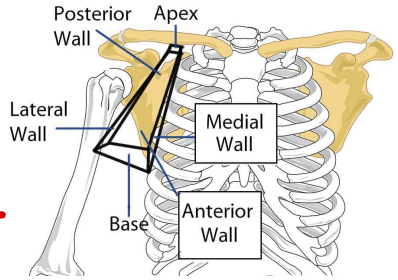
The Axilla

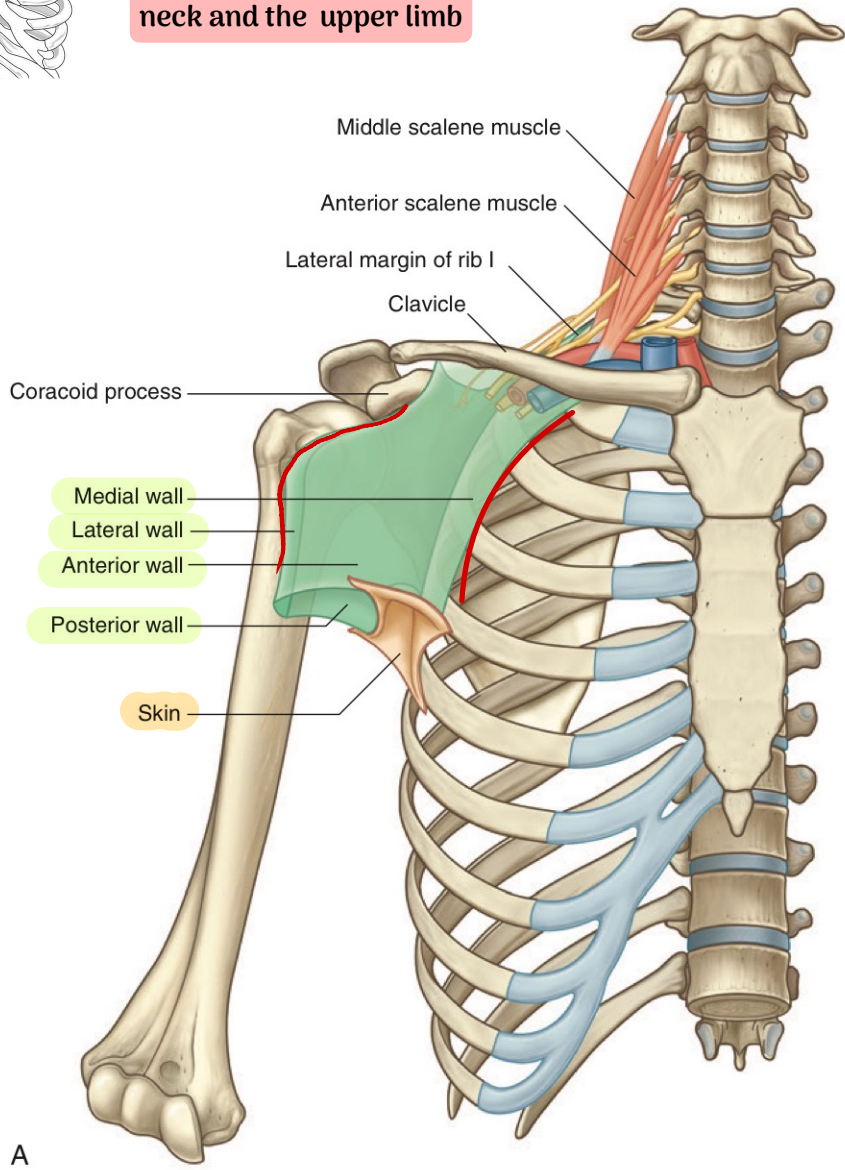
اللَّهُمَّ صَلِّ وَسَلِّمْ وَبَارِكْ على نَبِيِّنَا مُحمَّد

The Axilla

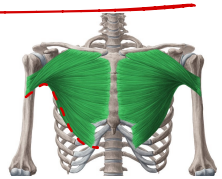


It has a connection between the root of the neck and the upper limb

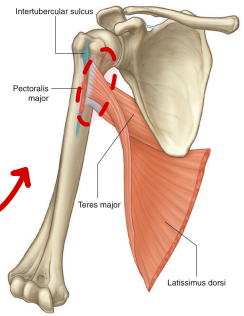
- The axilla, or armpit, is a pyramid-shaped space between the upper part of the arm and the side of the chest
- It forms an important passage for nerves, blood, and lymph vessels as they travel from the root of the neck to the upper limb.
- The upper end of the axilla, or apex, is directed into the root of the neck
- is bounded in front by the clavicle, behind by the upper border of the scapula, and medially by the outer border of the first rib



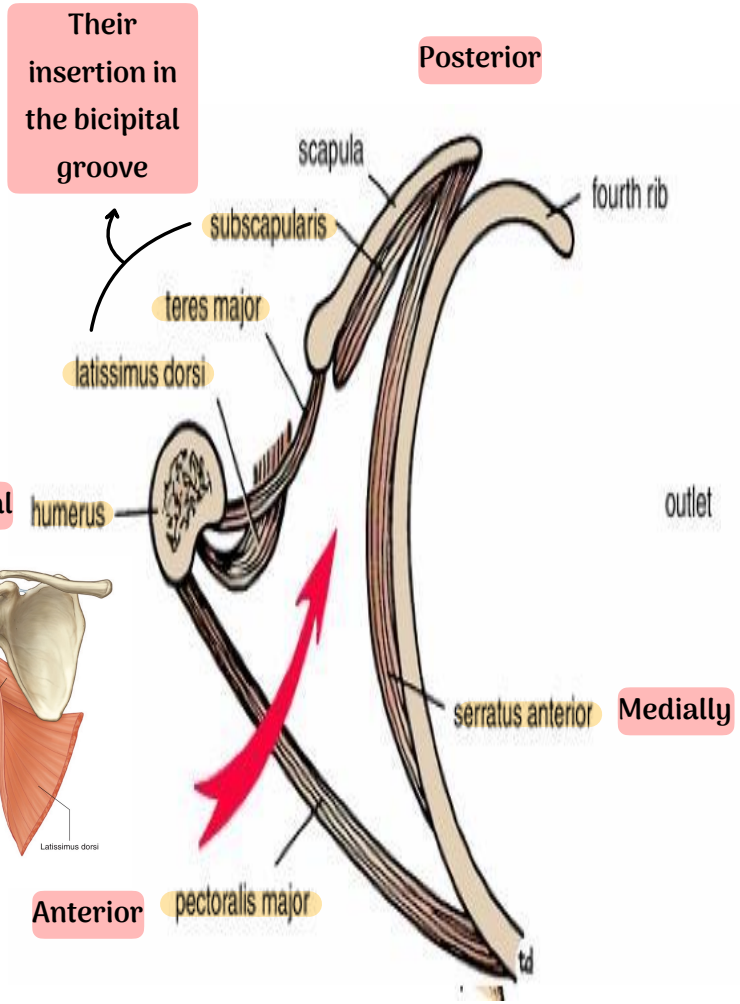
- The lower end, or base, is bounded in front by the anterior axillary fold (formed by the lower border of the pectoralis major muscle),



- behind by the posterior axillary fold (formed by the tendon of latissimus dorsi and the teres major muscle),



- and medially by the chest wall



Walls of the Axilla

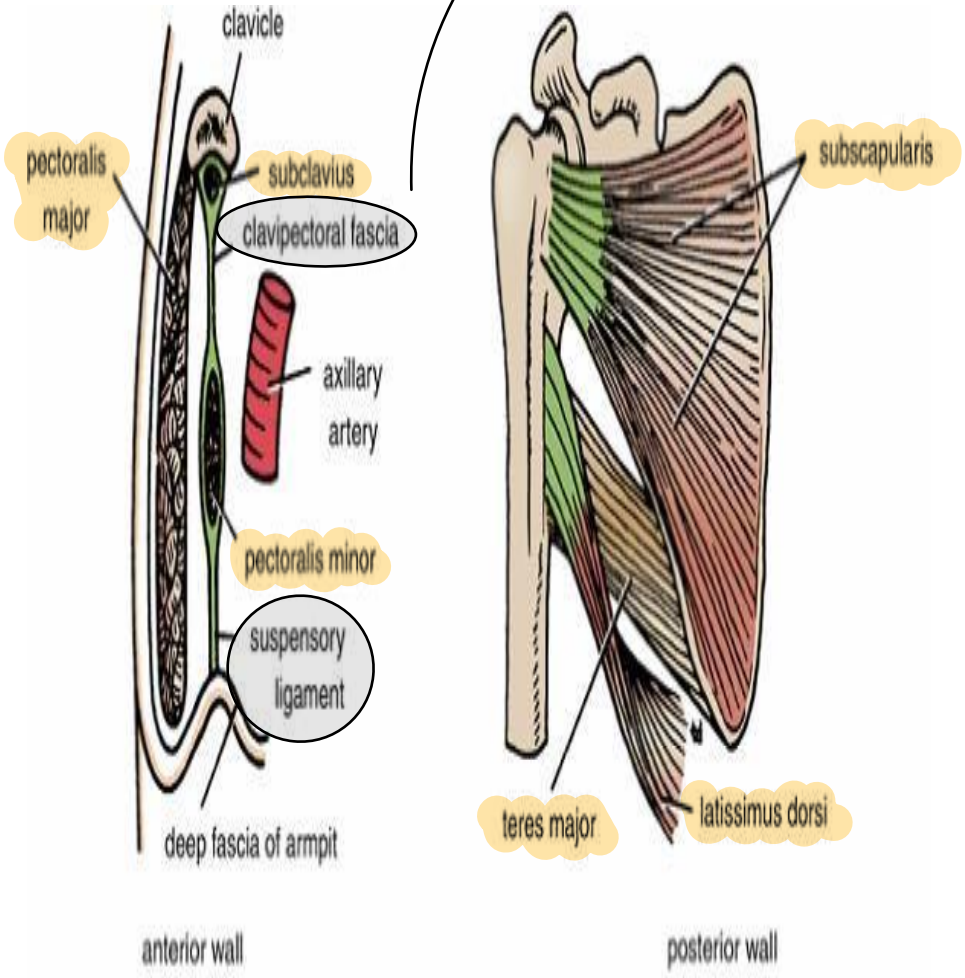
- **Anterior wall:** By the pectoralis major, subclavius, and pectoralis minor muscles

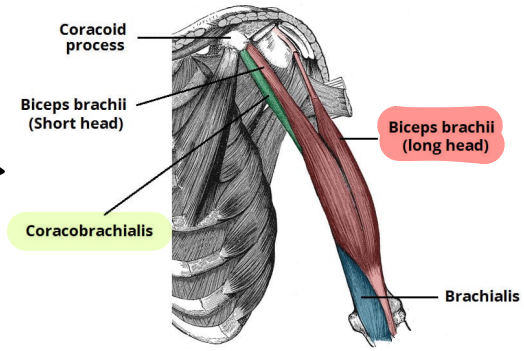
- **Posterior wall:** By the subscapularis, latissimus dorsi, and teres major muscles from above down

  Insertion of these muscle will be in the bicipital groove

- **Medial wall:** By the upper four or five ribs and the intercostal spaces covered by the serratus anterior muscle

The clavipectoral fascia surround the pectoralis minor muscle and it end in the floor of the axilla as suspensory ligament



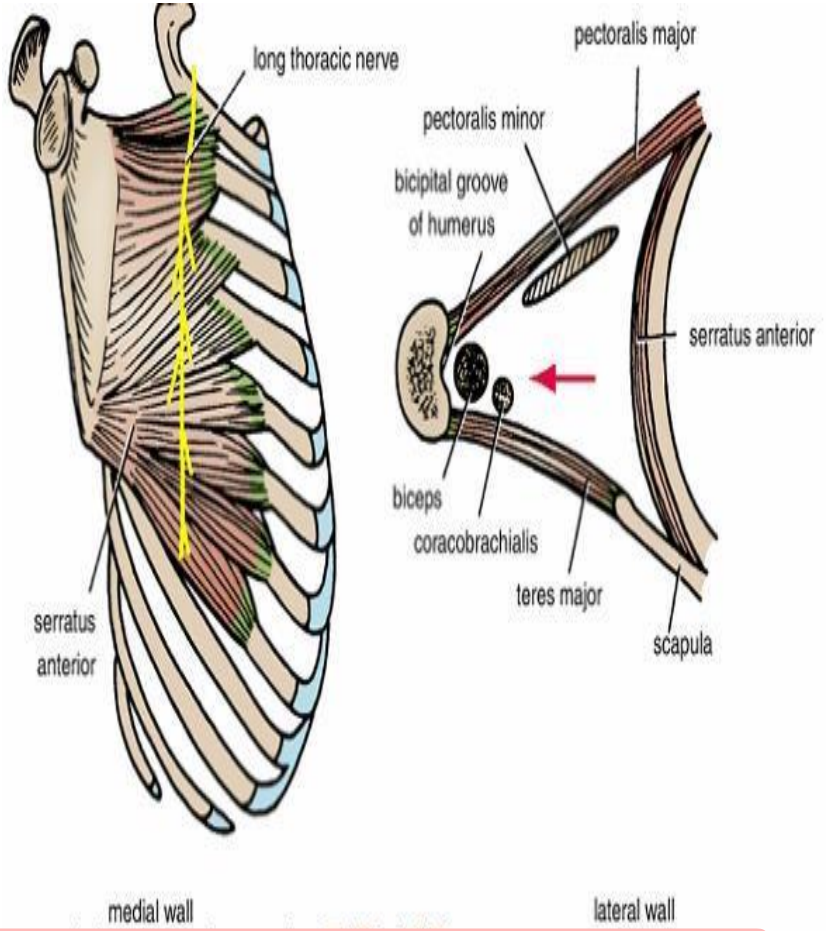


- Lateral wall: By the coracobrachialis and biceps muscles in the bicipital groove of the humerus

