



**ВОЛГОГРАДСКИЙ
ГОСУДАРСТВЕННЫЙ
МЕДИЦИНСКИЙ
УНИВЕРСИТЕТ**

Upper extremity

**Upper extremity in general. Shoulder
region**

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Upper limb



The upper limb is essential for our daily functioning. It enables us to grip, write, lift and throw among many other movements. The upper limb has been shaped by evolution, into a highly mobile part of the human body. This contrasts with the lower limb, which has developed for stability.

Homologous parts of the upper and lower limbs



Upper limb	Lower limb
Shoulder/pectoral girdle	Hip girdle/pelvic girdle
Shoulder joint	Hip joint
Arm	Thigh
Elbow joint	Knee joint
Forearm	Leg
Wrist joint	Ankle joint
Hand	Foot
(a) Carpus	(a) Tarsus
(b) Metacarpus	(b) Metatarsus
(c) Fingers*	(c) Toes*

Summary table of comparison

	Upper limb	Lower limb
Function	Prehension (i.e., manipulation of objects by grasping)	Locomotion and transmission of weight
Bones	Smaller and weaker	Larger and stronger
Joints	Smaller and less stable	Larger and more stable
Muscles	<ul style="list-style-type: none"> •Smaller and attached to smaller bony areas •Antigravity muscles less developed 	<ul style="list-style-type: none"> •Larger and attached to larger bony areas •Antigravity muscles more developed
Girdle	Pectoral girdle <ul style="list-style-type: none"> •Made up of two bones, clavicle and scapula •No articulation with vertebral column •Articulation with axial skeleton is very small through sternoclavicular joint 	Pelvic girdle <ul style="list-style-type: none"> •Made up of single bone, the hip bone* •Articulates with vertebral column •Articulation with axial skeleton is large, through sacroiliac joint
Preaxial border	Faces laterally	Faces medially

Upper limb



The upper limb is characterized by its mobility and ability to grasp, strike, and perform fine motor skills (manipulation).

These characteristics are especially marked in the hand. Efficiency of hand function results in a large part from the ability to place it in the proper position by movements at the scapulothoracic, glenohumeral, elbow, radio-ulnar, and wrist joints.

Upper limb



Maybe the most convenient way to study the anatomy of the upper limb is to do it topographically. In that manner of speaking, we will go through certain regions of the upper limb, where each of them has its own most dominant function.



Regions of the upper limb

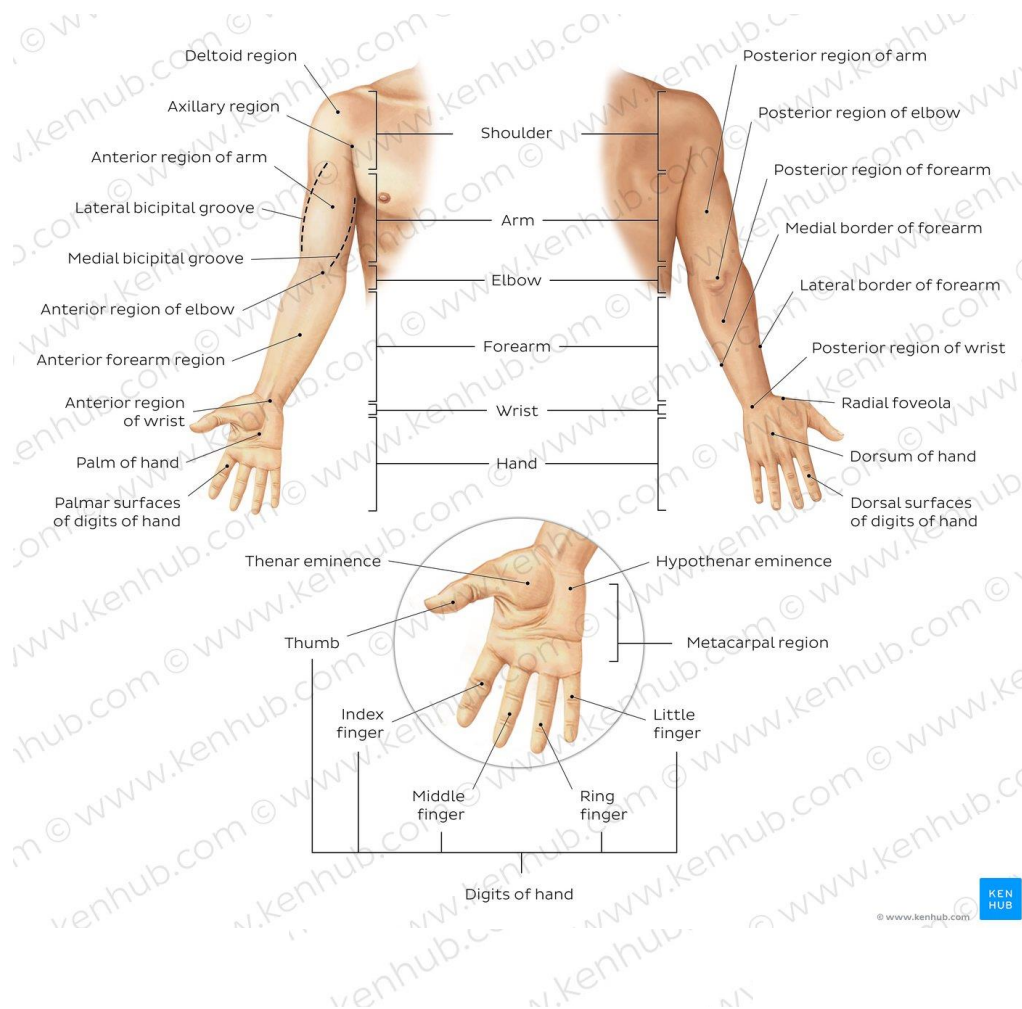
The upper limb is divided into 4 main parts - shoulder, arm, forearm and hand. The shoulder contains three important regions; the deltoid region, the scapular region and the axillary (armpit) region. The arm and forearm contain two regions each that correspond to their anterior and posterior surfaces. Found between the arm and forearm are the anterior and posterior cubital regions.



Regions of the upper limb

Below the forearm is the carpal region, which connects the forearm with the hand. Lastly, the hand consists of the palm anteriorly, and dorsum of hand posteriorly. The hand can be subdivided into the metacarpal region and the digits. The digits are numbered 1-5 from the thumb to the little finger.

Regions of the upper limb (overview)



Regions of the upper limb



Many of the main regions of the upper limb are also known by other names. Some of these represent their synonyms, and some are their subregions or other related terms that may be used interchangeably. It's important you know these as you will find them in anatomy textbooks and articles.

Important anatomy terms for regions of the upper limb

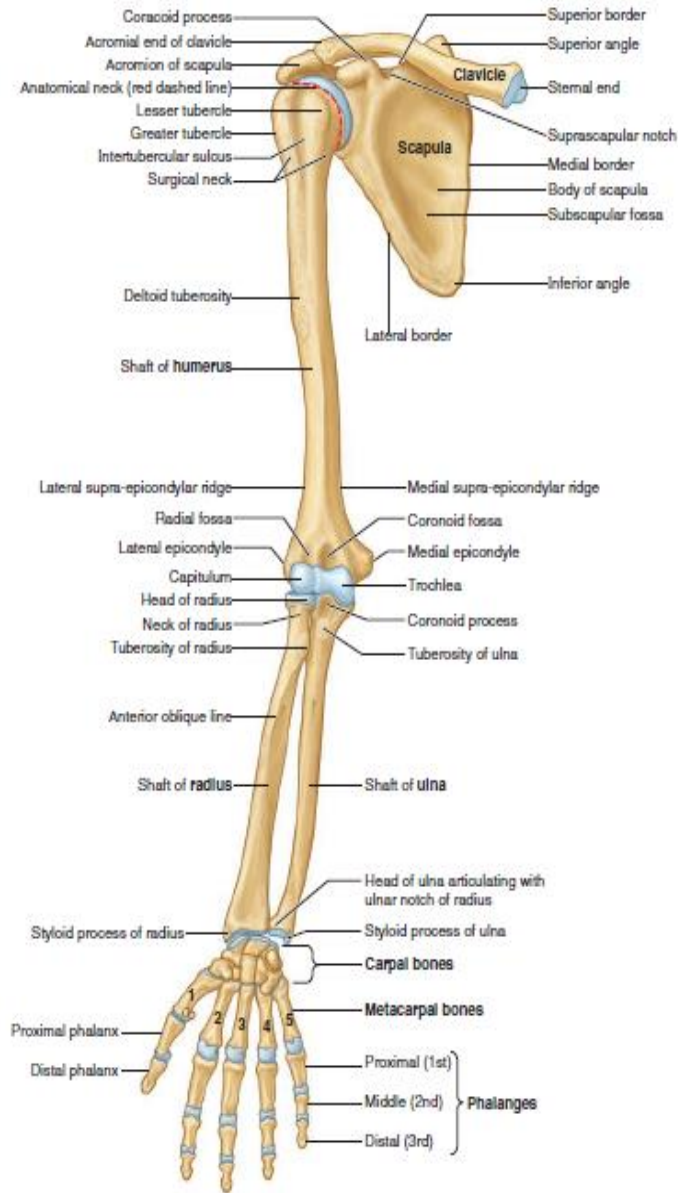
Shoulder region	Deltoid region (subregion, but in some sources used as synonym)
Axillary region	Axilla, axillary fossa
Arm region	Brachial region <i>Anterior arm region:</i> anterior brachial region <i>Posterior arm region:</i> posterior brachial region
Elbow region	Cubital region <i>Anterior elbow region:</i> anterior cubital region, cubital fossa <i>Posterior elbow region:</i> posterior cubital region, olecranon region
Forearm region	Antebrachial region <i>Anterior forearm region:</i> anterior antebrachial region <i>Posterior forearm:</i> posterior antebrachial region <i>Medial border of forearm:</i> Ulnar border <i>Lateral border of forearm:</i> Radial border

Important anatomy terms for regions of the upper limb (continued)

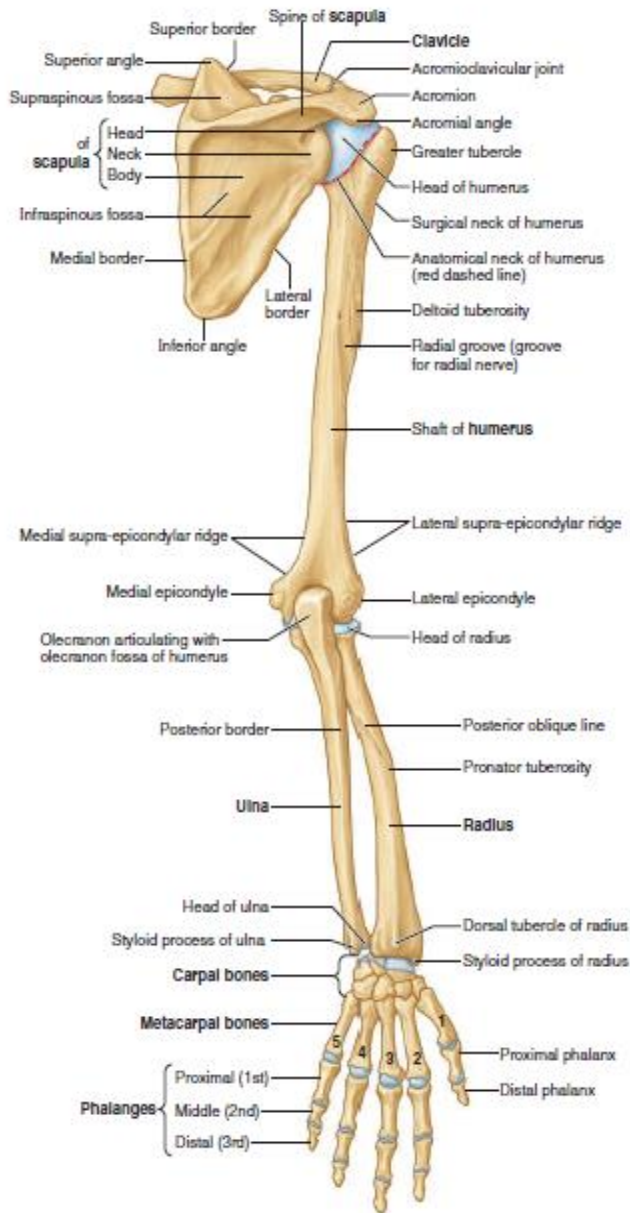


Wrist region	Carpal region <i>Anterior region of wrist:</i> anterior carpal region <i>Posterior region of wrist:</i> posterior carpal region
Hand region	Radial foveola: anatomical snuffbox Digits: <i>Thumb (pollex):</i> 1st digit <i>Index finger:</i> 2nd digit <i>Middle finger:</i> 3rd digit <i>Ring finger:</i> 4th digit <i>Little finger:</i> 5th digit

Bones of upper limb

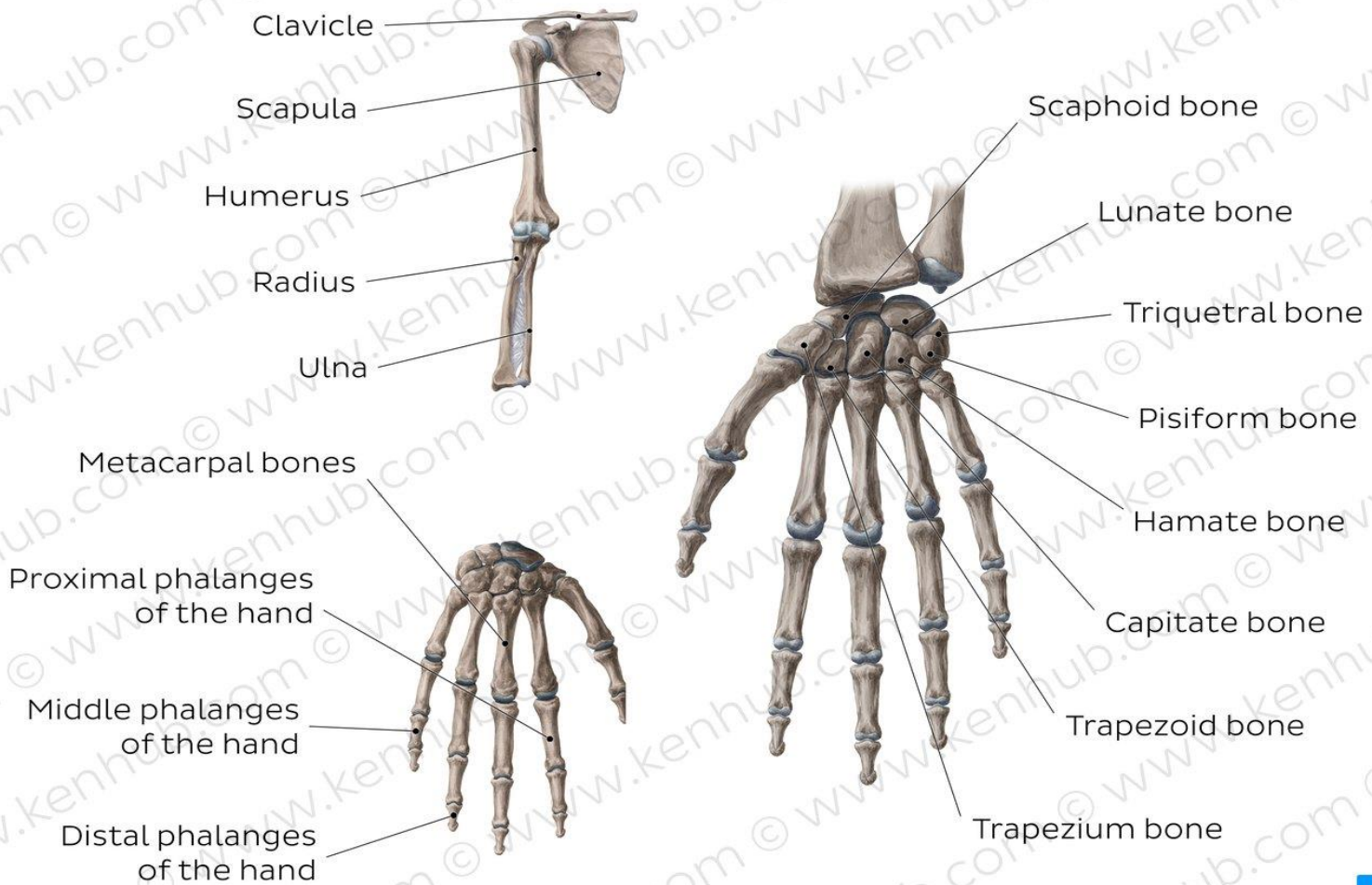


(A) Anterior view



(B) Posterior view

Bones of upper limb

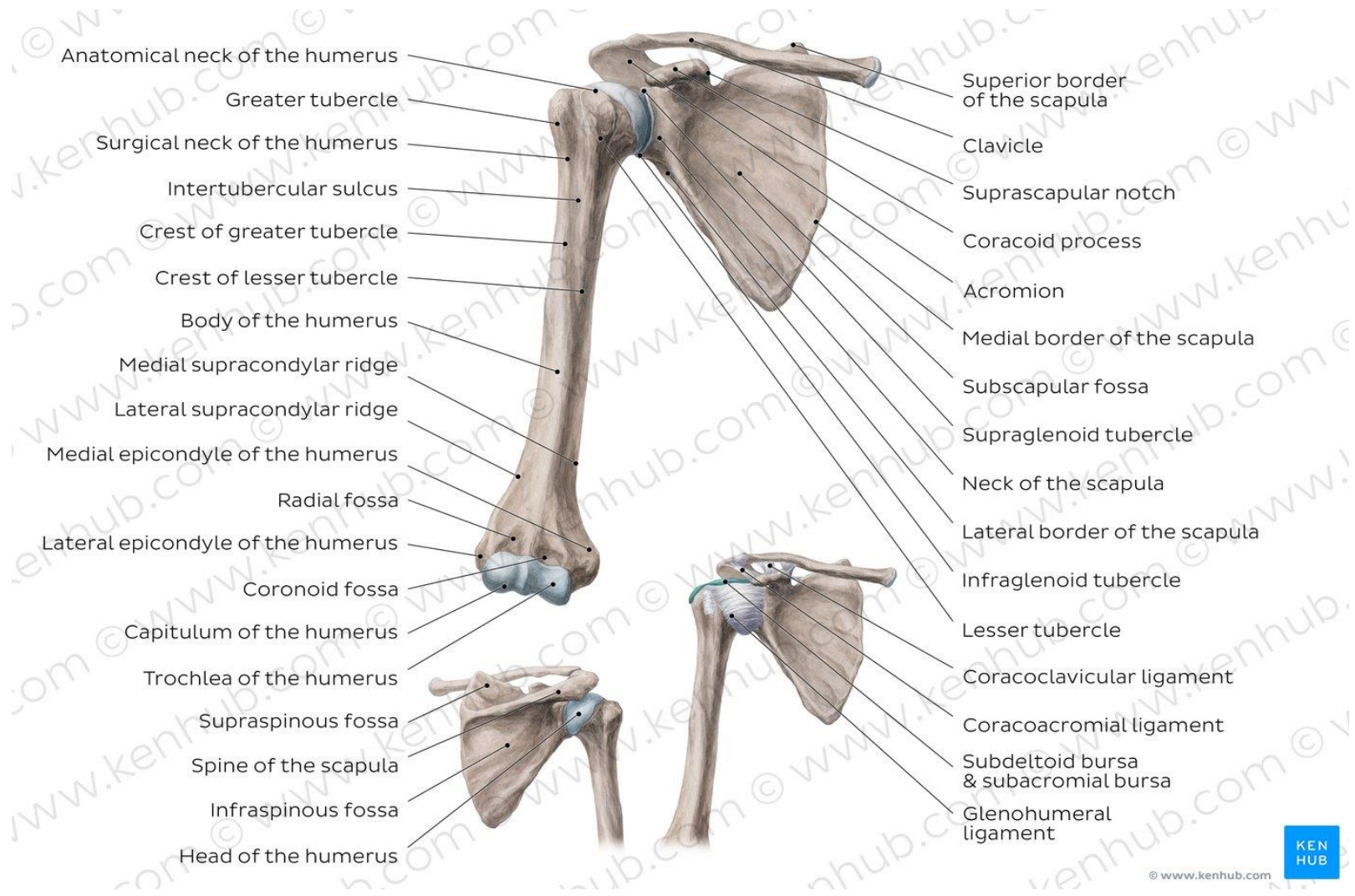


Bones of upper limb



The pectoral girdle and bones of the free part of the upper limb form the **superior appendicular skeleton**, which articulates with the axial skeleton only at the sternoclavicular joint, allowing great mobility. The pectoral (shoulder) girdle is a bony ring, incomplete posteriorly, formed by the scapulae and clavicles and completed anteriorly by the manubrium of the sternum.

Bones of upper limb: shoulder girdle



Bones of upper limb



The scapula bone is otherwise known as the shoulder blade. Although the scapula is located on the posterior side of the body, it is not a part of the human back. It is classified as a part of the upper limb as it is so important for its functioning.

The scapula bone

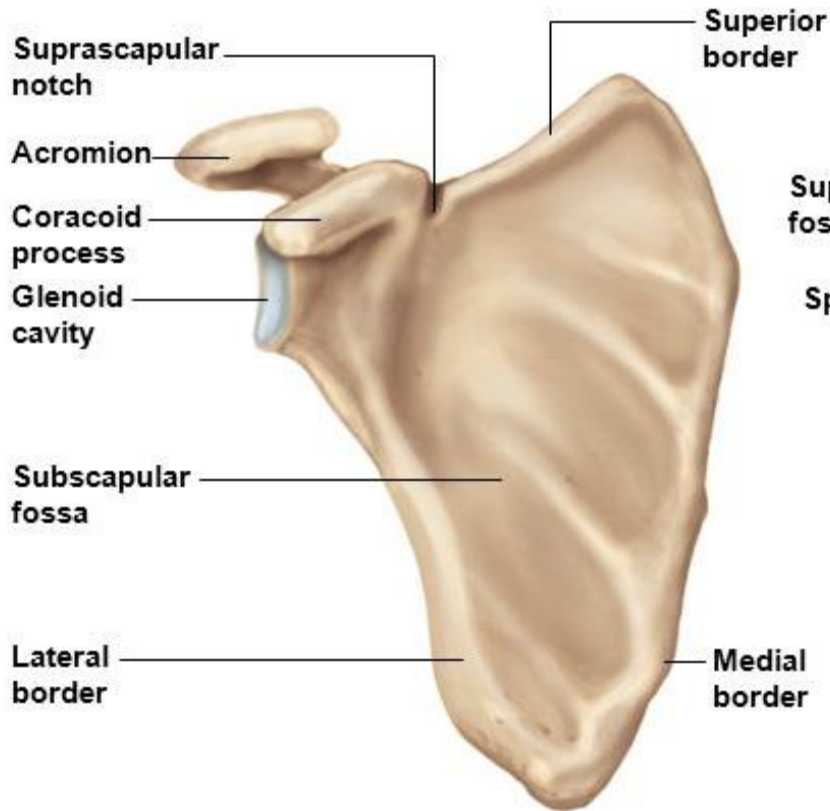


Bones of upper limb

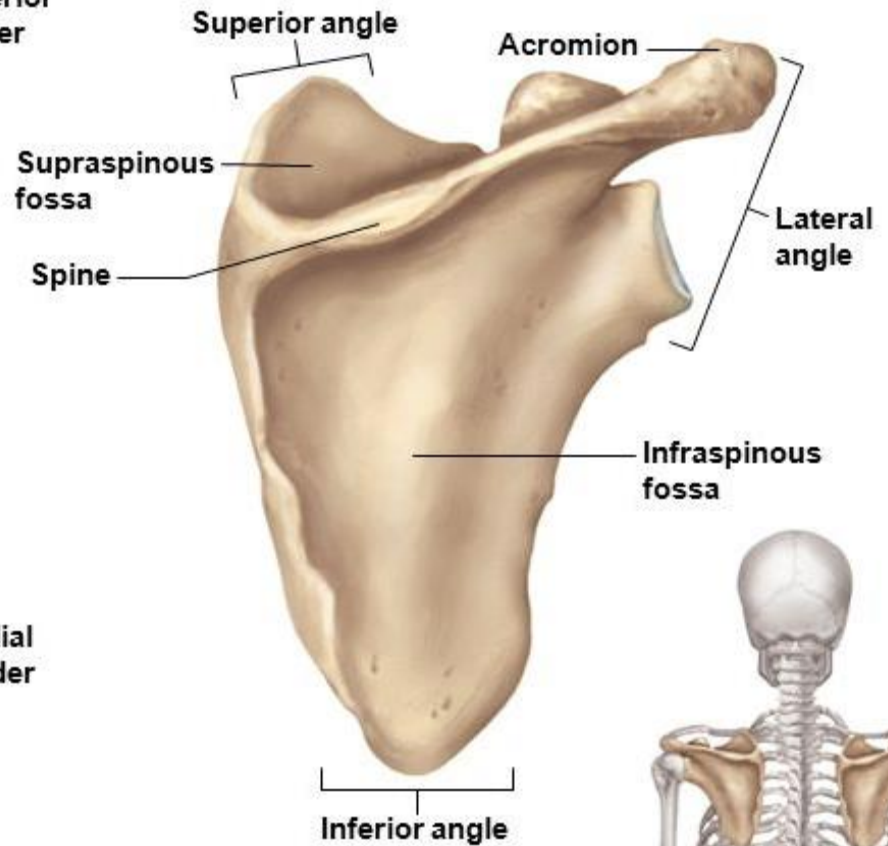


The scapula (shoulder blade) is a triangular flat bone that lies on the posterolateral aspect of the thorax, overlying the 2nd through 7th ribs. The convex posterior surface of the scapula is unevenly divided by the spine of the scapula into a small supraspinous fossa and a much larger infraspinous fossa. The concave costal surface of the scapula has a large subscapular fossa.

Scapula



(a) Anterior view



(b) Posterior view



Bones of upper limb



The triangular body of the scapula is thin and translucent superior and inferior to the scapular spine. The scapula has medial (vertebral), lateral (axillary), and superior borders and superior and inferior angles. The lateral border of scapula is the thickest part of the bone, which, superiorly, includes the head of the scapula where the glenoid cavity is located. The neck of the scapula is just medial to the head.

Bones of upper limb



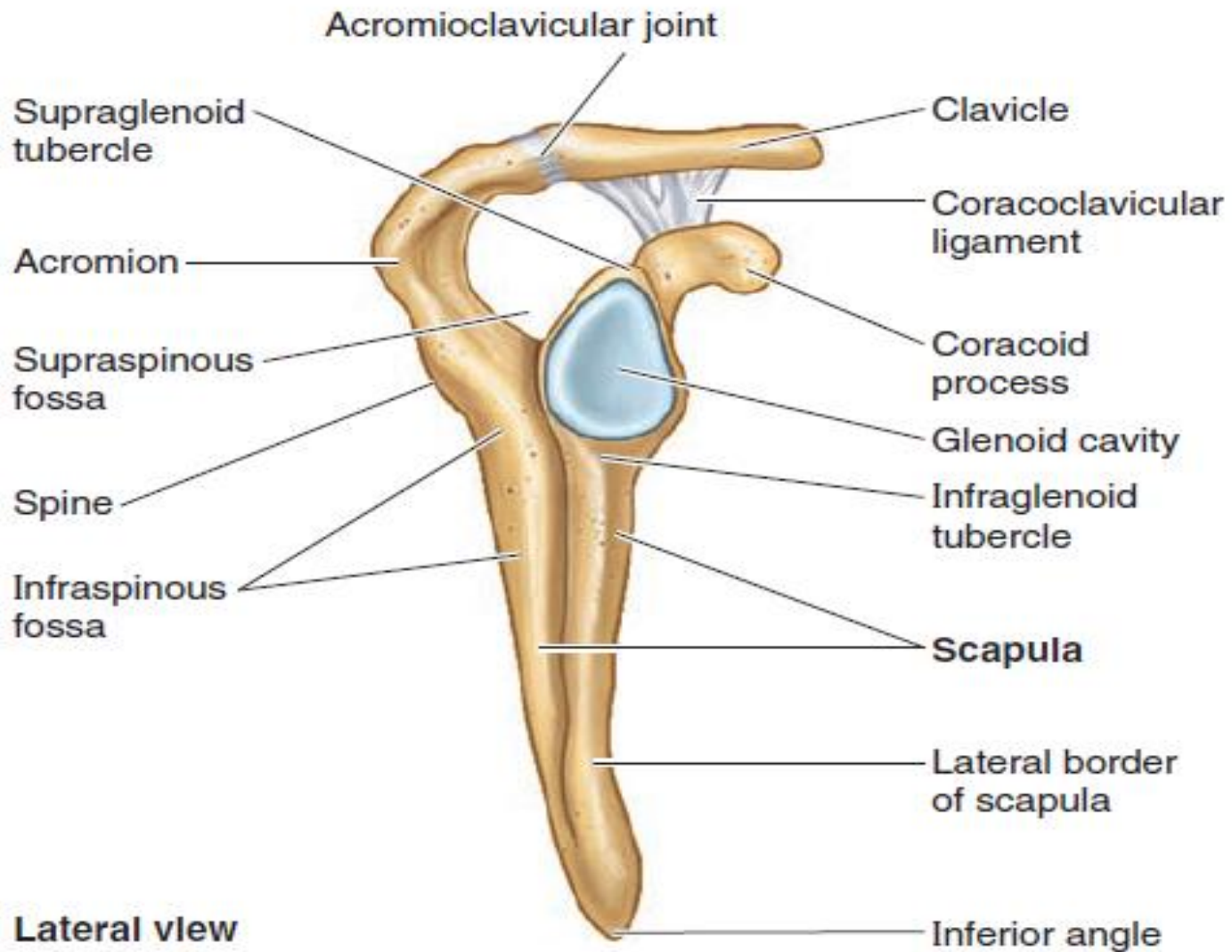
The superior border of the scapula is marked near the junction of its medial two thirds and lateral third by the suprascapular notch. The spine of the scapula continues laterally, expanding to form the acromion, the subcutaneous point of the shoulder that articulates with the acromial end of the clavicle.

Bones of upper limb



Superolaterally, the lateral surface of the head of the scapula has a glenoid cavity, which articulates with the head of the humerus at the glenohumeral (shoulder) joint. The glenoid (G. socket) cavity is a shallow, concave, oval fossa, which is directed anterolaterally and slightly superiorly and is considerably smaller than the head of the humerus for which it serves as a socket. The beak-like coracoid process is superior to the glenoid cavity and projects anterolaterally.

Right scapula

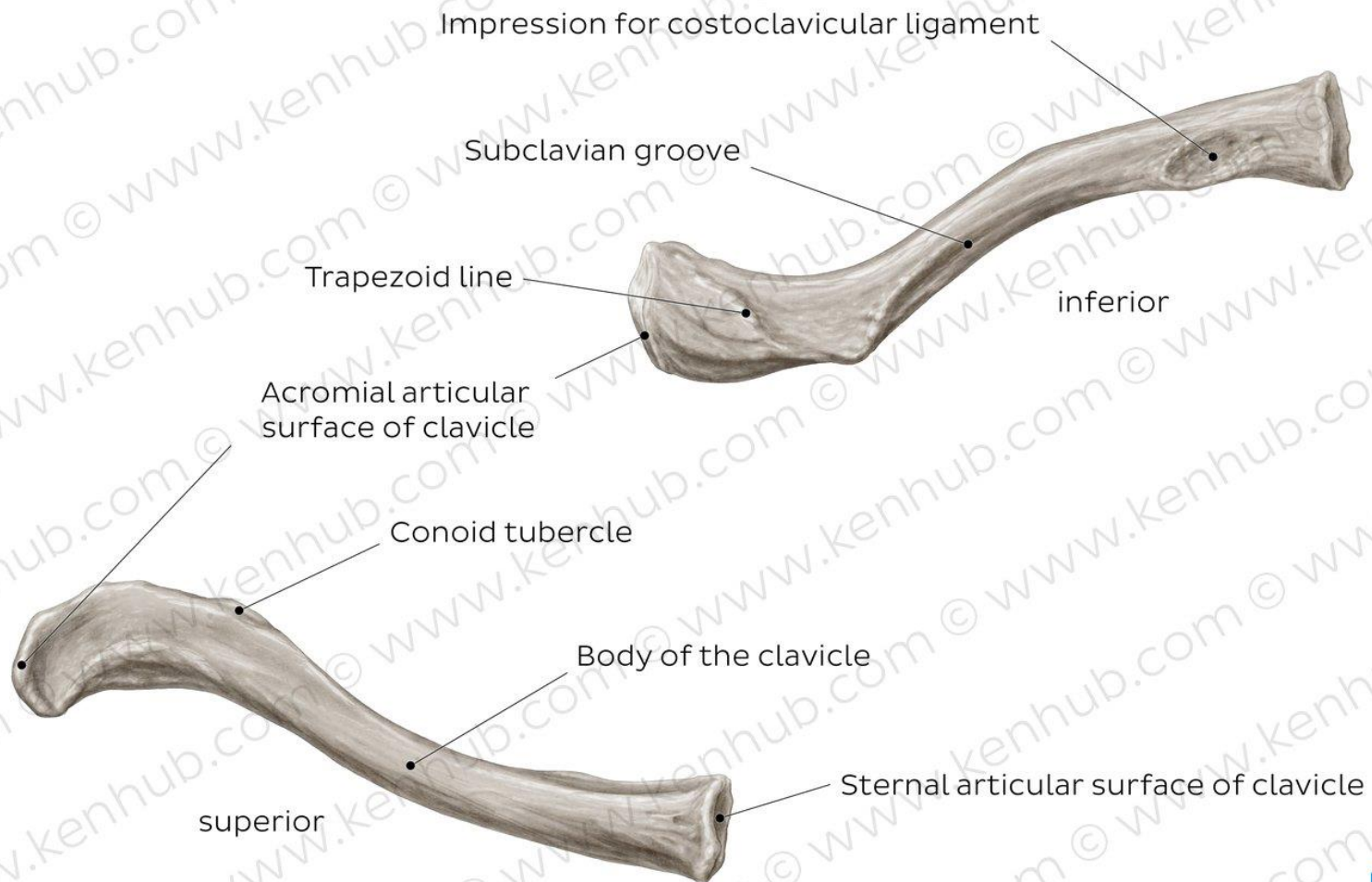


Bones of upper limb

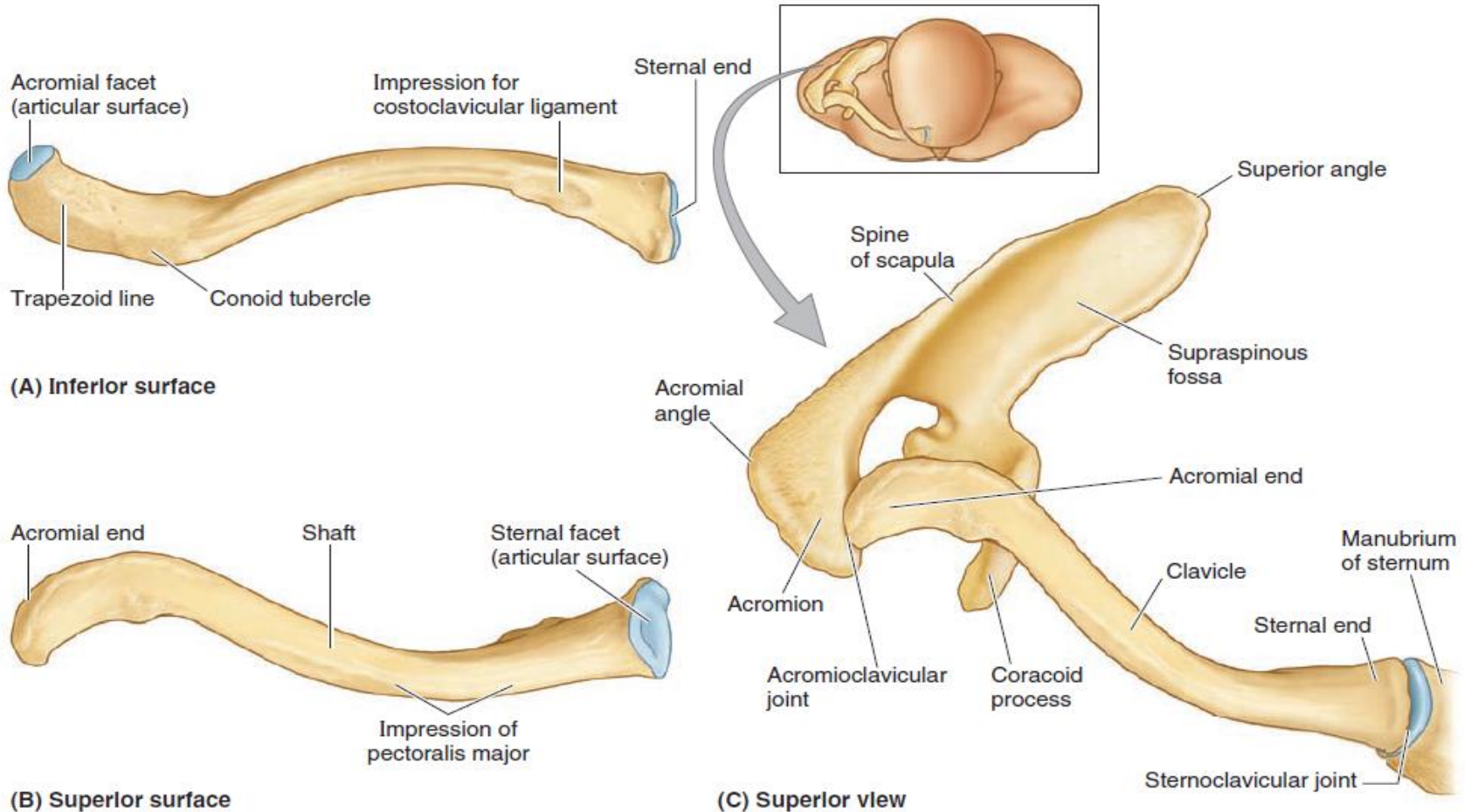


The clavicle (collar bone) connects the upper limb to the trunk. Its sternal end articulates with the manubrium of the sternum at the sternoclavicular (SC) joint. Its acromial end articulates with the acromion of the scapula at the acromioclavicular (AC) joint. The medial two thirds of the shaft of the clavicle are convex anteriorly, whereas the lateral third is flattened and concave anteriorly. These curvatures increase the resilience of the clavicle and give it the appearance of an elongated capital S.

