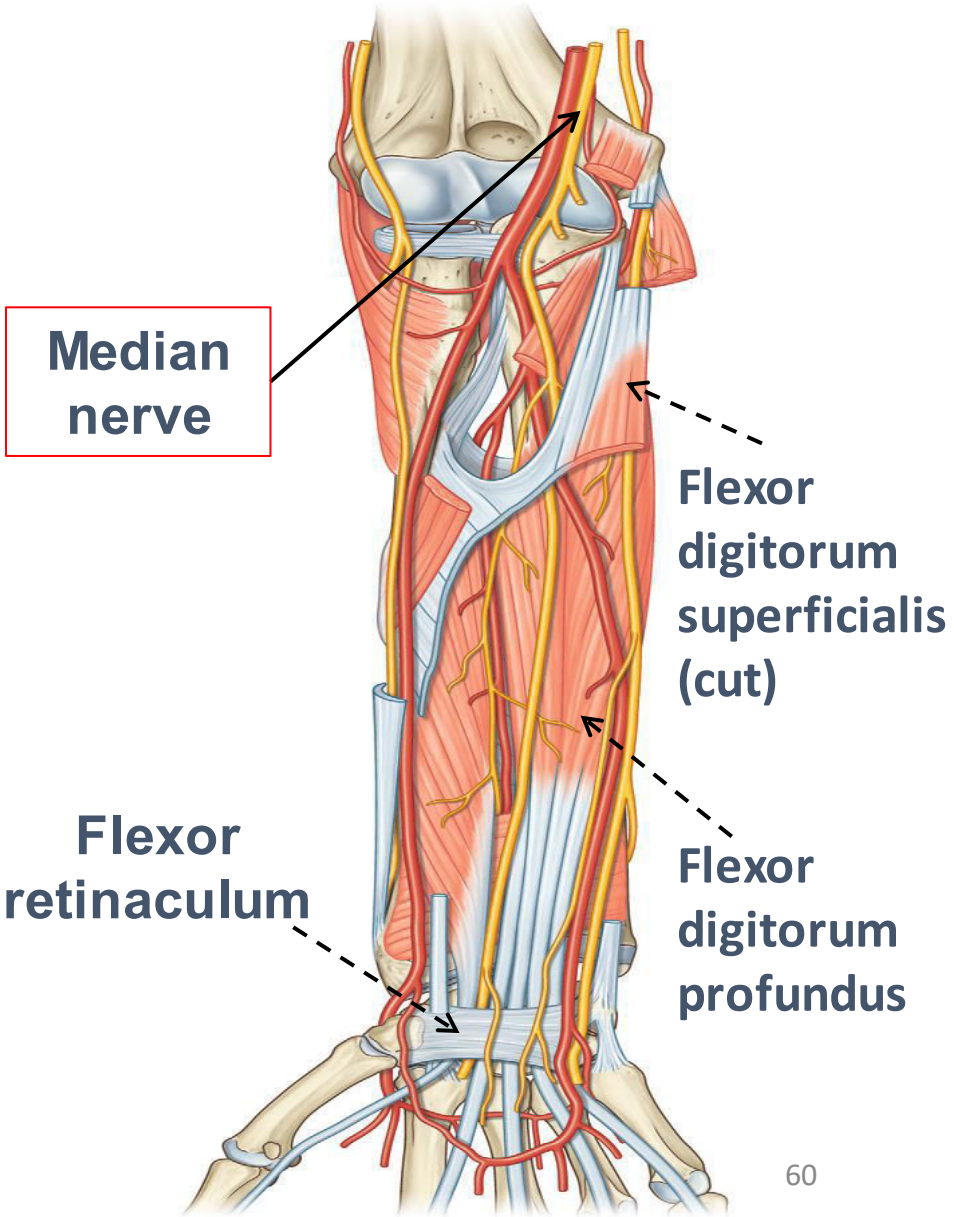
- It is formed by union of lateral root (lateral cord) & medial root (medial cord)
- Descends lateral to brachial artery
- **Distally,** it crosses brachial artery & lies medially to it
- Enter the cubital fossa



MEDIAN NERVE (C6,C7,C8,T1)

- Once exit from cubital fossa, it descends between flexor digitorum superficialis & flexor digitorum profundus