Fold of skin between the walls

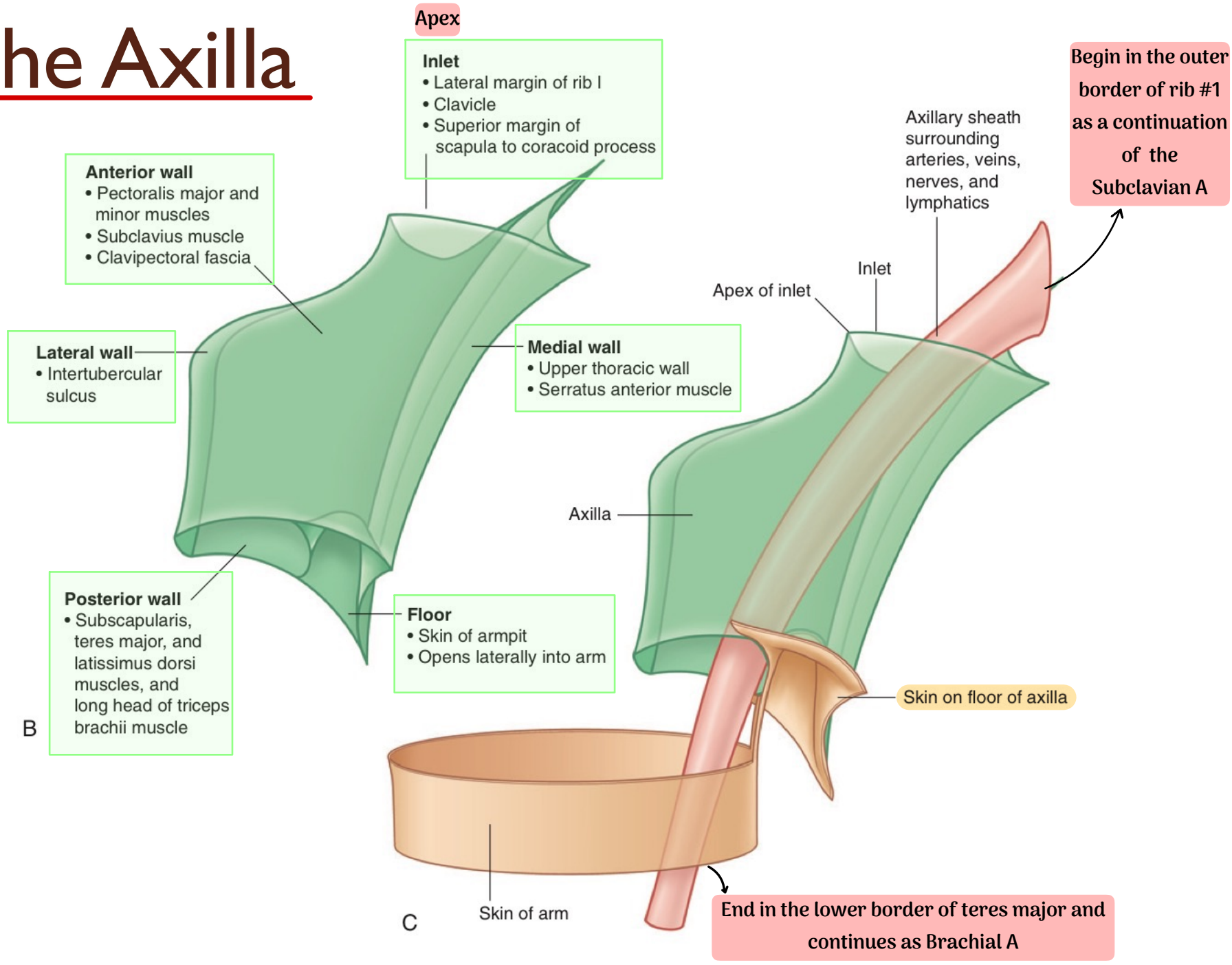
- The base is formed by the skin stretching between the anterior and posterior walls

- The axilla contains the principal vessels and nerves to the upper limb and many lymph nodes



Content of Axilla : Axillary artery , vein, lymph node and cords of brachial plexus and their branches [lateral + posterior + medial]

The Axilla


Apex
Inlet
• Lateral margin of rib I
• Clavicle
• Superior margin of scapula to coracoid process
Anterior wall
• Pectoralis major and minor muscles
• Subclavius muscle
• Clavipectoral fascia
Lateral wall
• Intertubercular sulcus
Medial wall
• Upper thoracic wall
• Serratus anterior muscle
Posterior wall
• Subscapularis, teres major, and latissimus dorsi muscles, and long head of triceps brachii muscle
Floor
• Skin of armpit
• Opens laterally into arm
B
Axillary sheath surrounding arteries, veins, nerves, and lymphatics
Begin in the outer border of rib #1 as a continuation of the Subclavian A
Inlet
Apex of inlet
Axilla
Skin on floor of axilla
Skin of arm
C
End in the lower border of teres major and continues as Brachial A

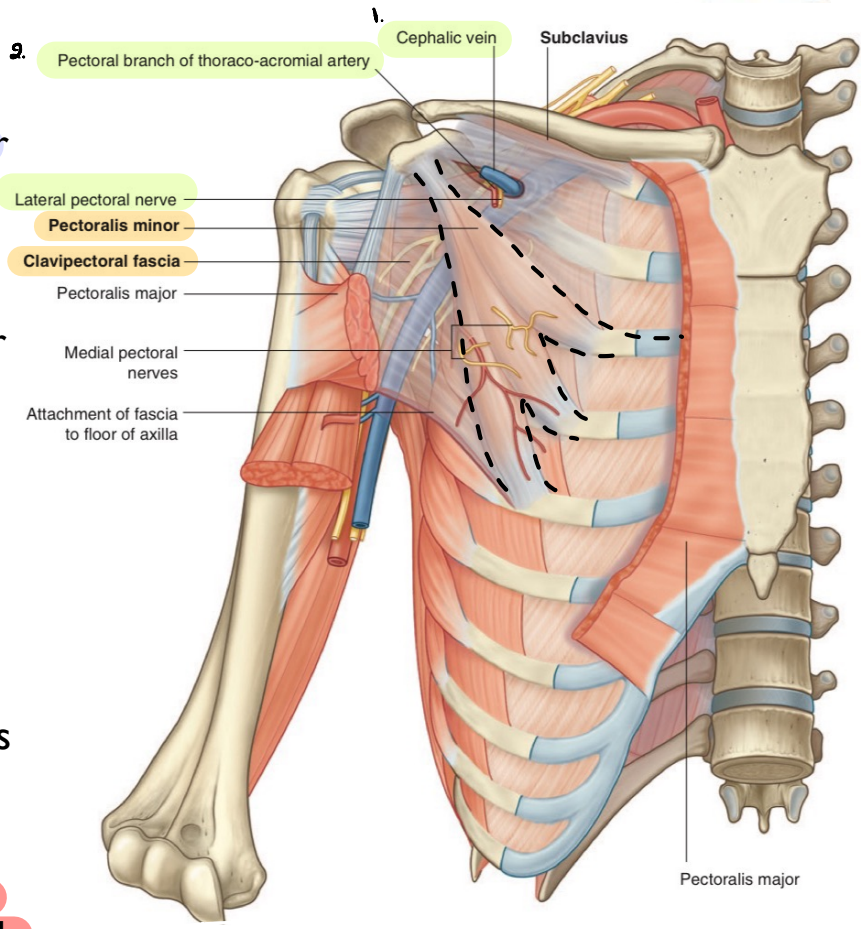
Start from the clavicle

Surround the pectoralis minor

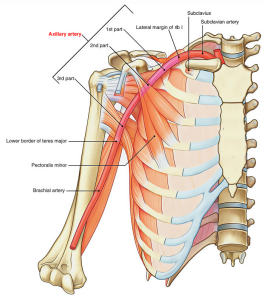
Originate from the 2,3,4 rib
Inserted in the achromion process

Clavipectoral Fascia

- The clavipectoral fascia is a strong sheet of connective tissue that is attached above to the clavicle
- Below, it splits to enclose the pectoralis minor muscle
- then continues downward as the suspensory ligament of the axilla and joins the fascial floor of the armpit.
- Structures travel between the axilla and the anterior wall of the axilla by passing through the clavipectoral fascia
- either between the pectoralis minor and subclavius muscles or inferior to the pectoralis minor muscle.
- Important structures that pass between the subclavius and pectoralis minor muscles include the 1. cephalic vein, 2. the thoraco-acromial artery, and 3. the lateral pectoral nerve. 4. + lymphatic vessels



Contents of the Axilla



- The axilla contains the axillary artery and its branches, which supply blood to the upper limb
- the axillary vein and its tributaries, which drain blood from the upper limb
- lymph vessels and lymph nodes, which drain lymph from the upper limb and the breast and from the skin of the trunk, down as far as the level of the umbilicus
- Lying among these structures in the axilla is an important nerve plexus, the brachial plexus, which innervates the upper limb
- These structures are embedded in fat.

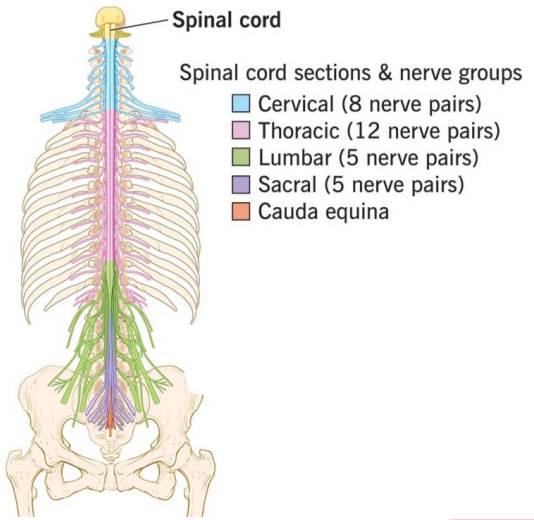
Introduction to the Nervous System

Nervous System

- The nervous system is divided into two main parts: the central nervous system, which consists of the brain and spinal cord
- the peripheral nervous system, which consists of 12 pairs of cranial nerves and 31 pairs of spinal nerves and their associated ganglia.

  Motor nerve supply the muscles / sensory nerve that bring sensation from the skin
- Functionally, the nervous system can be further divided into the somatic nervous system, which controls voluntary activities
- and the autonomic nervous system, which controls involuntary activities. Sympathetic + parasympathetic [have opposite function]

- total of 31 pairs of spinal nerves leave the spinal cord and pass through intervertebral foramina in the vertebral column

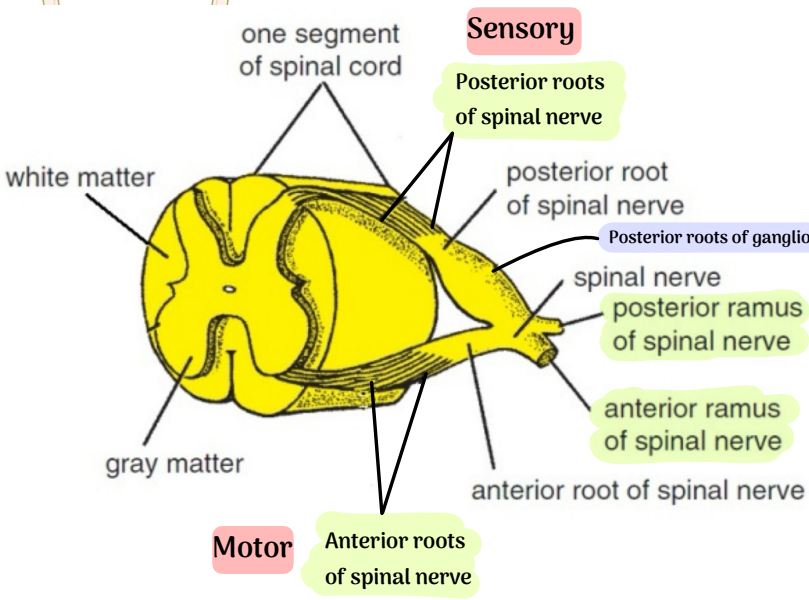


- The spinal nerves are named according to the region of the vertebral column with which they are associated:
- 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 1 coccygeal
- Each spinal nerve is connected to the spinal cord by two roots: the anterior root and the posterior root

Motor

Dorsal / anterior

- The anterior root consists of bundles of nerve fibers carrying nerve impulses away from the central nervous system Such nerve fibers are called efferent fibers



The spinal nerve originates from the spinal cord and consists of an anterior (ventral) root and a posterior (dorsal) root. The anterior root carries motor fibers, while the posterior root contains a dorsal root ganglion, which is a collection of sensory neuron cell bodies. Sensory information is transmitted through the dorsal root, whereas motor commands are conveyed via the ventral root. These roots merge to form the spinal nerve, which is classified as a mixed nerve since it contains both sensory and motor fibers. Each spinal nerve exits the vertebral column through the intervertebral foramen and subsequently divides into the anterior (ventral) ramus and posterior (dorsal) ramus. The posterior ramus is smaller and innervates the intrinsic muscles of the back and the overlying skin. In contrast, the anterior ramus is larger, as it supplies the anterolateral trunk, as well as the upper and lower limbs.

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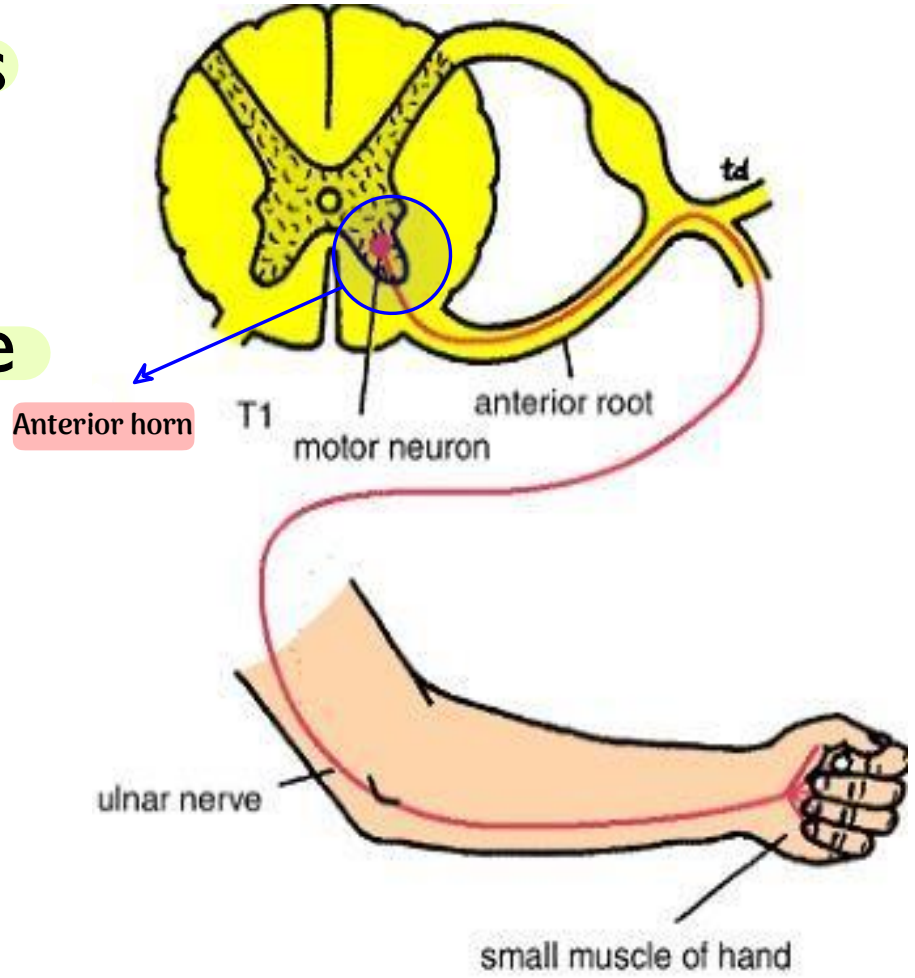
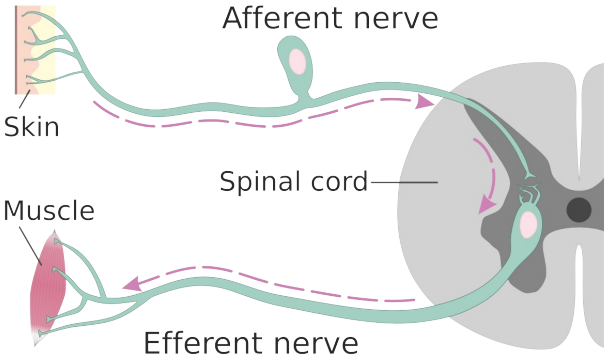
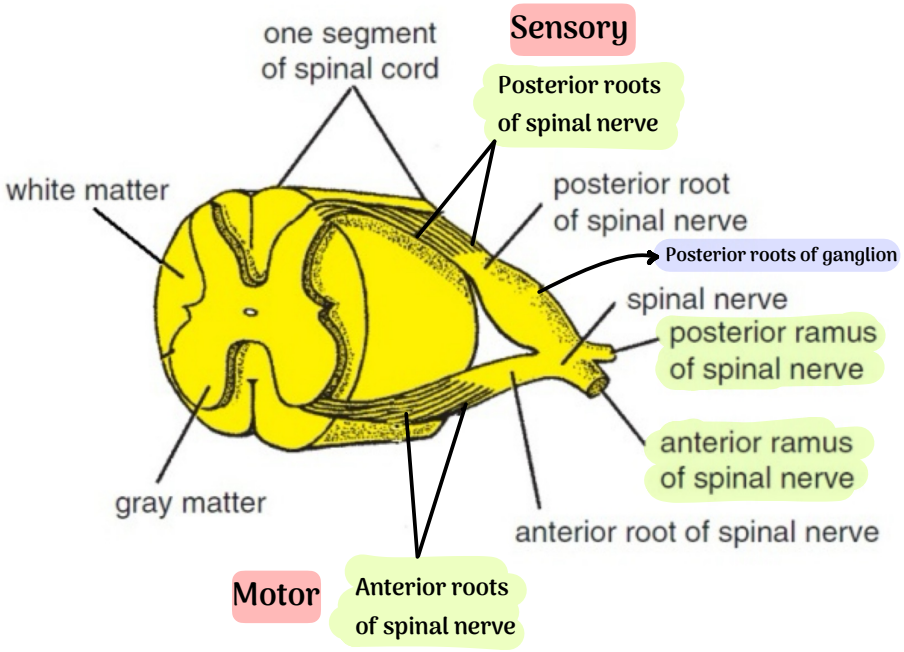
- Those efferent fibers that go to skeletal muscle and cause them to contract are called motor fibers

- Their cells of origin lie in the anterior gray horn of the spinal cord.