Bones of upper limb



Bones of upper limb



The clavicle

Landmarks	<p><i>Superior surface:</i> acromial facet</p> <p><i>Inferior surface:</i> sternal facet, costal tuberosity, conoid tubercle</p>
Muscles	<p><i>Lateral third:</i> trapezius muscle (posterior surface), deltoid muscle (anterior surface)</p> <p><i>Medial third:</i> sternocleidomastoid muscle (superior surface), pectoralis major muscle (anterior surface), subclavian muscle (inferior surface - subclavian groove)</p>
Joints	<p>Acromioclavicular - between acromial head of clavicle and acromion of scapula</p> <p>- ligament: <i>acromioclavicular ligament</i></p> <p>Sternoclavicular - between sternal end of clavicle and manubrium of sternum</p> <p>- ligaments: <i>sternoclavicular ligaments, anterior and posterior interclavicular ligaments</i></p>

Bones of upper limb



The clavicle

- Serves as a pivoting strut (rigid support) from which the scapula and free limb are suspended, keeping the free limb lateral to the thorax so that the arm has maximum freedom of motion. Fixing the strut in position, especially after its elevation, enables elevation of the ribs for deep inspiration.

Bones of upper limb



The clavicle

- Forms one of the boundaries of the cervico-axillary canal (passageway between neck and arm), affording protection to the neurovascular bundle supplying the upper limb
- Transmits shocks (traumatic impacts) from the upper limb to the axial skeleton

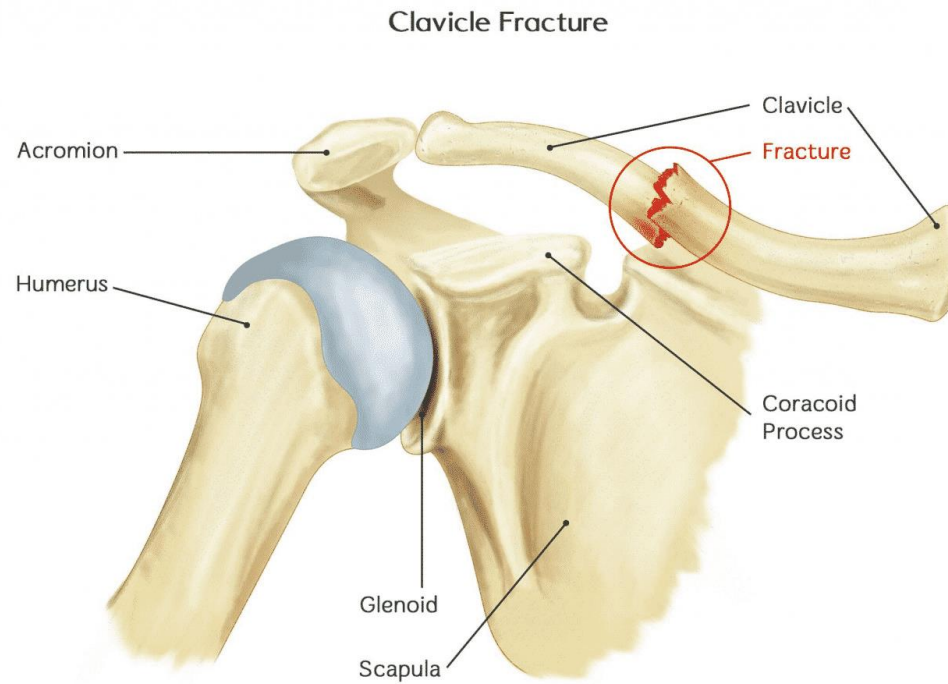
Although designated as a long bone, the clavicle has no medullary (marrow) cavity. It consists of spongy (trabecular) bone with a shell of compact bone.

Fracture of clavicle



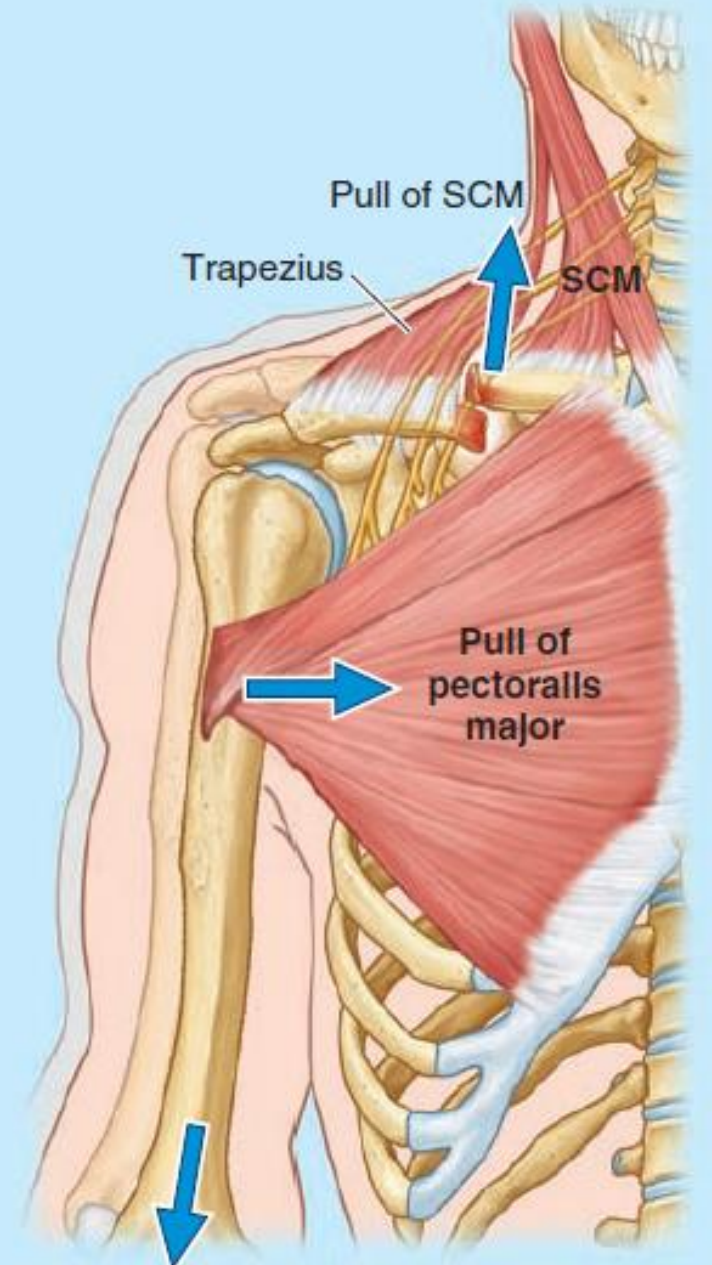
The clavicle is commonly fractured, often by an indirect force transmitted from an outstretched hand through the bones of the forearm and arm to the shoulder during a fall. A fracture may also result from a fall directly on the shoulder. The weakest part of the clavicle is at the junction of its middle and lateral thirds.

Fracture of clavicle



Fracture of clavicle

After fracture of the clavicle, the sternocleidomastoid (SCM) muscle elevates the medial fragment of bone



Gravity Sternocleidomastoid (SCM)

Anterior view

Fracture of clavicle



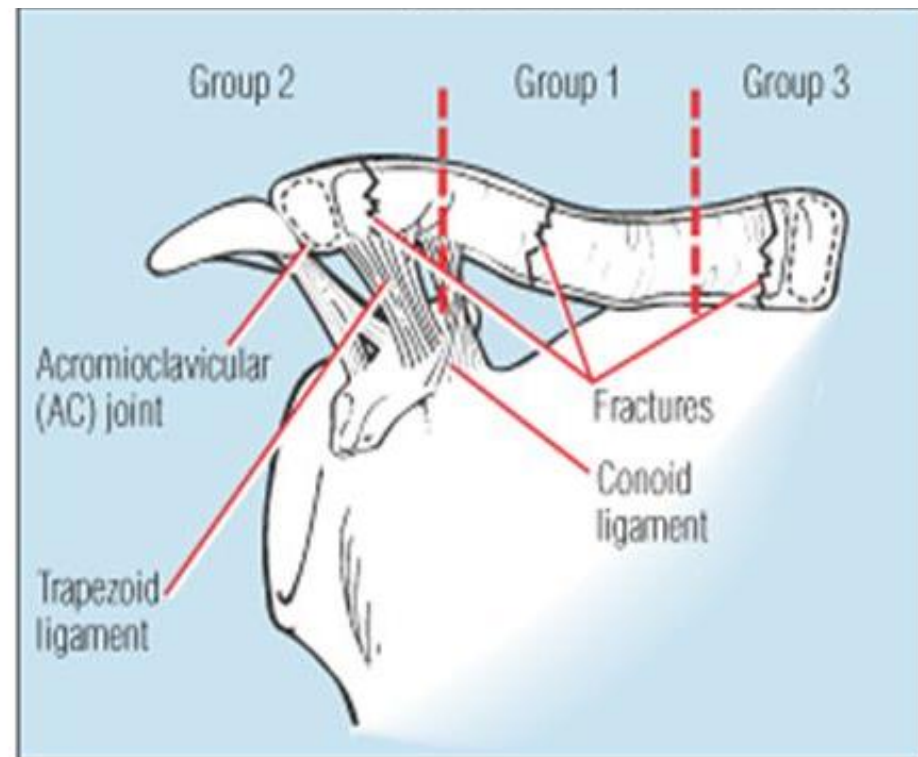
The trapezius muscle is unable to hold up the lateral fragment owing to the weight of the upper limb, and thus the shoulder drops.

In addition to being depressed, the lateral fragment of the clavicle may be pulled medially by muscles that normally adduct the arm at the shoulder joint, such as the pectoralis major. Overriding of the bone fragments shortens the clavicle.

Fractures of the shoulder girdle complex

Clavicle: 75% occur in children under 13

- Proximal fracture
 - Rare, differentiate from epiphyseal injuries
- Middle Third fracture- Most common, 80%
 - Usually displaced upward by pull of the sternocleidomastoid muscle
- Distal fracture
 - Displaced downward by the weight of the arm.



Classification of clavicle fractures based on their location: mid, distal, or proximal. Ossification centers of the clavicle appear as dotted silhouettes at the ends of the bone.

Fracture of clavicle



The clavicle is the first long bone to ossify (via intramembranous ossification), beginning during the fifth and sixth embryonic weeks from medial and lateral primary ossification centers that are close together in the shaft of the clavicle. The ends of the clavicle later pass through a cartilaginous phase (endochondral ossification); the cartilages form growth zones similar to those of other long bones.

Fracture of clavicle



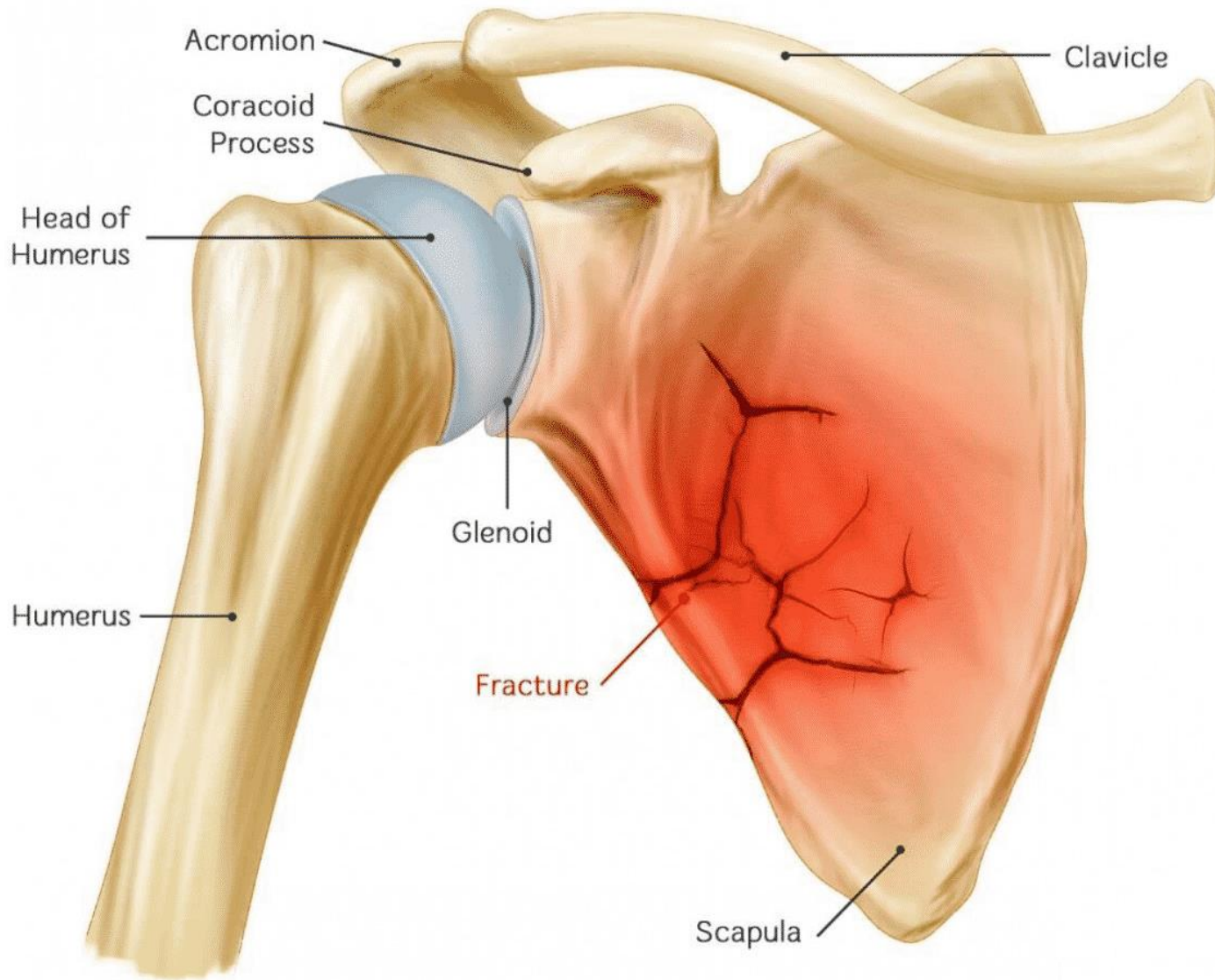
A secondary ossification center appears at the sternal end and forms a scale-like epiphysis that begins to fuse with the shaft (diaphysis) between 18 and 25 years of age; it is completely fused to it between 25 and 31 years of age. This is the last of the epiphyses of long bones to fuse. An even smaller scale-like epiphysis may be present at the acromial end of the clavicle; it must not be mistaken for a fracture.

Fracture of clavicle



Sometimes, fusion of the two ossification centers of the clavicle fails to occur; as a result, a bony defect forms between the lateral and the medial thirds of the clavicle. Awareness of this possible birth defect should prevent diagnosis of a fracture in an otherwise normal clavicle. When doubt exists, both clavicles are radiographed because this defect is usually bilateral.

Fracture of scapula

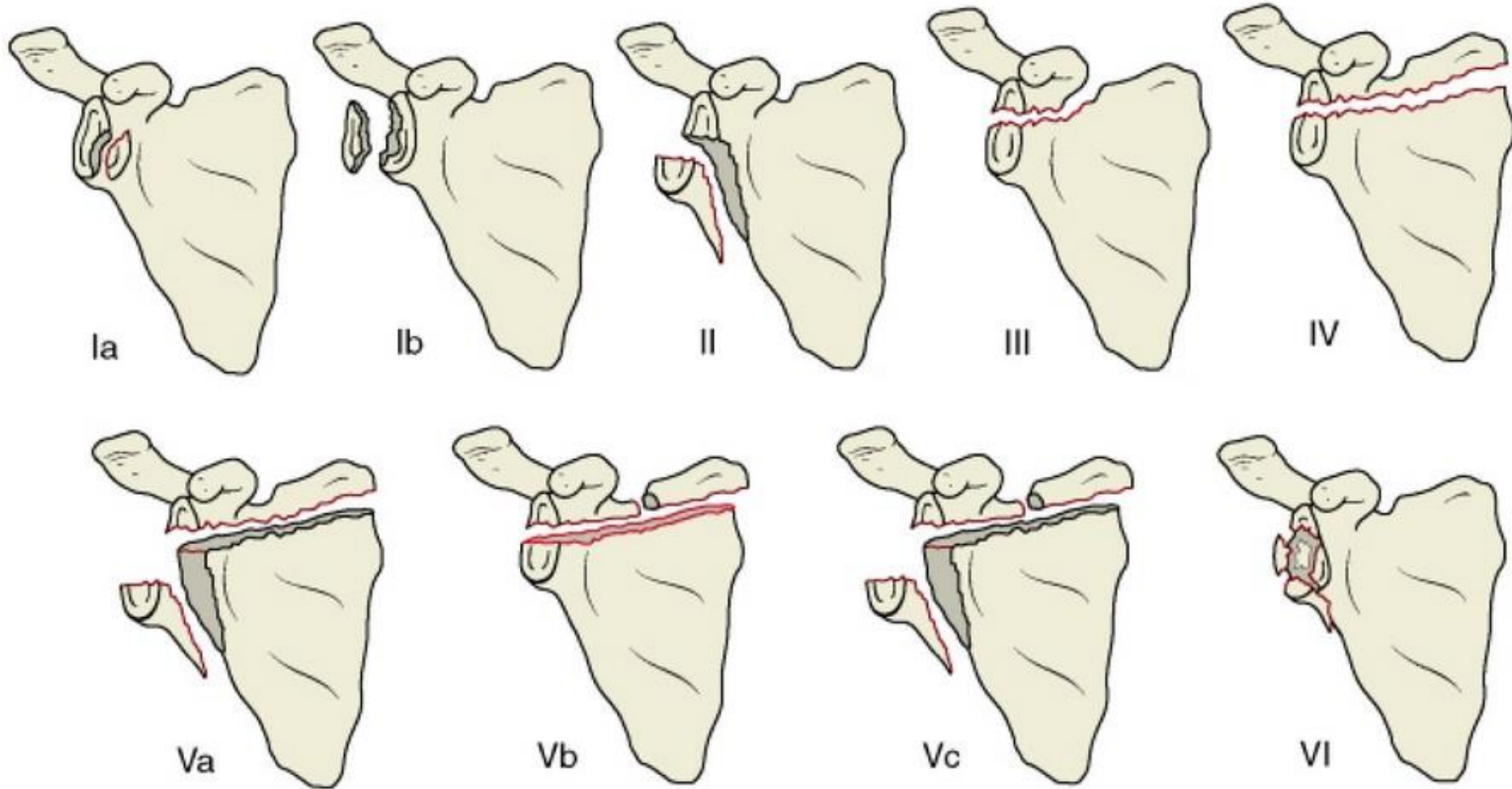


Fracture of scapula



Fracture of the scapula is usually the result of severe trauma, as occurs in pedestrian–vehicle accidents. Usually, there are also fractured ribs. Most fractures require little treatment because the scapula is covered on both sides by muscles. Most fractures involve the protruding subcutaneous acromion.

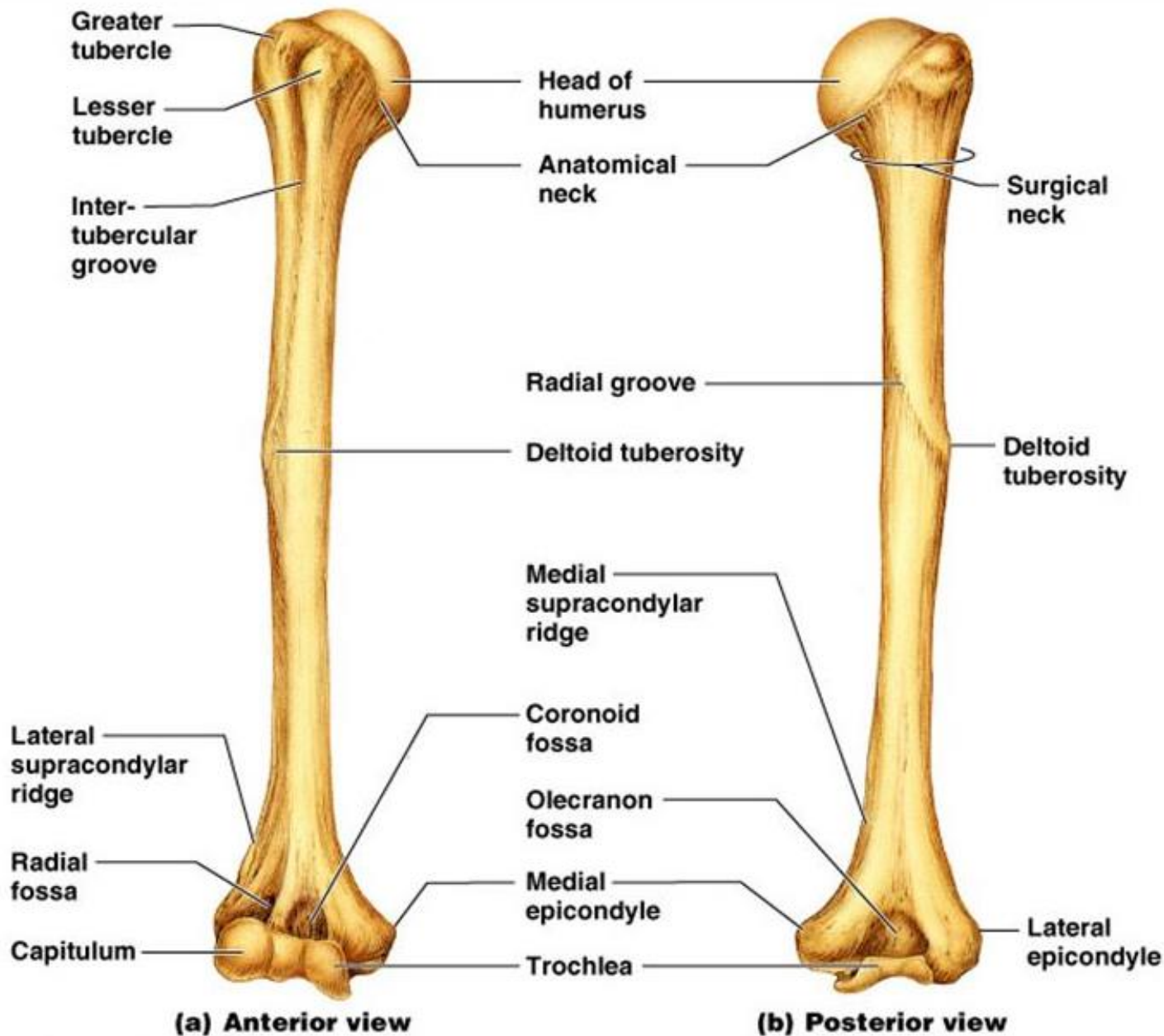
Fracture of scapula



Bones of upper limb



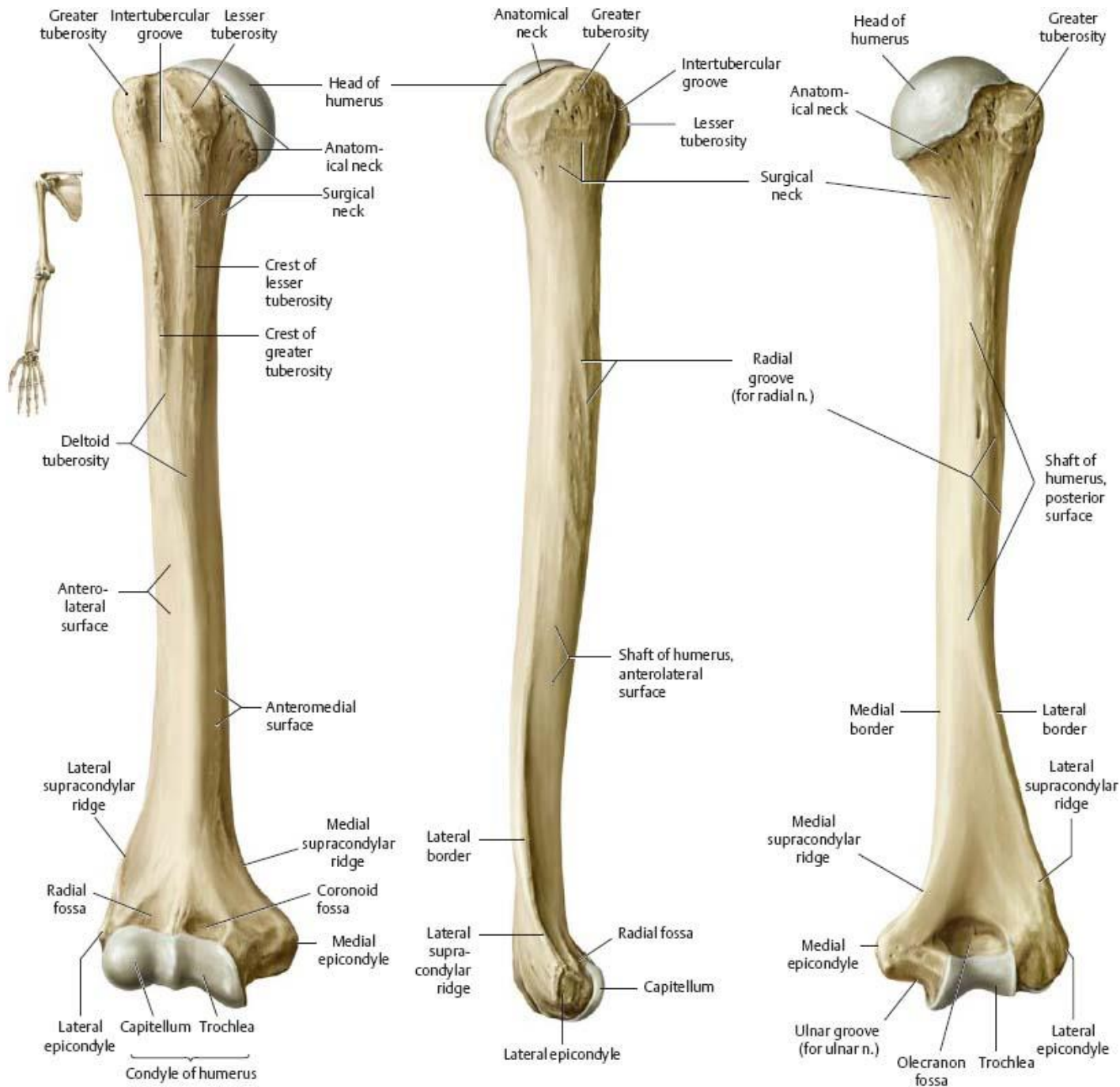
The humerus (arm bone), the largest bone in the upper limb, articulates with the scapula at the glenohumeral joint and the radius and ulna at the elbow joint. Proximally, the ball-shaped head of the humerus articulates with the glenoid cavity of the scapula. The intertubercular sulcus (bicipital groove) of the proximal end of the humerus separates the lesser tubercle from the greater tubercle.



Bones of upper limb



Just distal to the humeral head, the anatomical neck of the humerus separates the head from the tubercles. Distal to the tubercles is the narrow surgical neck of the humerus. The shaft of the humerus has two prominent features: the deltoid tuberosity laterally and the radial groove (groove for radial nerve, spiral groove) posteriorly for the radial nerve and profunda brachii artery.



A Anterior view.

B Lateral view.

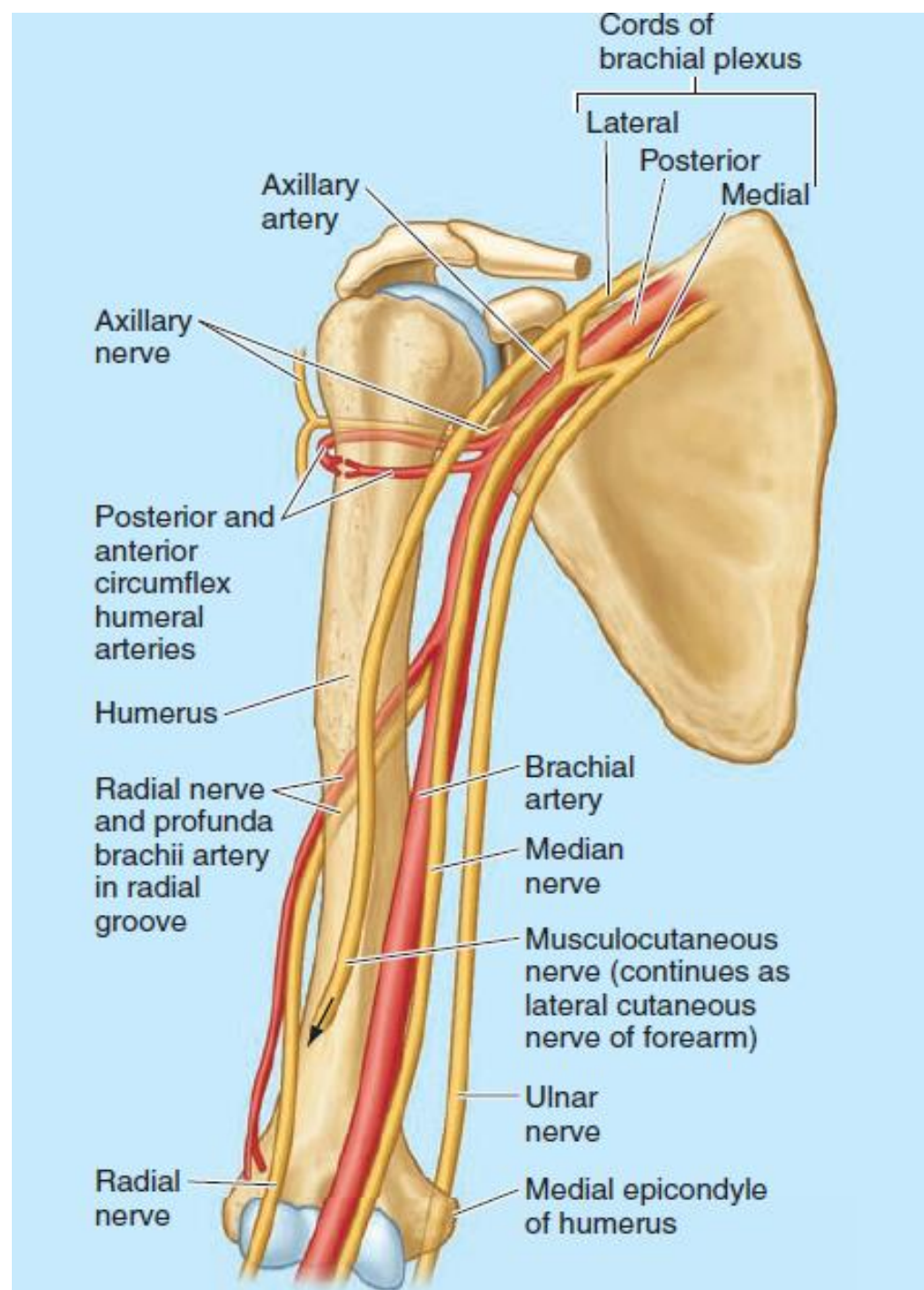
C Posterior view.

Fractures of humerus



Fractures of the surgical neck of the humerus are especially common in elderly people with osteoporosis. Even a low-energy fall on the hand, with the force being transmitted up the forearm bones of the extended limb, may result in a fracture. Transverse fractures of the shaft of humerus frequently result from a direct blow to the arm.