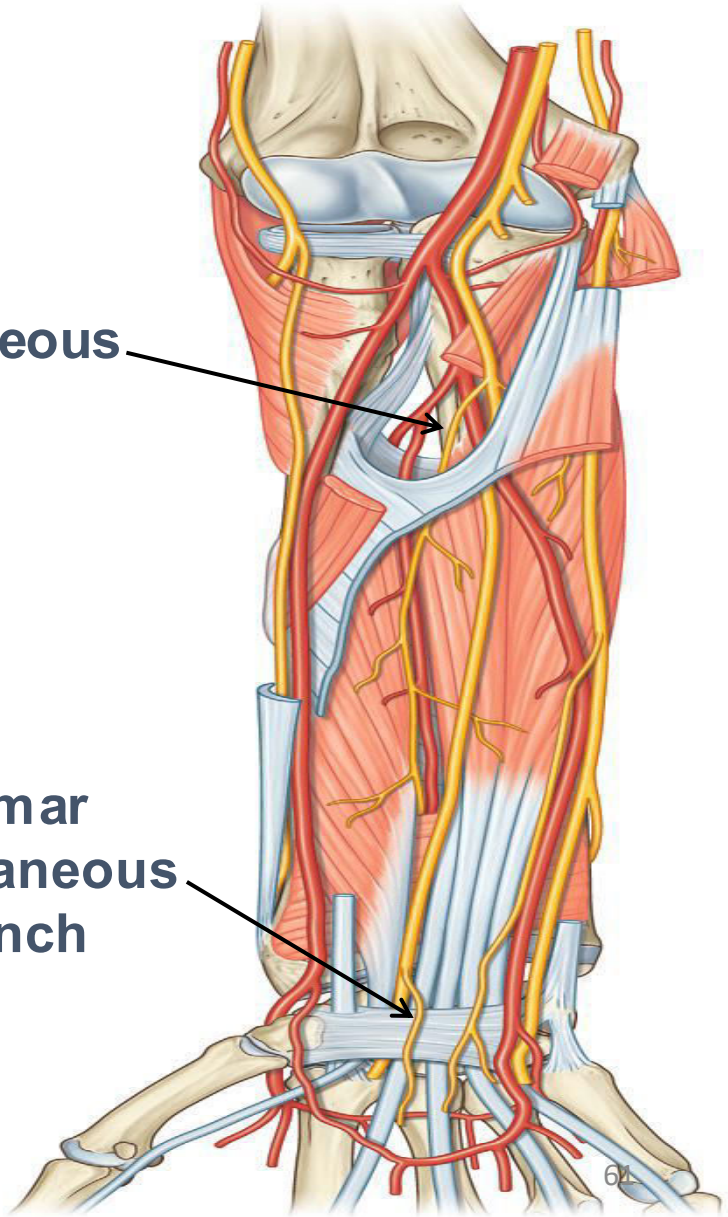
- It enters the hand by passing **deep** to flexor retinaculum to transverse carpal tunnel



MEDIAN NERVE (C6,C7,C8,T1)

- Has no branches in arm
- In forearm :

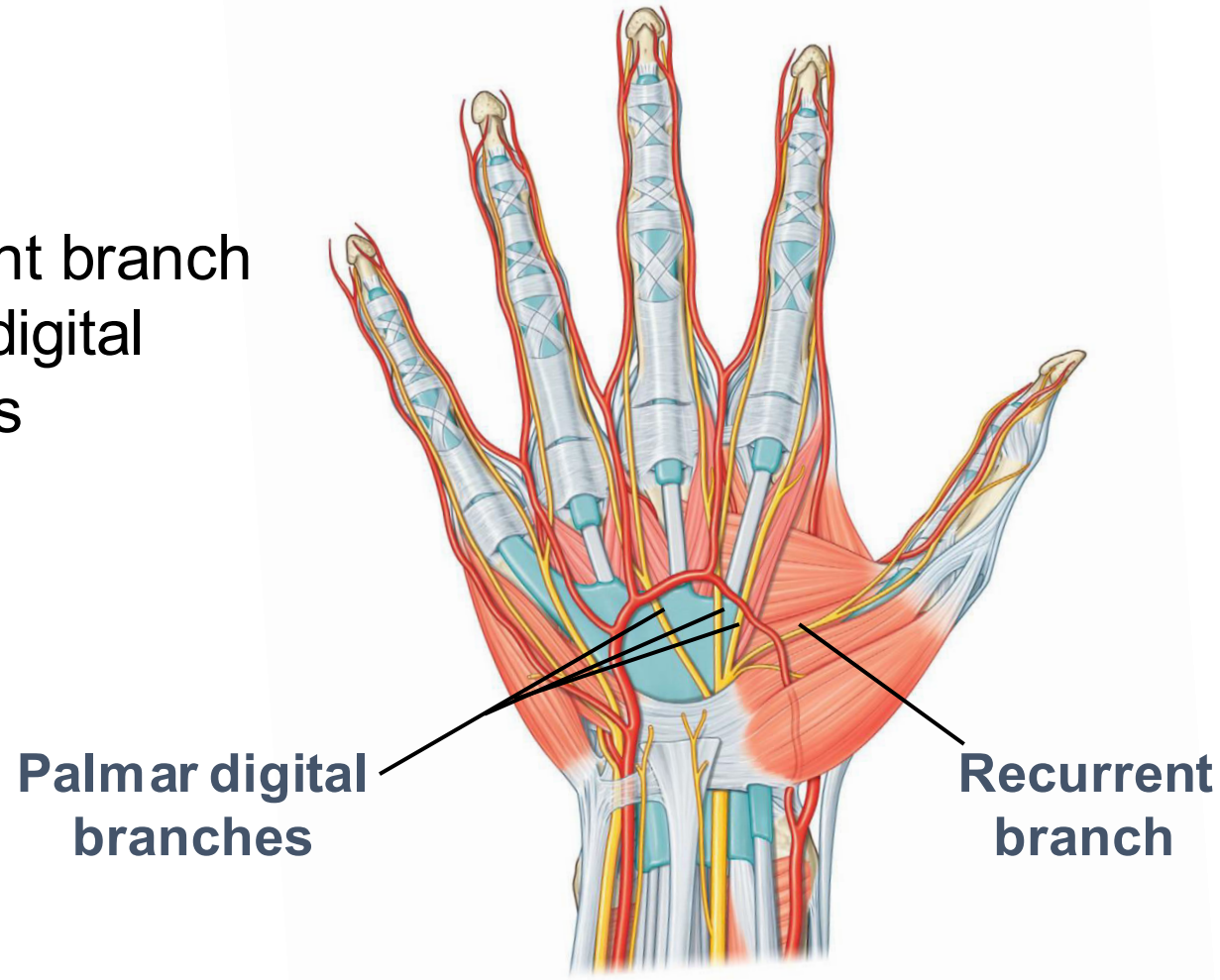
1. Anterior interosseous nerve
2. Palmar cutaneous branch