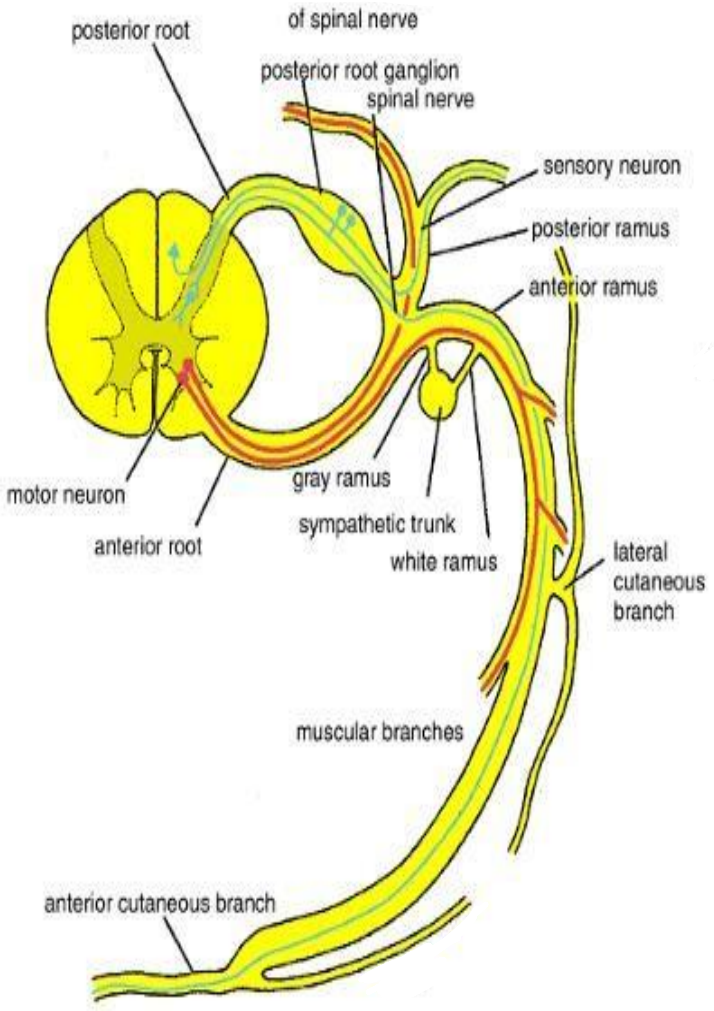


- The posterior root consists of bundles of nerve fibers that carry impulses to the central nervous system and are called afferent fibers
- Because these fibers are concerned with conveying information about sensations of touch, pain, temperature, and vibrations, they are called sensory fibers
- The cell bodies of these nerve fibers are situated in a swelling on the posterior root called the posterior root ganglion





- At each intervertebral foramen, the anterior and posterior roots unite to form a spinal nerve
- Here, the motor and sensory fibers become mixed together, so that a spinal nerve is made up of a mixture of motor and sensory fibers
- On emerging from the foramen, the spinal nerve divides into a large anterior ramus and a smaller posterior ramus
- The posterior ramus passes posteriorly around the vertebral column to supply the muscles and skin of the back
- The anterior ramus continues anteriorly to supply the muscles and skin over the anterolateral body wall and all the muscles and skin of the limbs

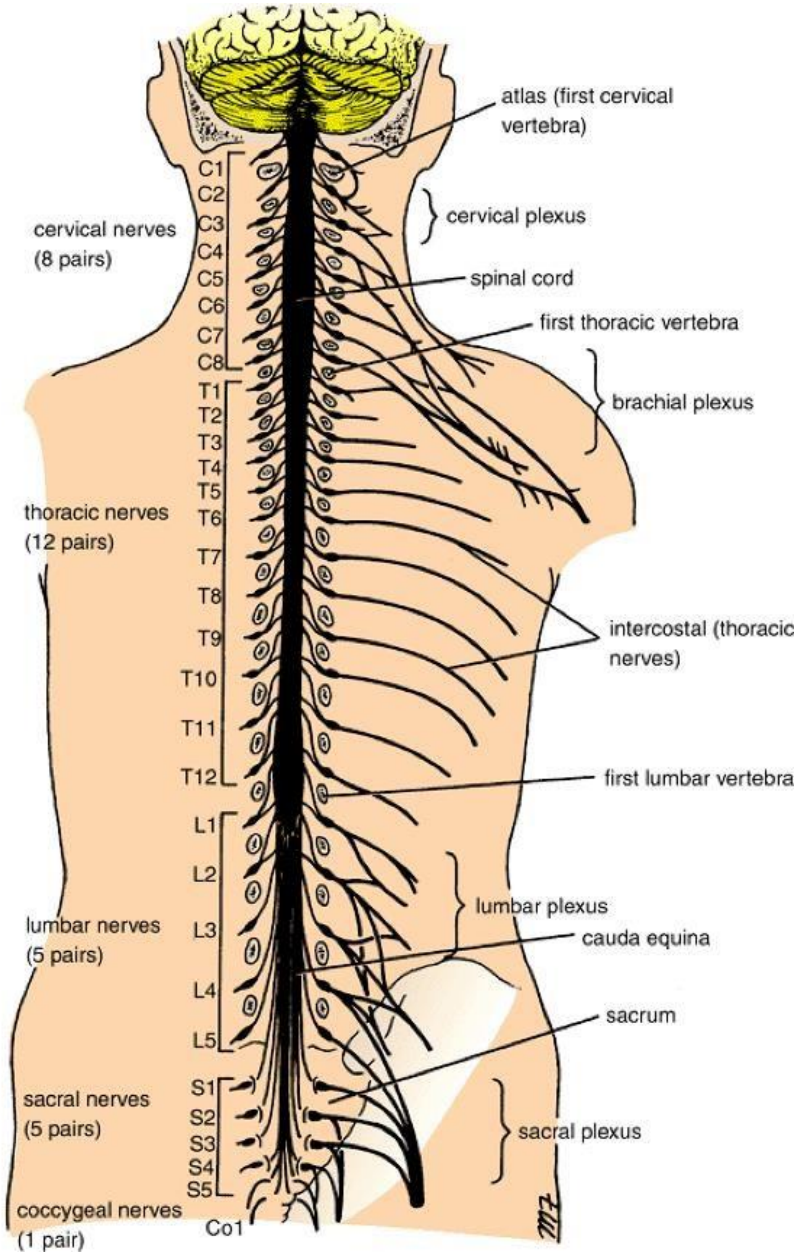


Plexuses

- At the root of the limbs, the anterior rami join one another to form complicated nerve plexuses

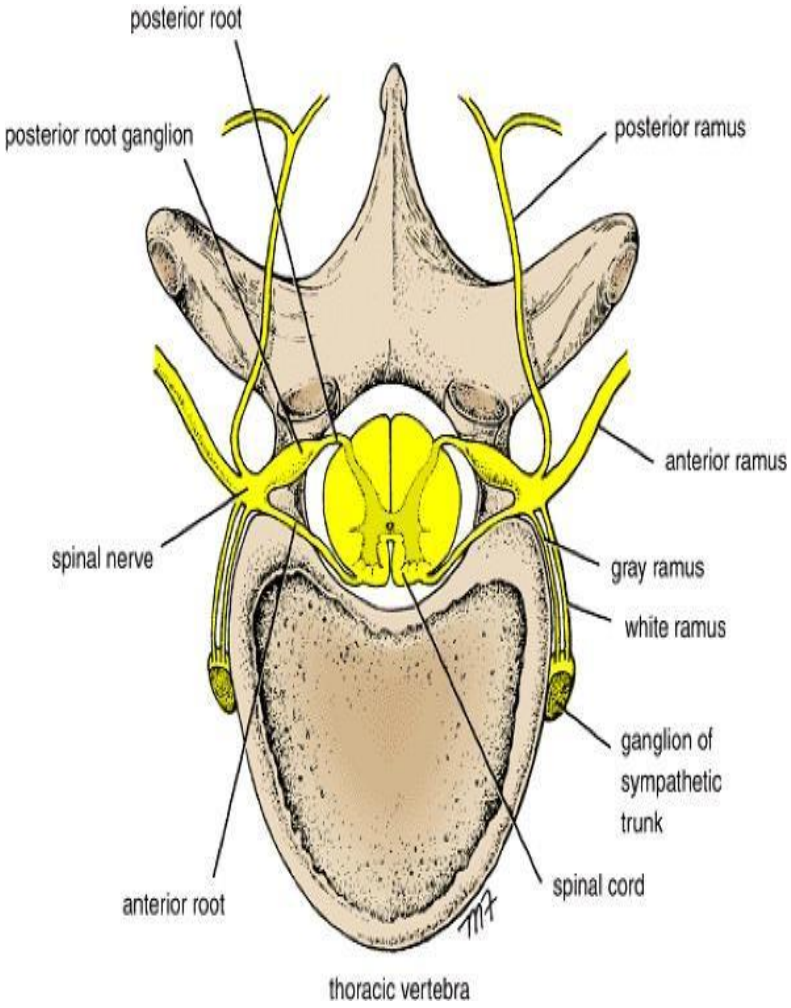
①

- The cervical and brachial plexuses are found at the root of the upper limbs, and the ② lumbar and sacral plexuses are found at the root of the lower limbs.

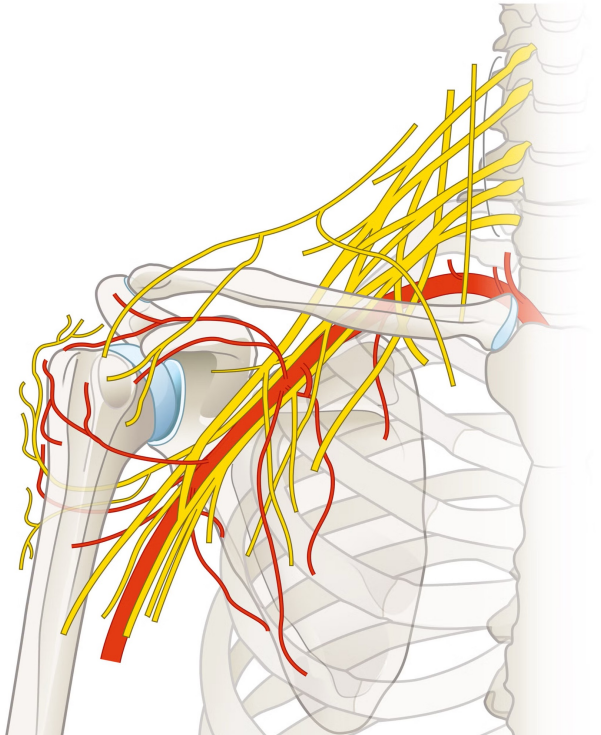


Autonomic Nervous System

- The autonomic nervous system is the part of the nervous system concerned with the innervation of involuntary structures such as the heart, smooth muscle, and glands throughout the body
- distributed throughout the central and peripheral nervous system
- The autonomic system may be divided into two parts the sympathetic and the parasympathetic and both parts have afferent and efferent nerve fibers
- The activities of the sympathetic part of the autonomic system prepare the body for an emergency



The Brachial Plexus



Brachial Plexus

- The nerves entering the upper limb provide the following important functions:

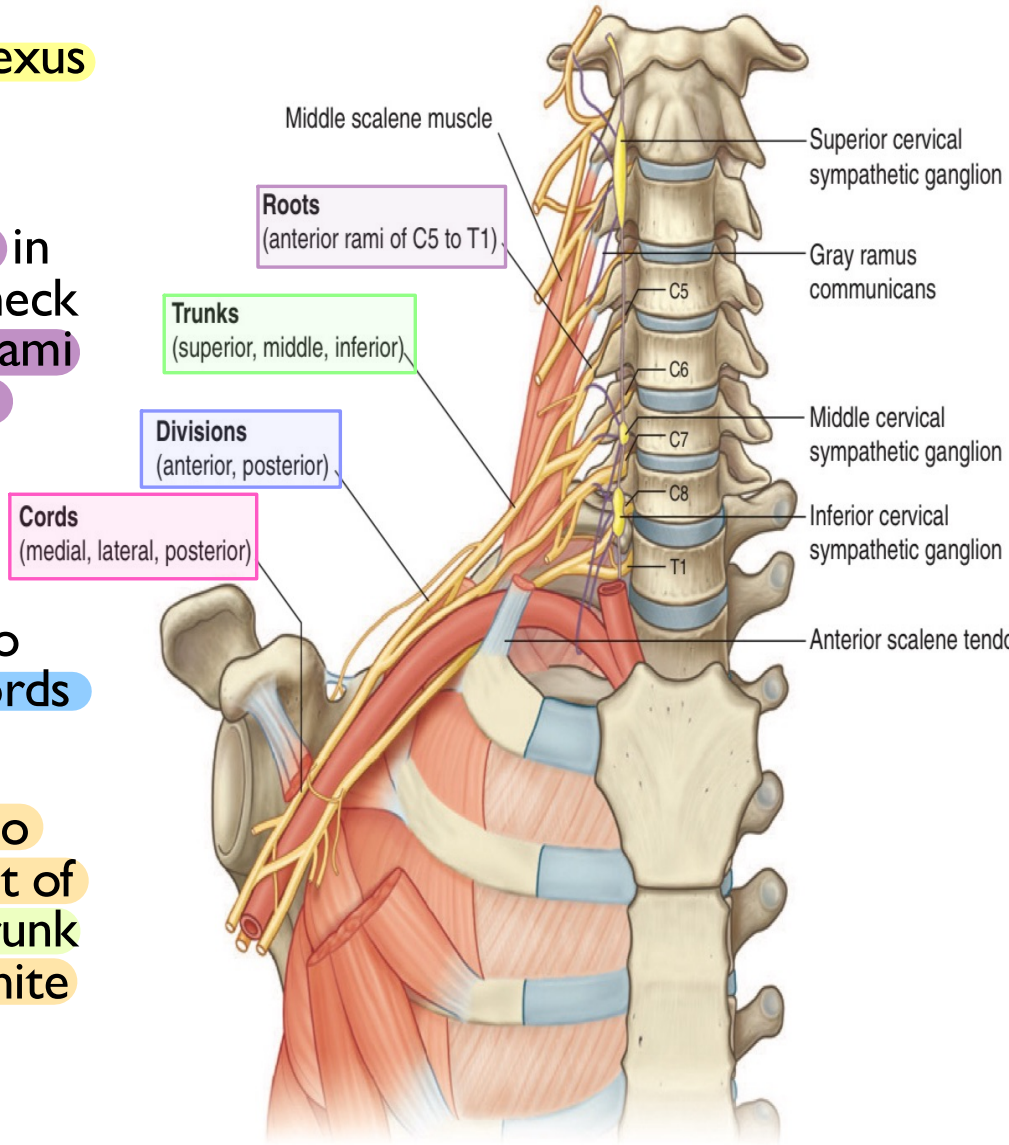
1. sensory innervation to the skin and deep structures, such as the joints
2. motor innervation to the muscles
3. influence over the diameters of the blood vessels by the sympathetic vasomotor nerves
4. and sympathetic secretomotor supply to the sweat glands.