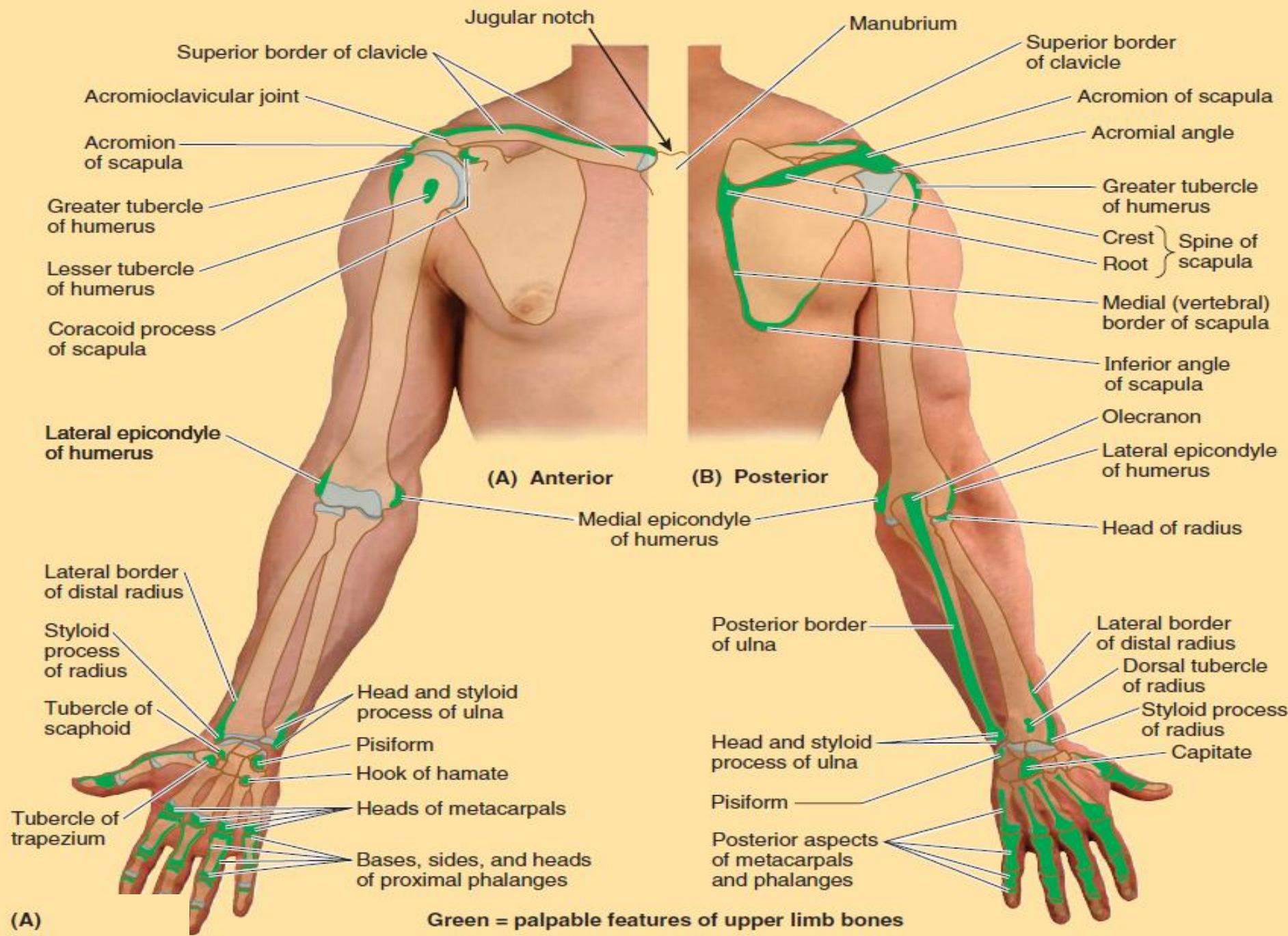
Fractures of Humerus:
Because nerves are in contact with the humerus, they may be injured when the associated part of the humerus is fractured:
surgical neck, axillary nerve;
radial groove, radial nerve;
distal humerus, median nerve; and medial epicondyle, ulnar nerve.



Surface anatomy



Most bones of the upper limb offer a palpable segment or surface, enabling the skilled examiner to discern abnormalities owing to trauma or malformation.



(A)

Green = palpable features of upper limb bones

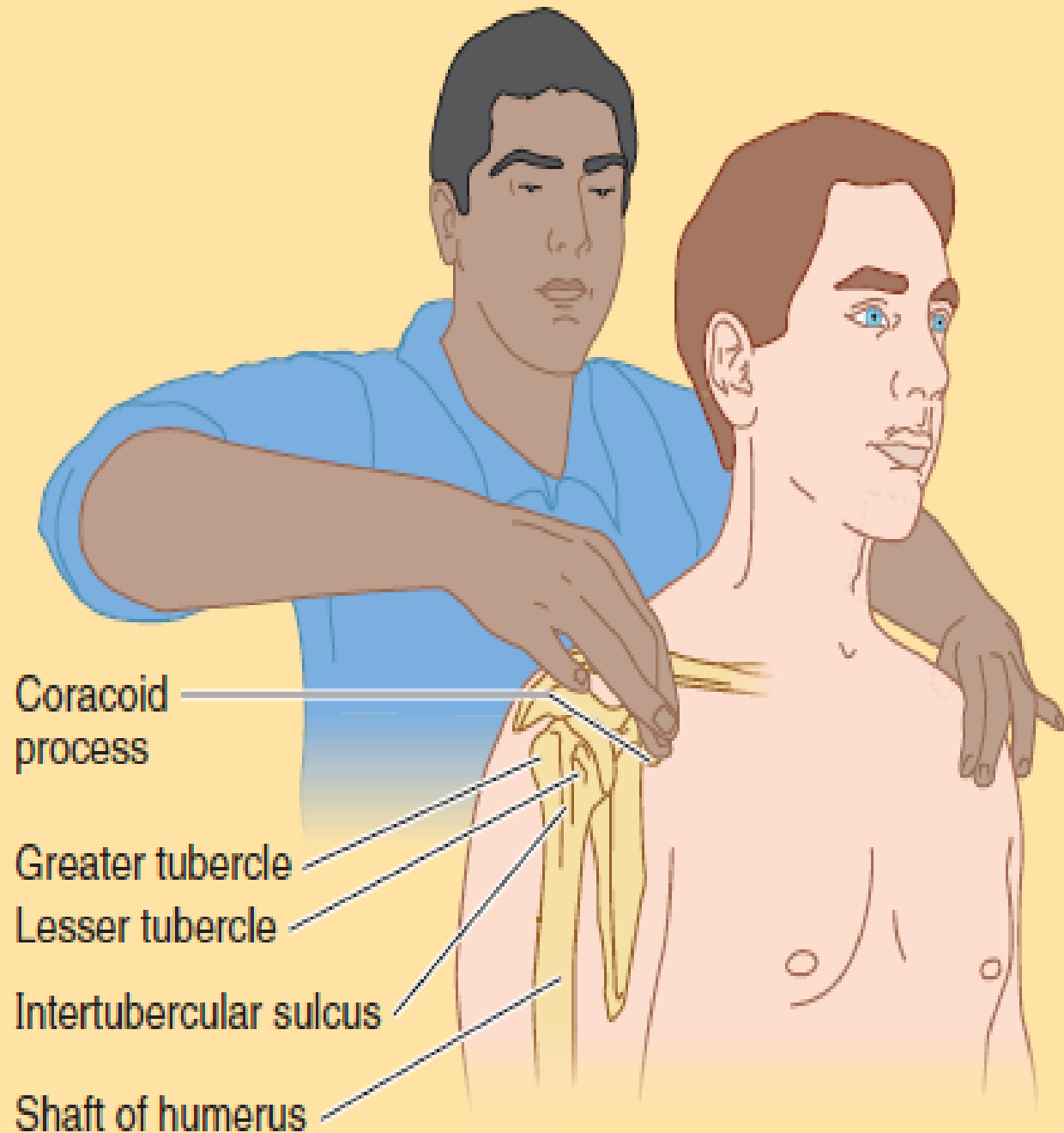
Surface anatomy



The clavicle is subcutaneous and can be palpated throughout its length. Its sternal end projects superior to the manubrium of the sternum. Between the elevated sternal ends of the clavicles is the jugular notch (suprasternal notch). The acromial end of the clavicle often rises higher than the acromion, forming a palpable elevation at the acromioclavicular joint.

Surface anatomy

The coracoid process of scapula can be felt deeply at the lateral end of the clavicle in the clavipectoral (deltopectoral) triangle



Surface anatomy



The acromion of the scapula is felt easily and is often visible. The lateral and posterior borders of the acromion meet to form the acromial angle. Inferior to the acromion, the deltoid muscle forms the rounded curve of the shoulder. The crest of the spine of the scapula is subcutaneous throughout and can be easily palpated.

Surface anatomy



When the upper limb is in the anatomical position, the

- Superior angle of the scapula (not palpable) lies at the level of the T2 vertebra.
- Medial end of the root of the scapular spine is opposite the spinous process of the T3 vertebra.
- Inferior angle of the scapula lies at the level of the T7 vertebra, near the inferior border of the 7th rib and 7th intercostal space.

Surface anatomy



The medial border of scapula is palpable inferior to the root of the spine of the scapula as it crosses the 3rd–7th ribs.

The lateral border of scapula is not easily palpated because it is covered by the teres major and minor muscles. The inferior angle of scapula is easily felt and is often visible.

Surface anatomy



The greater tubercle of humerus may be felt with the person's arm by the side on deep palpation through the deltoid muscle, inferior to the lateral border of the acromion. In this position, the tubercle is the most lateral bony point of the shoulder. When the arm is abducted, the greater tubercle is pulled beneath the acromion and is no longer palpable.

Surface anatomy



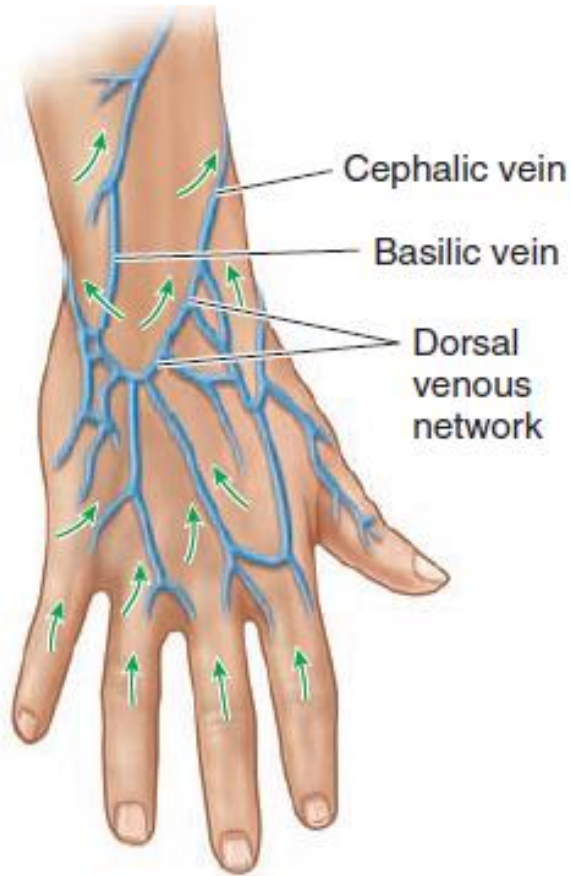
The lesser tubercle of the humerus may be felt with difficulty by deep palpation through the anterior deltoid, approximately 1 cm laterally and slightly inferior to the tip of the coracoid process. Rotation of the arm facilitates palpation of this tubercle. The location of the intertubercular sulcus or groove, between the greater and the lesser tubercles, is identifiable during flexion and extension of the elbow joint by palpating in an upward direction along the tendon of the long head of the biceps brachii as it moves through the intertubercular sulcus.

Venous drainage of upper limb

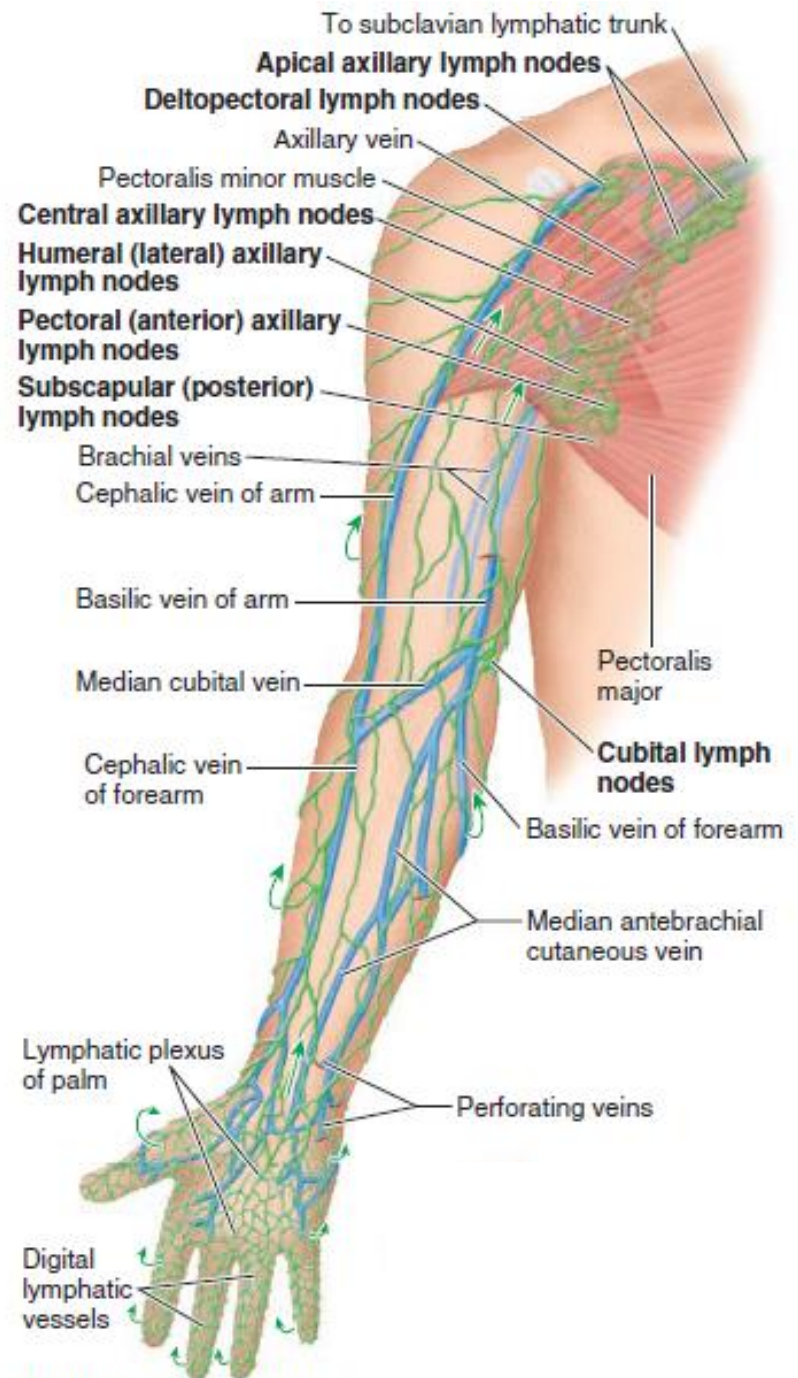


The main superficial veins of the upper limb, the cephalic and basilic veins, originate in the subcutaneous tissue on the dorsum of the hand from the dorsal venous network. Perforating veins form communications between the superficial and the deep veins.

Venous drainage of upper limb



(B) Posterior view



(A) Anterior (palmar) view

Venous drainage of upper limb



The cephalic vein (G. kephalé, head) ascends in the subcutaneous tissue from the lateral aspect of the dorsal venous network, proceeding along the lateral border of the wrist and the anterolateral surface of the forearm and arm. Anterior to the elbow, the cephalic vein communicates with the median cubital vein, which passes obliquely across the anterior aspect of the elbow and joins the basilic vein.

Venous Drainage of Upper Limb



Superiorly, the cephalic vein passes between the deltoid and the pectoralis

major muscles and enters the clavipectoral triangle, where it

pierces the costocoracoid membrane, part of the clavipectoral fascia, and joins the terminal part of the axillary vein.

Venous drainage of upper limb



The basilic vein ascends in the subcutaneous tissue from the medial end of the dorsal venous network along the medial side of the forearm and inferior part of the arm. It then passes deeply near the junction of the middle and inferior thirds of the arm, piercing the brachial fascia and running superiorly parallel to the brachial artery, where it merges with the accompanying veins (L. *venae comitantes*) of the brachial artery to form the axillary vein.

Venous drainage of upper limb



Deep veins lie internal to the deep fascia and usually occur as paired, continually interanastomosing, accompanying veins that travel with and bear the same name as the major arteries of the upper limb.

Superficial veins of upper limb are commonly used for intravenous injections

Common sites for intravenous injections

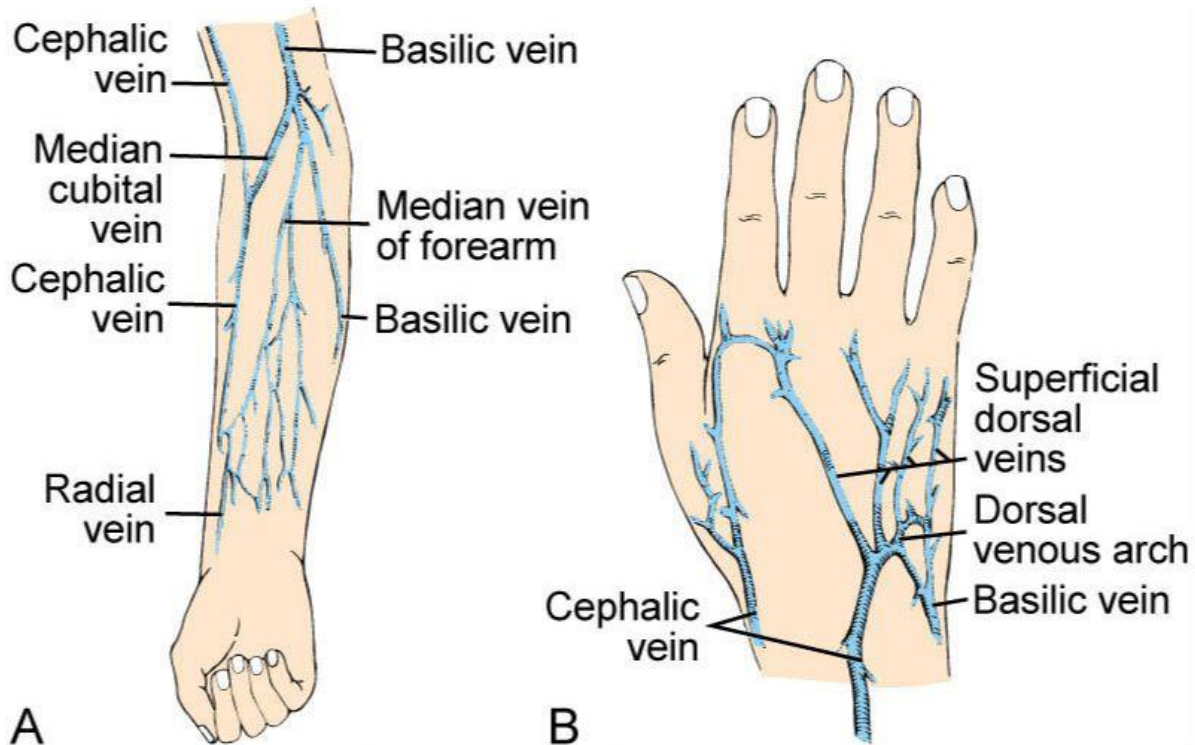


Fig. 15-3. Common IV sites. **A**, Inner arm. **B**, Dorsal surface of hand.

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Nerve supply of upper limb



The brachial plexus is a major network of nerves supplying the upper limb. It begins in the lateral cervical region (posterior triangle) and extends into the axilla. The brachial plexus is formed by the union of the anterior rami of the C5–T1 nerves, which constitute the roots of brachial plexus.

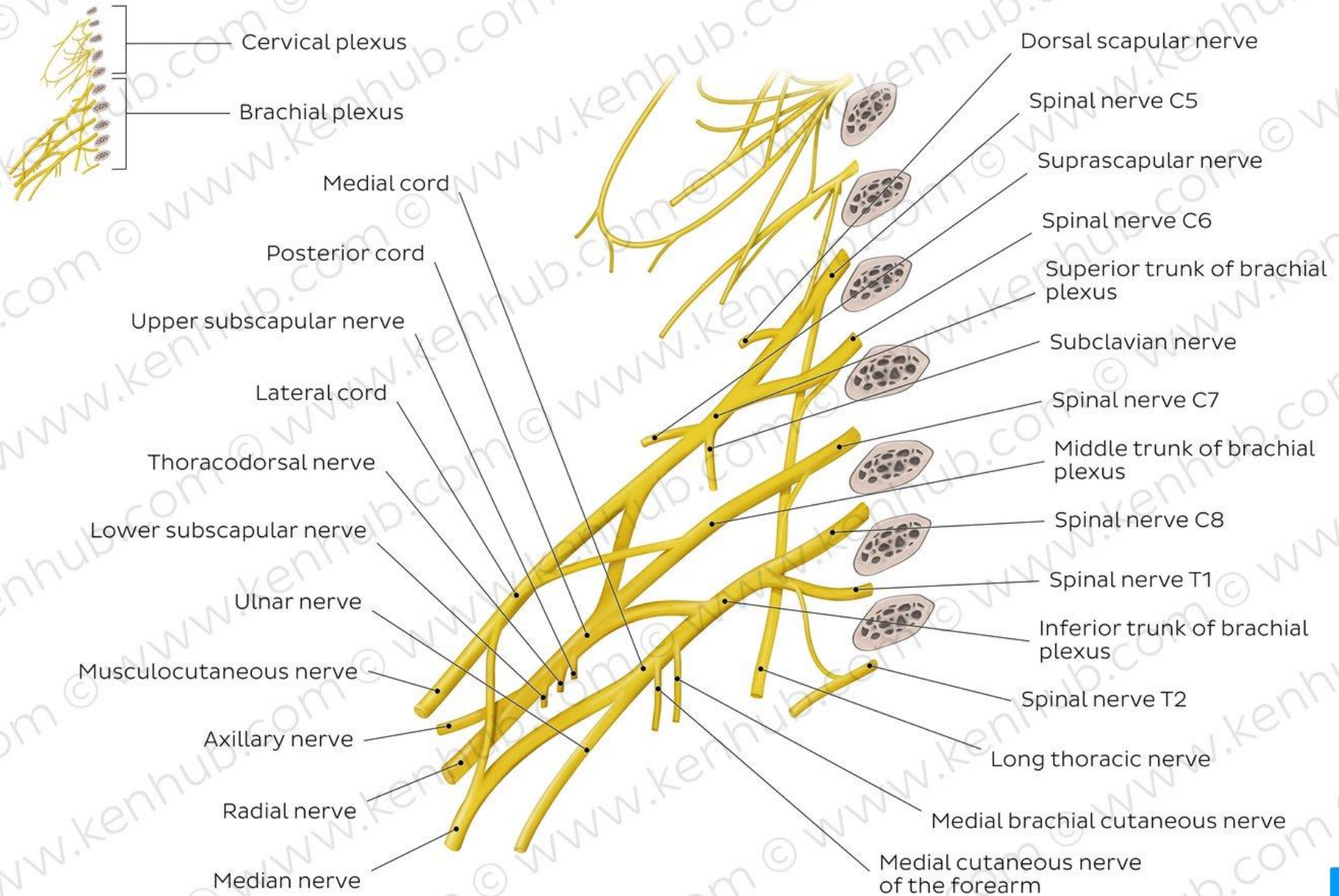
Nerve supply of upper limb



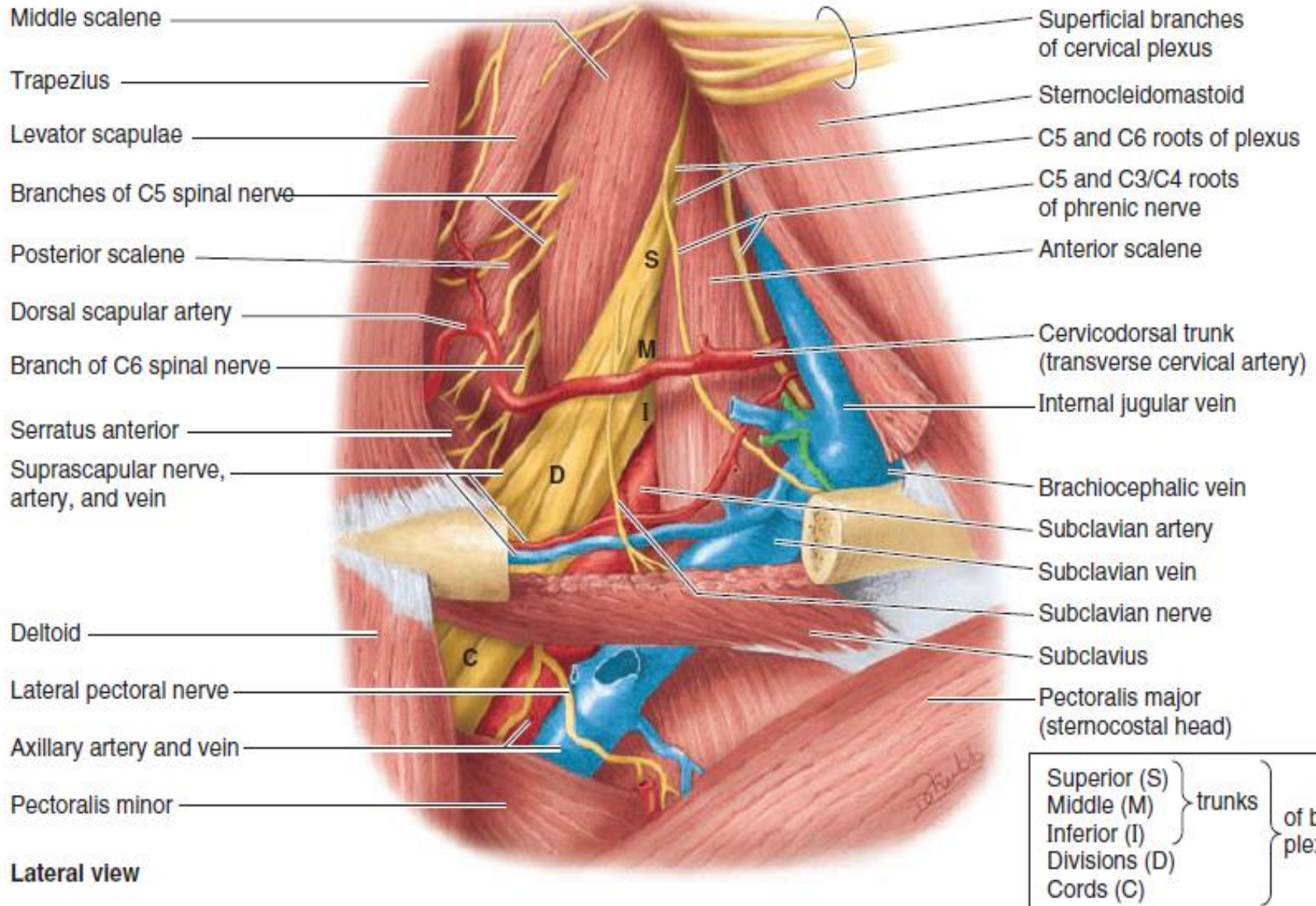
The roots usually pass through the gap between the anterior and middle scalene muscles with the subclavian artery. The sympathetic fibers carried by each root of the plexus are received from gray rami of the middle and inferior cervical ganglia as the roots pass between the scalene muscles.

Brachial plexus

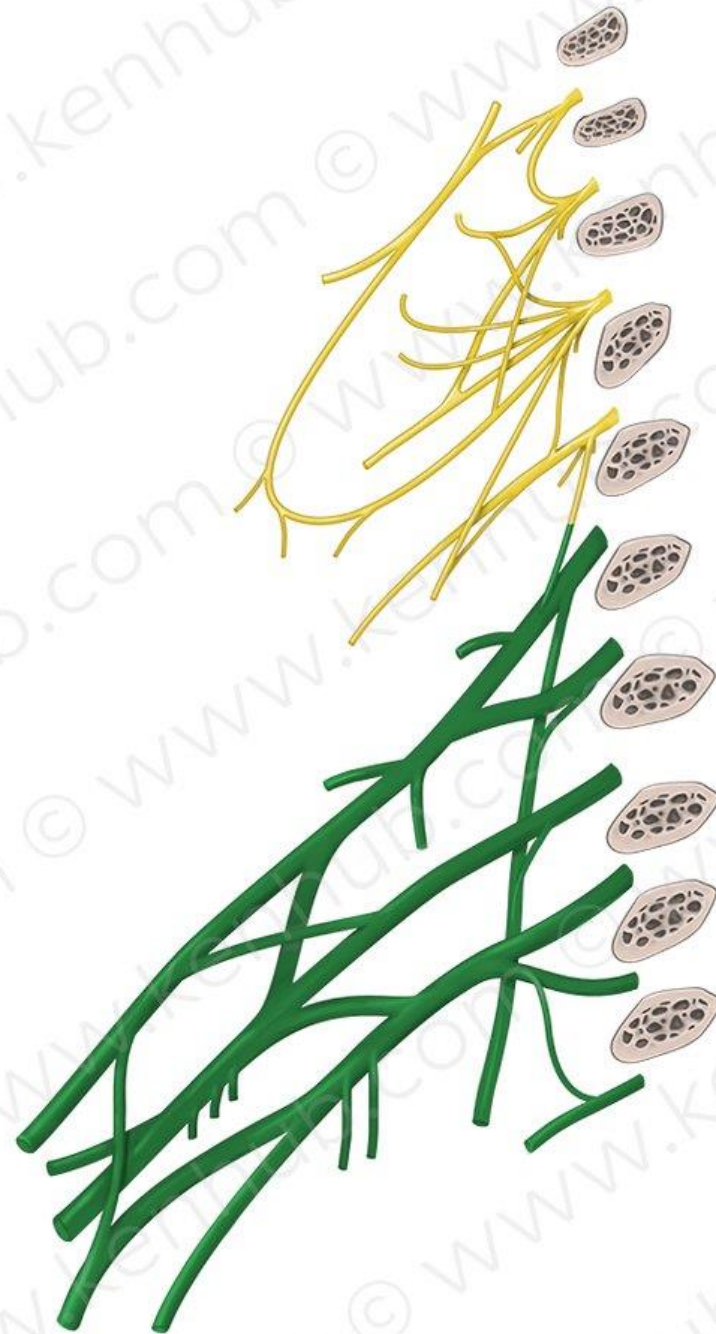
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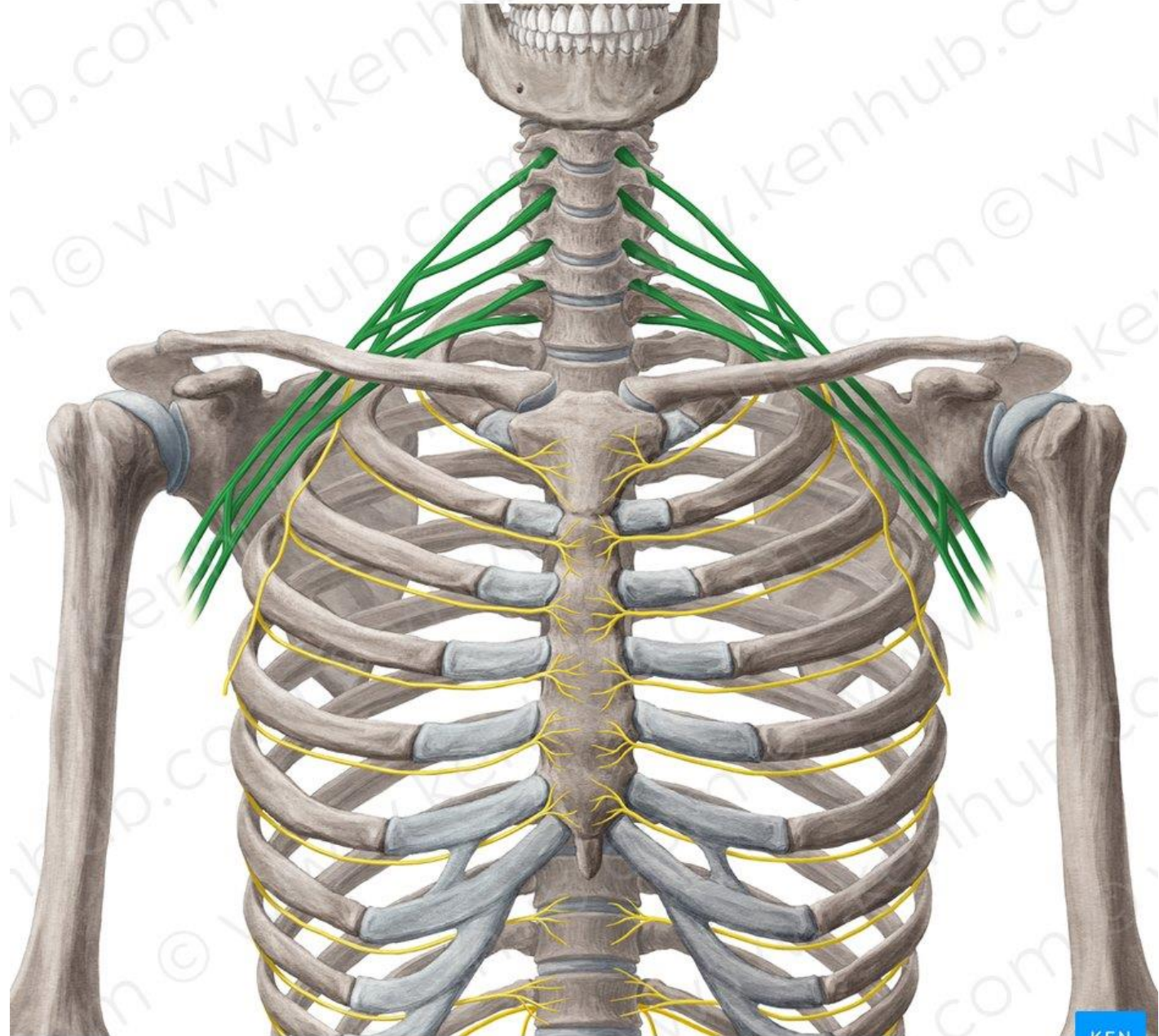
Brachial plexus



Brachial plexus



Brachial plexus



Brachial plexus



In the inferior part of the neck, the roots of the brachial plexus unite to form three trunks:

- A superior trunk, from the union of the C5 and C6 roots
- A middle trunk, which is a continuation of the C7 root
- An inferior trunk, from the union of the C8 and T1 roots

Brachial plexus



Each trunk of the brachial plexus divides into anterior and posterior divisions as the plexus passes through the cervicoaxillary canal posterior to the clavicle. The cervicoaxillary canal is a structure that is anteriorly bordered by the clavicle, posteriorly by the scapula, and medially by the first rib. This canal connects the neck with the arm and it is used by the brachial plexus, among other structures, to reach the arm.