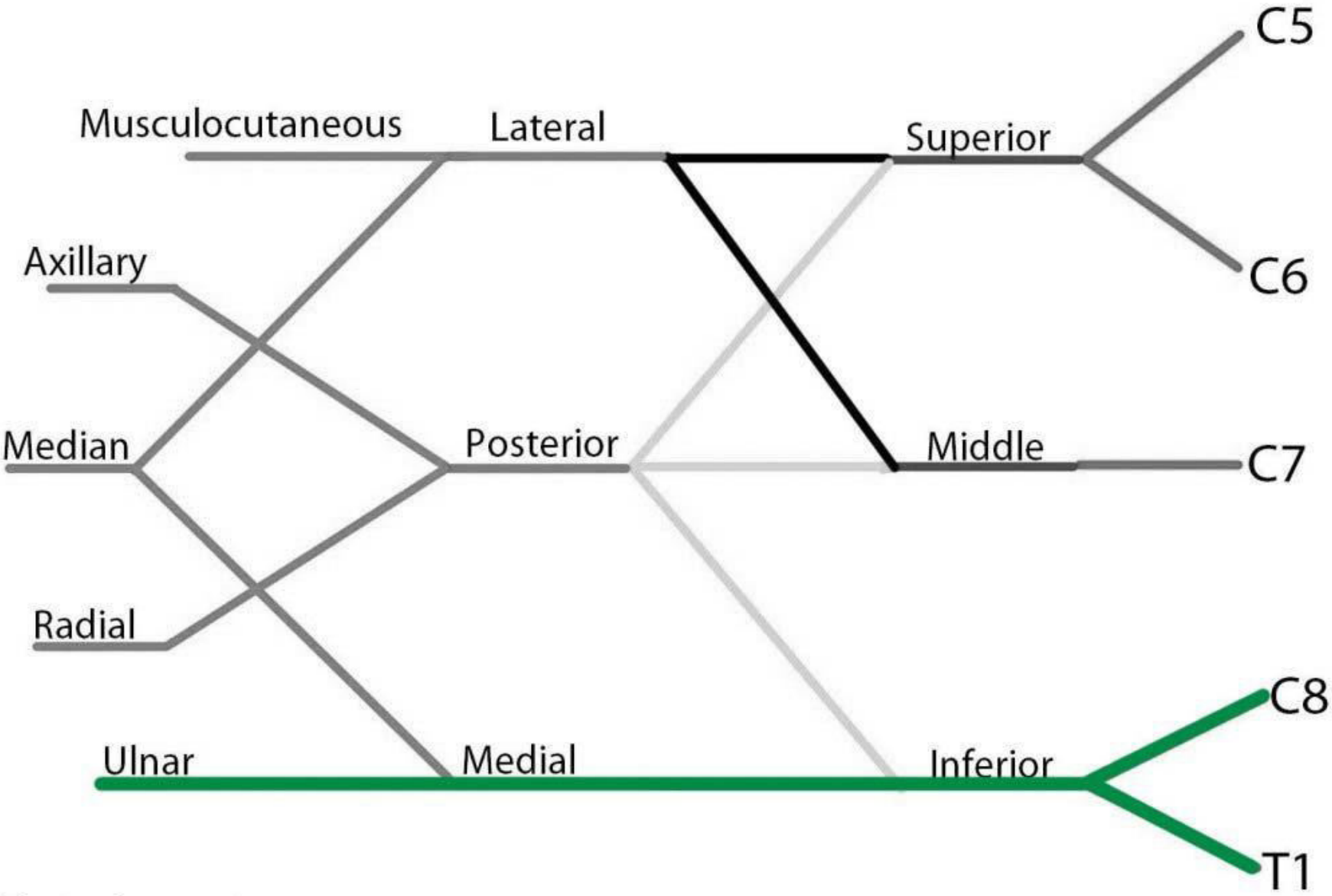
MEDIAN NERVE (C6,C7,C8,T1)