- At the root of the neck, the nerves form a complicated plexus called the brachial plexus

- The brachial plexus is formed in the posterior triangle of the neck by the union of the anterior rami of the fifth, sixth, seventh, and eighth cervical and the first thoracic spinal nerves
  - They are called roots

- The plexus can be divided into roots, trunks, divisions, and cords

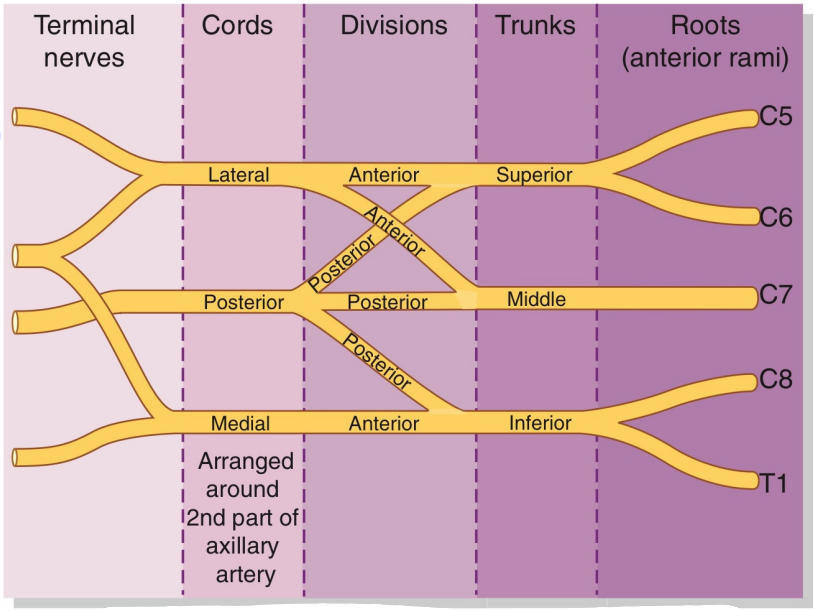
- The roots of C5 and 6 unite to form the upper trunk the root of C7 continues as the middle trunk and the roots of C8 and T1 unite to form the lower trunk



- Each trunk then divides into anterior and posterior divisions

6 divisions

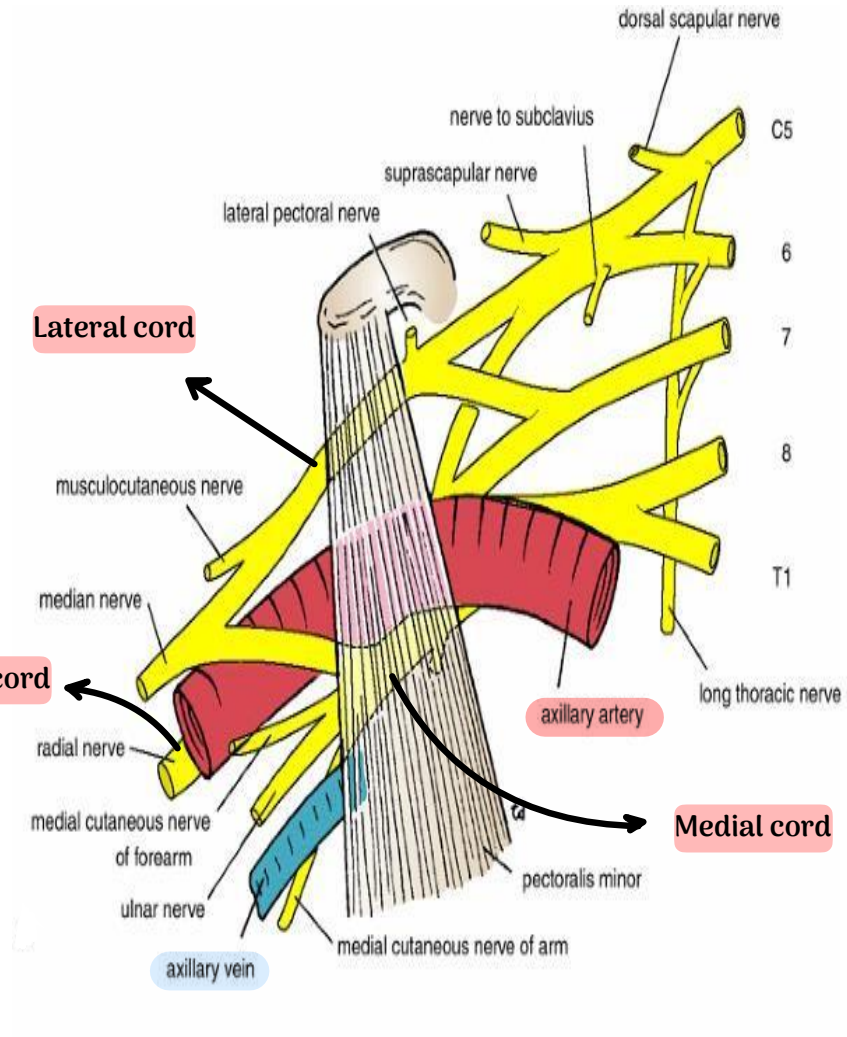
- The anterior divisions of the upper and middle trunks unite to form the lateral cord
- the anterior division of the lower trunk continues the medial cord
- and the posterior divisions of all three trunks join form the posterior cord



- The roots, trunks, and divisions of the brachial plexus reside in the lower part of the posterior triangle of the neck
- The cords become arranged around the axillary artery in the axilla
- the brachial plexus and the axillary artery and vei enclosed in the axillary sheath.

Cords of the Brachial Plexus

- All three cords of the brachial plexus lie above and lateral to the first part of the axillary artery
- The medial cord crosses behind the artery to reach the medial side of the second part of the artery
- The posterior cord lies behind the second part of the artery,
- and the lateral cord lies on the lateral side of the second part of the artery
- Thus, the cords of the plexus have the relationship to the second part of the axillary artery that is indicated by their names.
- Most branches of the cords that form the main nerve trunks of the upper limb continue this relationship to the artery in its third part



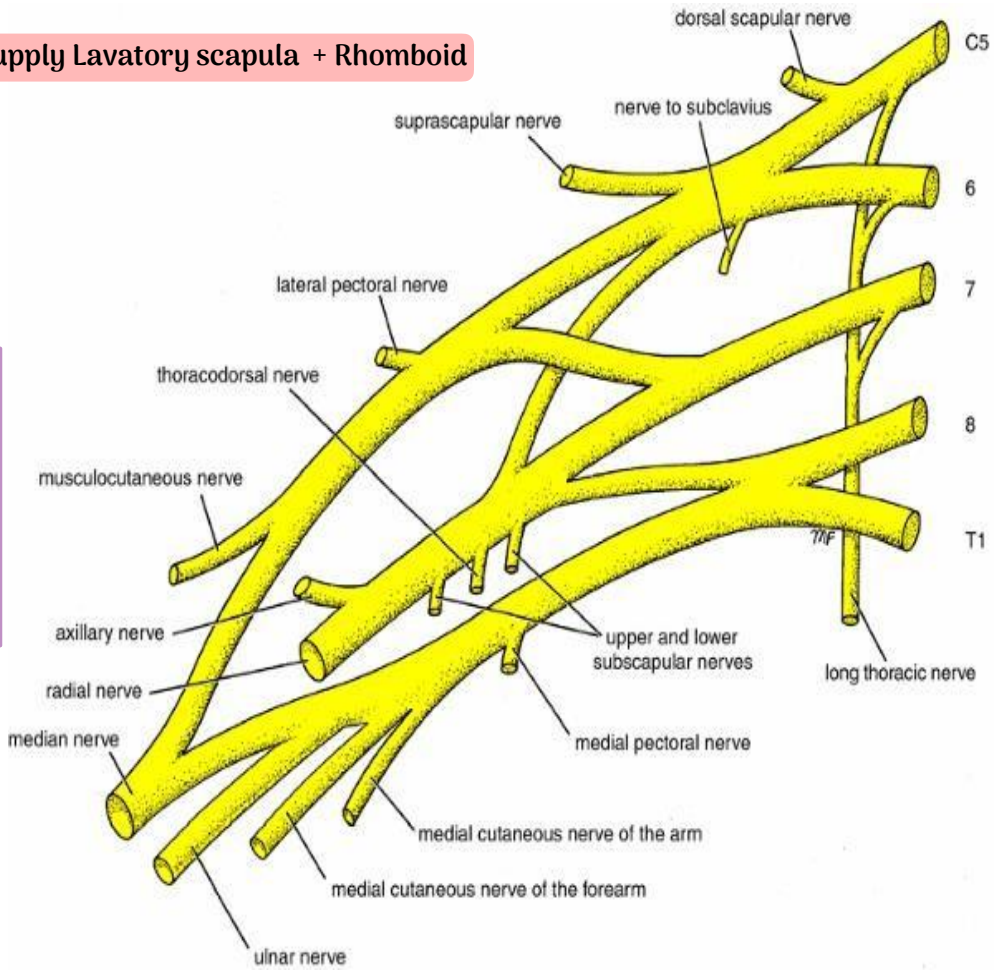
The branches of the different parts of the brachial plexus

- Roots
- Dorsal scapular nerve (C5) → Supply Lavatory scapula + Rhomboid
- Long thoracic nerve (C5, 6, and 7) → serratus anterior muscle

- Upper trunk
- Nerve to subclavius (C5 and 6)
- Suprascapular nerve (supplies the supraspinatus and infraspinatus muscles)

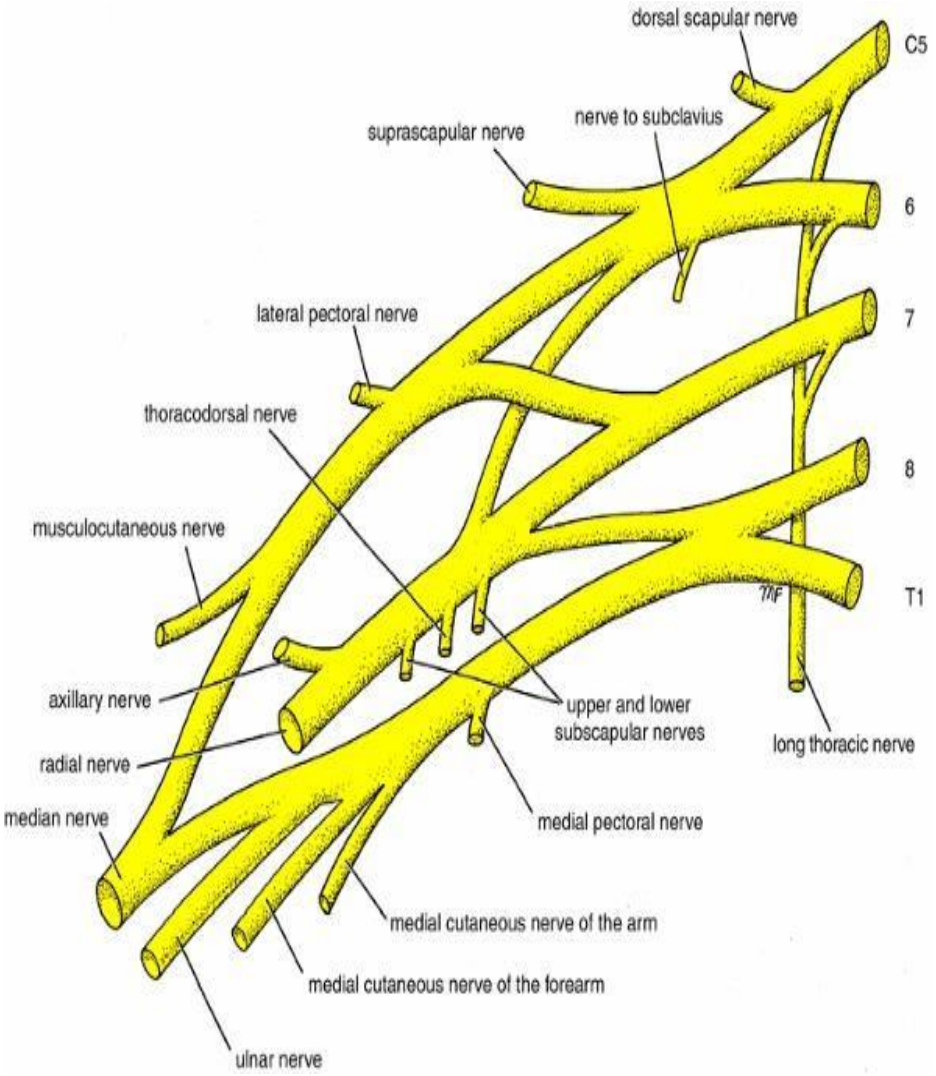
No branches from lateral or medial trunk

- Lateral cord
- Lateral pectoral nerve
- Musculocutaneous nerve
- Lateral root of median nerve



- Medial cord
- Medial pectoral nerve
- Medial cutaneous nerve of arm and medial cutaneous nerve of forearm Skin
- Ulnar nerve
- Medial root of median nerve

- Posterior cord
- Upper and lower subscapular nerves
- Thoracodorsal nerve
- Axillary nerve
- Radial nerve