Brachial plexus



The divisions of the trunks form three cords of the brachial plexus within the axilla:

- Anterior divisions of the superior and middle trunks unite to form the lateral cord.
- The anterior division of the inferior trunk continues as the medial cord.
- Posterior divisions of all three trunks unite to form the posterior cord.

Brachial plexus



When the brachial plexus reaches the axilla, it is at first located laterally and posteriorly to the axillary artery. At this point, the neuronal fibers are organized in the form of the divisions. Not long after the axilla is reached, the divisions merge to form the cords, which take their own positions related to the axillary artery: laterally to the artery is the lateral cord, medially to it is the medial cord, and posteriorly to the axillary artery is the posterior cord.

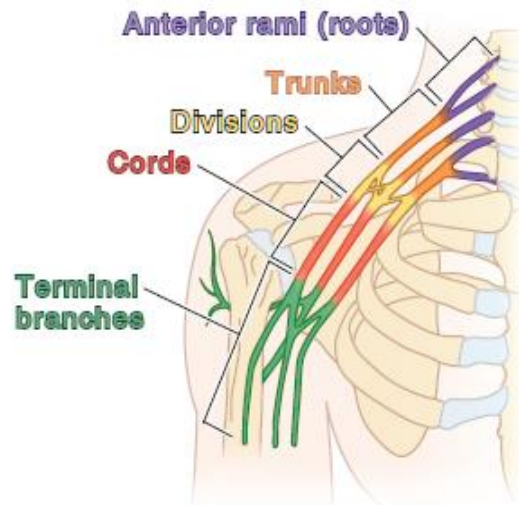
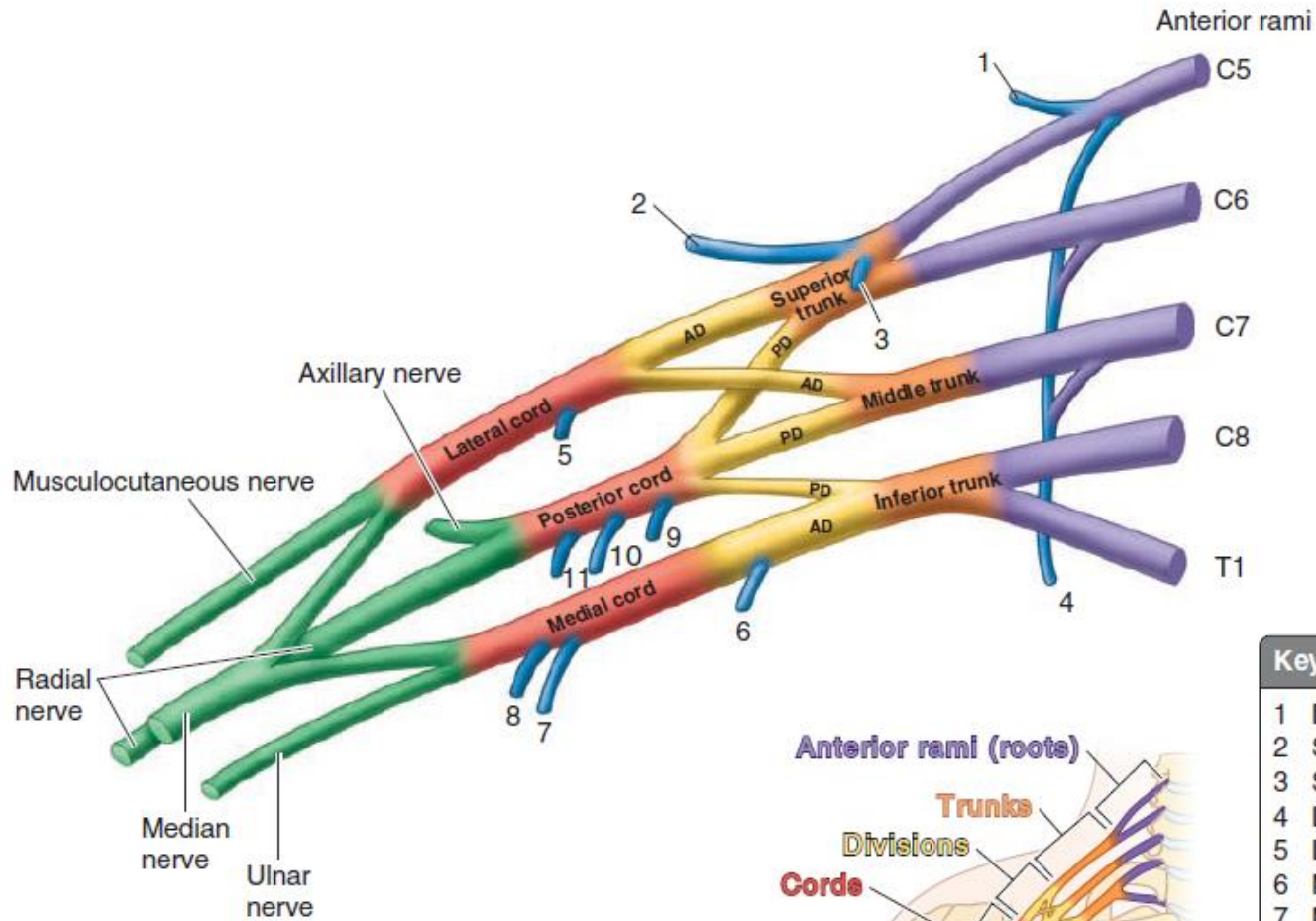
Brachial plexus



The brachial plexus is divided into supraclavicular and infraclavicular parts by the clavicle:

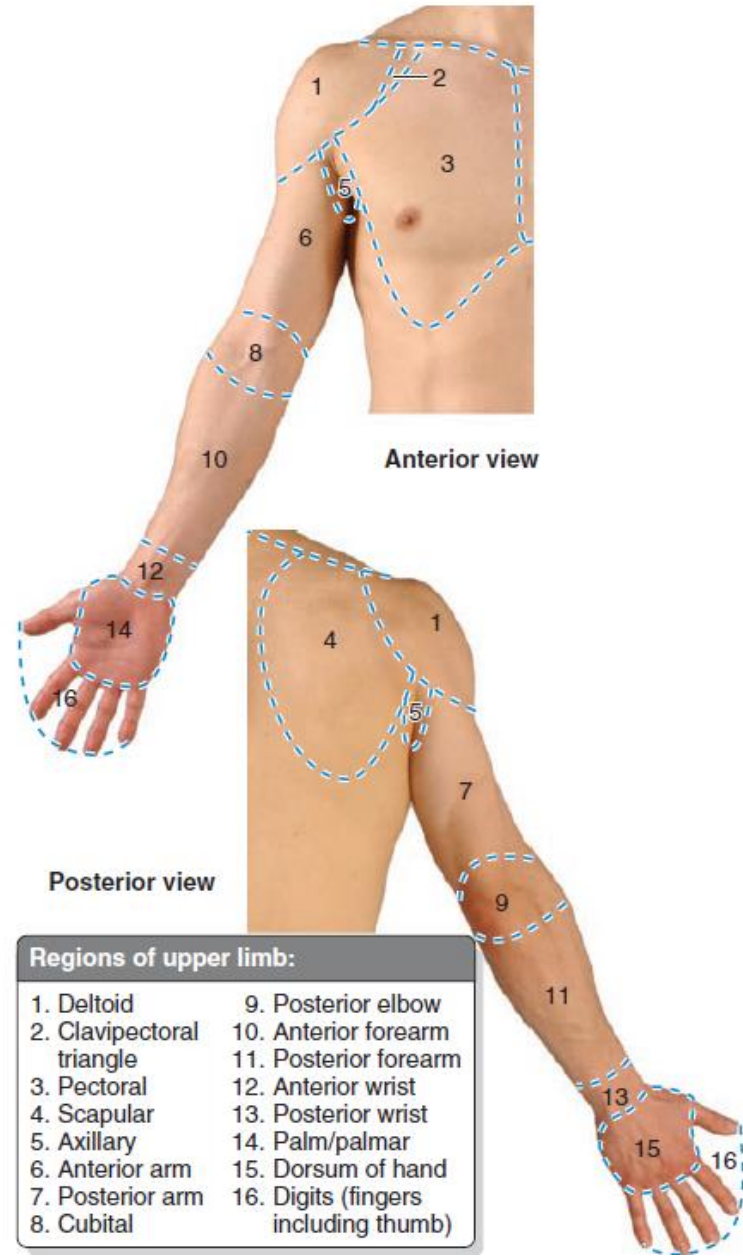
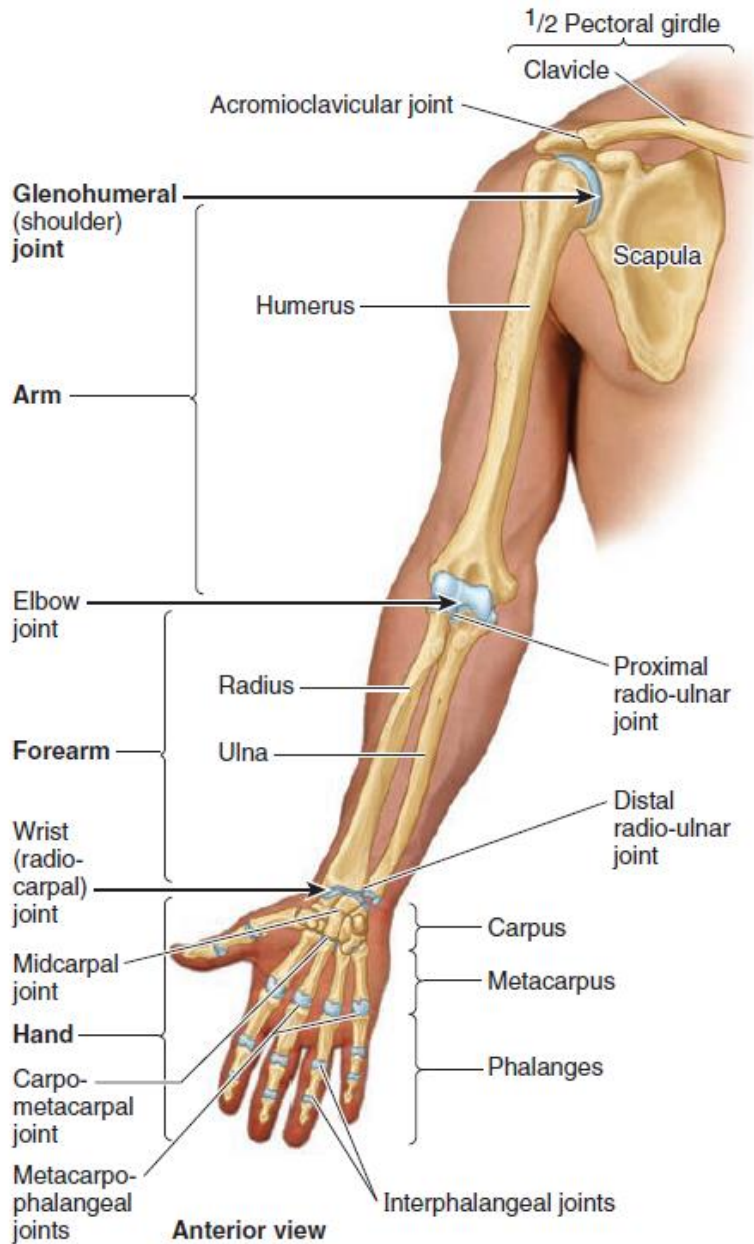
- Four branches of the supraclavicular part of the plexus arise from the roots (anterior rami) and trunks of the plexus (dorsal scapular nerve, long thoracic nerve, nerve to the subclavius, and suprascapular nerve) and are approachable through the neck.
- Branches of the infraclavicular part of the plexus arise from the cords of the brachial plexus and are approachable through the axilla.

Schematic illustrations of brachial plexus



Key	
1	Dorsal scapular nerve
2	Suprascapular nerve
3	Subclavian nerve
4	Long thoracic nerve
5	Lateral pectoral nerve
6	Medial pectoral nerve
7	Medial cutaneous nerve of arm
8	Medial cutaneous nerve of forearm
9	Upper subscapular nerve
10	Thoracodorsal nerve
11	Lower subscapular nerve
AD: Anterior division	
PD: Posterior division	
1-4: Supraclavicular branches	
5-11: Infraclavicular branches	

Regions of the upper extremity



Regions of upper limb:

- | | |
|---------------------------|--------------------------------------|
| 1. Deltoid | 9. Posterior elbow |
| 2. Clavipectoral triangle | 10. Anterior forearm |
| 3. Pectoral | 11. Posterior forearm |
| 4. Scapular | 12. Anterior wrist |
| 5. Axillary | 13. Posterior wrist |
| 6. Anterior arm | 14. Palm/palmar |
| 7. Posterior arm | 15. Dorsum of hand |
| 8. Cubital | 16. Digits (fingers including thumb) |

Regions of the upper limb



The upper limb is divided into 4 main parts - shoulder, arm, forearm and hand. The shoulder region contains three important regions: the deltoid region, the scapular region and the axillary (armpit) region.

The axilla



The axilla is the pyramidal space inferior to the glenohumeral joint and superior to the skin and axillary fascia at the junction of the arm and thorax. The shape and size of the axilla vary depending on the position of the arm; it almost disappears when the shoulder joint is fully abducted. The axilla provides a passageway for vessels and nerves going to and from the upper limb. The axilla has an apex, base, and four walls, three of which are muscular.

The axilla



- The apex of the axilla is the cervico-axillary canal, the passageway between the neck and the axilla. It is bounded by the 1st rib, clavicle, and superior edge of the scapula. The arteries, veins, lymphatics, and nerves traverse this superior opening to pass to or from the arm.
- The base of the axilla is formed by the concave skin, subcutaneous tissue, and axillary (deep) fascia extending from the arm to the thoracic wall forming the axillary fossa (armpit).

The axilla



- The anterior wall of the axilla is formed by the pectoralis major and minor and the pectoral and clavipectoral fascia associated with them. The anterior axillary fold is the inferiormost part of the anterior wall.
- The posterior wall of the axilla is formed chiefly by the scapula and subscapularis on its anterior surface and inferiorly by the teres major and latissimus dorsi. The posterior axillary fold is the inferiormost part of the posterior wall that may be grasped.

The axilla



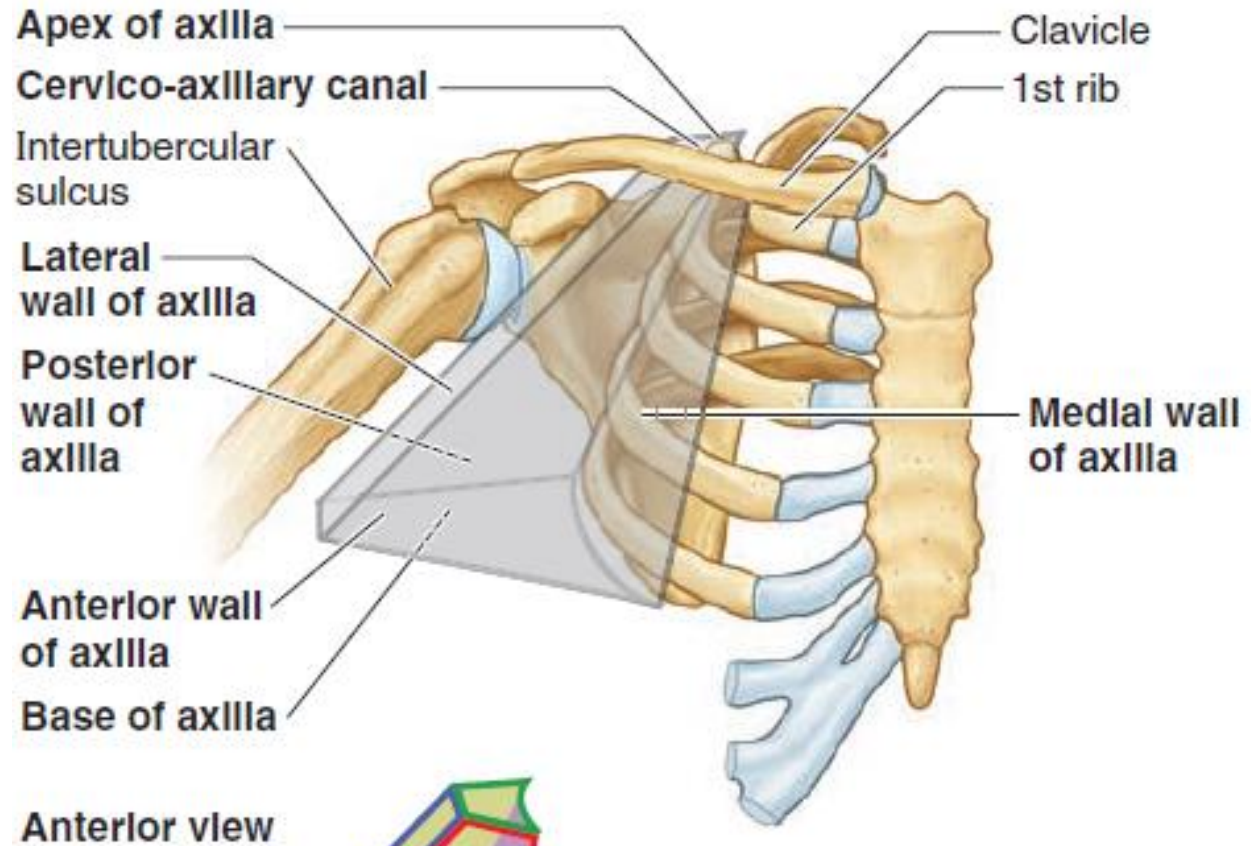
- The medial wall of the axilla is formed by the thoracic wall and the overlying serratus anterior.
- The lateral wall of the axilla is the narrow bony wall formed by the intertubercular sulcus of the humerus.

The axilla

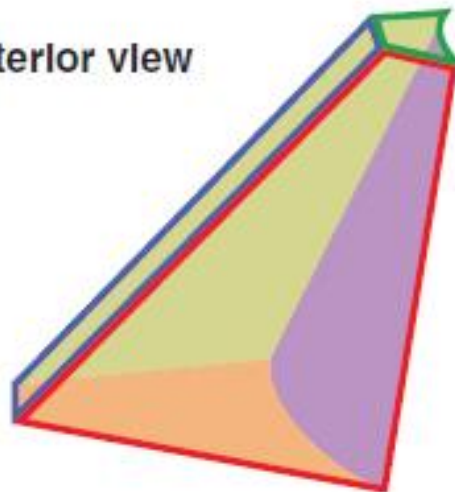


The axilla contains the axillary artery and its branches, axillary vein and its tributaries, nerves of the cords and branches of the brachial plexus, lymphatic vessels, and several groups of axillary lymph nodes all embedded in axillary fat.

Location and boundaries of axilla



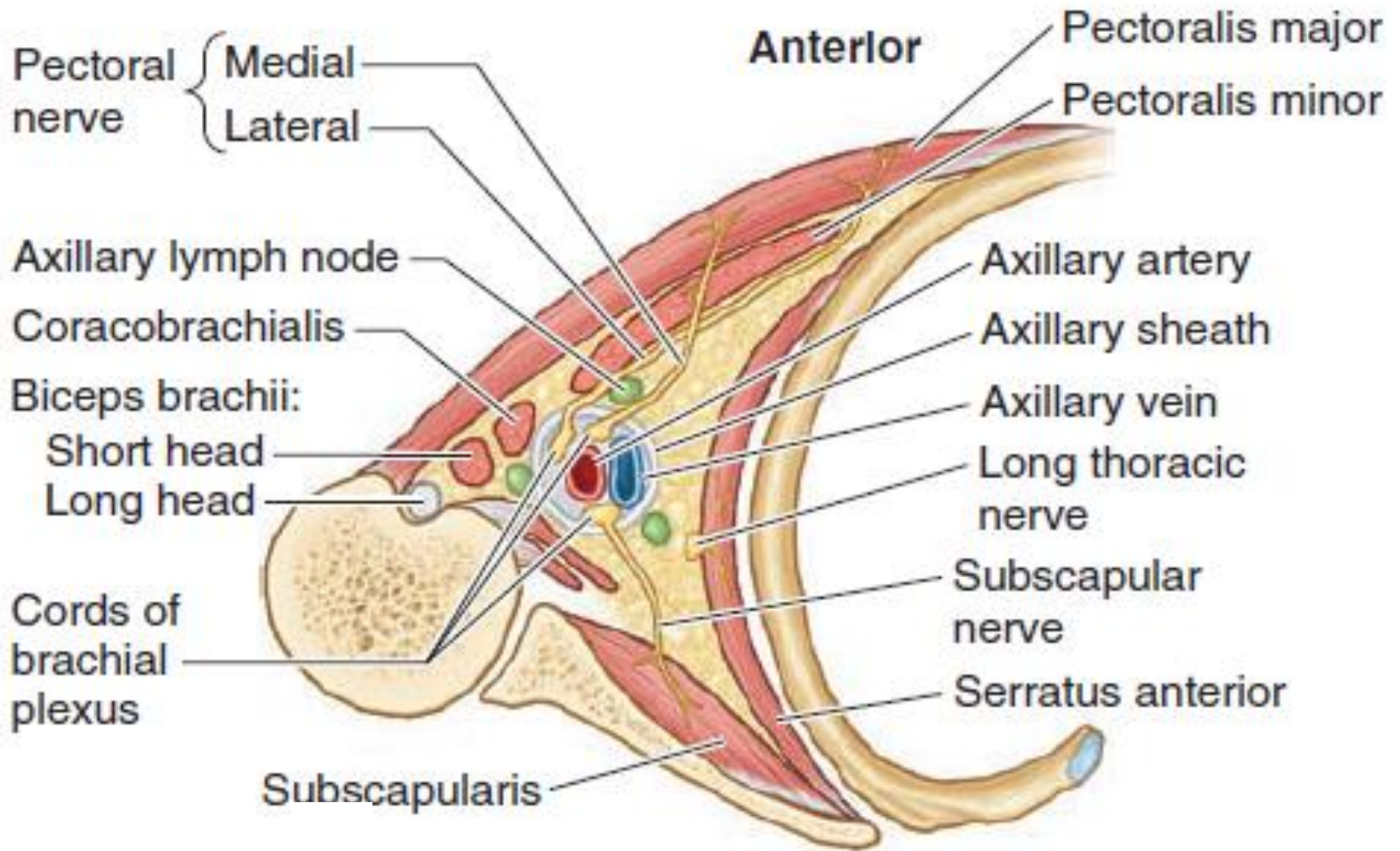
Anterior view



Axillary boundrles	
	Apex
	Base
	Anterior wall
	Lateral wall
	Medial wall
	Posterior wall

The contents of axilla

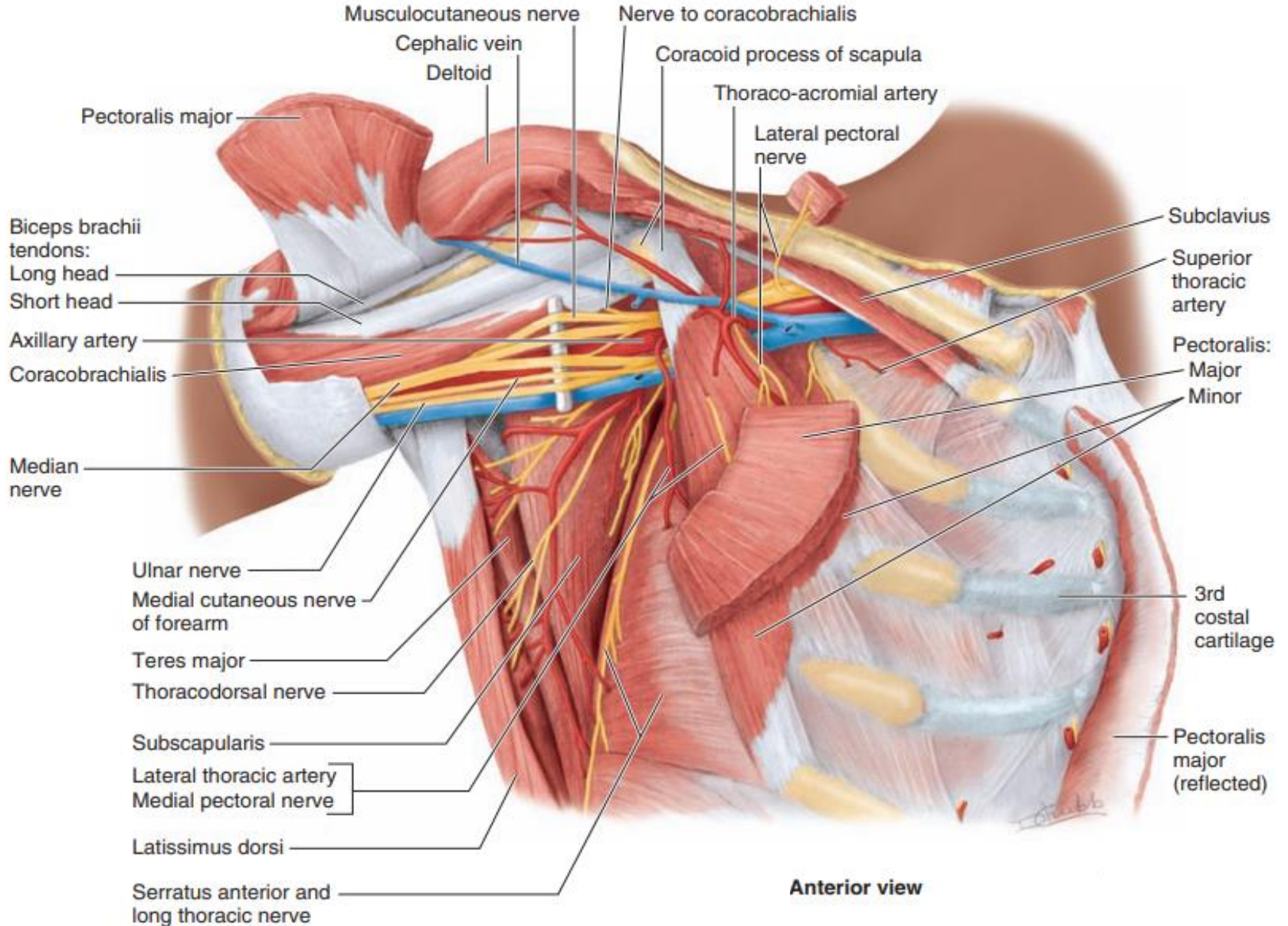
ВолГМУ



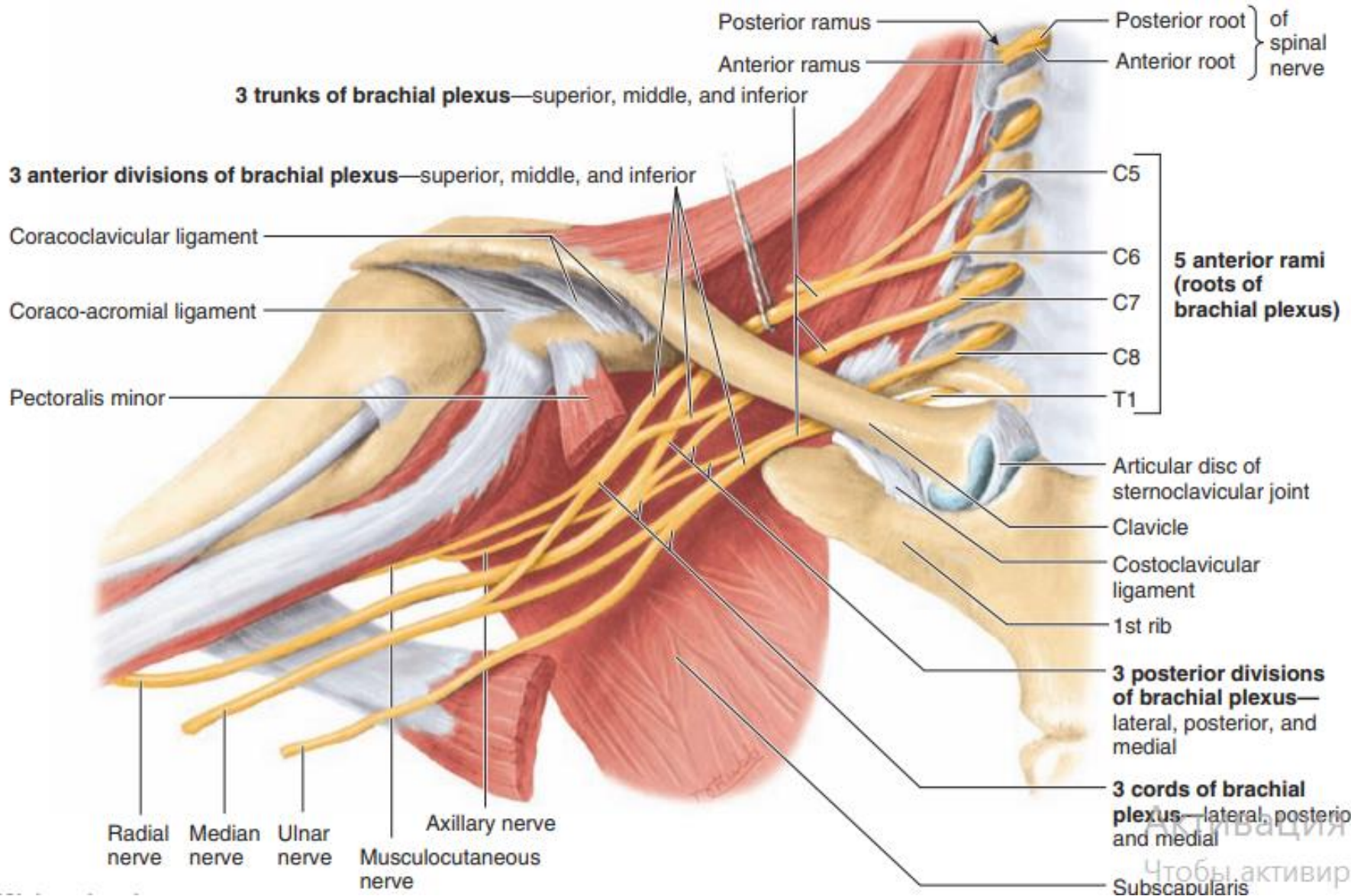
Inferior view of
transverse section

Posterior

The contents of axilla

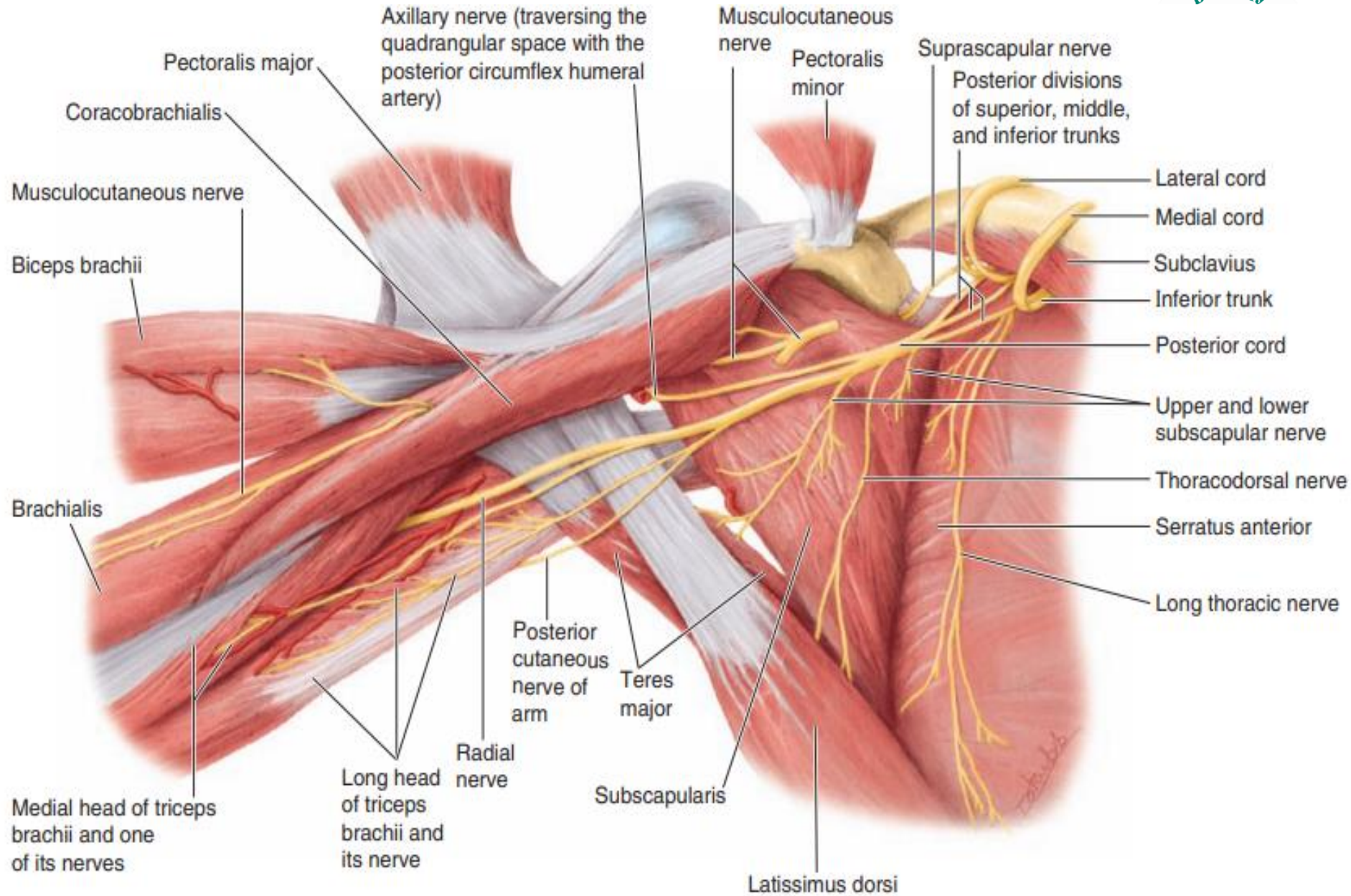


The contents of axilla

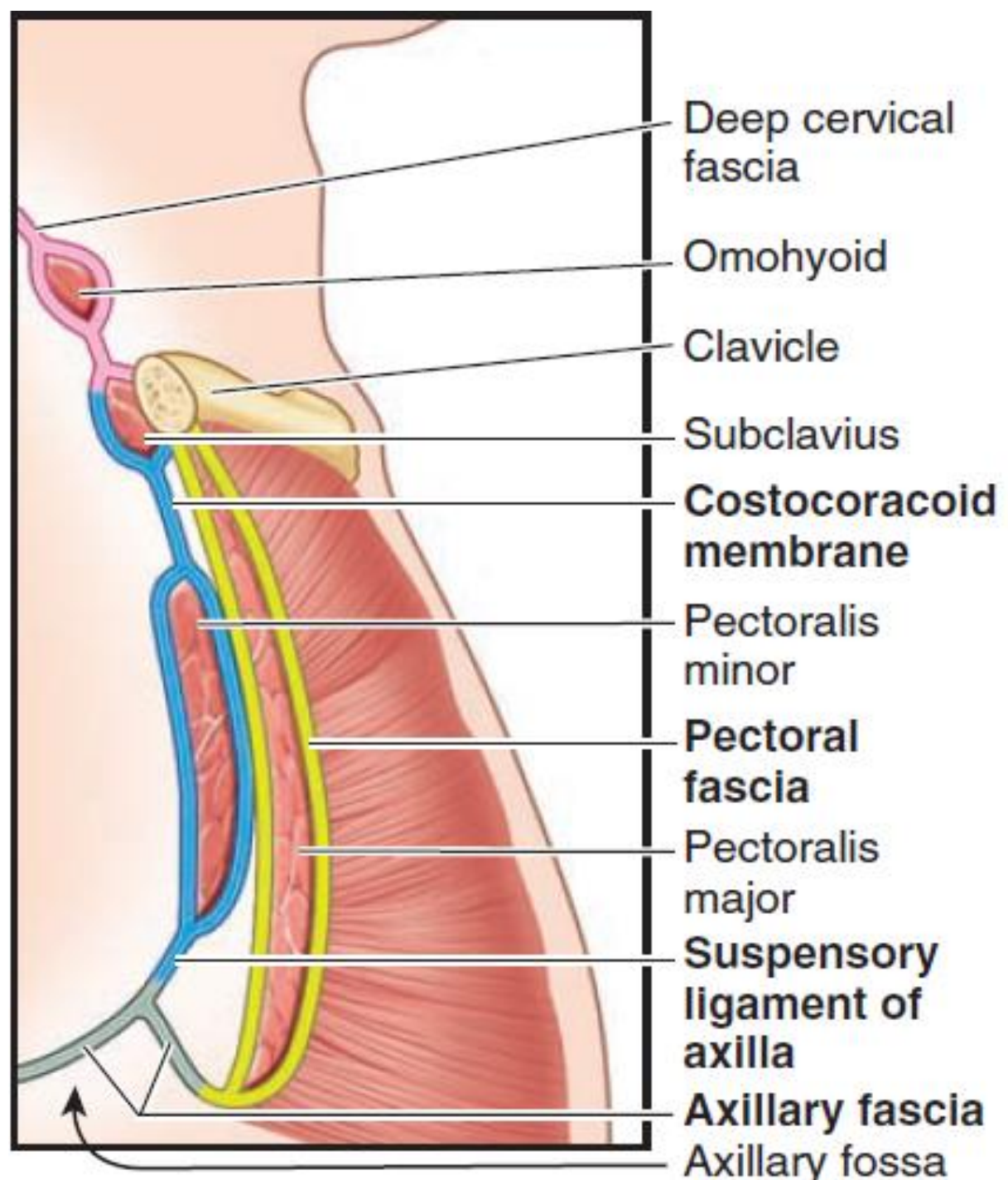


The contents of axilla

ВОИГМУ



Layers of
anterior wall of
axilla and
subclavian area
(sagittal section)