- In hand :

1. Recurrent branch
2. Palmar digital branches

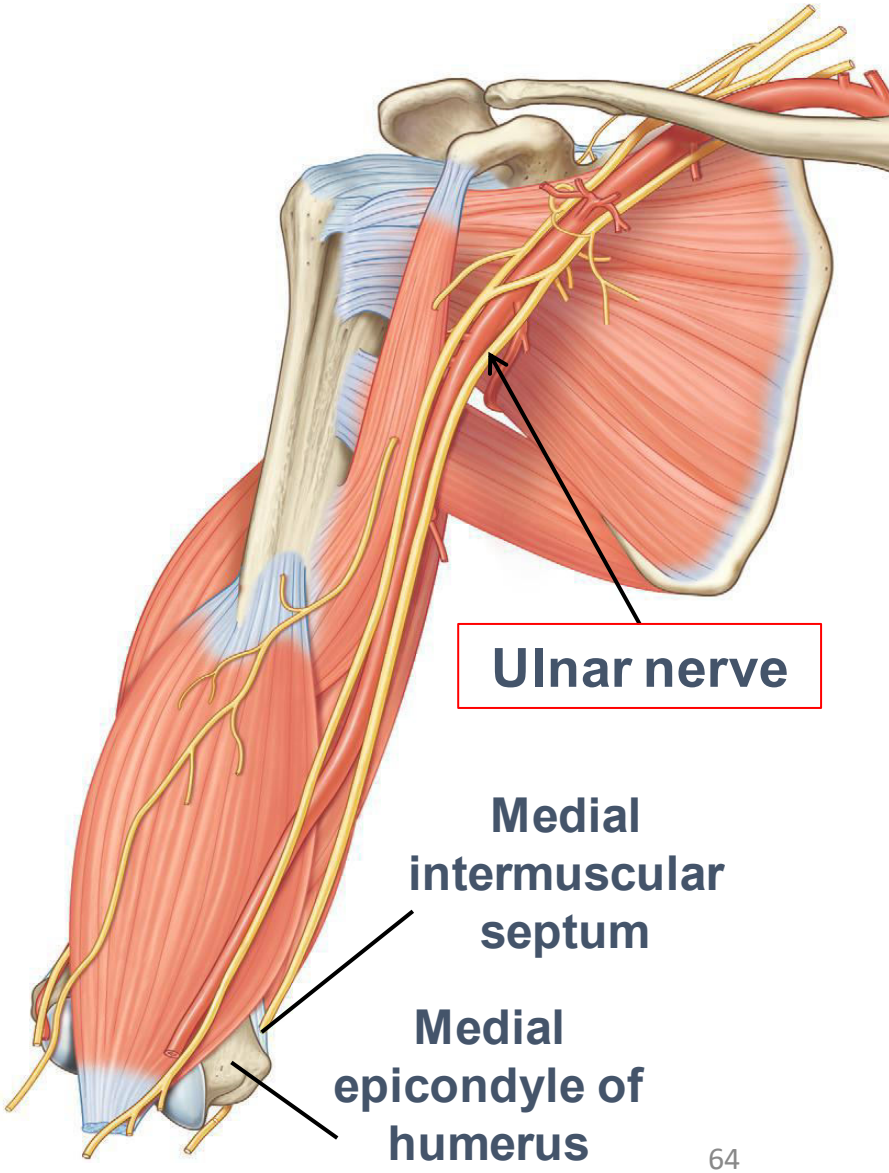


ULNAR NERVE (C8,T1)