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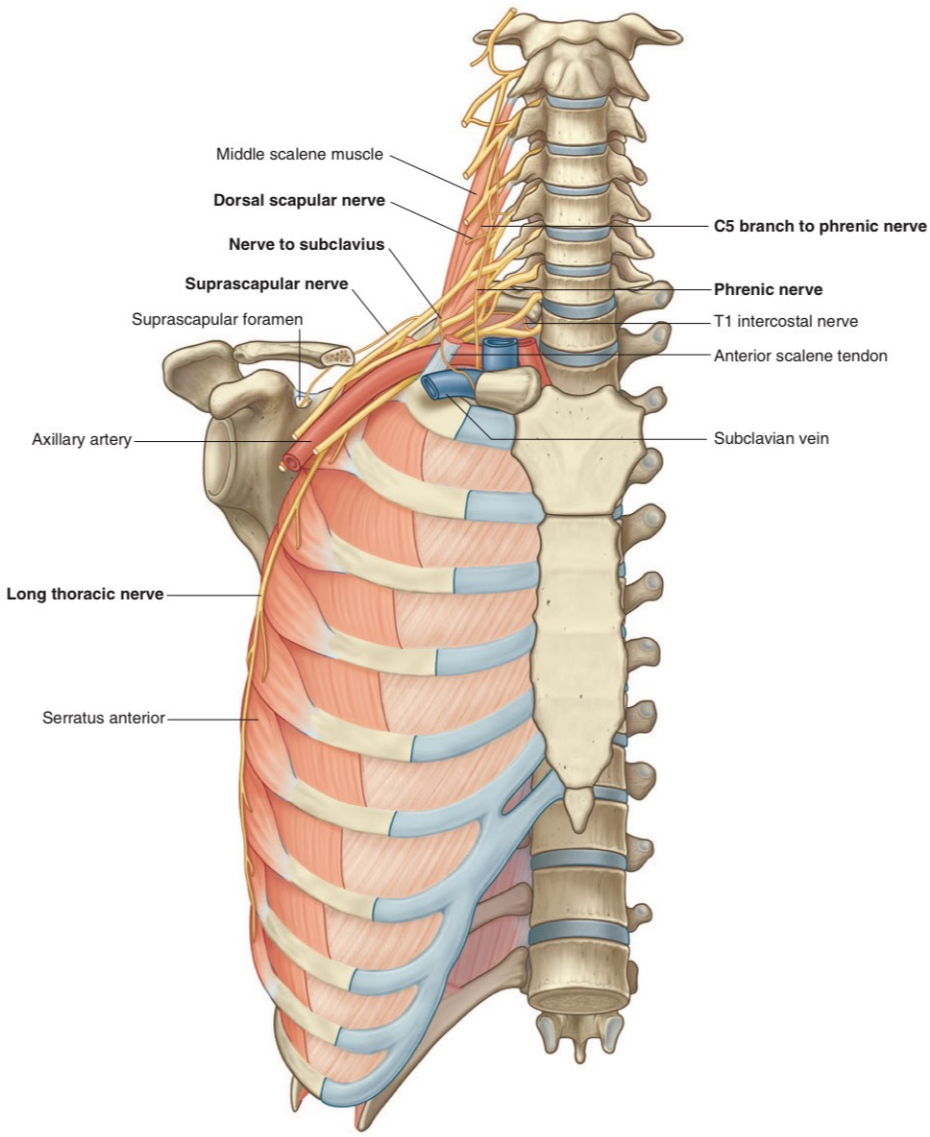
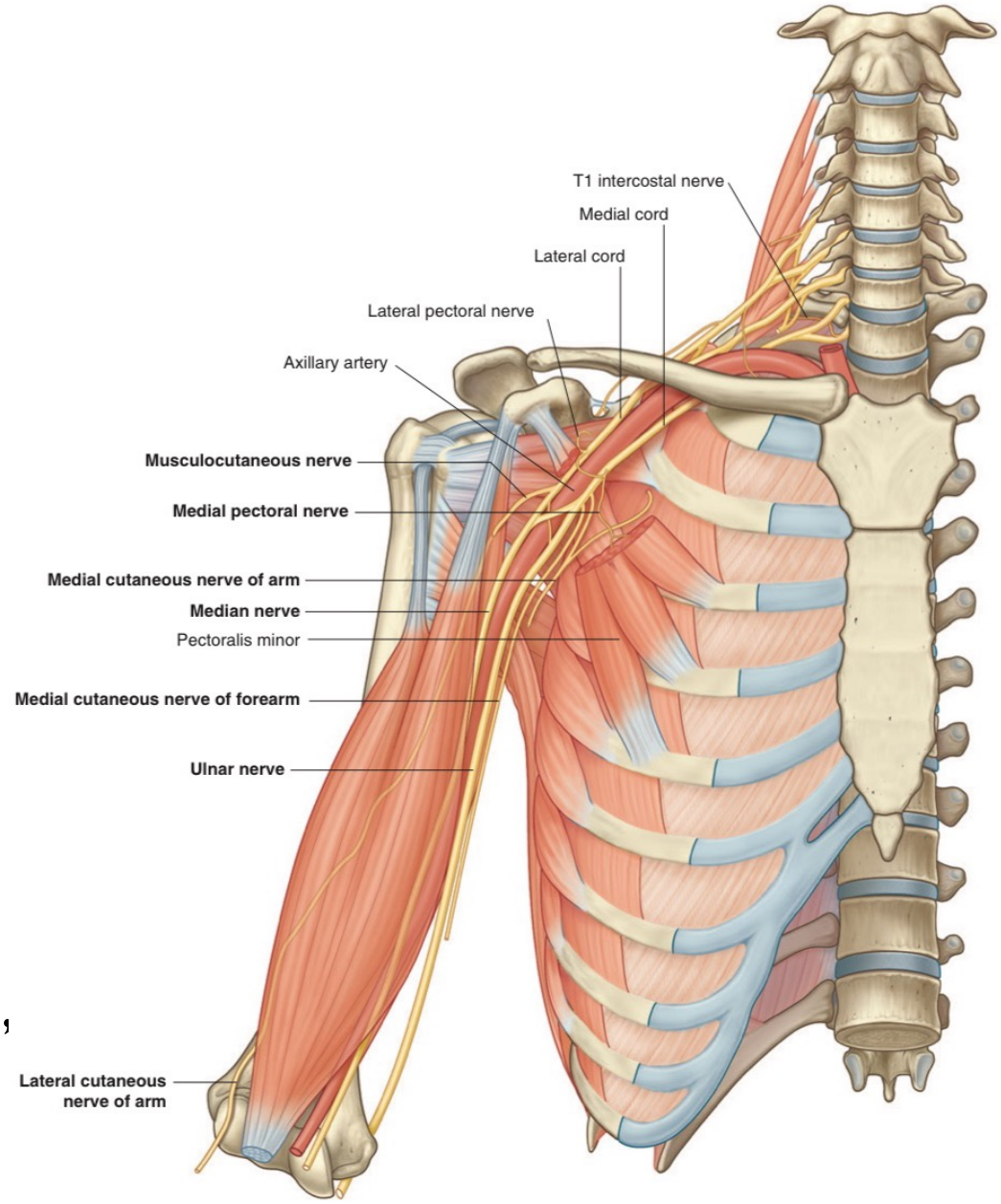
Branches of the Brachial Plexus Found in the Axilla

The second part of axillary nerve

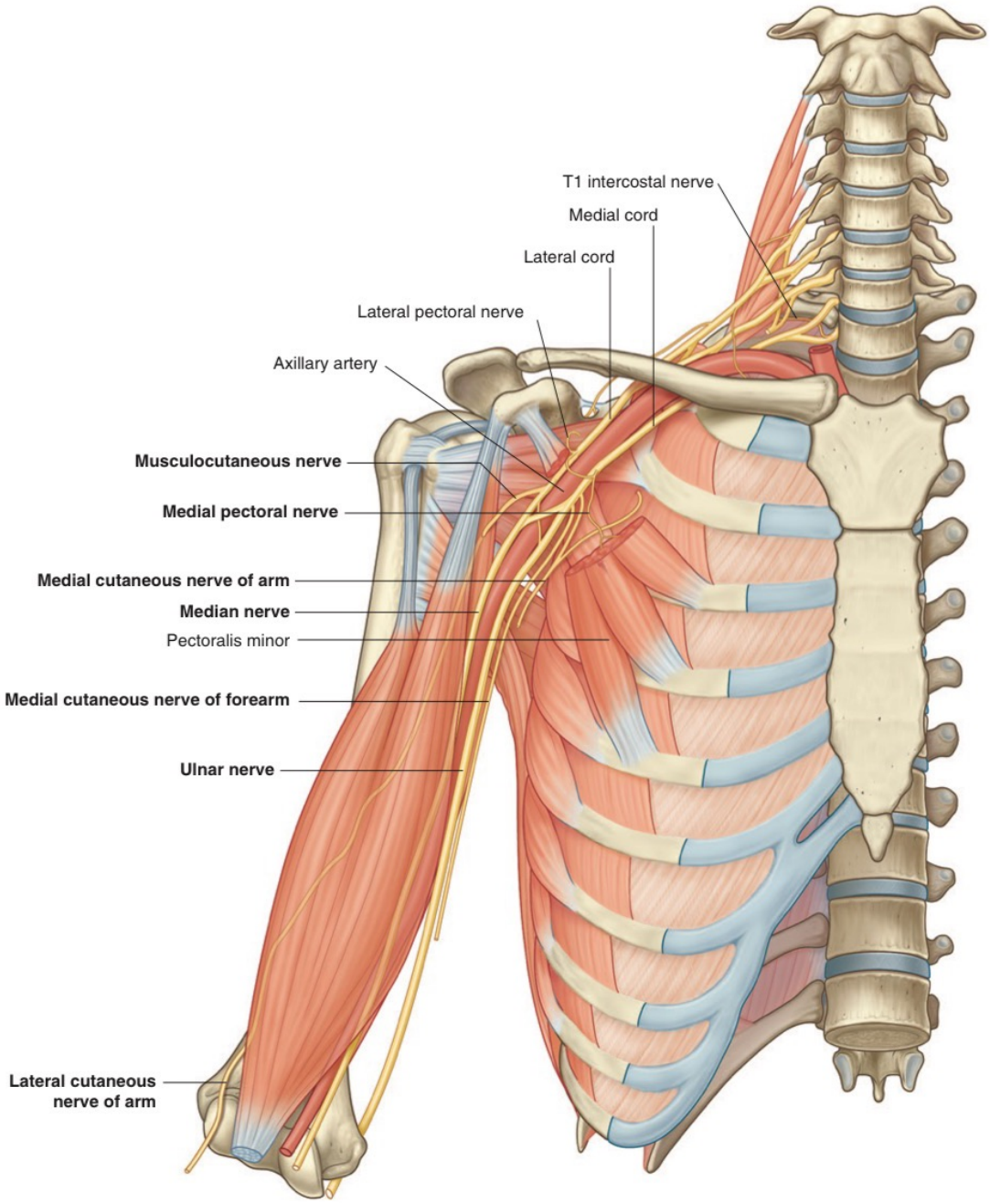
- The nerve to the subclavius (C5 and 6) supplies the subclavius muscle
- It is important clinically because it may give a contribution (C5) to the phrenic nerve; this branch, when present, is referred to as the accessory phrenic nerve.
- The long thoracic nerve (C5, 6, and 7) arises from the roots of the brachial plexus in the neck
- enters the axilla by passing down over the lateral border of the first rib behind the axillary vessels and brachial plexus
- It descends over the lateral surface of the serratus anterior muscle, which it supplies.



- The lateral pectoral nerve arises from the lateral cord of the brachial plexus and supplies the pectoralis major muscle
- The musculocutaneous nerve arises from the lateral cord of the brachial plexus
- supplies the coracobrachialis muscle, and leaves the axilla by piercing that muscle

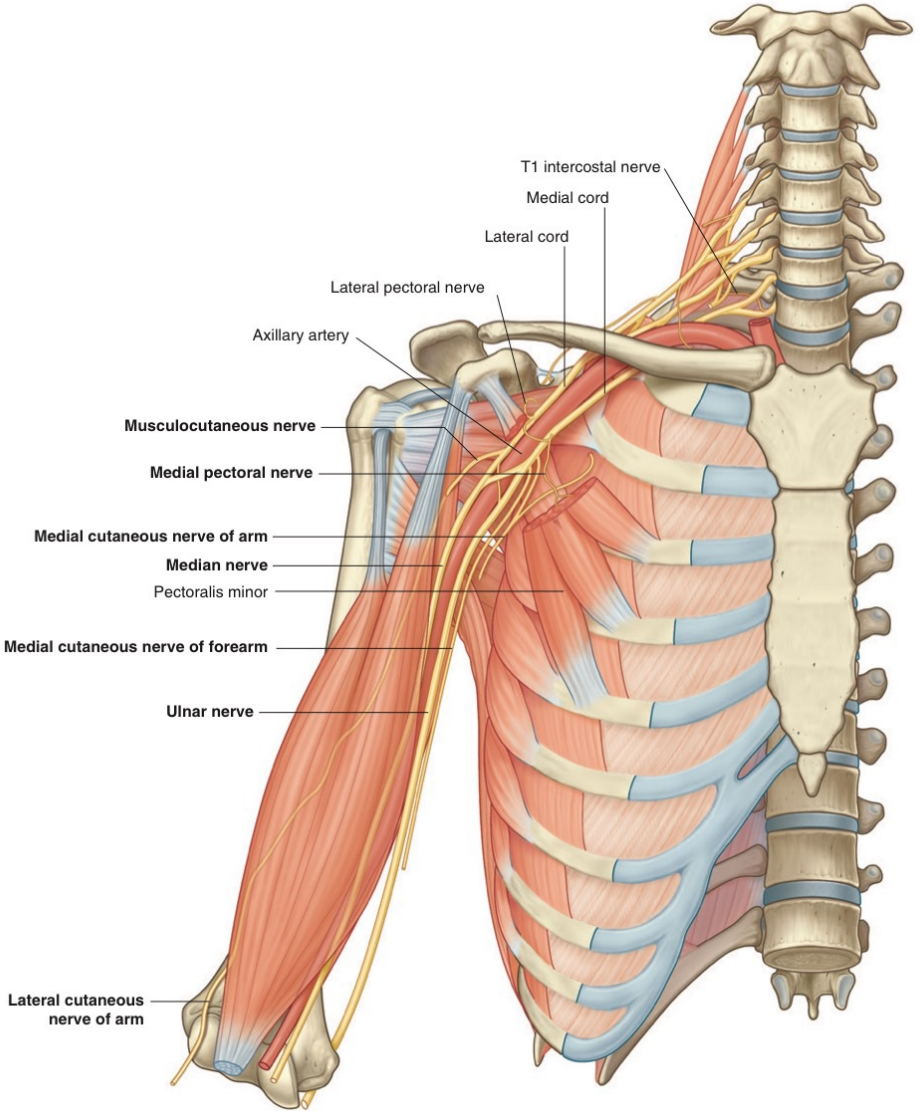


- The lateral root of the median nerve is the direct continuation of the lateral cord of the brachial plexus
- It is joined by the medial root to form the median nerve trunk and this passes downward on the lateral side of the axillary artery
- The median nerve gives off no branches in the axilla
- The medial pectoral nerve arises from the medial cord of the brachial plexus
- supplies and pierces the pectoralis minor muscle, and supplies the pectoralis major muscle