Layers of anterior wall of axilla and subclavian area



Anterior Thoracic Wall

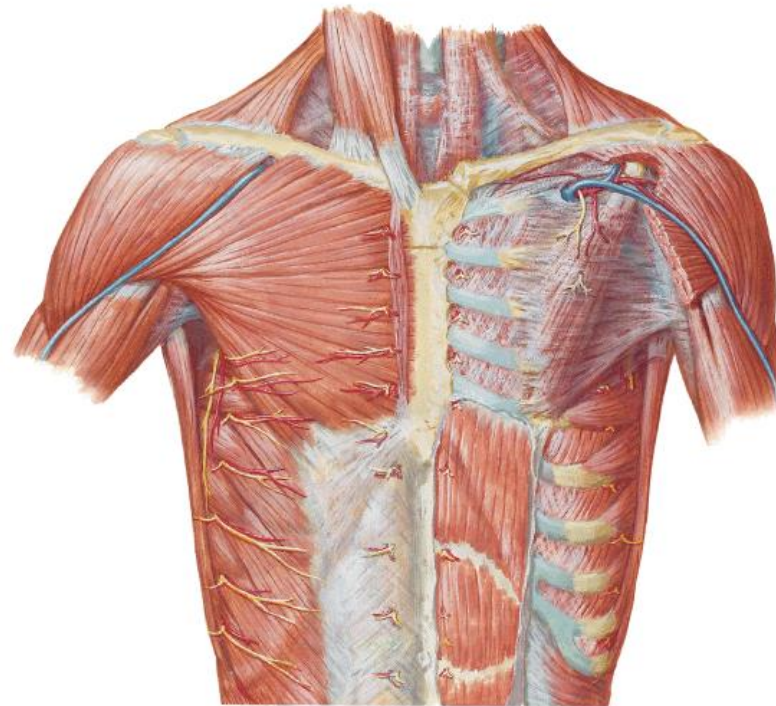


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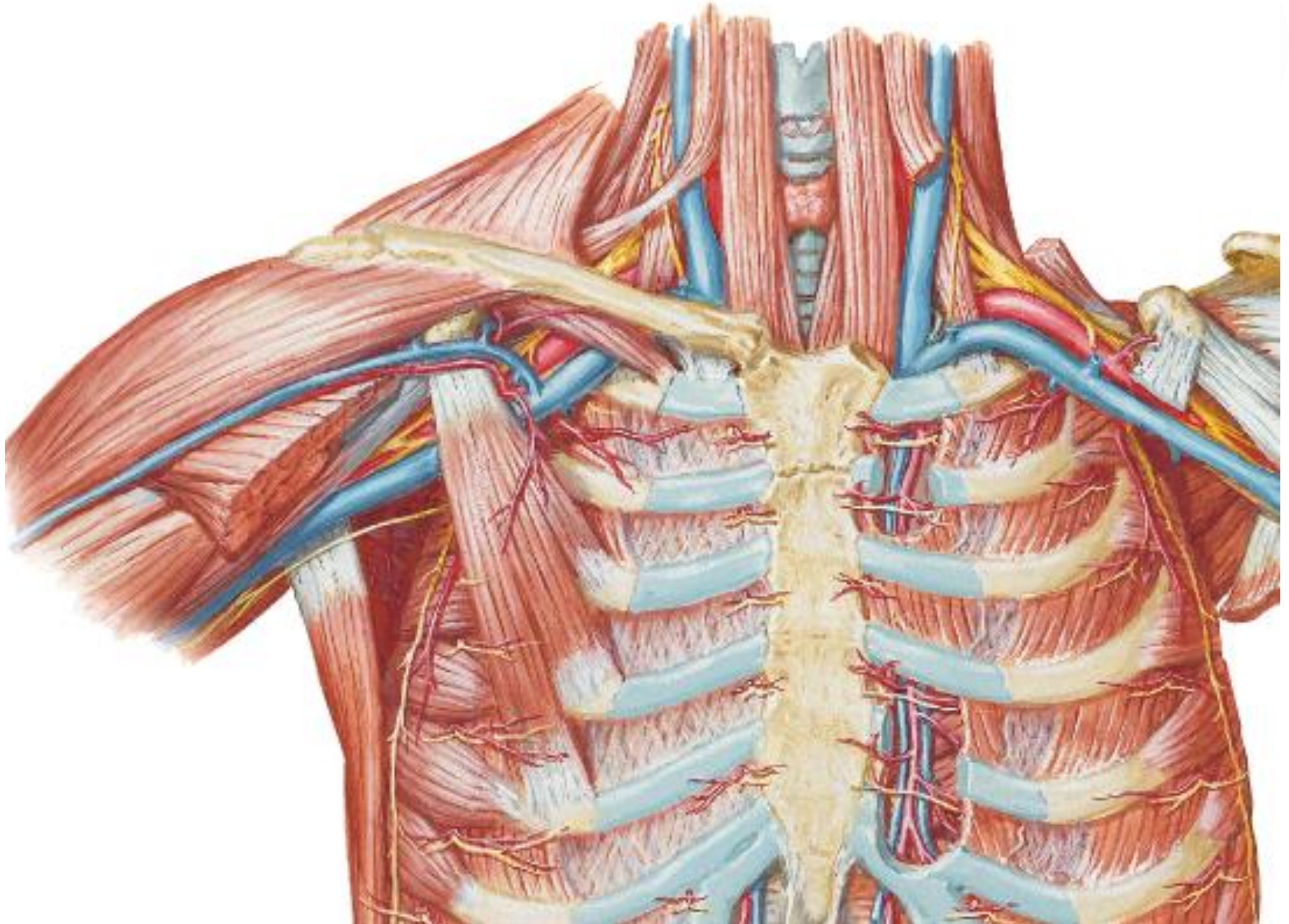
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Layers of anterior wall of axilla and subclavian area

ВоИГМУ



Subclavian area



The pectoral fascia invests the pectoralis major and is continuous inferiorly with the fascia of the anterior abdominal wall. The pectoral fascia leaves the lateral border of the pectoralis major and becomes the axillary fascia, which forms the floor of the axilla.

Subclavian area



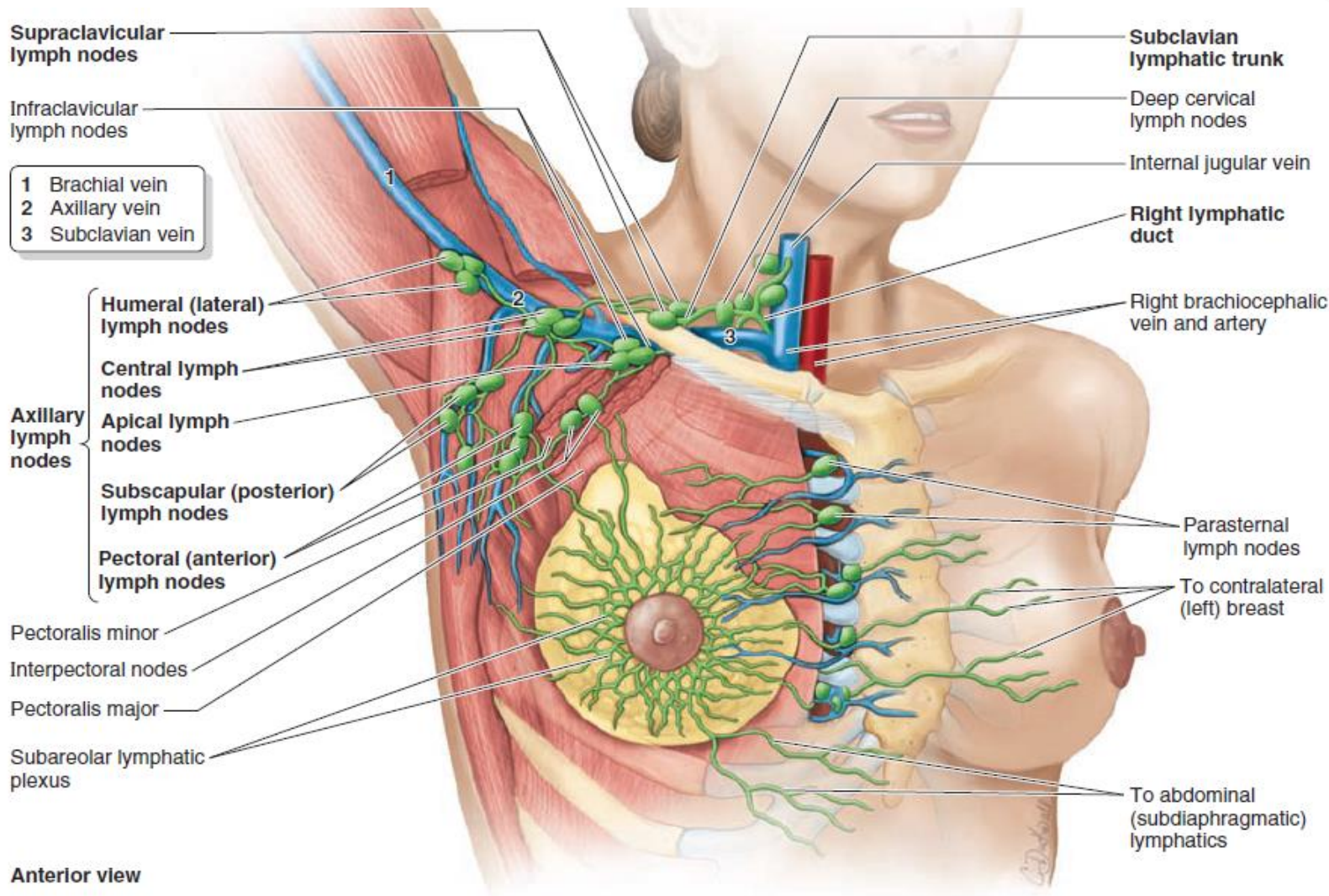
Deep to the pectoral fascia and the pectoralis major, another fascial layer, the clavipectoral fascia, descends from the clavicle, enclosing the subclavius and then the pectoralis minor, becoming continuous inferiorly with the axillary fascia.

Subclavian area



The part of the clavipectoral fascia between the pectoralis minor and the subclavius, the costocoracoid membrane, is pierced by the lateral pectoral nerve, which primarily supplies the pectoralis major. The part of the clavipectoral fascia inferior to the pectoralis minor, the suspensory ligament of axilla, supports the axillary fascia and pulls it and the skin inferior to it upward during abduction of the arm, forming the axillary fossa.

Axillary lymph nodes and lymphatic drainage of upper limb and breast



Axillary lymph nodes and lymphatic drainage of upper limb and breast



There are five principal groups of axillary lymph nodes: pectoral, subscapular, humeral, central, and apical.

The pectoral (anterior) nodes consist of three to five nodes that lie along the medial wall of the axilla, around the lateral thoracic vein and inferior border of the pectoralis minor.

The pectoral nodes receive lymph mainly from the anterior thoracic wall, including most of the breast

Axillary lymph nodes and lymphatic drainage of upper limb and breast



The subscapular (posterior) nodes consist of six or seven nodes that lie along the posterior axillary fold and subscapular blood vessels. These nodes receive lymph from the posterior aspect of the thoracic wall and scapular region.

Axillary lymph nodes and lymphatic drainage of upper limb and breast



The humeral (lateral) nodes consist of four to six nodes that lie along the lateral wall of the axilla, medial and posterior to the axillary vein. These humeral nodes receive nearly all the lymph from the upper limb, except that carried by lymphatic vessels accompanying the cephalic vein, which primarily drain to the apical axillary and infraclavicular nodes.

Axillary lymph nodes and lymphatic drainage of upper limb and breast



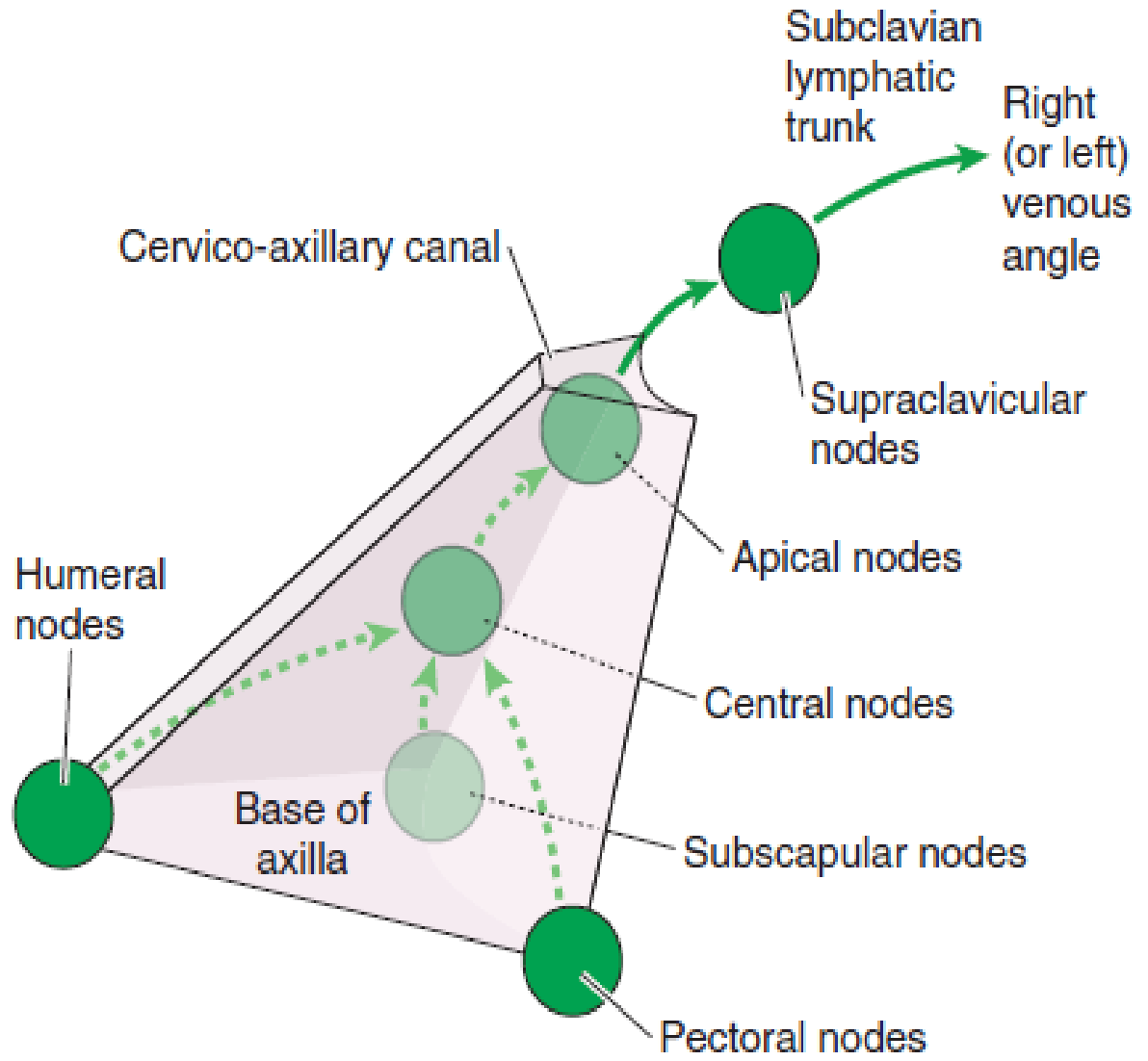
Efferent lymphatic vessels from the pectoral, subscapular, and humeral nodes pass to the central nodes. These nodes consist of three or four large nodes situated deep to the pectoralis minor near the base of the axilla, in association with the second part of the axillary artery. Efferent vessels from the central nodes pass to the apical nodes.

Axillary lymph nodes and lymphatic drainage of upper limb and breast



The apical nodes are located at the apex of the axilla along the medial side of the axillary vein and the first part of the axillary artery. These nodes receive lymph from all other groups of axillary nodes as well as from lymphatics accompanying the proximal cephalic vein.

Location and drainage pattern of axillary lymph nodes, (schematic illustration)



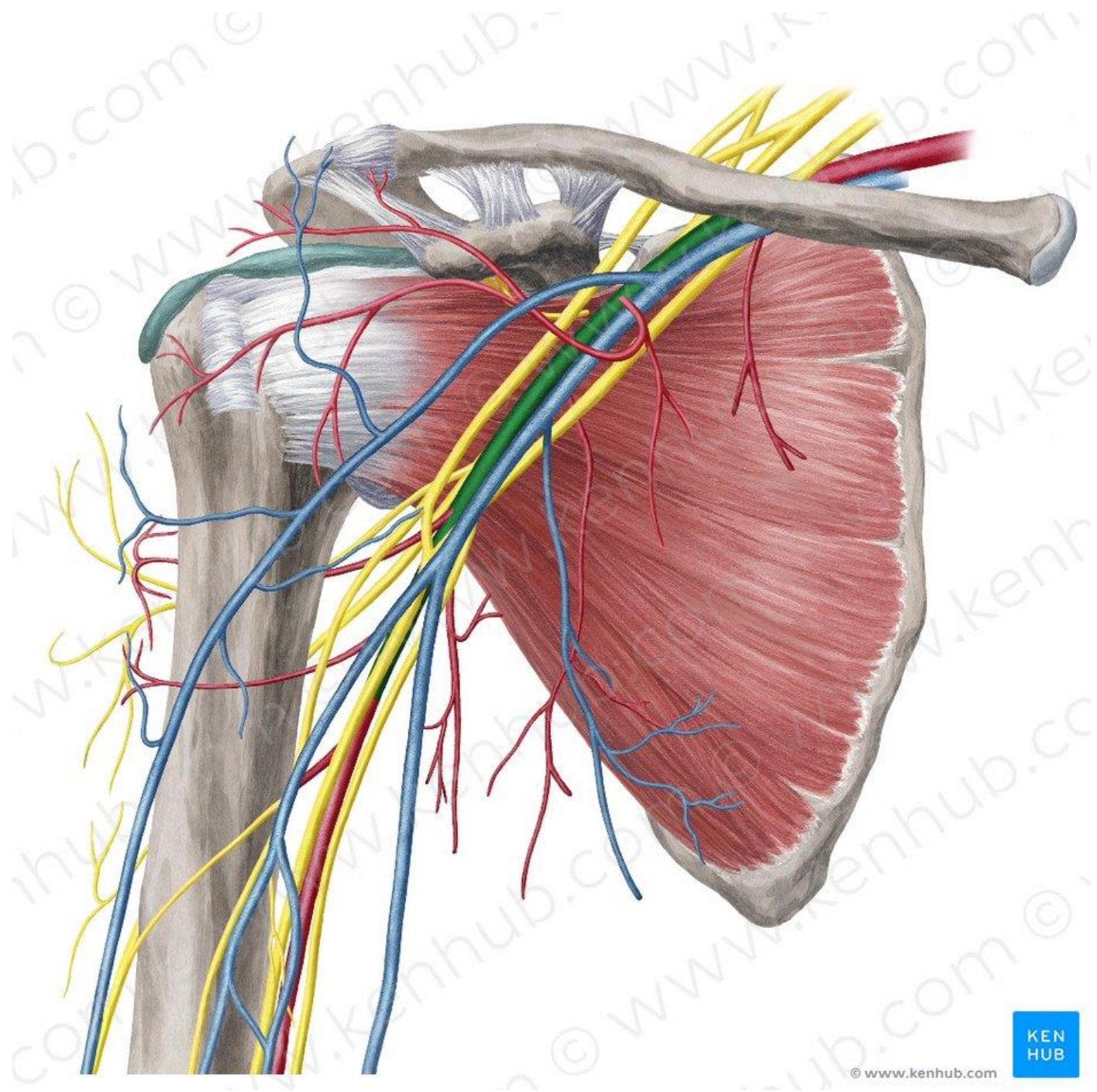
Axillary lymph nodes

Axillary lymph nodes and lymphatic drainage of upper limb and breast



Efferent vessels from the apical nodes traverse the cervico-axillary canal and unite to form the subclavian lymphatic trunk, although some vessels may drain en route through the clavicular (infraclavicular and supraclavicular) nodes. The subclavian lymphatic trunk may be joined by the jugular and bronchomediastinal trunks on the right side to form the right lymphatic duct, or it may enter the right venous angle independently. On the left side, the subclavian trunk most commonly joins the thoracic duct.

Brachial
plexus and
axillary
artery
(Arteria
axillaris)



Axillary artery (Arteria axillaris)



The axillary artery begins at the lateral border of the 1st rib as the continuation of the subclavian artery and ends at the inferior border of the teres major. It passes posterior to the pectoralis minor into the arm and becomes the brachial artery when it passes distal to the inferior border of the teres major.

Axillary artery (Arteria axillaris)



For descriptive purposes, the axillary artery is divided into three parts relative to the pectoralis minor (the part number also indicates the number of its branches):

- The first part of the axillary artery is located between the lateral border of the 1st rib and the medial border of the pectoralis minor; it is enclosed in the axillary sheath and has one branch: the superior thoracic artery.

Axillary artery (Arteria axillaris)



- The second part of the axillary artery lies posterior to the pectoralis minor and has two branches: the thoracoacromial artery and lateral thoracic artery, which pass medial and lateral to the muscle, respectively.

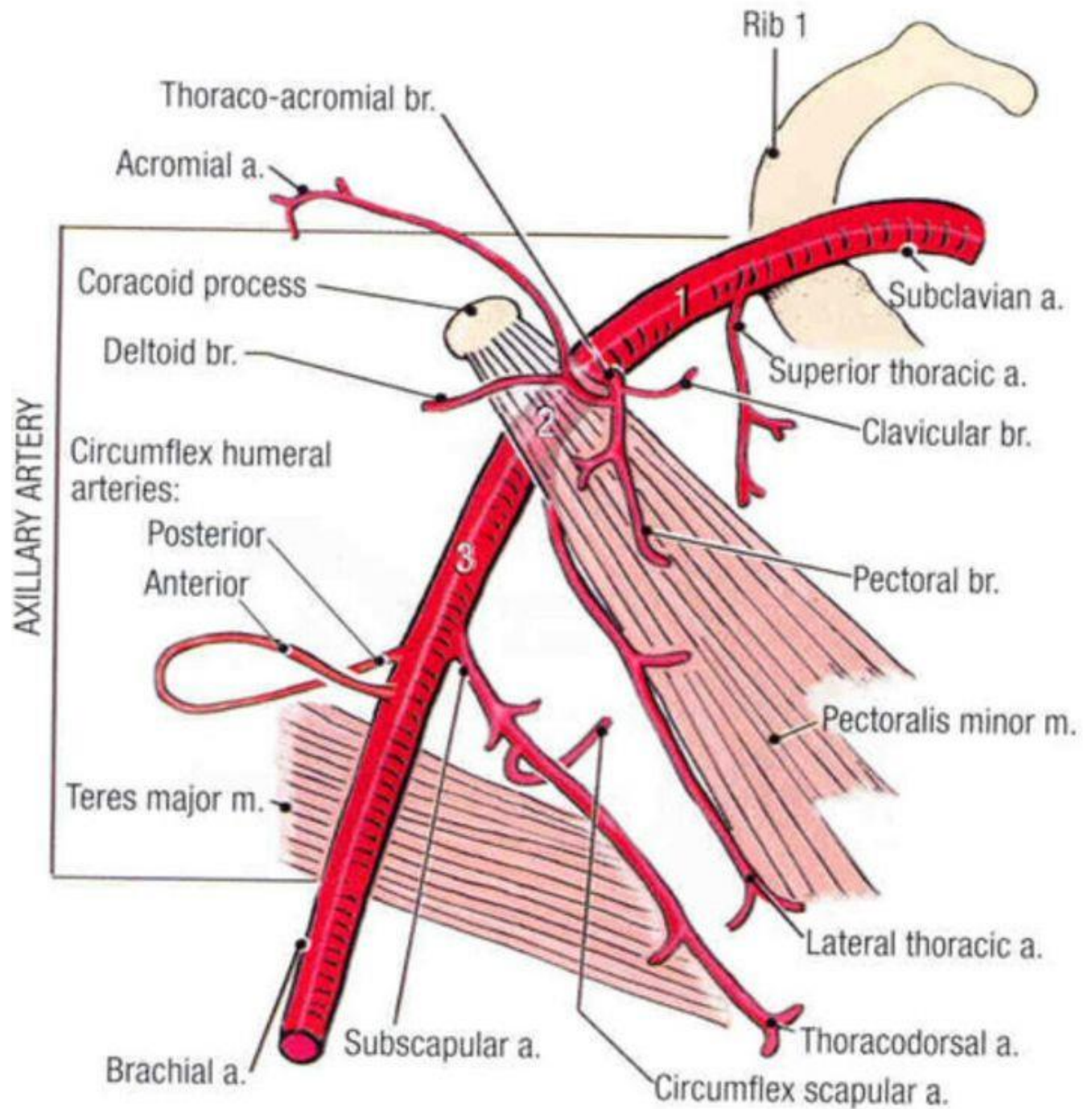
Axillary artery (Arteria axillaris)



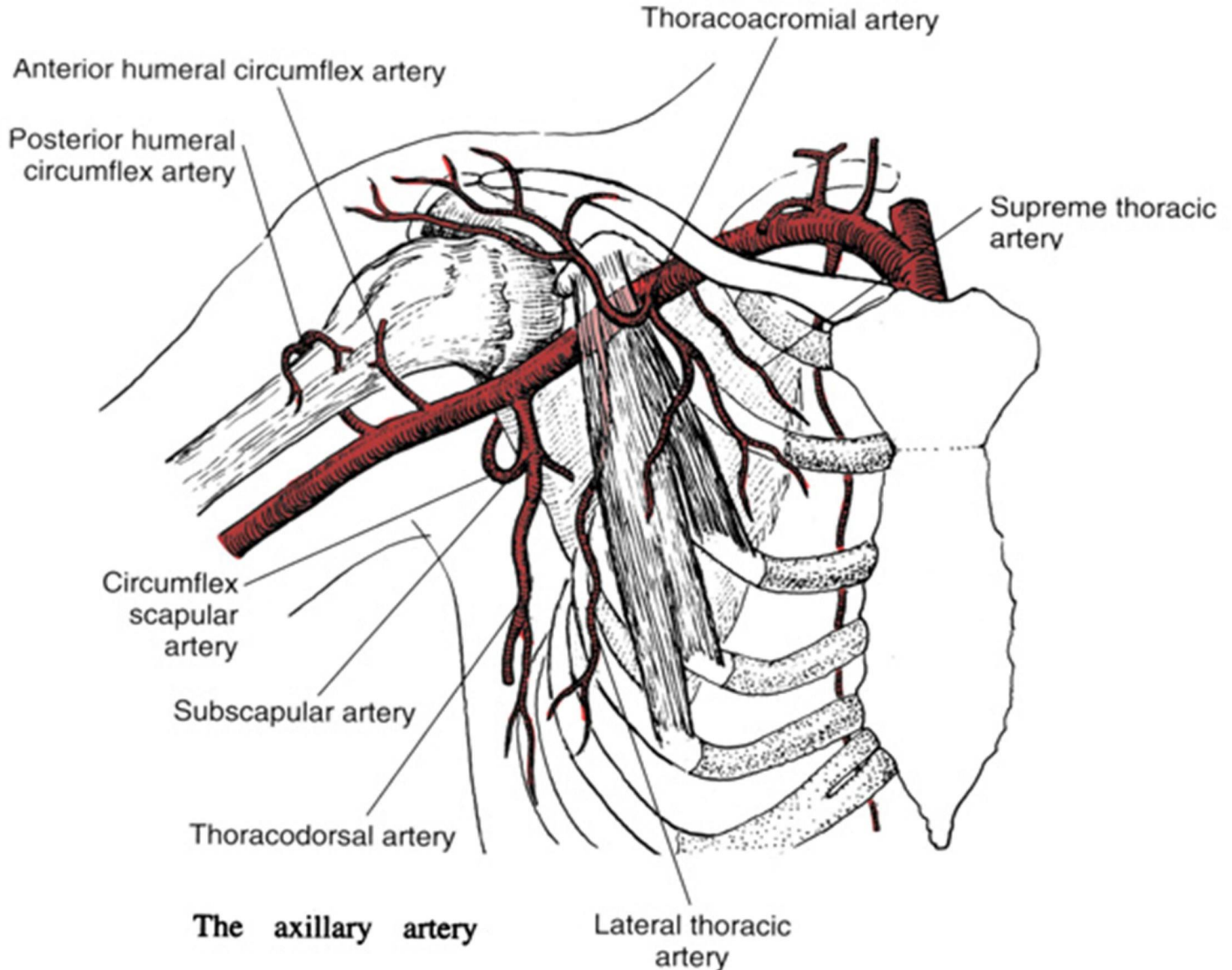
- The third part of the axillary artery extends from the lateral border of the pectoralis minor to the inferior border of the teres major and has three branches. The subscapular artery is the largest branch of the axillary artery.

Opposite the origin of this artery, the anterior circumflex humeral artery and posterior circumflex humeral artery arise.