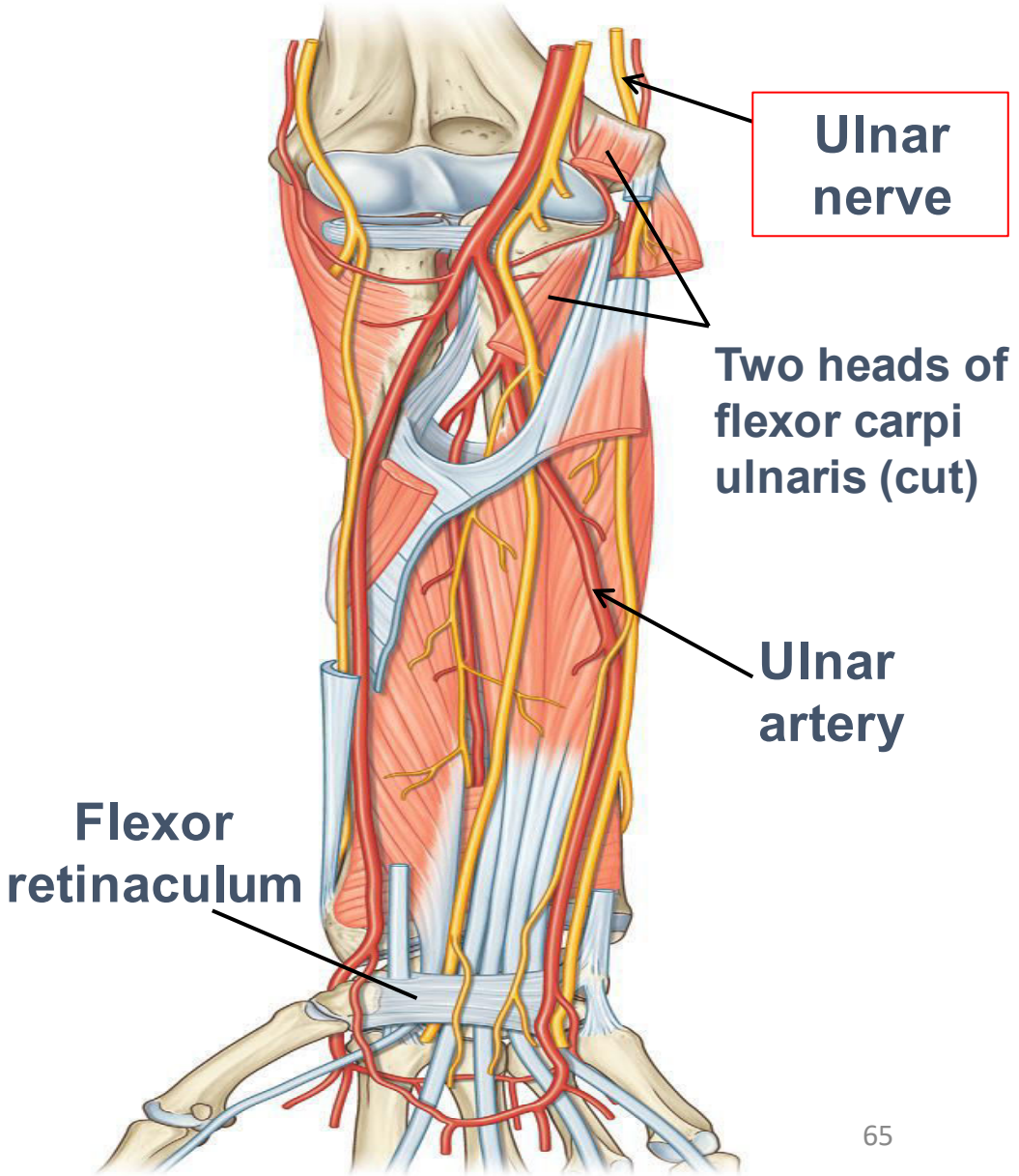
ULNAR NERVE (C8,T1)

- Descends in the medial side of arm
- Penetrates the medial intermuscular septum & enter the posterior compartment of arm
- Passes posterior to the medial epicondyle of humerus then into the anterior compartment of forearm