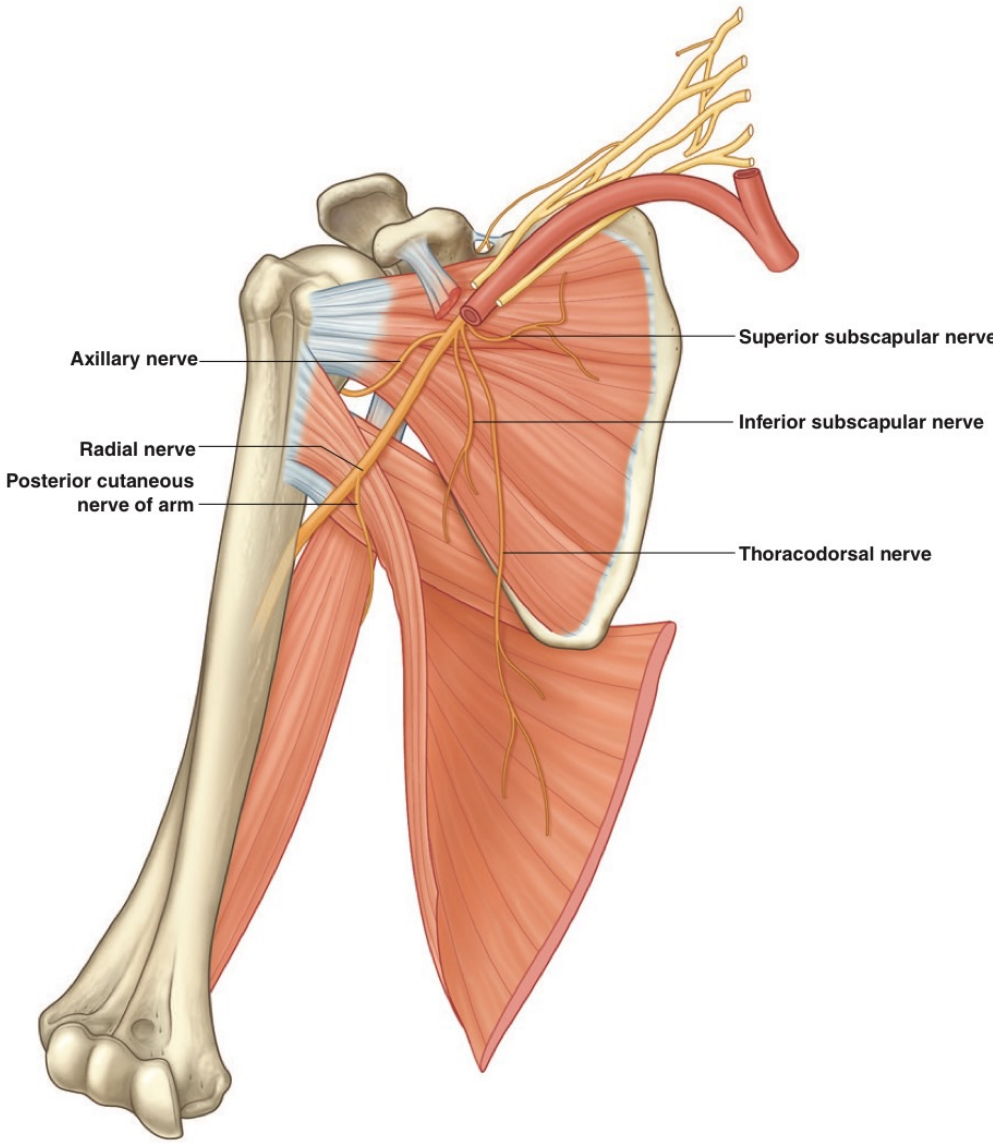


- The medial cutaneous nerve of the arm (T1) arises from the medial cord of the brachial plexus
- and is joined by the intercostobrachial nerve (lateral cutaneous branch of the second intercostal nerve).
- It supplies the skin on the medial side of the arm.

- The medial cutaneous nerve of the forearm arises from the medial cord of the brachial plexus and descends in front of the axillary artery
- The ulnar nerve (C8 and T1) arises from the medial cord of the brachial plexus and descends in the interval between the axillary artery and vein
- The ulnar nerve gives off no branches in the axilla
- The medial root of the median nerve arises from the medial cord of the brachial plexus and crosses in front of the third part of the axillary artery to join the lateral root of the median nerve



- The upper and lower subscapular nerves arise from the posterior cord of the brachial plexus and supply the upper and lower parts of the subscapularis muscle
- In addition, the lower subscapular nerve supplies the teres muscle
- The thoracodorsal nerve arises from the posterior cord of the brachial plexus and runs downward to supply the latissimus dorsi muscle

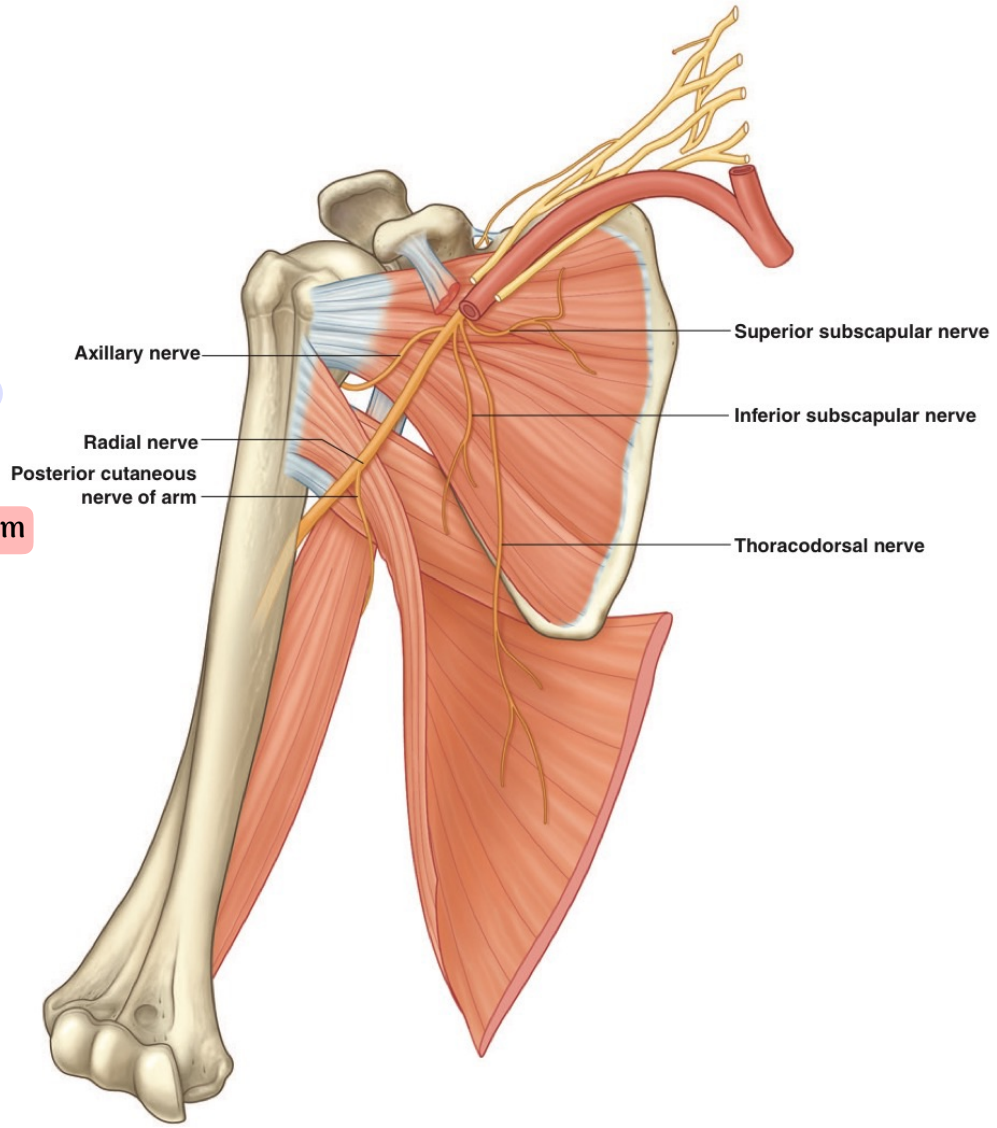


- The axillary nerve is one of the terminal branches of the posterior cord of the brachial plexus
- Having given off a branch to the shoulder joint, it divides into anterior and posterior branches
- The radial nerve is the largest branch of the brachial plexus and lies behind the axillary artery

Supply all the extensor muscle of the hand and forearm

- It gives off branches to the long and medial heads of the triceps muscle and the posterior cutaneous nerve of the arm
- The latter branch is distributed to the skin on the middle of the back of the arm

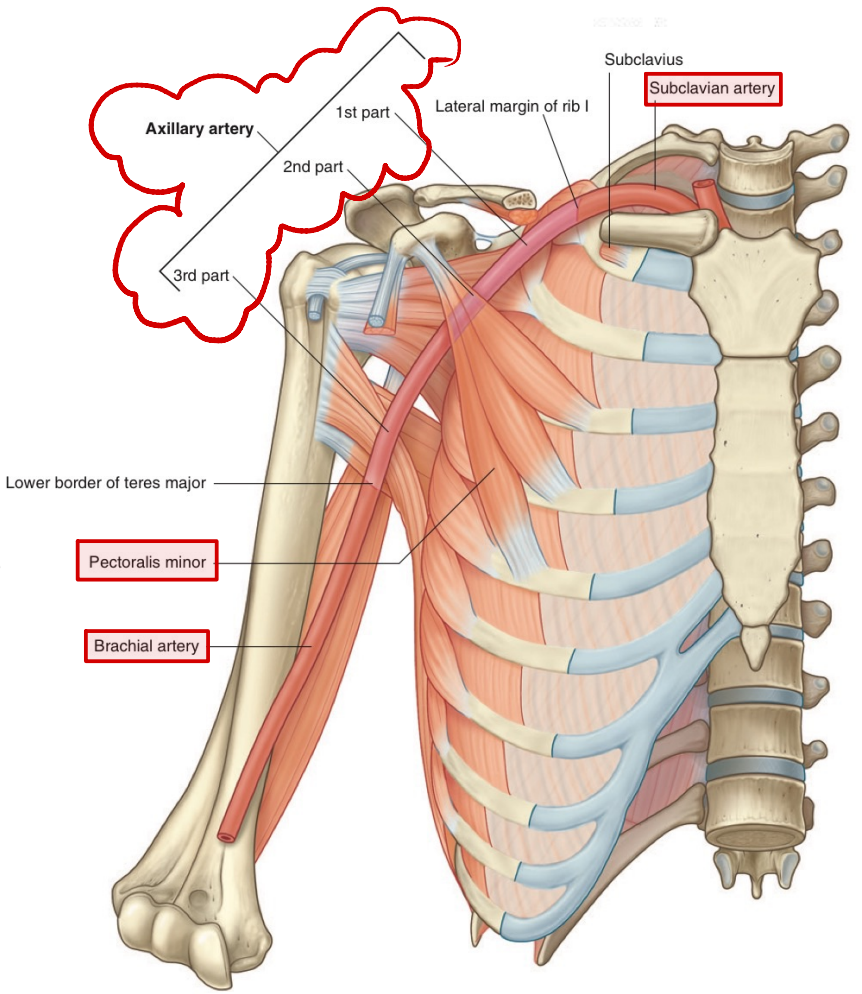
Any injury of the radial nerve will result in [arm drop] because there is no extension



Blood Vessels in The Axilla

Axillary Artery

- The axillary artery begins at the lateral border of the first rib as a continuation of the subclavian
- and ends at the lower border of the teres major muscle, where it continues as the brachial artery
- Throughout its course, the artery is closely related to the cords of the brachial plexus and their branches and is enclosed with them in a connective tissue sheath called the axillary sheath
- If this sheath is traced upward into the root of the neck, it is seen to be continuous with the prevertebral fascia.
- The pectoralis minor muscle crosses in front of the axillary artery and divides it into three parts



First Part of the Axillary Artery

- This extends from the lateral border of the first rib to the upper border of the pectoralis minor

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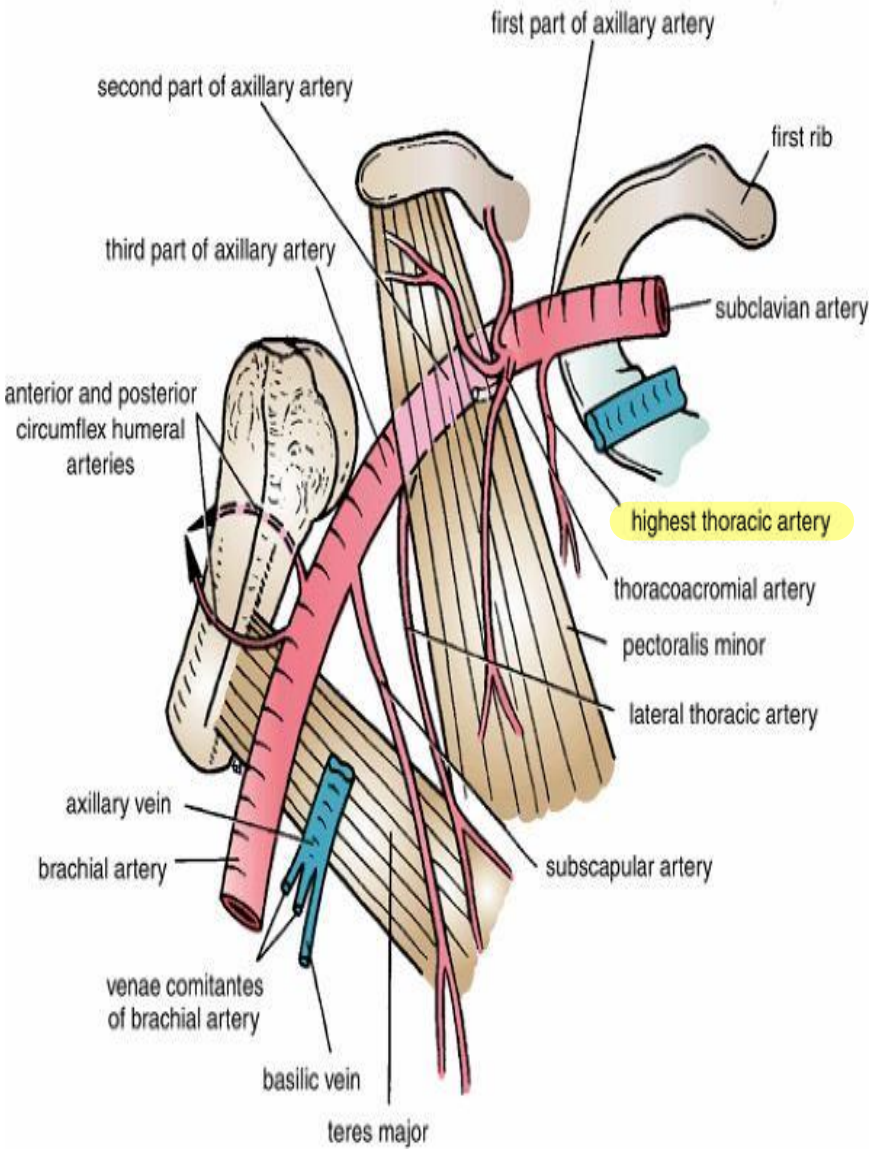
- Relations
- Anteriorly: The pectoralis major and the skin. The cephalic vein crosses the artery
- Posteriorly: The long thoracic nerve (nerve to the serratus anterior)
- Laterally: The three cords of the brachial plexus
- Medially: The axillary vein