Axillary artery (Arteria axillaris)

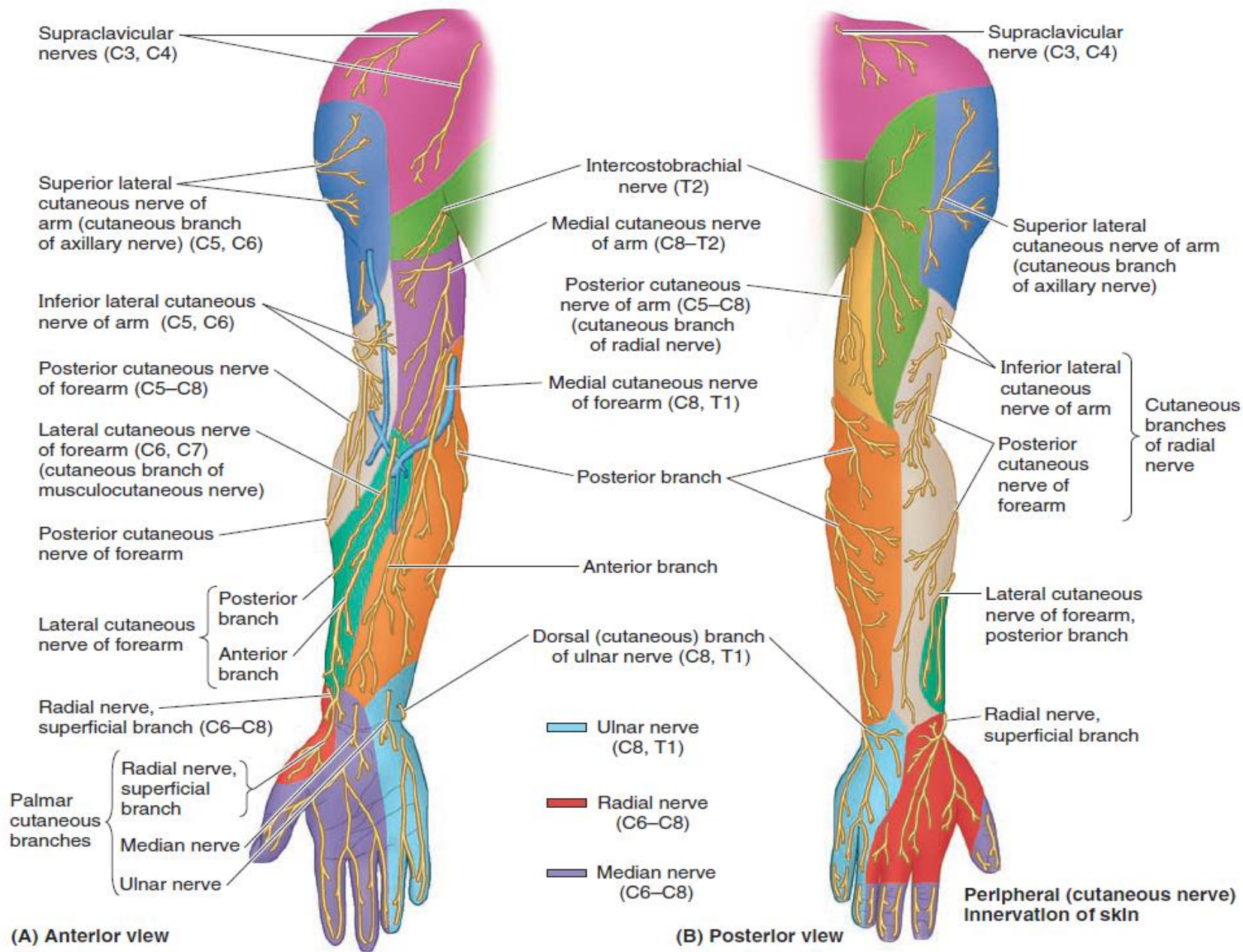


Axillary artery (Arteria axillaris)



Peripheral (cutaneous) innervation of upper limb

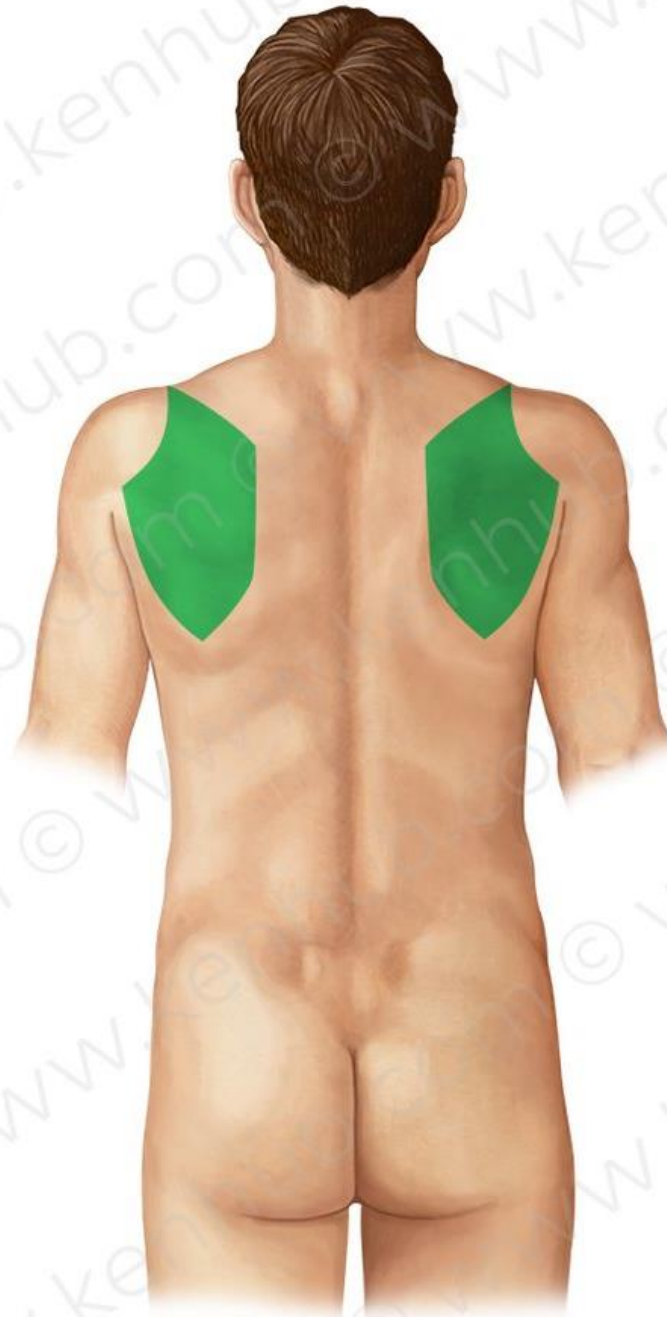
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Regions of the upper extremity

Scapular region

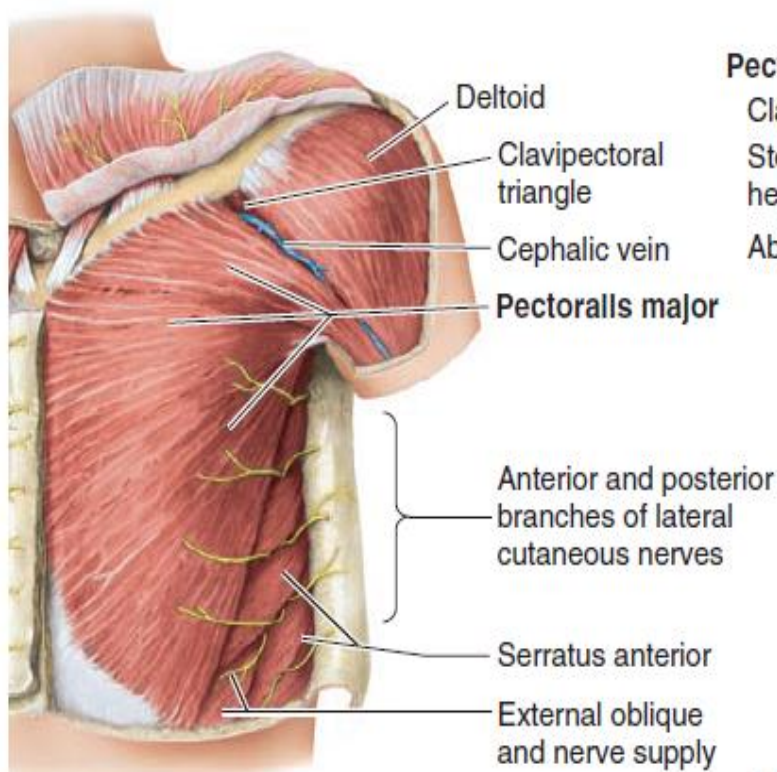


Regions of the upper extremity

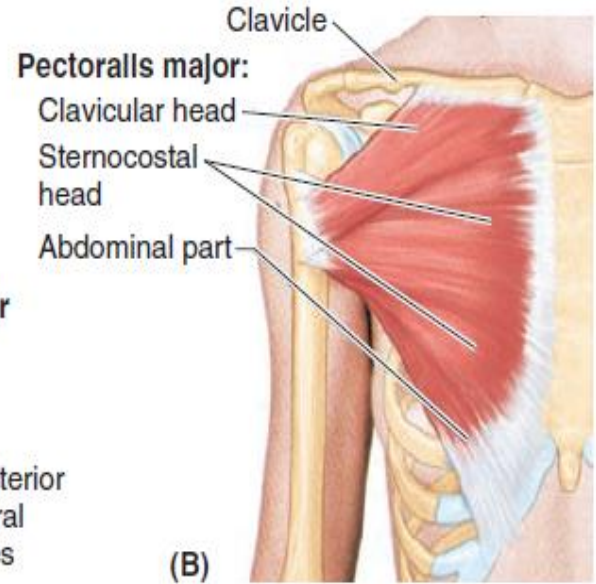


The scapular muscles allow us to elevate our arm beyond 90 degrees of abduction. The rotation of the scapula occurs through precise and coordinated contraction of several muscles including the rhomboids (which are attached to its medial border) in addition to trapezius and levator scapulae among others (both of which are attached to the superior border). The lateral border of the scapula also gives rise to teres major and minor. These muscles are adductors of the humerus.

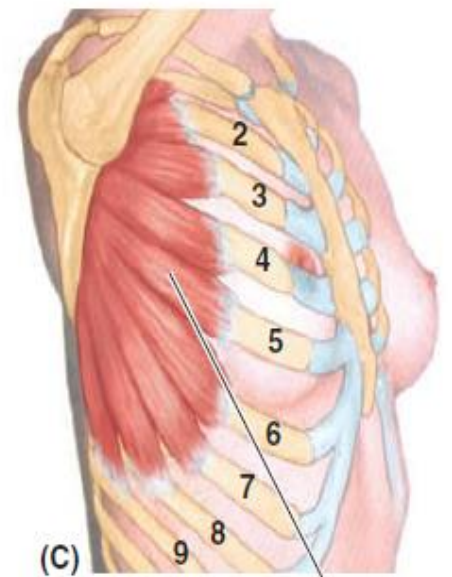
Anterior axio-appendicular muscles



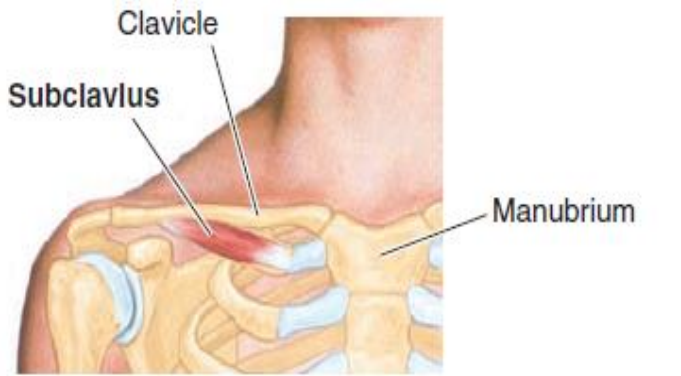
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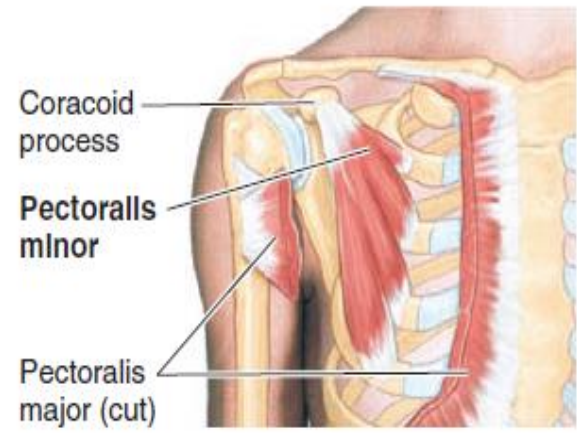
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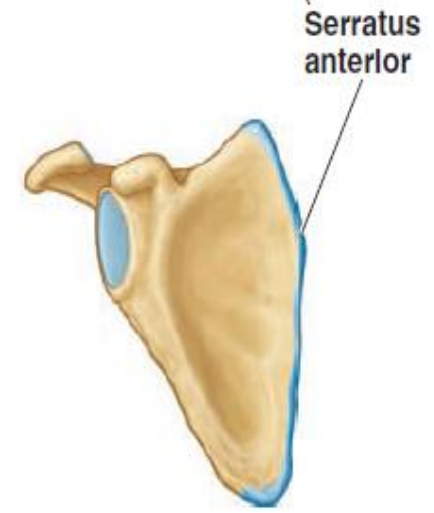
(C)



(D)



(E)



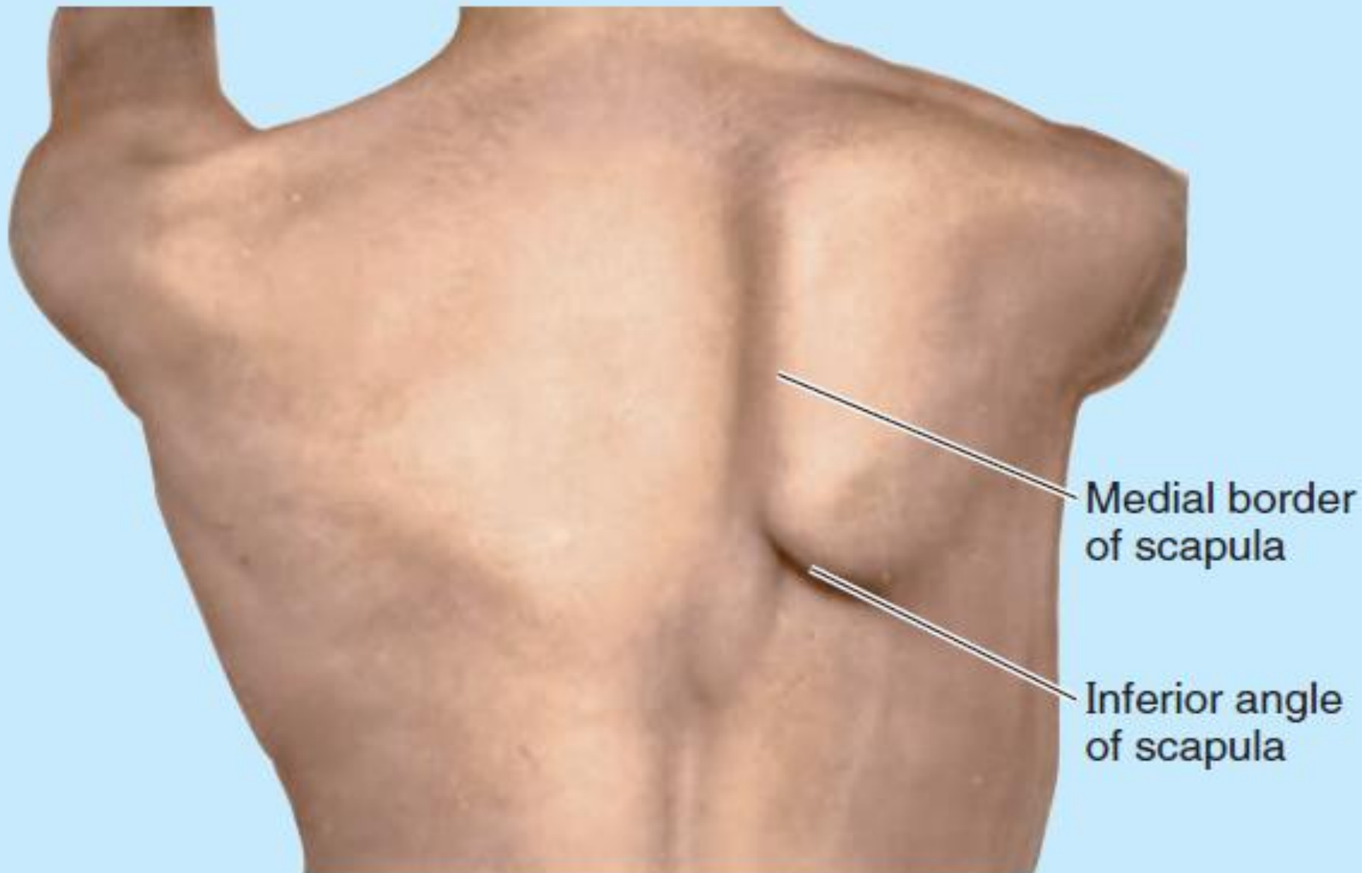
Serratus anterior

Paralysis of serratus anterior



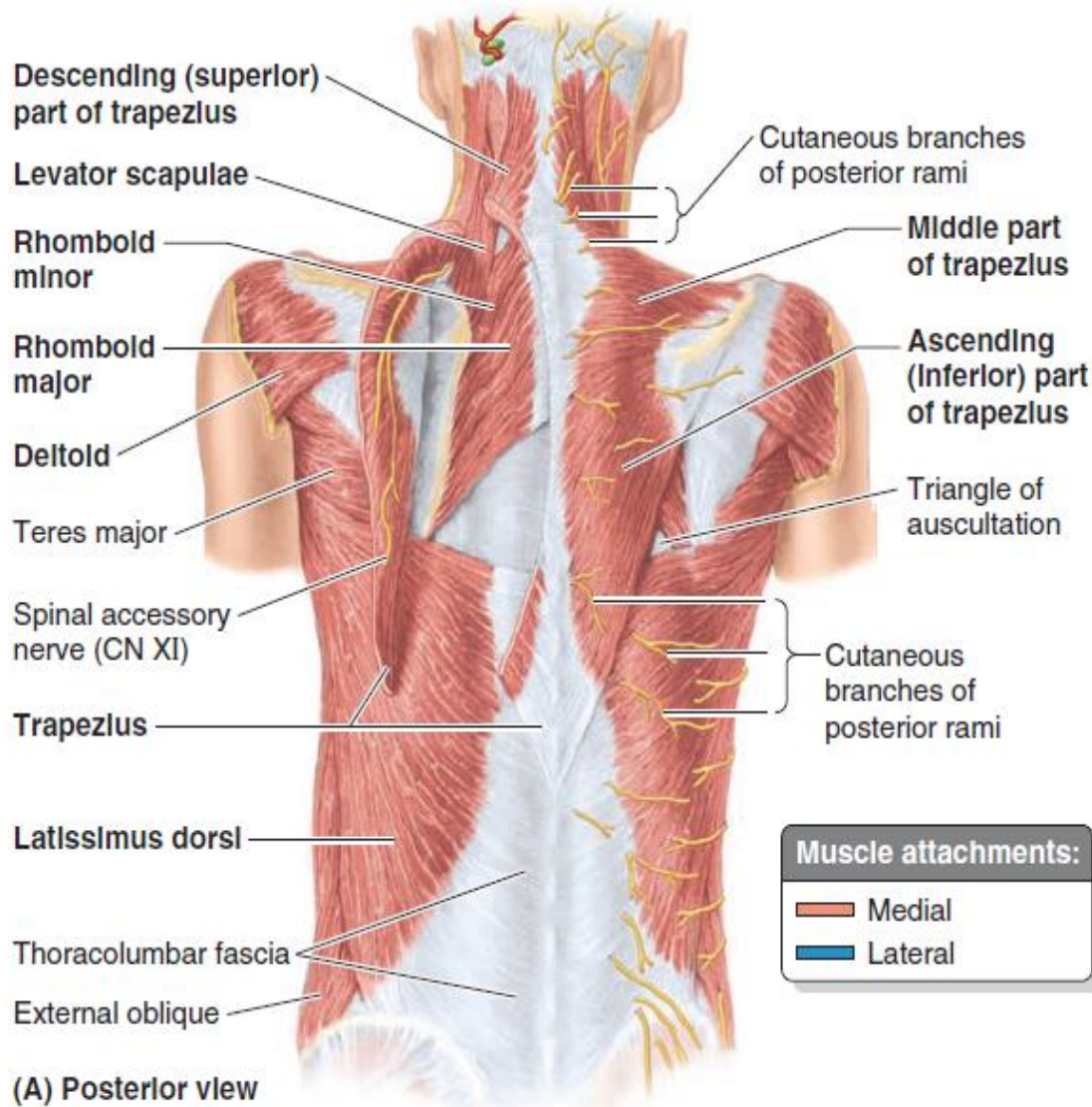
When the serratus anterior is paralyzed because of injury to the long thoracic nerve, the medial border of the scapula moves laterally and posteriorly away from the thoracic wall. When the arm is raised, the medial border and inferior angle of the scapula pull markedly away from the posterior thoracic wall, a deformation known as a winged scapula. The arm cannot be abducted above the horizontal position because the serratus anterior is unable to rotate the glenoid cavity superiorly to allow complete abduction of the limb.

Paralysis of serratus anterior

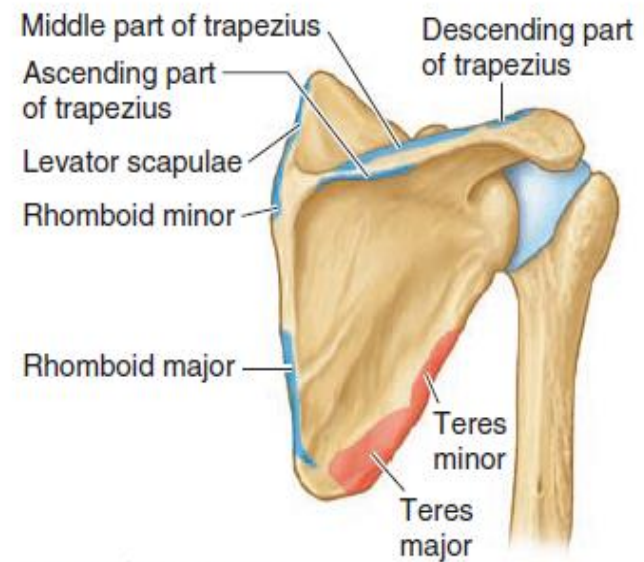


Posterior axio-appendicular muscles

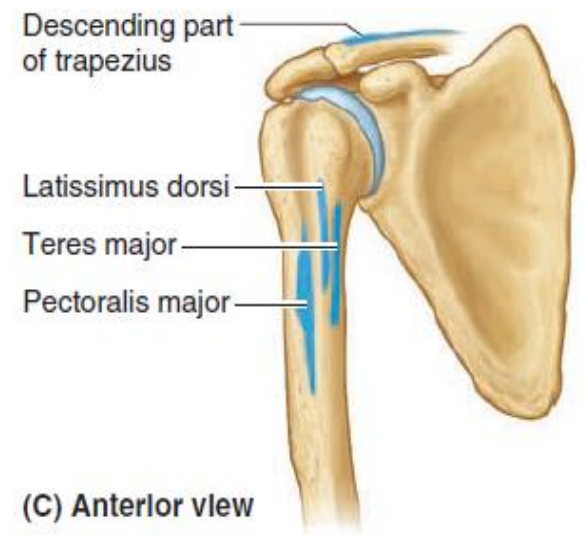
Вопросы



(A) Posterior view



(B) Posterior view



(C) Anterior view

Regions of the upper extremity



Scapular region. Scapulohumeral muscles.

In the human body, the **rotator cuff** is a functional anatomical unit located in the upper extremity.

Its function is related to the glenohumeral joint, where the muscles of the cuff function both as the executors of the movements of the joint and the stabilization of the joint as well.

Scapular region.



The muscles that cover the anterior and posterior surfaces of the scapula are covered superficially by strong and opaque deep fascia, which is attached to the margins of the scapula. This arrangement creates osseofibrous subscapular, supraspinous, and infraspinous compartments.

Rotator cuff



The rotator cuff muscles are four muscles that form a musculotendinous unit around the shoulder joint. These are the supraspinatus, infraspinatus, teres minor and subscapularis muscles. The function of this entire muscular apparatus is to produce movement at the shoulder joint while keeping the head of humerus stable and centralized within the glenoid cavity.

Rotator cuff



Rotator cuff SITS on the shoulder:

- 1) Supraspinatus
- 2) Infraspinatus
- 3) Teres minor
- 4) Subscapularis

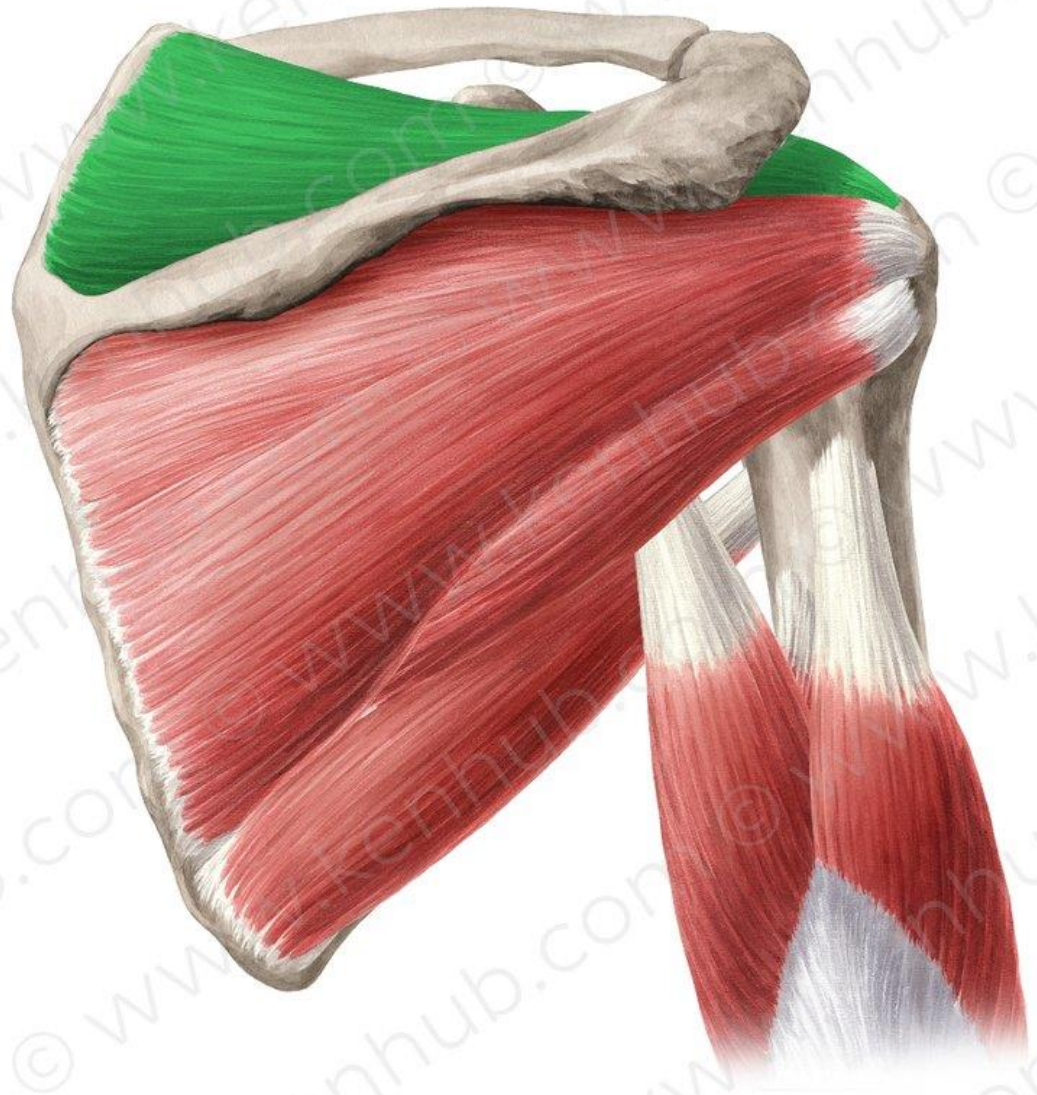
All four muscles are firmly attached around the joint in such a way that they form a sleeve (rotator capsule).

Rotator cuff

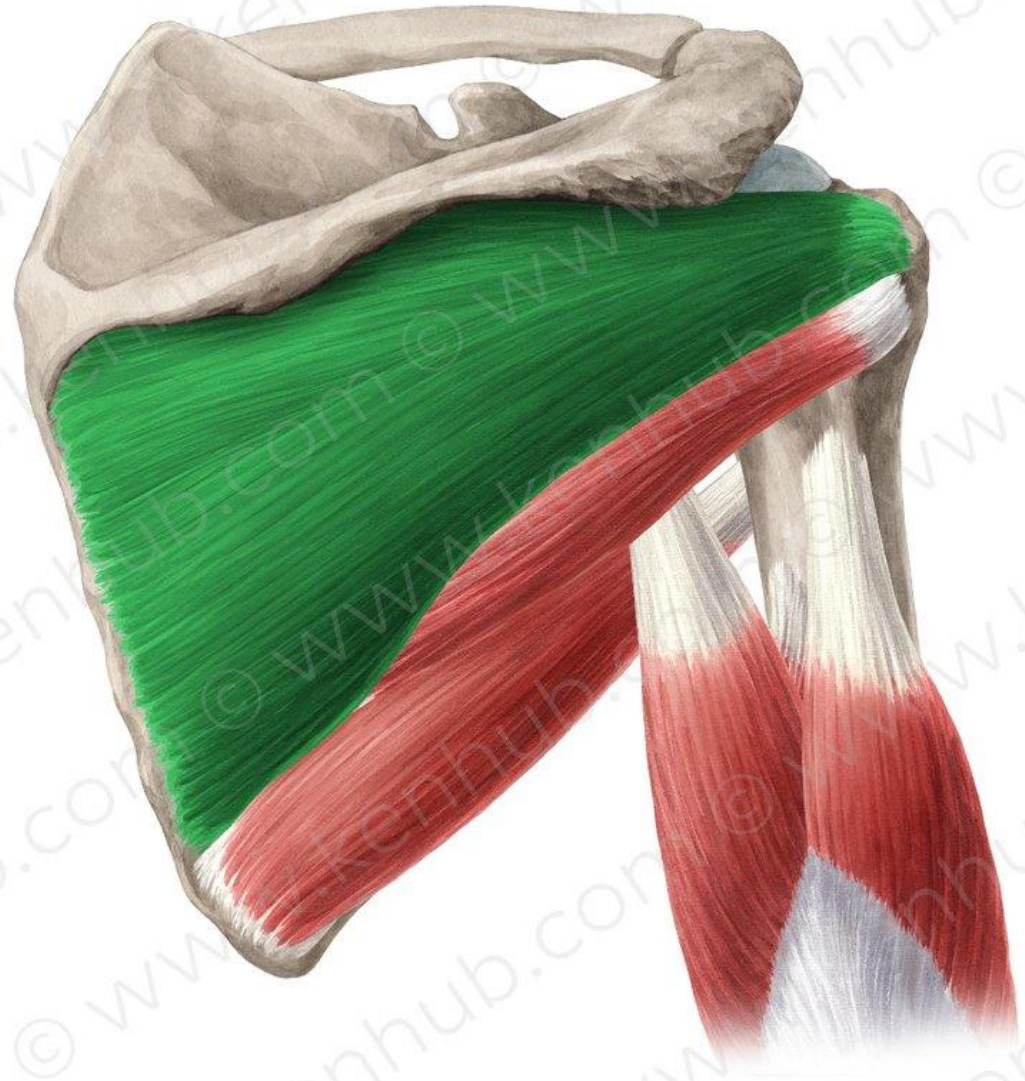


Individually, each muscle has its own pulling axis that results in a certain movement (prime mover), while together they create a concavity compression. This is a stabilizing mechanism in which compression of the humerus into the concavity of glenoid fossa prevents its dislocation by translating forces.