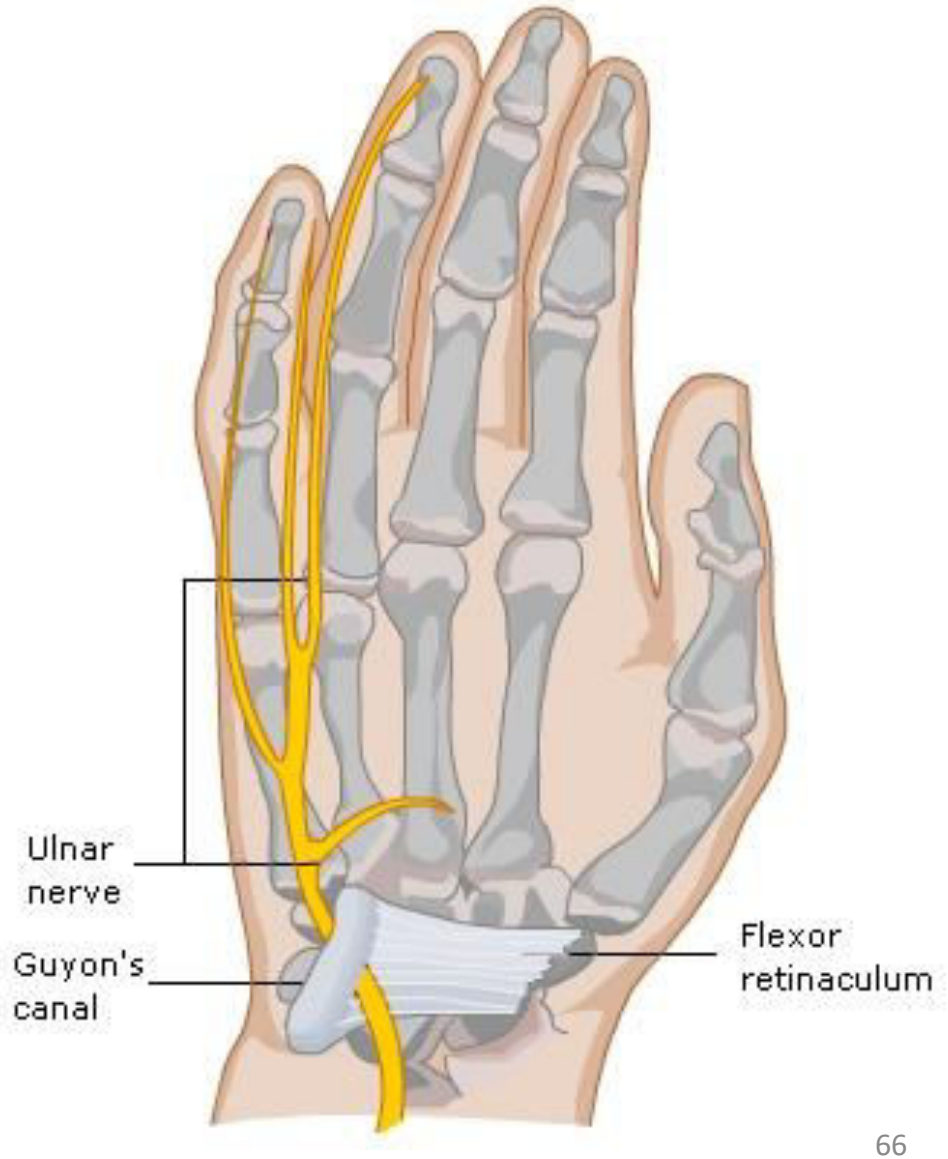
ULNAR NERVE (C8,T1)

- It passes between the two heads of flexor carpi ulnaris
- Descends in the medial side of forearm
- Ulnar artery is lateral to ulnar nerve & both pass **superficial** to the flexor retinaculum



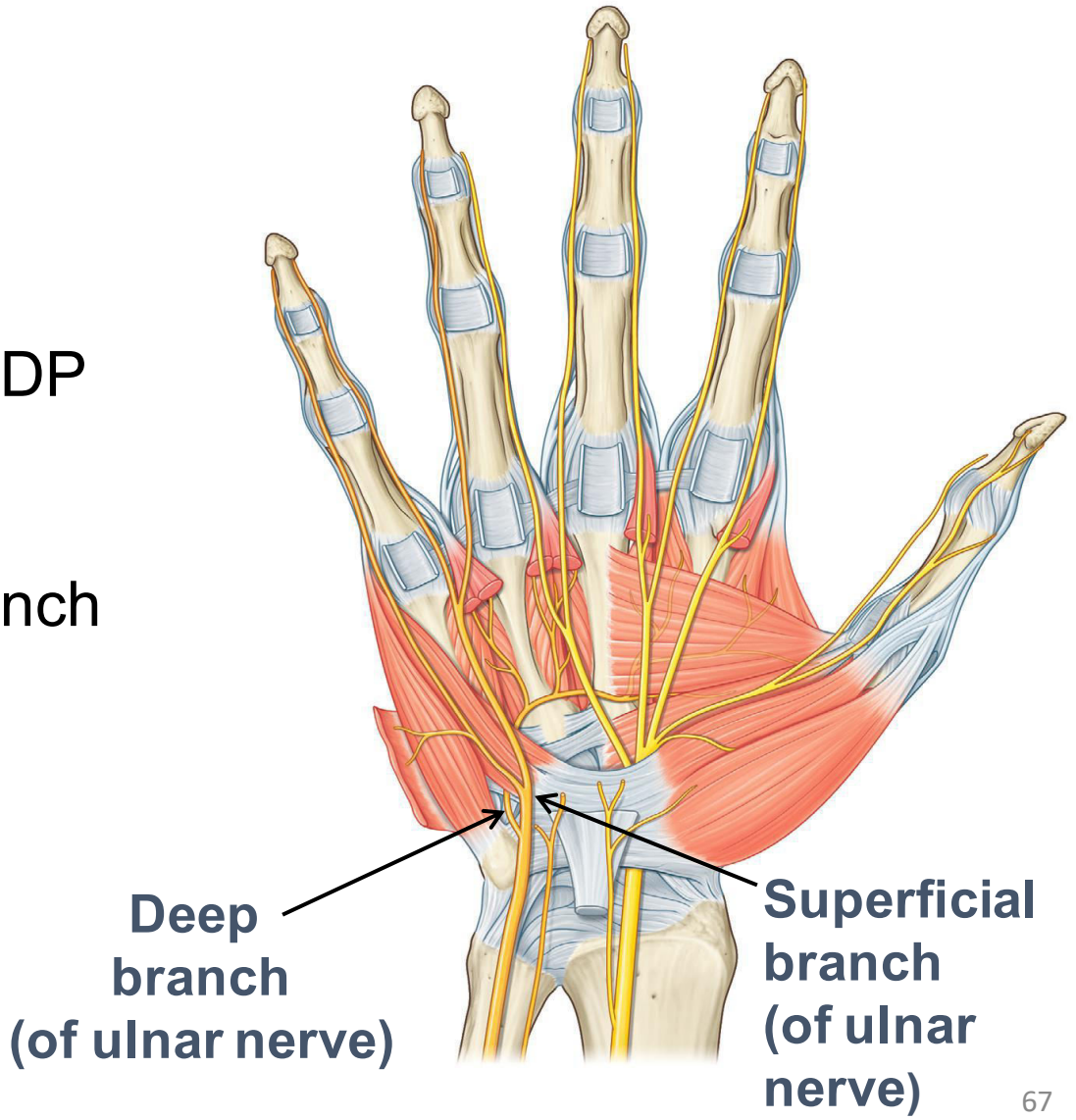
ULNAR NERVE (C8,T1)