Second Part of the Axillary Artery

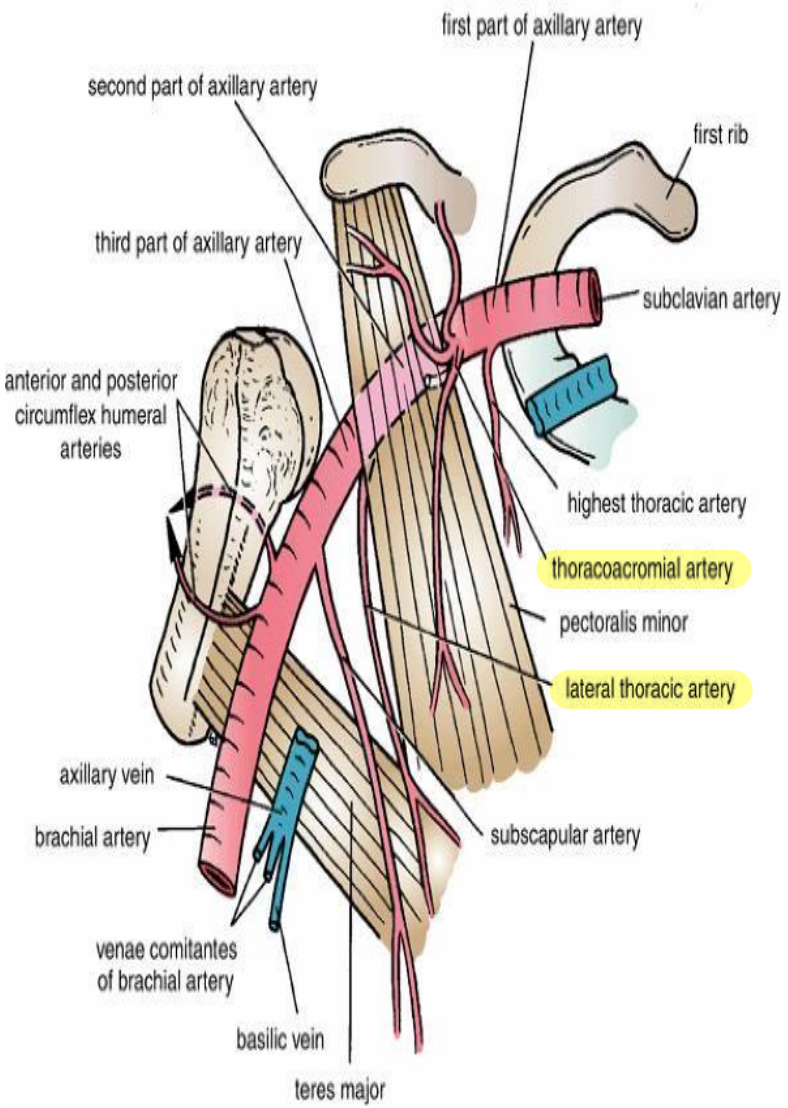
- This lies behind the pectoralis minor muscle

- Relations
- Anteriorly: The pectoralis minor, the pectoralis major, and the skin

- Posteriorly: The posterior cord of the brachial plexus, the subscapularis muscle, and the shoulder joint

- Laterally: The lateral cord of the brachial plexus

- Medially: The medial cord of the brachial plexus and the axillary vein



Third Part of the Axillary Artery

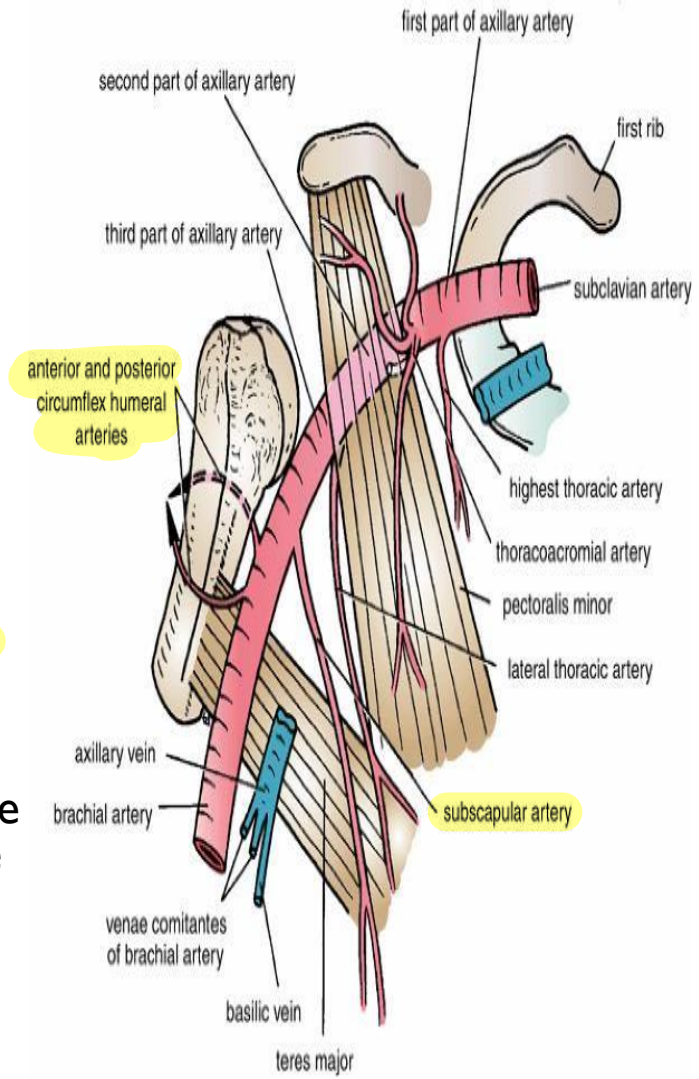
- This extends from the lower border of the pectoralis minor to the lower border of the teres major

- Relations
- Anteriorly: The pectoralis major for a short distance; lower down the artery it is crossed by the medial root of the median nerve

- Posteriorly: The subscapularis, the latissimus dorsi, and the teres major. The axillary and radial nerves also lie behind the artery

- Laterally: The coracobrachialis, the biceps, and the humerus. The lateral root of the median and the musculocutaneous nerves also lie on the lateral side

- Medially: The ulnar nerve, the axillary vein, and the medial cutaneous nerve of the arm



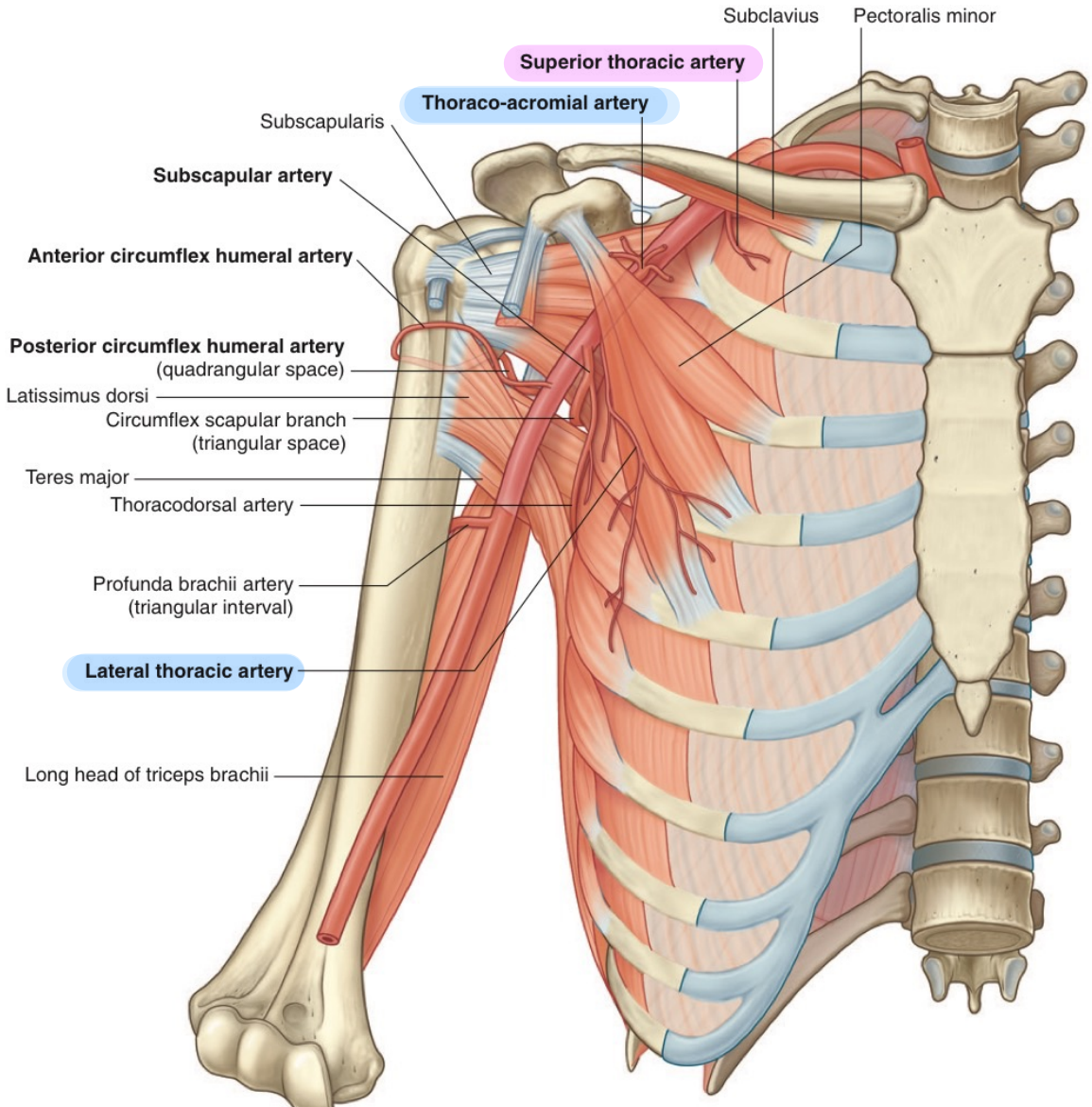
Branches of the Axillary Artery

- From the first part:

1. The highest thoracic artery is small and runs along the upper border of the pectoralis minor

- From the second part:

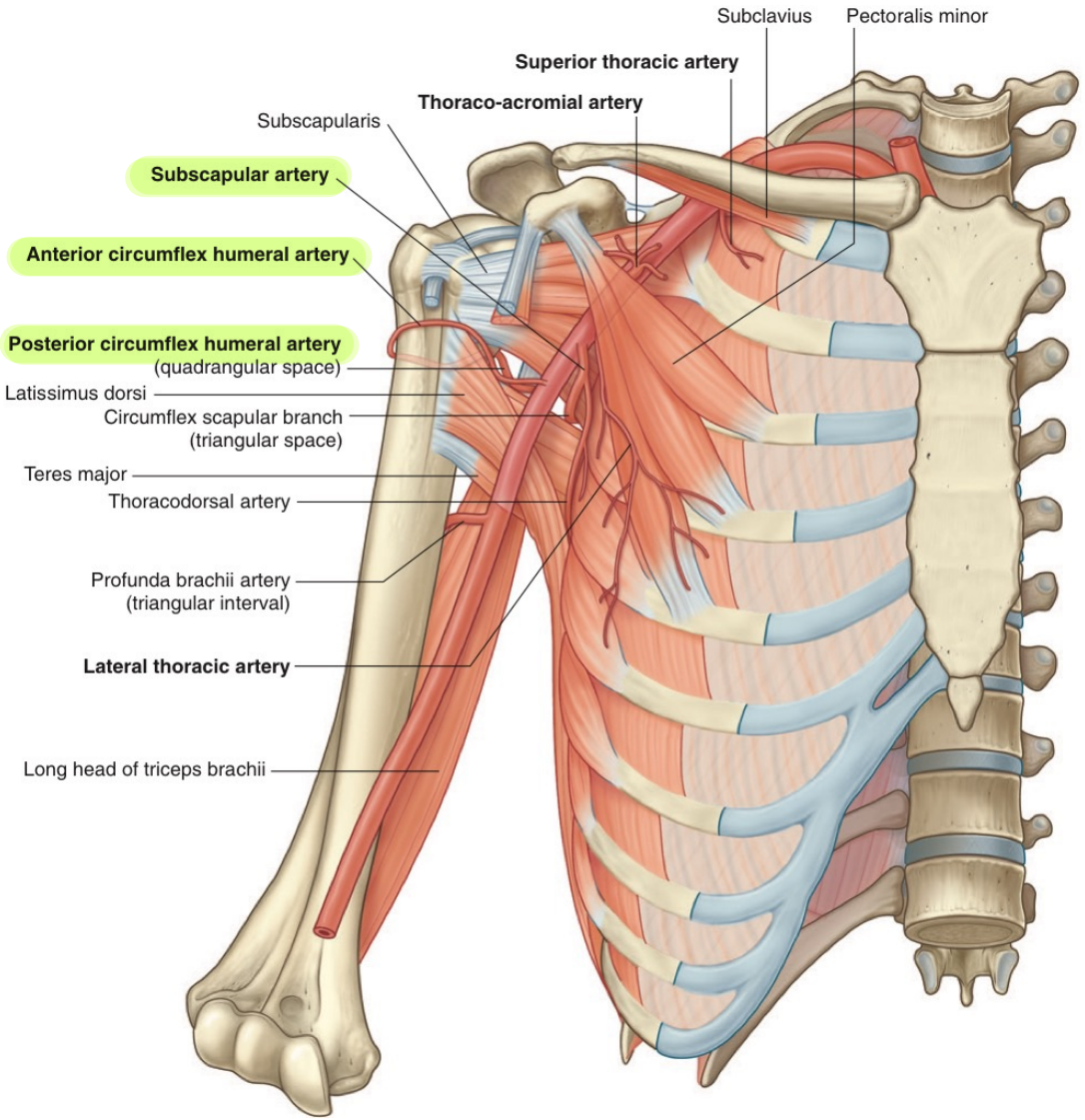
1. The thoracoacromial artery immediately divides into terminal branches.
2. The lateral thoracic artery runs along the lower border of the pectoralis minor



- From the third part:

1. The subscapular artery runs along the lower border of the subscapularis muscle.

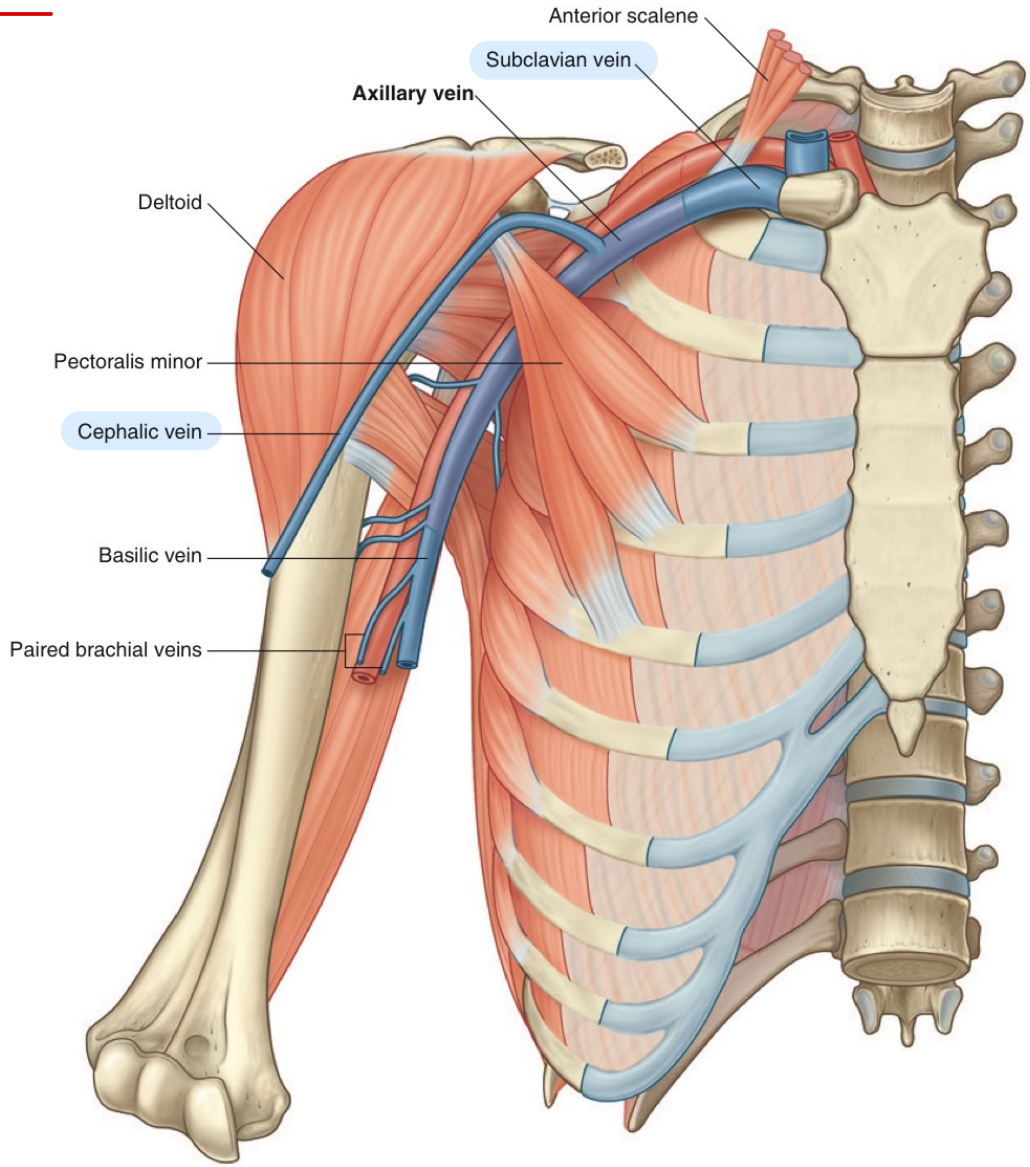
2. The anterior and posterior circumflex humeral arteries wind around the front and the back of the surgical neck of the humerus, respectively



Axillary Vein

Opposite to the artery

- The axillary vein is formed at the lower border of the teres major muscle by the union of the venae comitantes of the brachial artery and the basilic vein
- It runs upward on the medial side of the axillary artery and ends at the lateral border of the first rib by becoming the subclavian vein.
- The vein receives tributaries, which correspond to the branches of the axillary artery, and the cephalic vein



Axillary Lymph Nodes

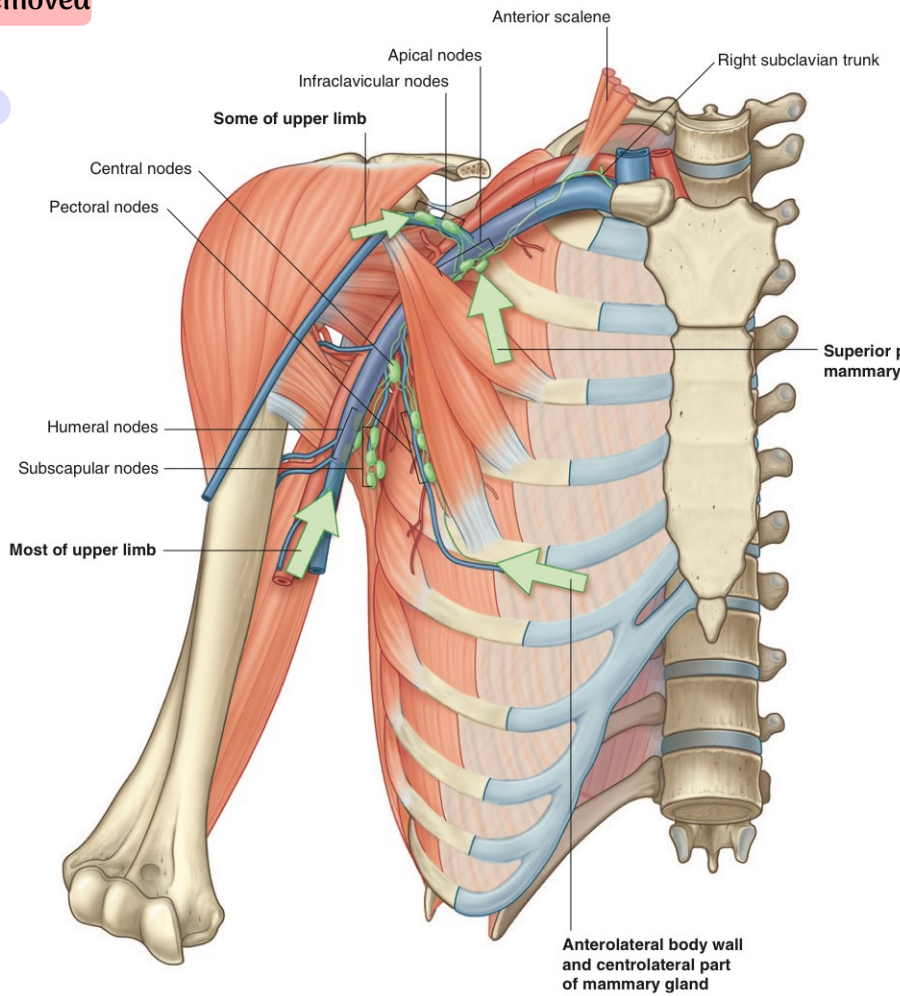
In the case of breast cancer, all the lymph node should be removed

- The lymph nodes are arranged in six groups

Most of the breast drainage go to this group of lymph node

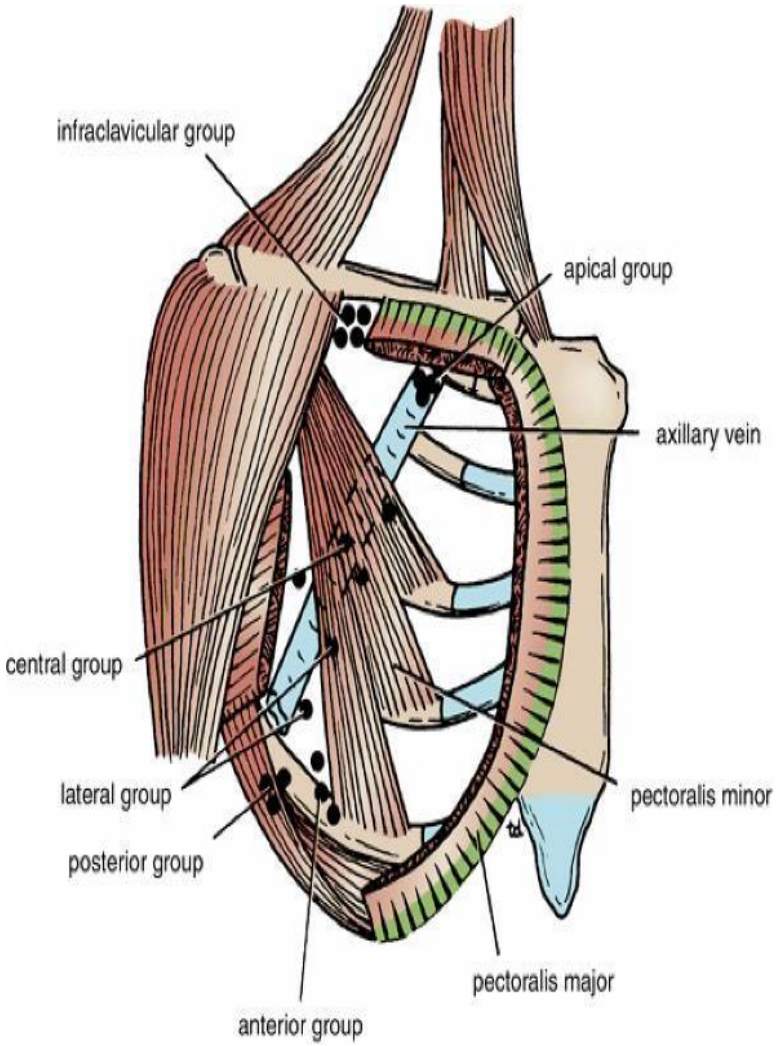
- Anterior (pectoral) group:
- Lying along the lower border of the pectoralis minor behind the pectoralis major

- receive lymph vessels from the lateral quadrants of the breast and superficial vessels from the anterolateral abdominal wall



- Posterior (subscapular) group
- Lying in front of the subscapularis muscle
- receive superficial lymph vessels from the back, down as far as the level of the iliac crests.

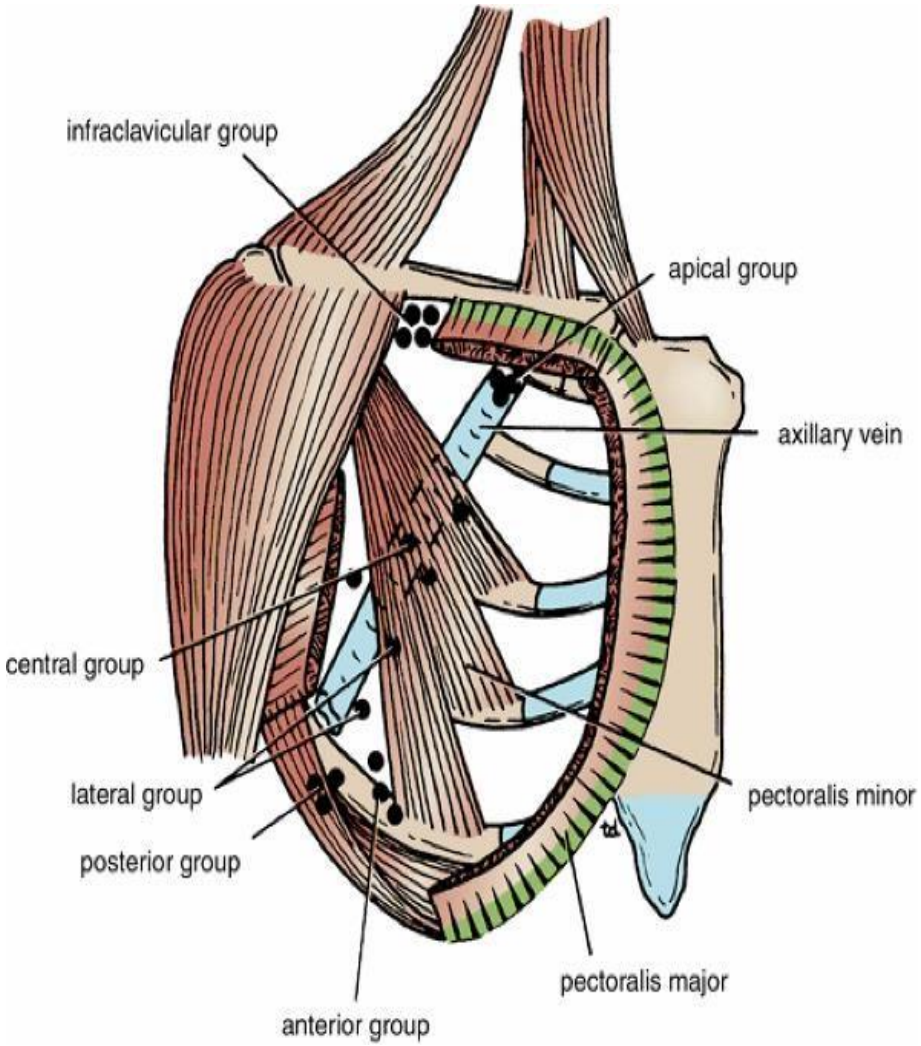
- Lateral group :
- Lying along the medial side of the axillary vein
- receive most of the lymph vessels of the upper limb (except those superficial vessels draining the lateral side)



The [anterior posterior lateral] lymph node Drain in the central lymph node, then go to the apical lymph node

- Central group:
- Lying in the center of the axilla in the axillary fat
- receive lymph from the above three groups

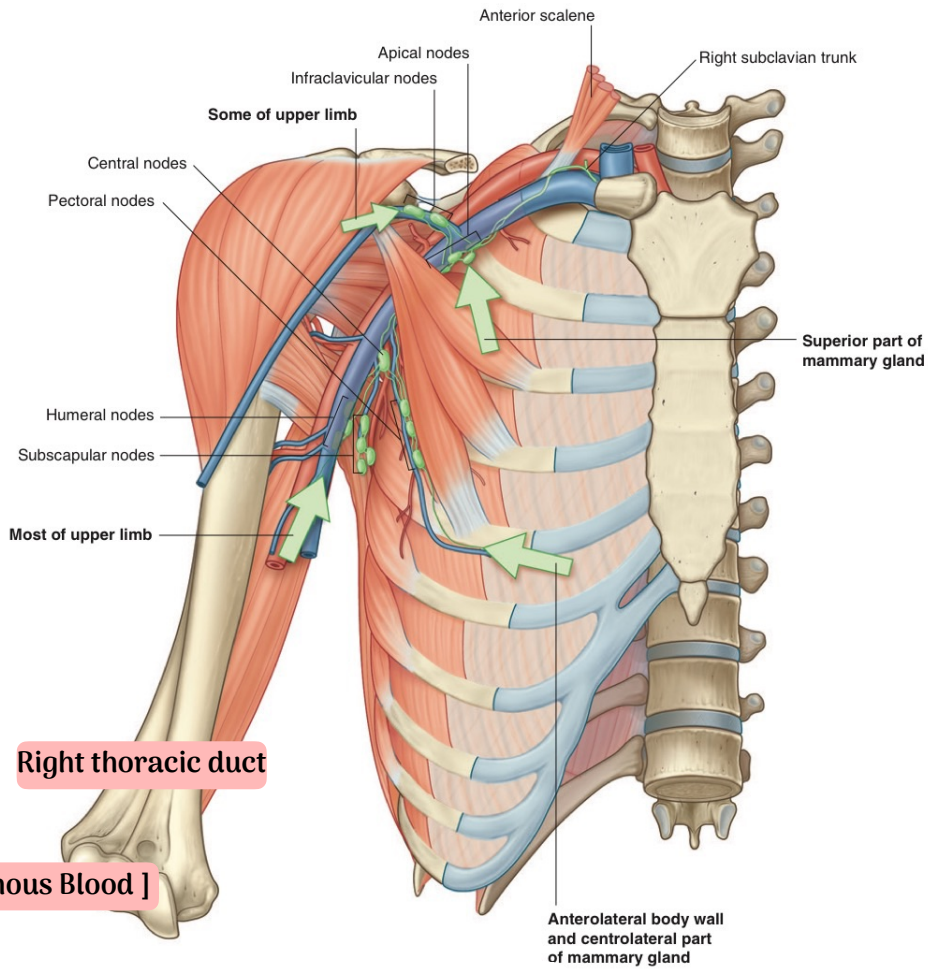
- Infraclavicular (deltopectoral) group:
- they are located outside the axilla
- They lie in the groove between the deltoid and pectoralis major muscles
- receive superficial lymph vessels from the lateral side of the hand, forearm, and arm



- Apical group :
- Lying at the apex of the axilla at the lateral border of the first rib
- receive the efferent lymph vessels from all the other axillary nodes.
- The apical nodes drain into the subclavian lymph trunk
- On the left side, this trunk drains into the thoracic duct; on the right side, it drains into the right lymph trunk

They end at the beginning of the brachiocephalic vein [Venous Blood]

- the lymph trunks may drain directly into one of the large veins at the root of the neck.



Thank You

Thank You

Done by Joud Al zubaidi