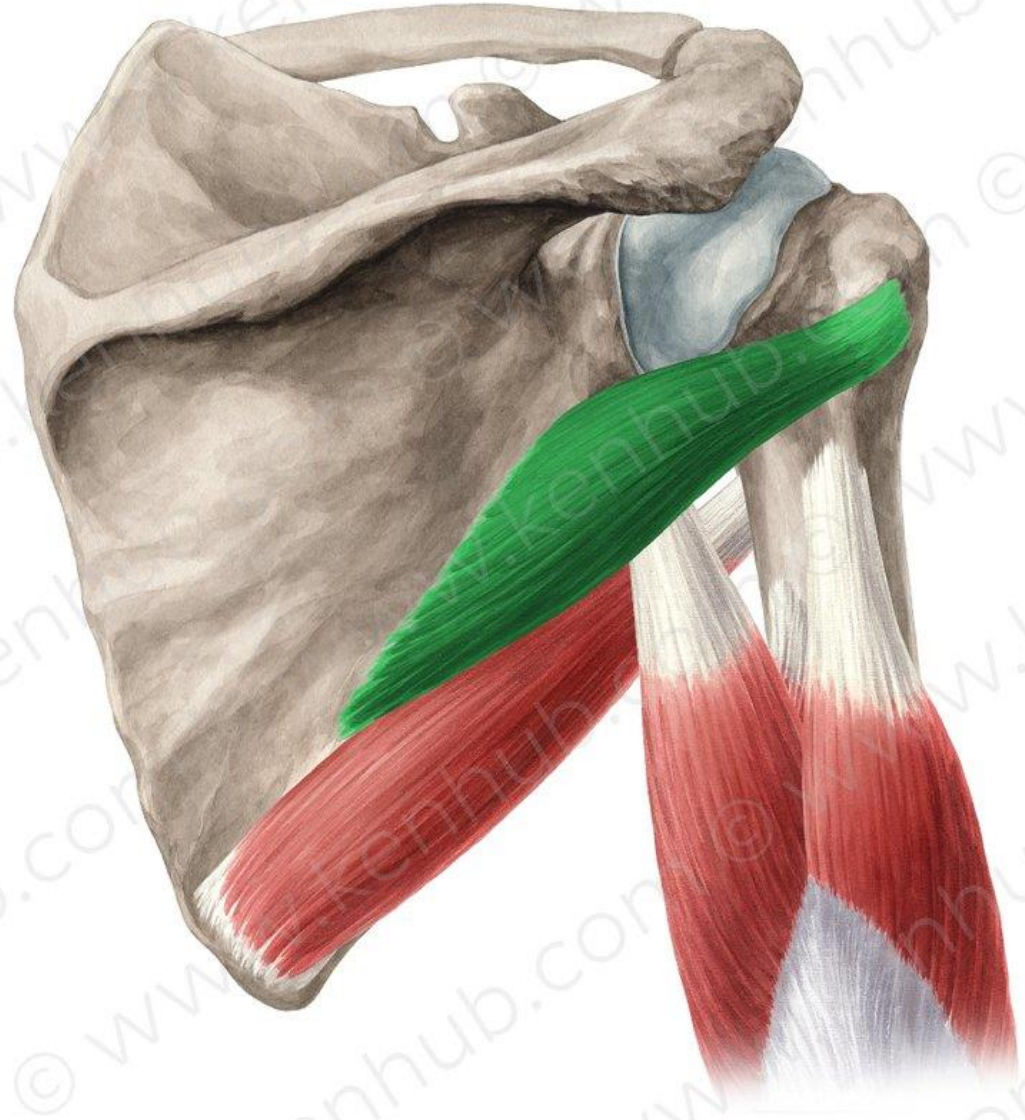
Supraspinatus
muscle
(Musculus
supraspinatus)



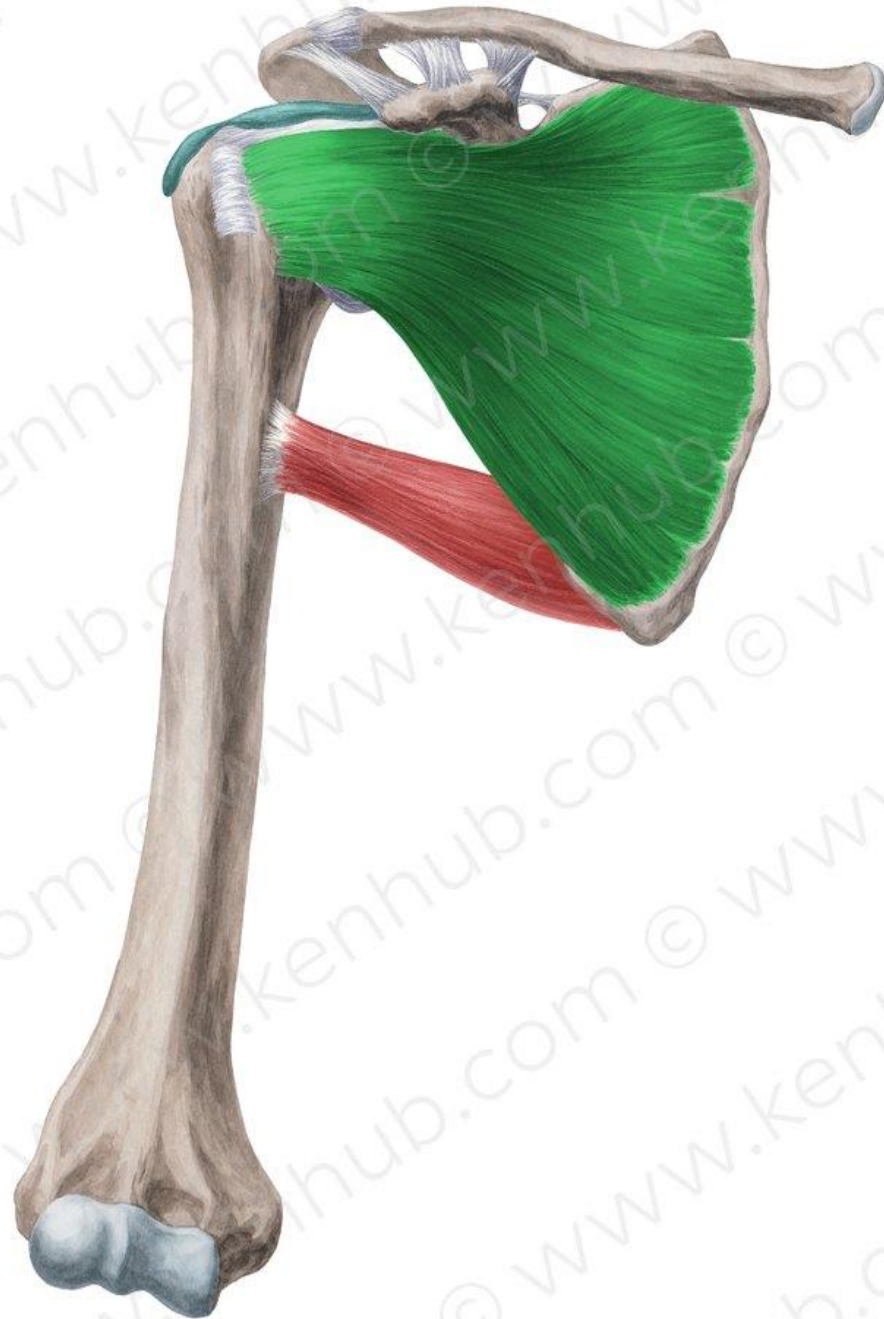
Infraspinatus
muscle
(Musculus
infraspinatus)



**Teres minor
muscle
(Musculus teres
minor)**



Subscapularis
muscle
(Musculus
subscapularis)



Scapular arterial circle

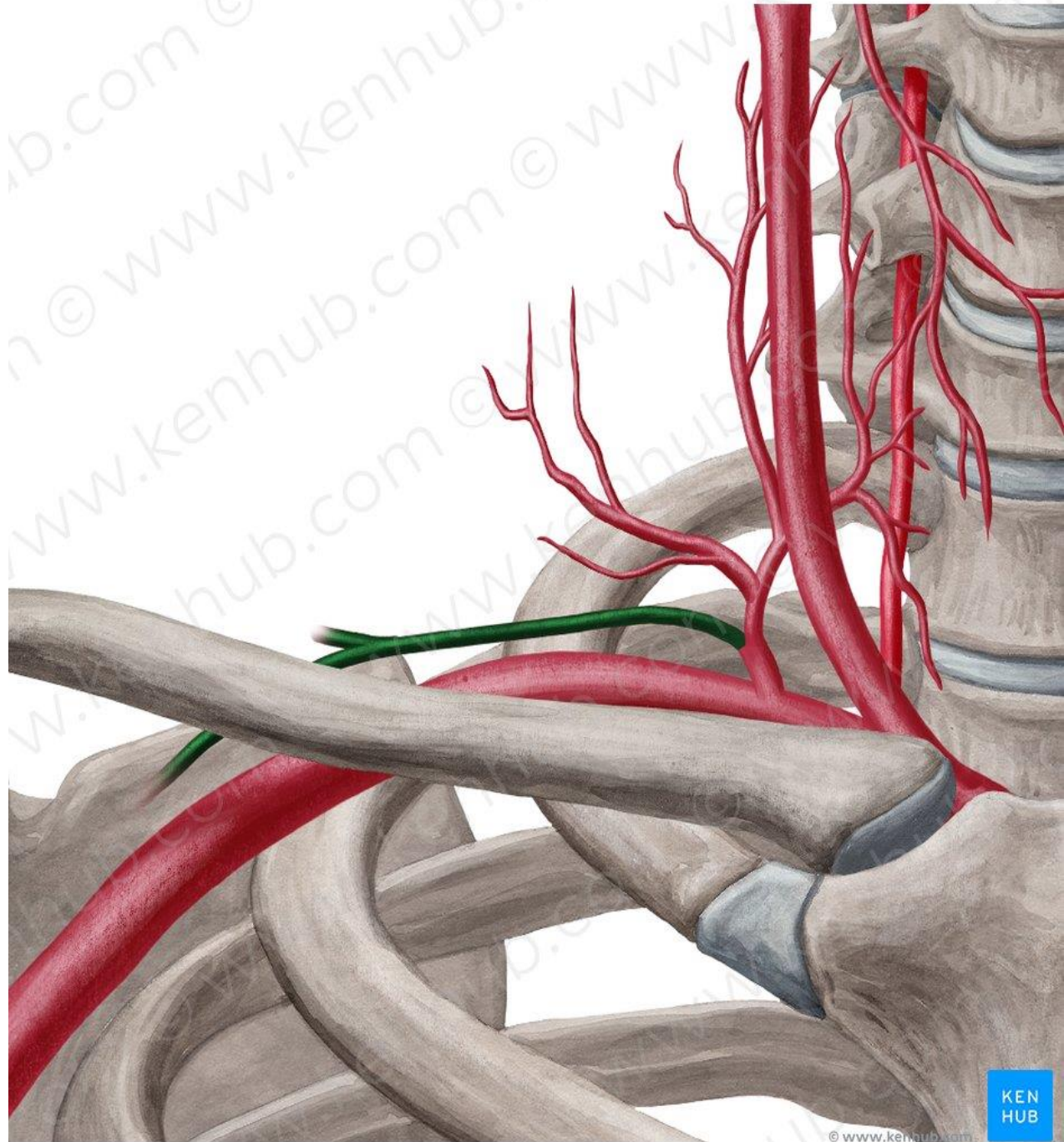


Several arteries form an anastomosis to supply blood to the posterior scapular region:

- Suprascapular artery - a branch of the thyrocervical trunk, which in turn arises from the subclavian artery. It runs along the suprascapular nerve and mostly supplies the supraspinatus and infraspinatus muscles.

Suprascapular
artery

(Arteria
suprascapularis)

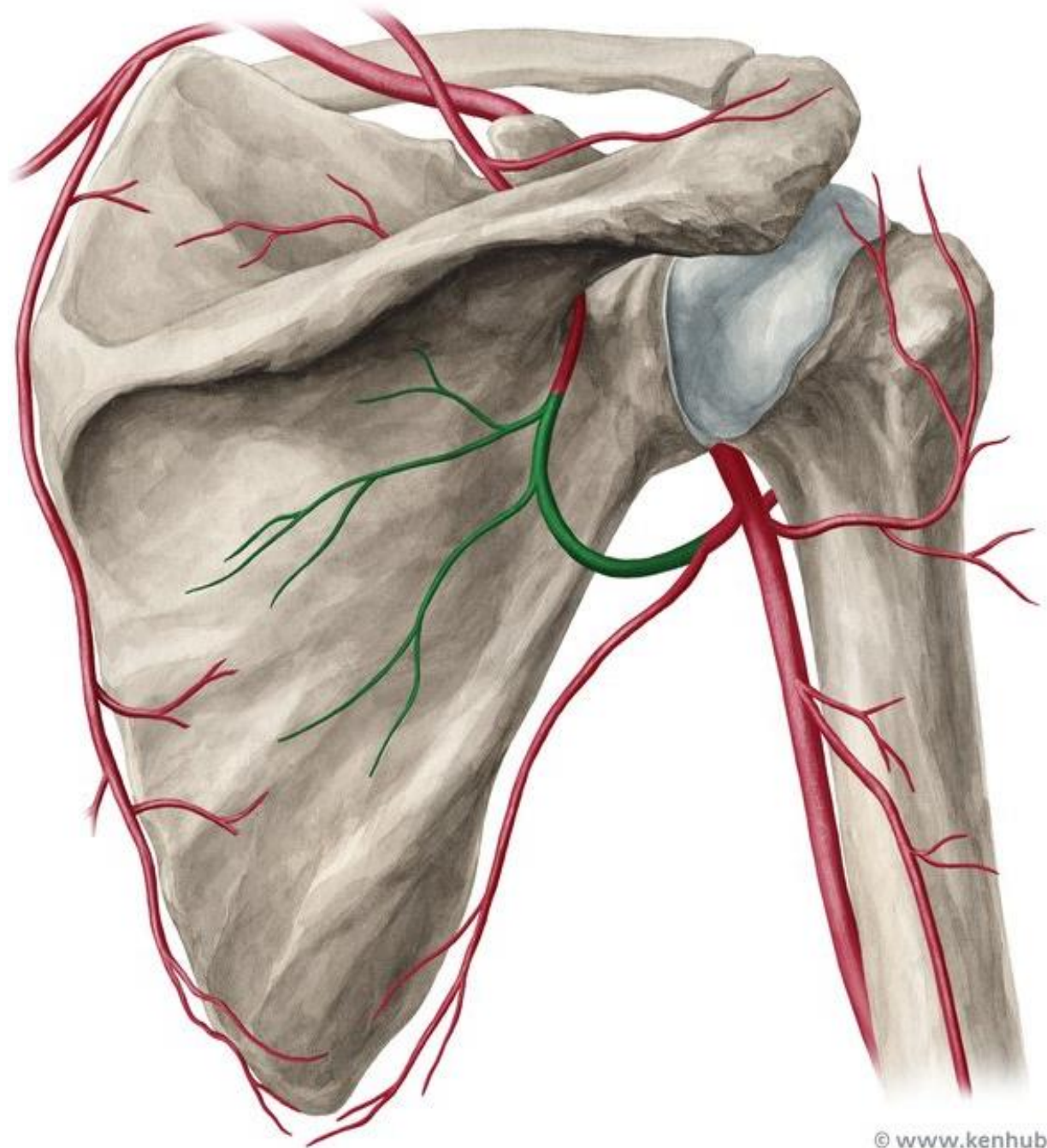


Scapular arterial circle

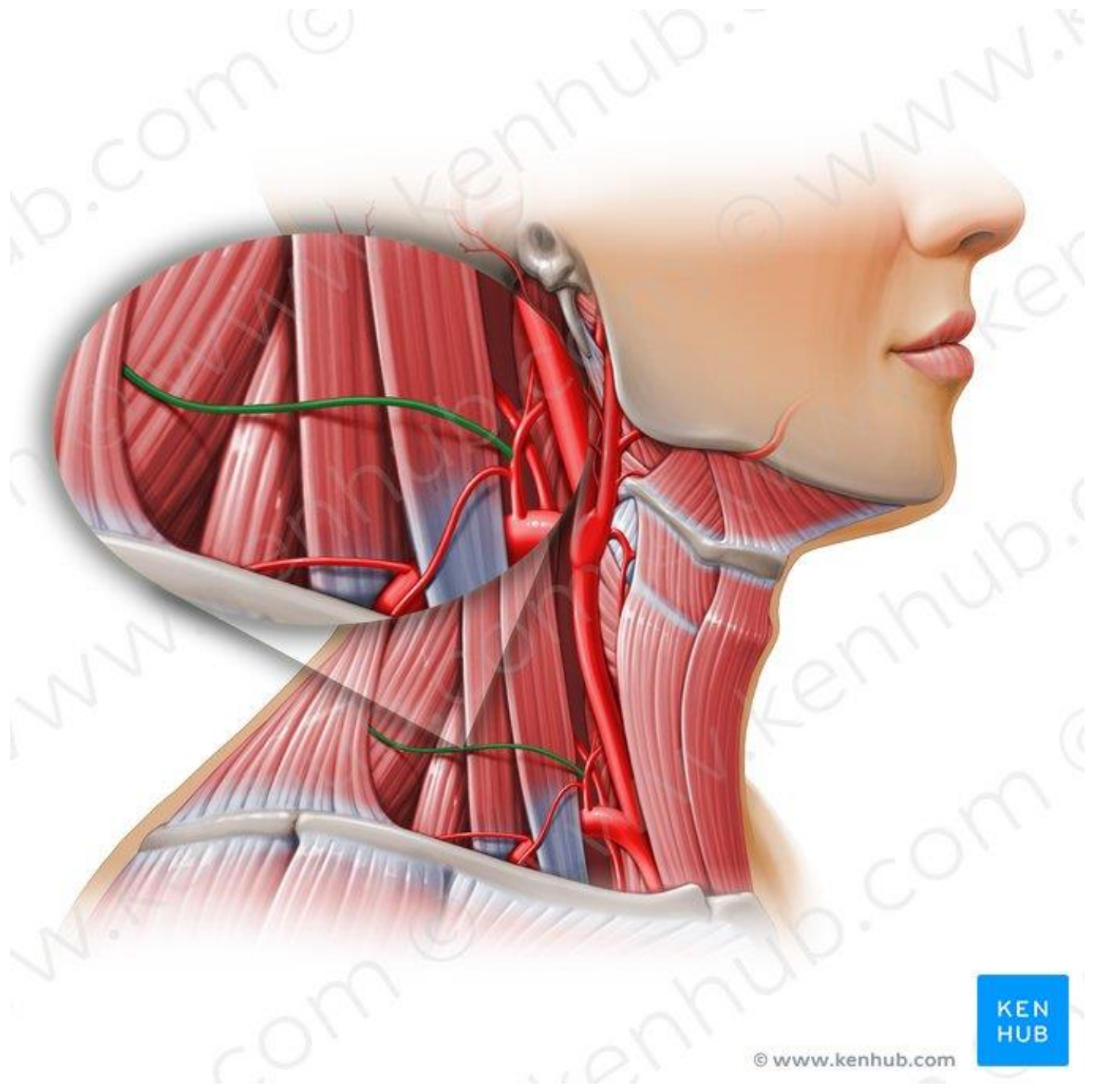


- Circumflex scapular artery - originating from the subscapular artery, which in turn is a branch of the axillary artery
- Transverse cervical artery (cervicodorsal trunk) - a branch of the thyrocervical trunk (sometimes an independent branch of subclavian artery): it gives off the descending branch, or dorsal scapular artery, running along the medial border of the scapula

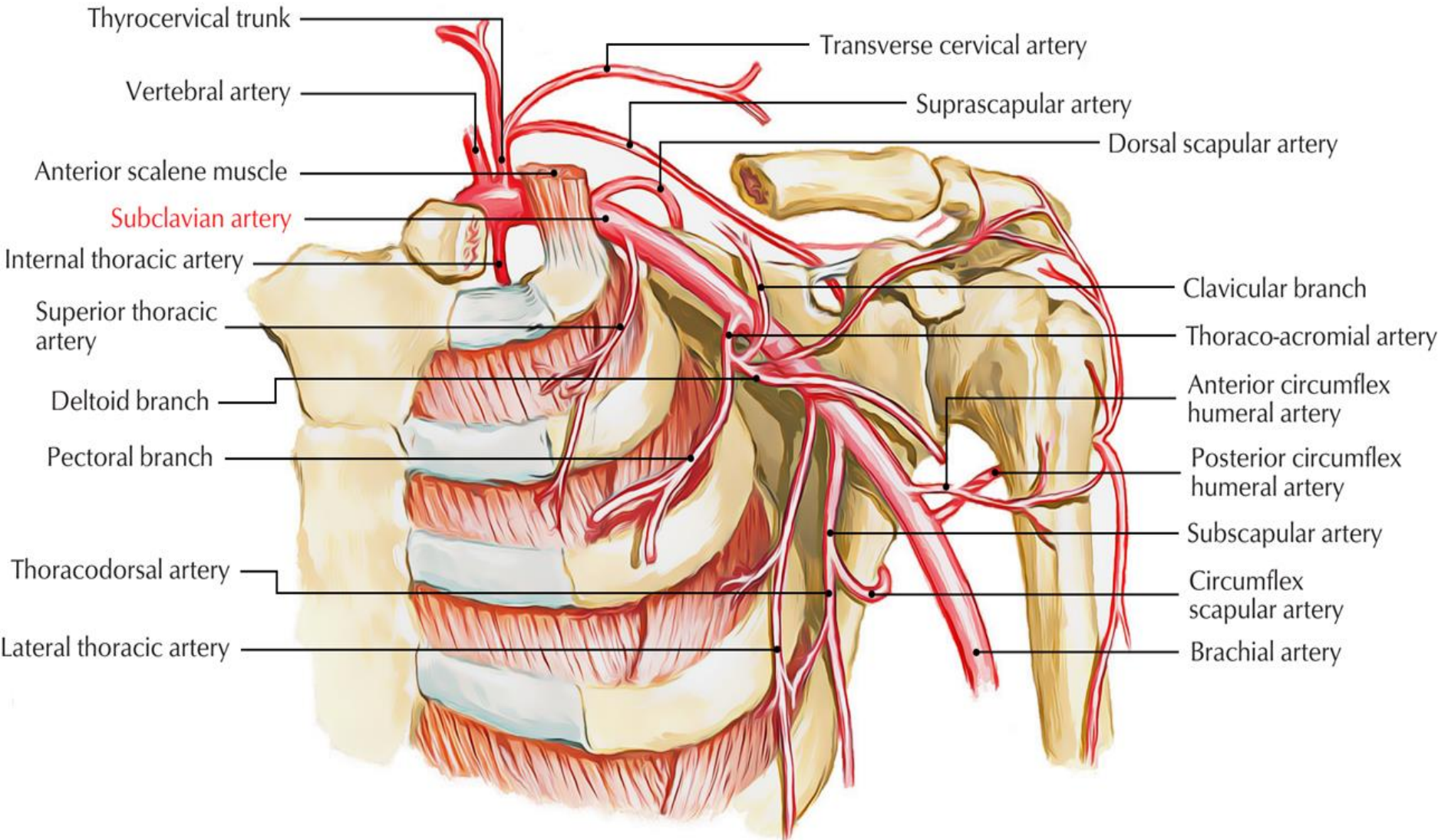
Circumflex scapular artery



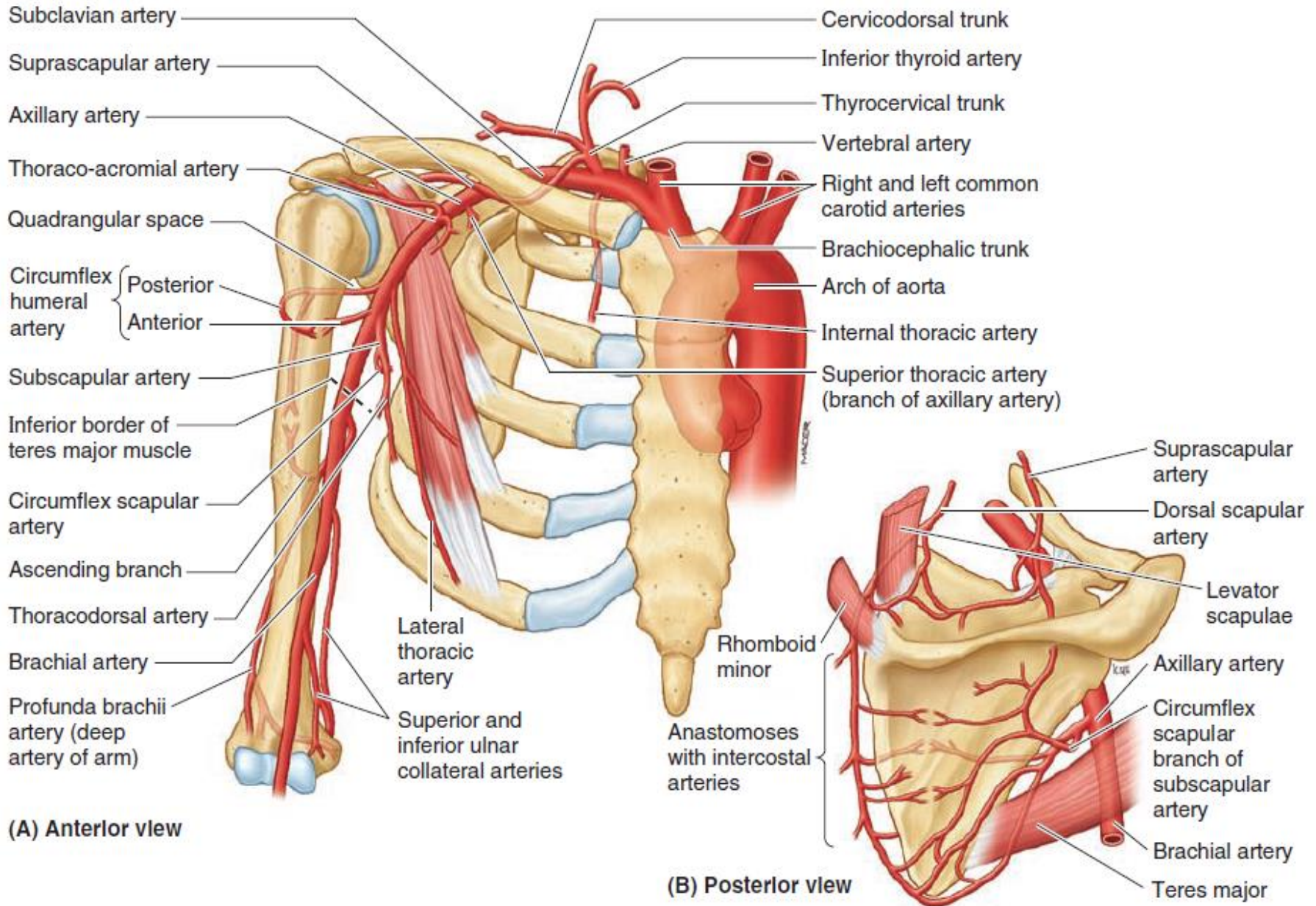
The transverse cervical artery arises directly from the subclavian artery in 30-40% of cases, and from the thyrocervical trunk in about 60-70%.



Scapular arterial circle



Scapular arterial circle



Scapular arterial circle



Many arterial anastomoses (communications between arteries) occur around the scapula. Several arteries join to form networks on the anterior and posterior surfaces of the scapula: the dorsal scapular, suprascapular, and subscapular (via the circumflex scapular branch). The importance of the collateral circulation made possible by these anastomoses becomes apparent when ligation of a lacerated subclavian or axillary artery is necessary.

Scapular arterial circle



For example, the axillary artery may have to be ligated between the 1st rib and subscapular artery; in other cases, vascular stenosis (narrowing) of the axillary artery may result from an atherosclerotic lesion that causes reduced blood flow. In either case, the direction of blood flow in the subscapular artery is reversed, enabling blood to reach the third part of the axillary artery.

Scapular arterial circle



Note that the subscapular artery receives blood through several anastomoses with the suprascapular artery, transverse cervical artery, and intercostal arteries. Slow occlusion of an artery (e.g., resulting from disease) often enables sufficient collateral circulation to develop, preventing ischemia (deficiency of blood). Sudden occlusion usually does not allow sufficient time for adequate collateral circulation to develop; as a result, ischemia of the upper limb occurs.

Scapular arterial circle

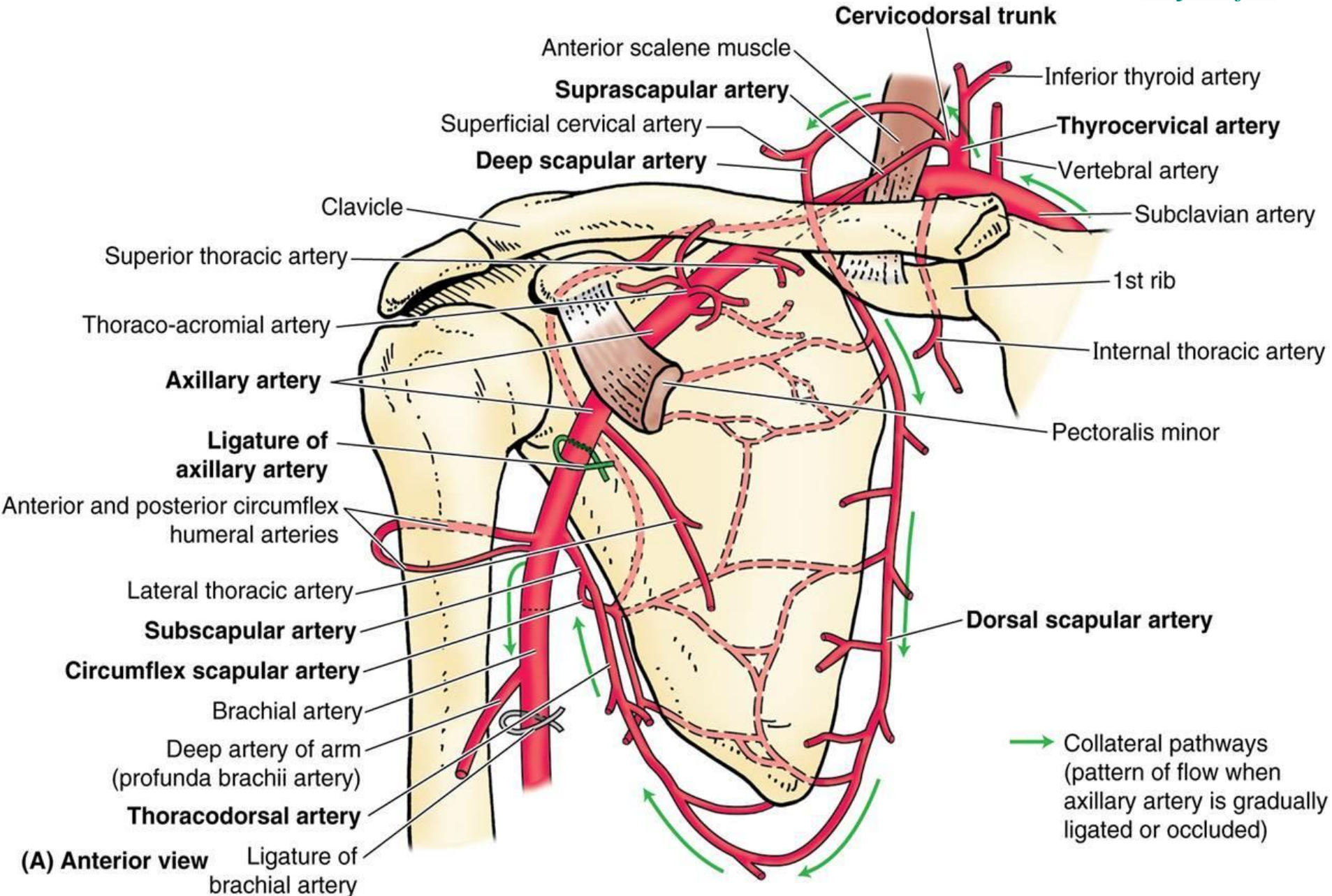


Note !

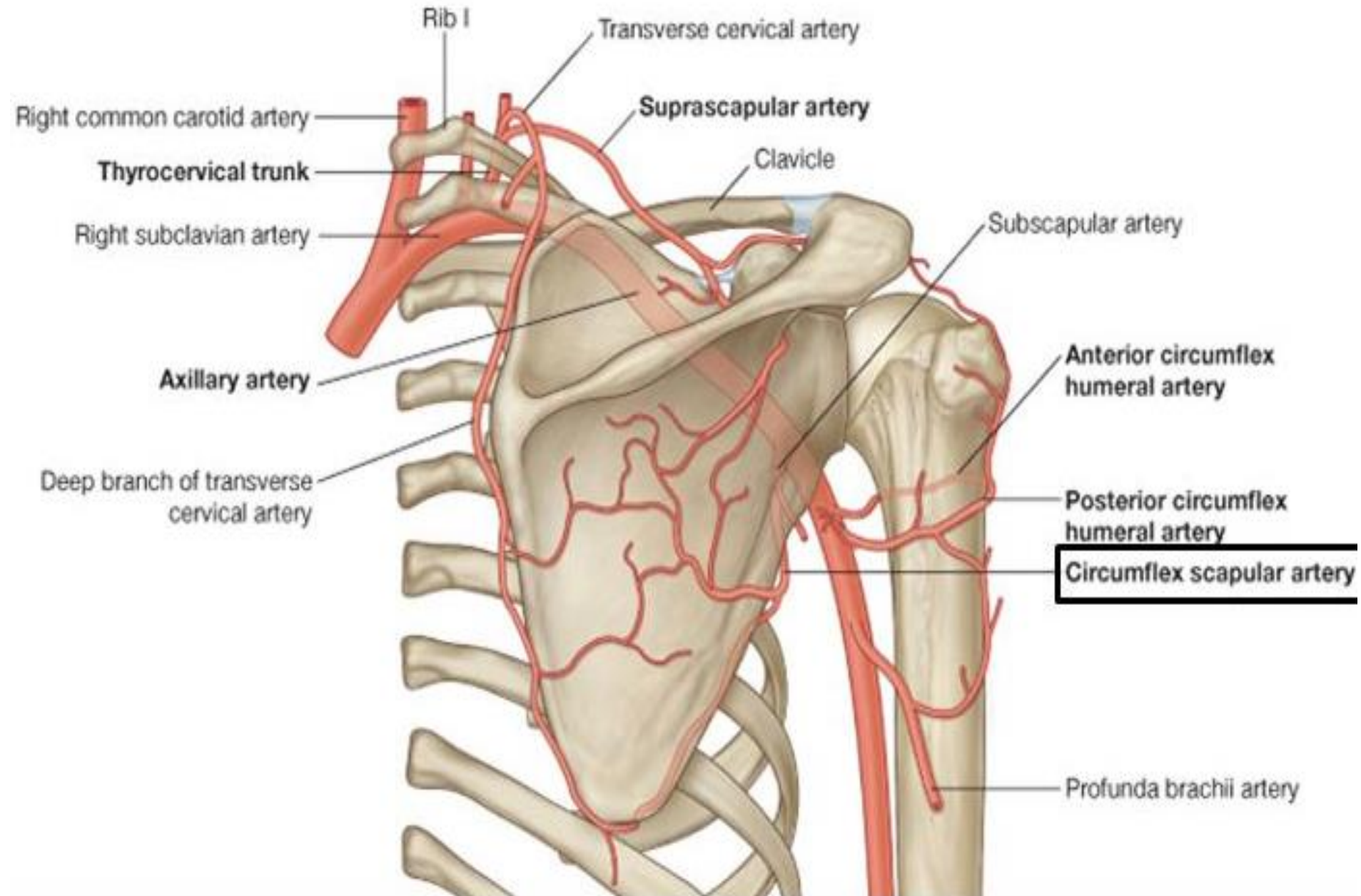
Abrupt surgical ligation of the axillary artery between the origins of the subscapular and the profunda brachii artery will cut off the blood supply to the arm because the collateral circulation is inadequate.

Scapular arterial circle

ВОИГМУ



Scapular arterial circle



Shoulder region: joints



The shoulder region must be seen as a complex of several joints, rather than an individual joint. Classically the glenohumeral joint is what anatomists mean when referring to the shoulder joint.

Acromioclavicular and scapulothoracic joints



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trapezius.

The **AC ligament**, a fibrous band extending from the acromion to the clavicle, strengthens the AC joint superiorly (Fig. 6.51). Most of its strength comes from the coracoclavicular ligament. It maintains its integrity and prevents the acromion from being driven under the clavicle even when the AC joint is separated. The strong, extra-articular **coracoclavicular ligament** (subdivided into conoid and

Supraclavicular, lateral pectoral, and axillary nerves supply the joint (Table 6.5).

Glenohumeral Joint

The **glenohumeral (shoulder) joint** is a ball-and-socket, synovial joint that permits a wide range of movement; however, its mobility makes the joint relatively unstable.

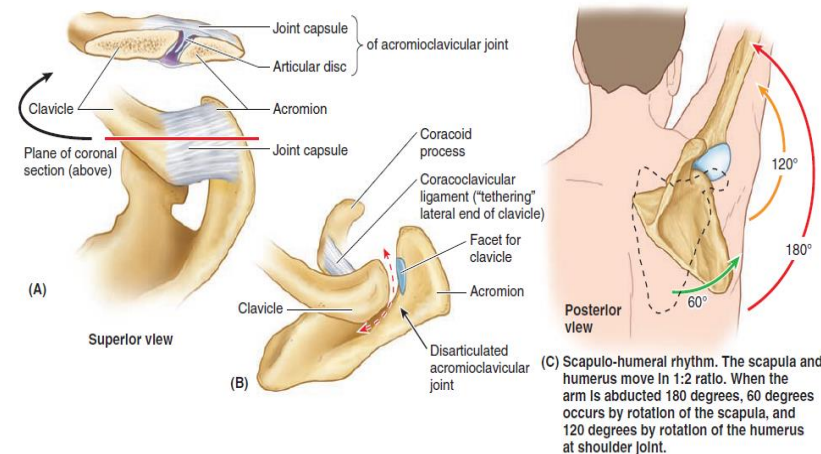


FIGURE 6.52. Acromioclavicular and scapulothoracic joints. A. Joint capsule and partial articular disc. B. Coracoclavicular ligament and articular facets. C. Rotation of scapula at the scapulothoracic joint.

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Shoulder region: joints



Acromioclavicular joint.

This joint is formed between the thin surface of the clavicle laterally and the acromion process of the scapula. It is a gliding synovial joint, which ensures functional continuity between the scapula region and the thoracic wall.

Shoulder region: joints



Sternoclavicular joint.

The manubrium is the superior part of the sternum and is attached to the clavicle laterally. It is a highly mobile synovial joint that allows for both anterior/posterior and medial/lateral movement. This enables the upper limb to reach a large area.

Shoulder region: joints



All these joints are best seen as a continuous functional unit rather than a series of isolated joints. They influence each other and work in coordination to mobilize the upper limb effectively.

Joints of pectoral girdle and associated tendons and ligaments



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465 (490 из 711) 100%

of the scapula.

Sternoclavicular Joint

The **sternoclavicular (SC) joint** is a synovial articulation between the sternal end of the clavicle and the manubrium of the sternum and the 1st costal cartilage. The SC joint is a saddle type of joint but functions as a ball-and-socket joint (Fig. 6.51). The SC joint is divided into two compartments

it is also attached to the superior border of the manubrium. The **costoclavicular ligament** anchors the inferior surface of the sternal end of the clavicle to the 1st rib and its costal cartilage, limiting elevation of the pectoral girdle.