- It enters the hand via ulnar (Guyon) canal



ULNAR NERVE (C8,T1)

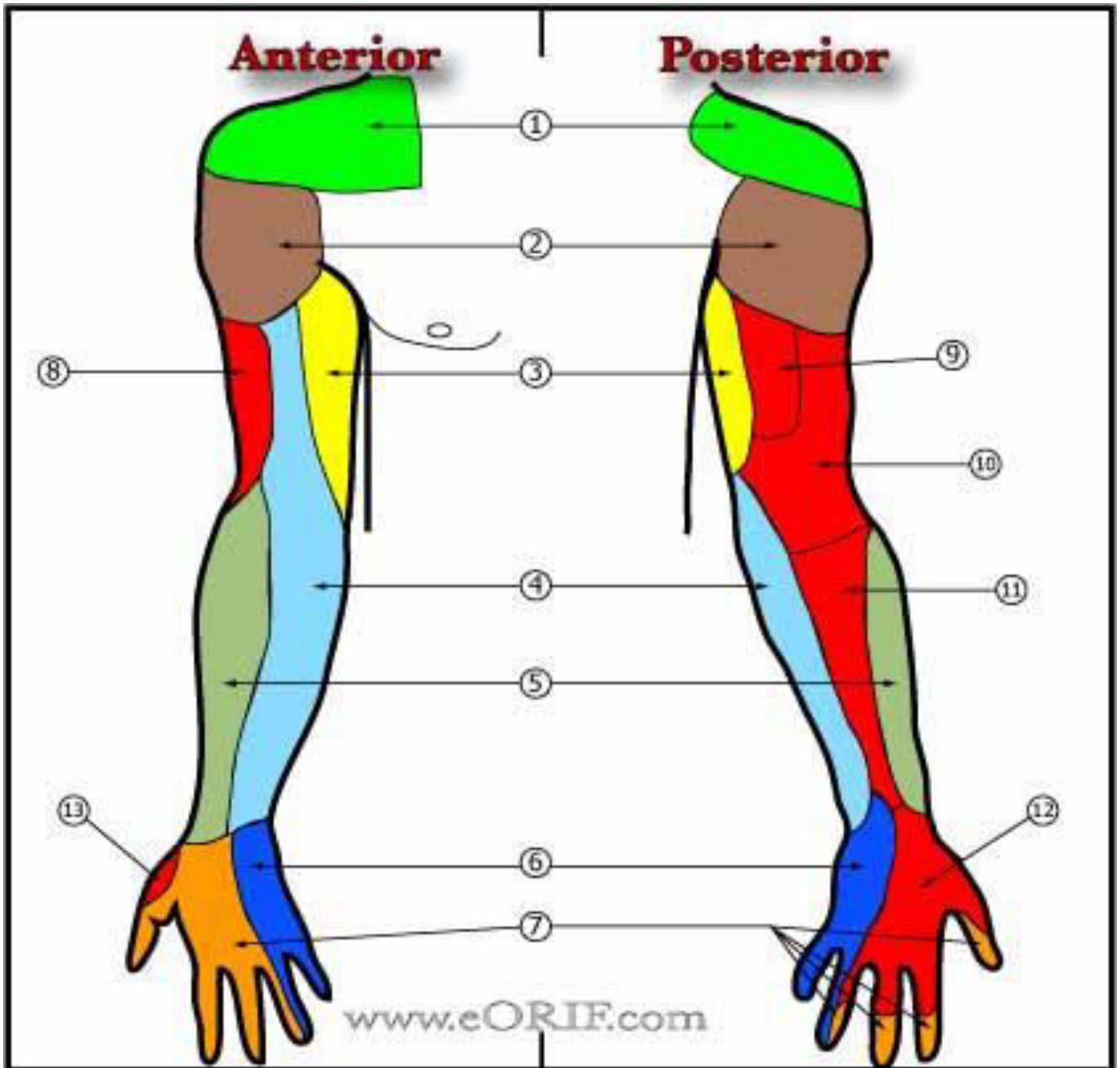
- No branches in the arm
- In forearm :
  - Muscular branches : FCU, medial half of FDP
  - Palmar cutaneous branch
  - Dorsal cutaneous branch
- In hand
  - Deep branch
  - Superficial branch



TERMINAL BRANCHES OF BRACHIAL PLEXUS : STRUCTURES SUPPLIED

Nerves	Motor supply	Sensory supply
Musculocutaneous nerve	- Biceps brachii - coracobrachialis - brachialis	skin of lateral forearm
Axillary nerve		
Radial nerve		
Median nerve		
Ulnar nerve		

CUTANEOUS INNERVATION OF UPPER LIMB



CLINICAL CORRELATIONS

- Brachial plexus injury

ERB-DUCHENNE PARALYSIS

- Injury to the **superior trunk** of brachial plexus **(C5 & C6) - erb's point**

- Causes : excessive increase in the angle between neck and shoulder
  - Birth injury
  - Fall on shoulder from motorbike/horse

ERB-DUCHENNE PARALYSIS

- **Motor affection**

1. Paralysis of abductor of arm : deltoid

   → **adduction of arm**

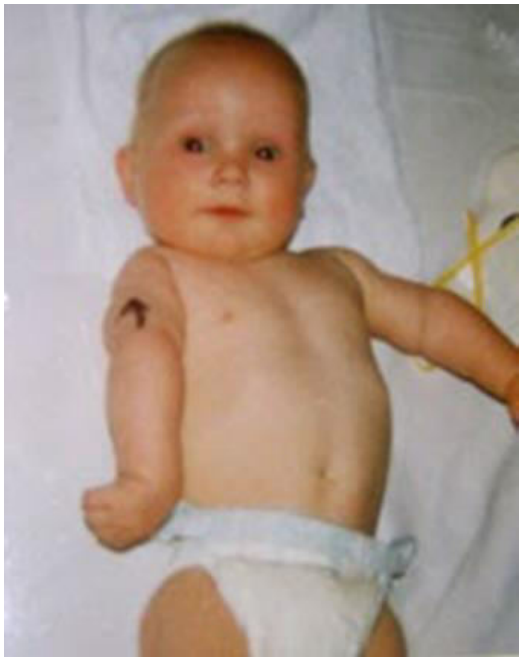
2. Paralysis of lateral rotator of arm : infraspinatus & teres minor

   → **medial rotation of arm**

3. Paralysis of flexor of forearm : biceps, brachialis, brachioradialis

   → **extension of forearm**

   → **pronated forearm & palm facing backward**



- **Deformity**

waiter's tip position

- **Sensory affection**

Loss of sensation at lower half of shoulder & lateral side of forearm

KLUMPKE PARALYSIS

- Injury to the **inferior trunk** of brachial plexus **(C8 & T1)**

- Causes : upper limb is suddenly pulled superiorly
  - Birth injury
  - When a person grasps something to break a fall
  - Malignant infiltration
  - Thoracic outlet syndrome

KLUMPKE PARALYSIS

- Motor affection

1. Paralysis of flexor of fingers & wrist
2. Paralysis of all intrinsic muscles of the hand

- Sensory affection

Loss of sensation along the ulnar border of forearm & hand

- **Deformity**

Claw hand deformity
→Hyperextension of the metacarpophalangeal joints
→Flexion of the interphalangeal joint

* Can be associated with Horner's Syndrome (involvement of cervical sympathetic chain)

POST LECTURE QUIZ

Fill in the blank

1. Axilla is composed of 4 walls, an apex and a floor
2. Axillary artery is divided into 3 parts by Pectoralis minor muscle
3. Axillary artery has 6 branches
4. Axillary vein is formed by the union of brachial vein and basilic vein
5. Axillary lymph nodes are composed of 5 groups
6. Brachial plexus is formed by ventral rami of C5-T1spinal nerves roots
7. Brachial plexus give 5 terminal branches
8. Median nerve is formed by lateral cord and posterior cord
9. Ulnar nerve is a terminal branch of medial cord
10. Ulnar artery is lateral to ulnar nerve


thank you