Although the SC joint is extremely strong, it is significantly mobile to allow movements of the pectoral girdle and upper limb. During full elevation of the limb, the clavicle is raised to approximately a 60-degree angle. The SC joint can

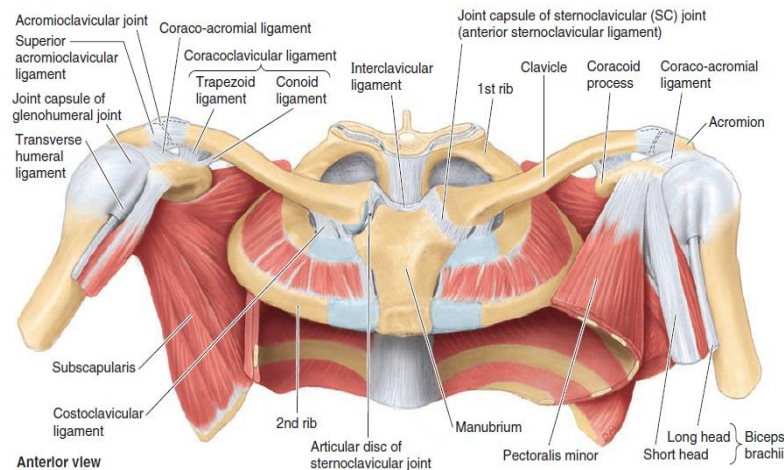


FIGURE 6.51. Joints of pectoral girdle and associated tendons and ligaments.

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Shoulder region: joints

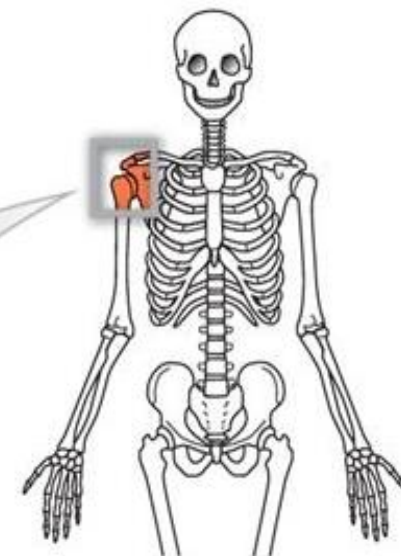


Glenohumeral joint.

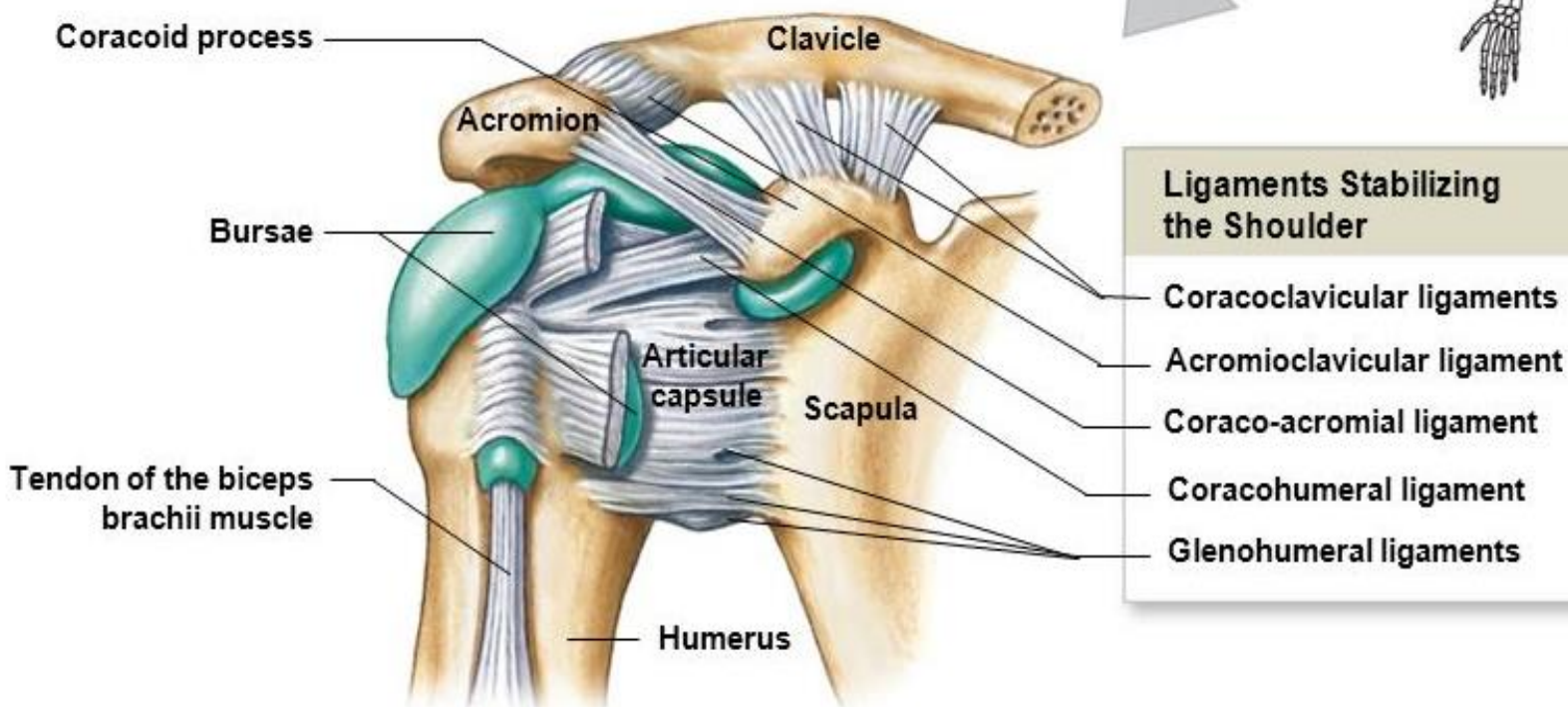
This is clearly a joint designed for mobility rather than stability. The glenoid fossa is a shallow dish like surface, deepened by the labrum that is attached at its periphery. The labrum is said to provide a suction effect to the head of the humerus, as well as deepening the joint socket and therefore increasing stability.

Shoulder region: joints

ВОЛГМУ



The shoulder joint (glenohumeral joint)



Shoulder region: Shoulder joint.

Glenoid fossa
of scapula.

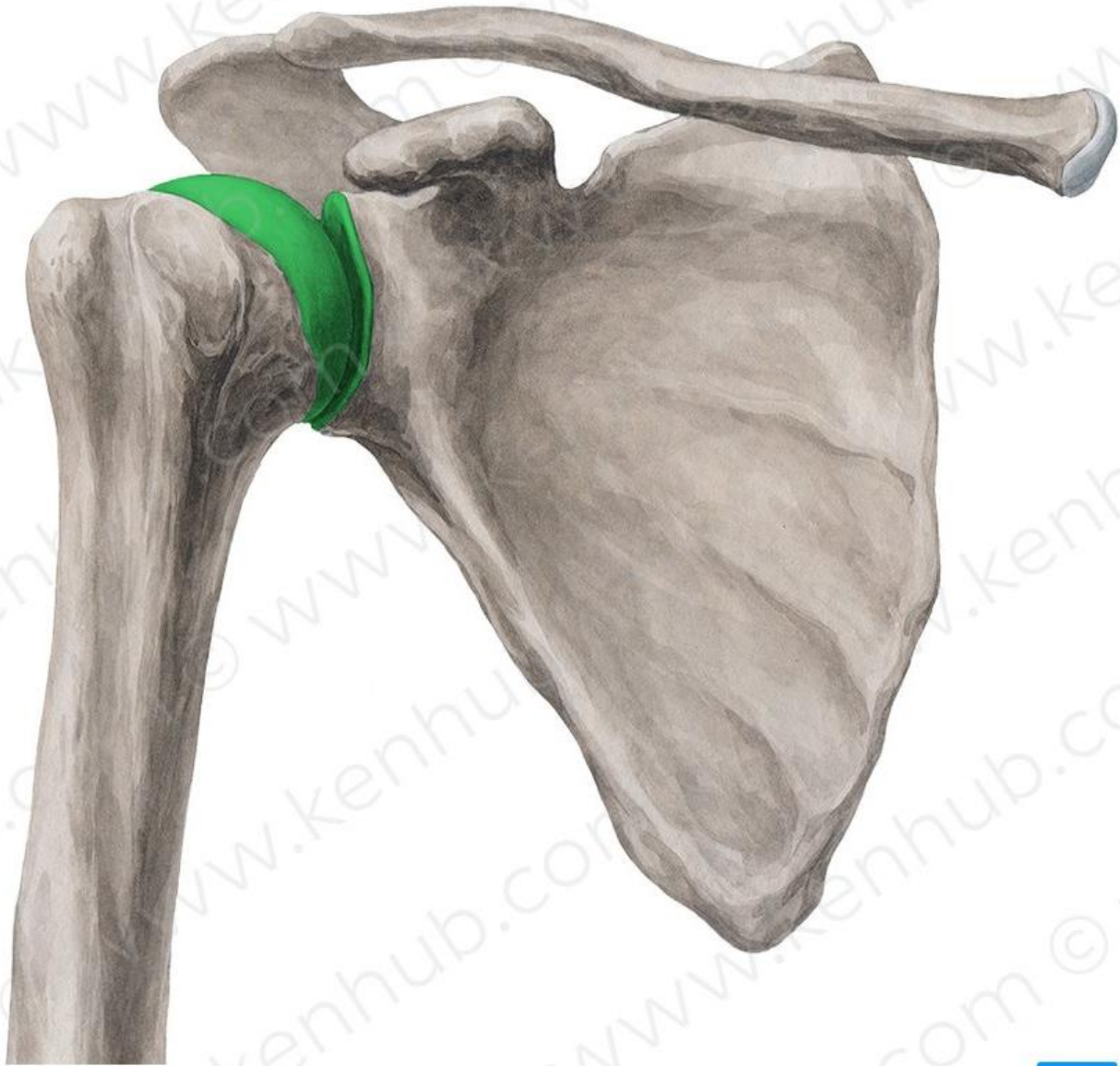
(Fossa
glenoidalis
scapulae)



Shoulder region: joints

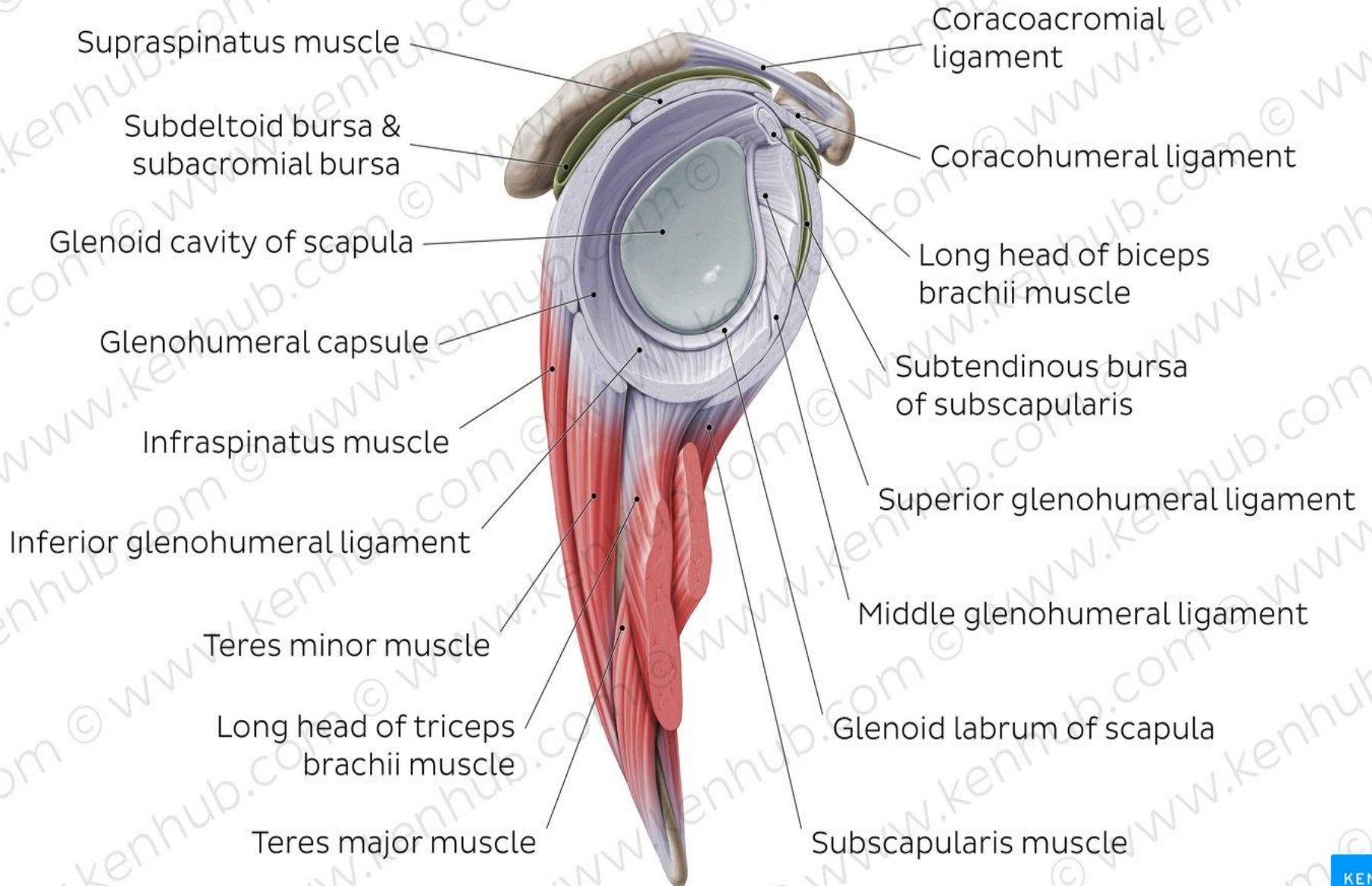
Shoulder joint.

(Articulatio
glenohumeralis)



Shoulder region: Shoulder joint

ВоЛГМУ



Shoulder region: Shoulder joint

Key facts about the glenohumeral joint

Type	Synovial ball and socket joint; multiaxial
Articular surfaces	Glenoid fossa of scapula, head of humerus; glenoid labrum
Ligaments	Superior glenohumeral, middle glenohumeral, inferior glenohumeral, coracohumeral, transverse humeral
Innervation	Subscapular nerve (joint); suprascapular nerve, axillary nerve, lateral pectoral nerve (joint capsule)
Blood supply	Anterior and posterior circumflex humeral, circumflex scapular and suprascapular arteries
Movements	Flexion, extension, abduction, adduction, external/lateral rotation, internal/medial rotation and circumduction
Rotator cuff muscles	Supraspinatus, infraspinatus, teres minor, Subscapularis <i>Mnemonic: Rotator cuff SITS on the shoulder</i>

Shoulder region: Shoulder joint



The glenohumeral, or shoulder, joint is a synovial joint that attaches the upper limb to the axial skeleton. It is a ball-and-socket joint, formed between the glenoid fossa of scapula (gleno-) and the head of humerus (-humeral).

Shoulder region: Shoulder joint



Acting in conjunction with the pectoral girdle, the shoulder joint allows for a wide range of motion at the upper limb; flexion, extension, abduction, adduction, external/lateral rotation, internal/medial rotation and circumduction. In fact, it is the **most mobile joint of the human body.**

Shoulder region: Shoulder joint



The glenohumeral joint has a greater range of movement (RoM) than any other body joint. Being a ball-and-socket joint, it allows movements in three degrees of freedom (average maximum glenohumeral active RoM is shown in brackets);

Flexion (110°) - extension (60°)

Abduction (120°) - adduction (0°)

Internal rotation (90°) - external rotation (90°)

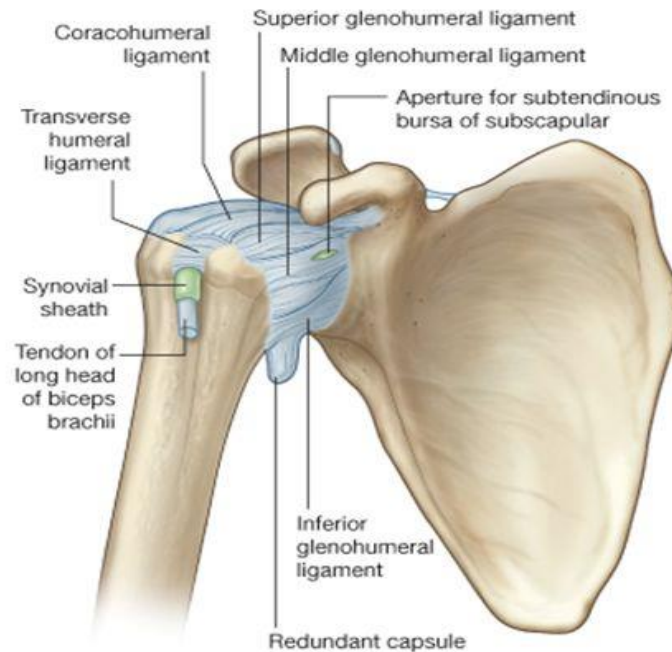
Combination of these movements gives circumduction.

Shoulder region: Shoulder joint



This shoulder function comes at the cost of stability however, as the bony surfaces offer little support. Instead the surrounding shoulder muscles and ligamentous structures offer the joint security; the capsule, ligaments and tendons of the rotator cuff muscles. Because of this mobility-stability compromise, the shoulder joint is **one of the most frequently injured joints of the body.**

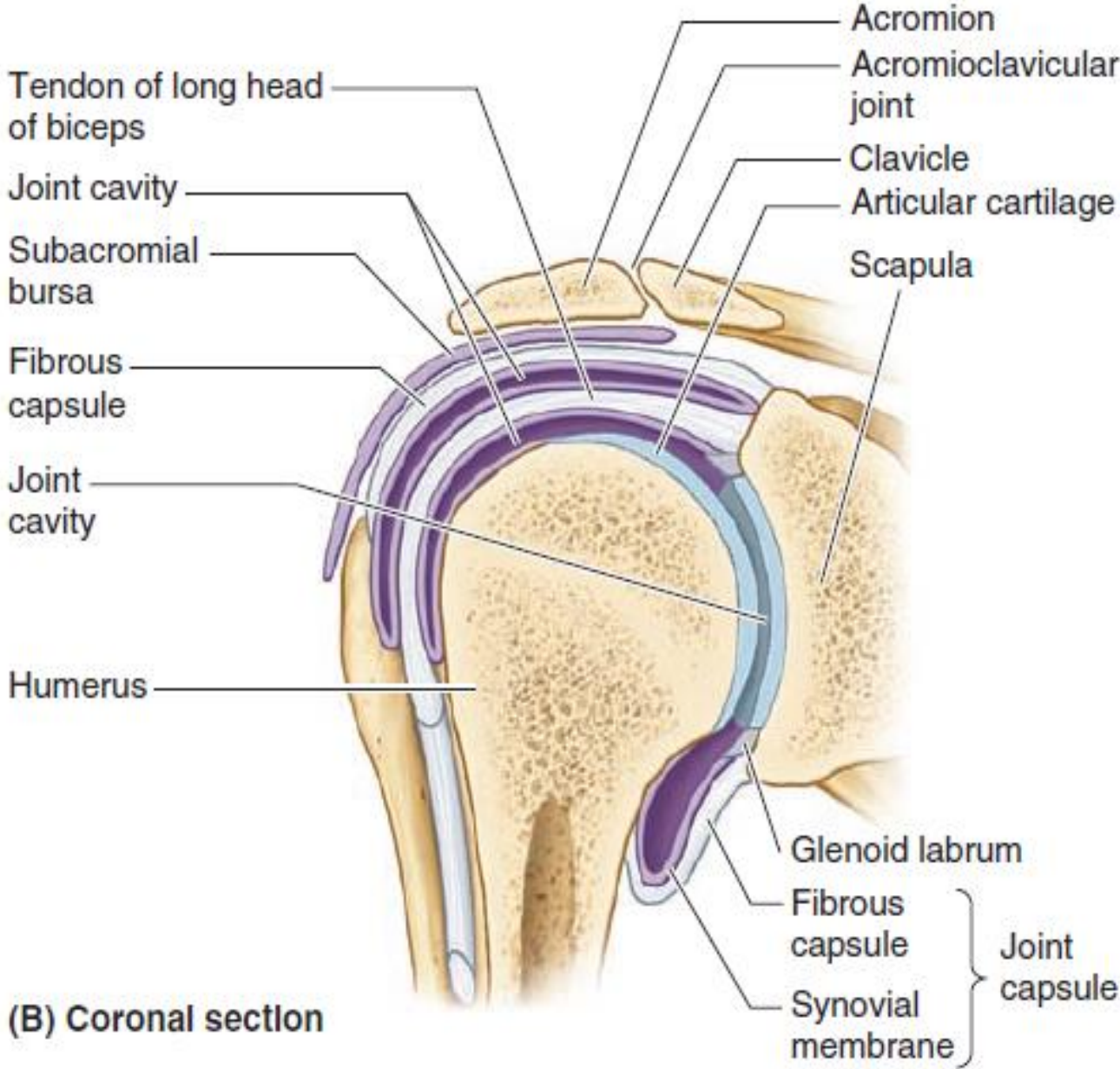
Shoulder region: Shoulder joint



Inferior, middle, and superior glenohumeral lig. Are thickenings in the joint capsule that help provide structure to the glenohumeral joint. Inferiorly is the most weak part of the joint. This is why most dislocations move anterior and inferior.

Shoulder
region:

Shoulder
joint.



Shoulder region: Shoulder joint



The glenohumeral ligaments, evident only on the internal aspect of the capsule, strengthen the anterior aspect of the capsule. The coracohumeral ligament, a strong band that passes from the base of the coracoid process to the anterior aspect of the greater tubercle, strengthens the capsule superiorly. The glenohumeral ligaments are intrinsic ligaments that are part of the fibrous layer of the capsule.

Shoulder region: Shoulder joint



The transverse humeral ligament is a broad fibrous band that runs from the greater to the lesser tubercle, bridging over the intertubercular sulcus (groove) and converting the sulcus into a canal for the tendon of the long head of biceps brachii and its synovial sheath. The coraco-acromial arch is an extrinsic, protective structure formed by the smooth inferior aspect of the acromion and coracoid process of the scapula, with the coracoacromial ligament spanning between them.

Shoulder region: Shoulder joint



The coraco-acromial arch overlies the head of the humerus, preventing its superior displacement from the glenoid cavity. The arch is so strong that a forceful superior thrust of the humerus will not fracture it; the shaft of the humerus or clavicle fractures first.

Shoulder region: Shoulder joint

Bursae related to the shoulder joint



Several bursae relate to the shoulder joint but the important ones are as follows :

- Subscapular bursa: It lies between the tendon of subscapularis and the neck of the scapula; and protects the tendon from friction from the neck. This bursa normally communicates with the joint cavity of glenohumeral joint.

Shoulder region: Shoulder joint

Bursae related to the shoulder joint



- Subacromial bursa: It lies between the coracoacromial ligament and acromion process above, and supraspinatus tendon and joint capsule below. It continues downwards beneath the deltoid, hence it is sometimes also described as subdeltoid bursa. It is the biggest synovial bursa in the body and helps with the movements of supraspinatus tendon under the coracoacromial arch.

Shoulder region: Shoulder joint

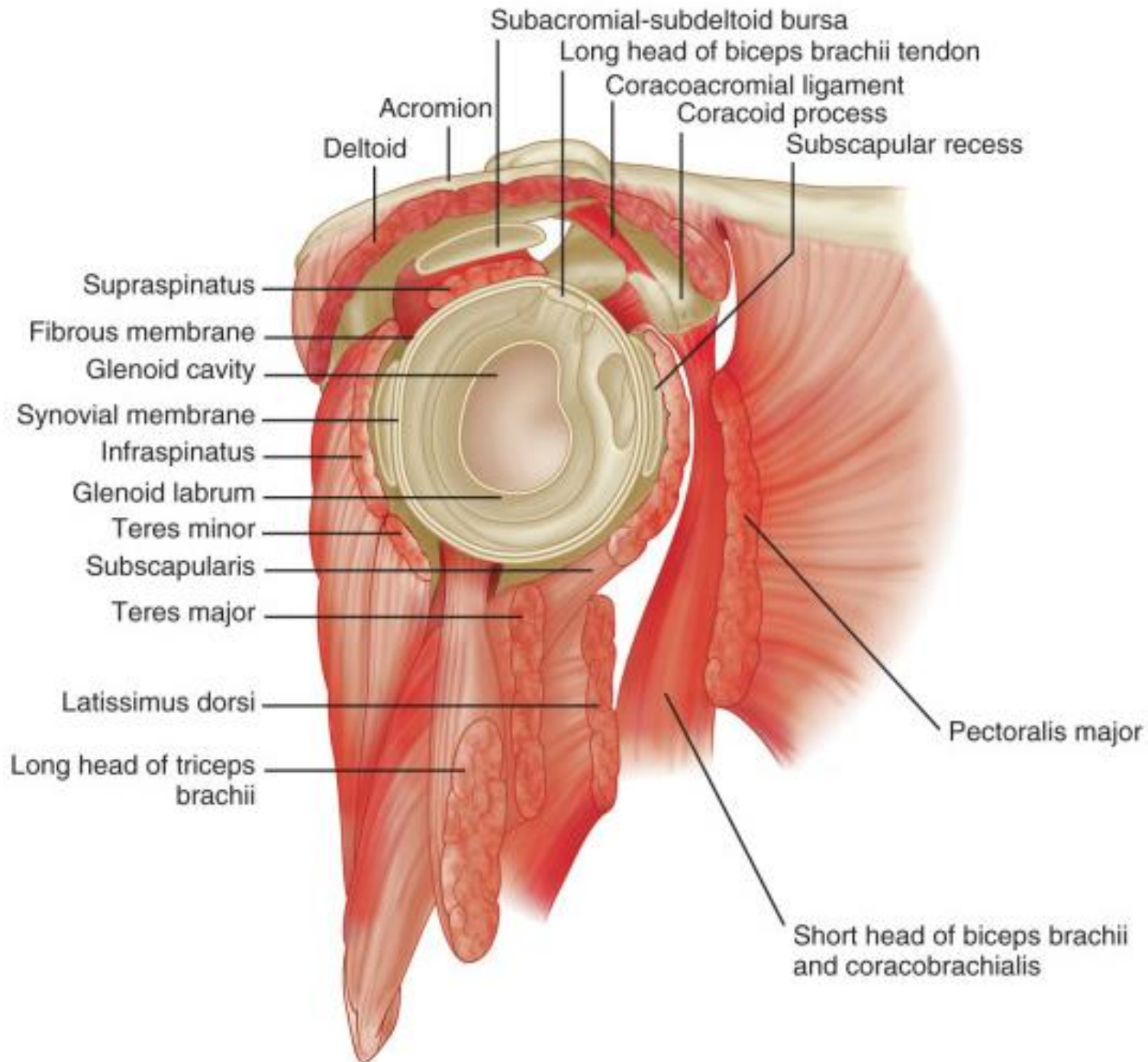
Bursae related to the shoulder joint



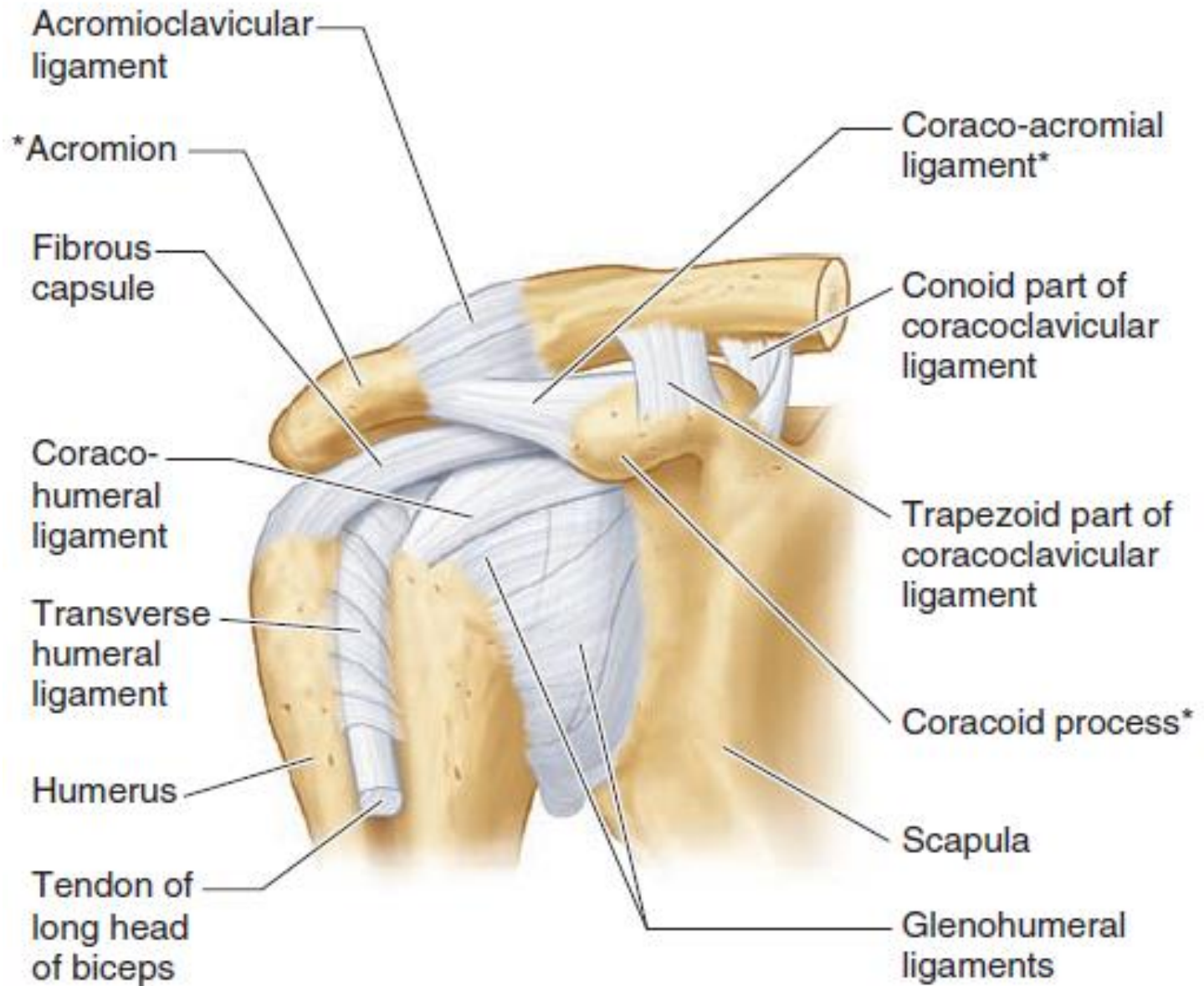
- Infraspinatus bursa: It lies between the tendon of infraspinatus and posterolateral aspect of the joint capsule. It may sometime communicate with the joint cavity.

The bursae around the shoulder joint are clinically vital as some of them interact with synovial cavity of the shoulder joint. Hence, opening a bursa may mean entering into the cavity of the glenohumeral joint.

Bursae related to the shoulder joint



Shoulder region: Shoulder joint

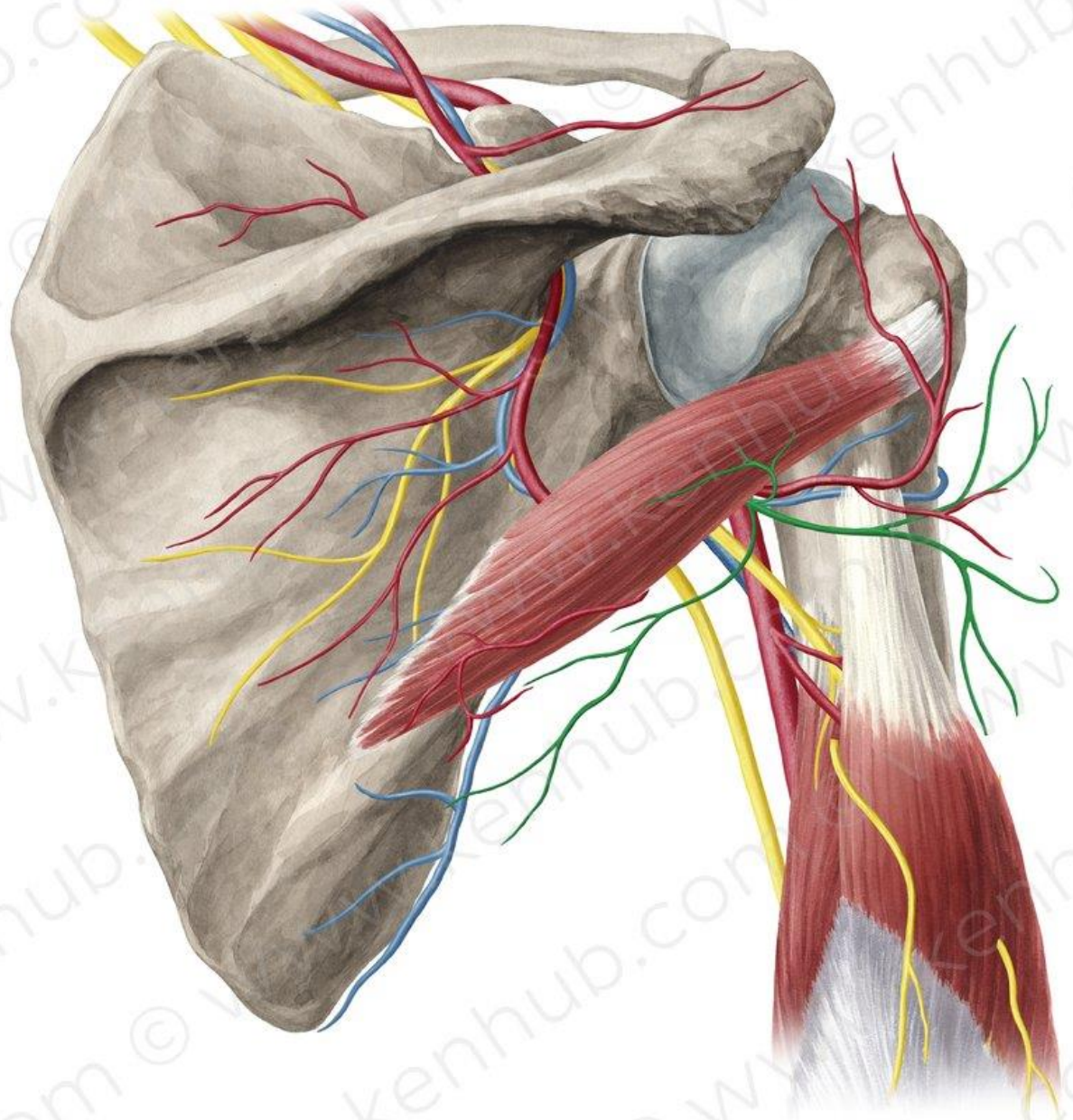


Anterior view

* Coracoid process + coraco-acromial ligament + acromion = **coraco-acromial arch**

Shoulder region

Innervation



Shoulder region: Shoulder joint



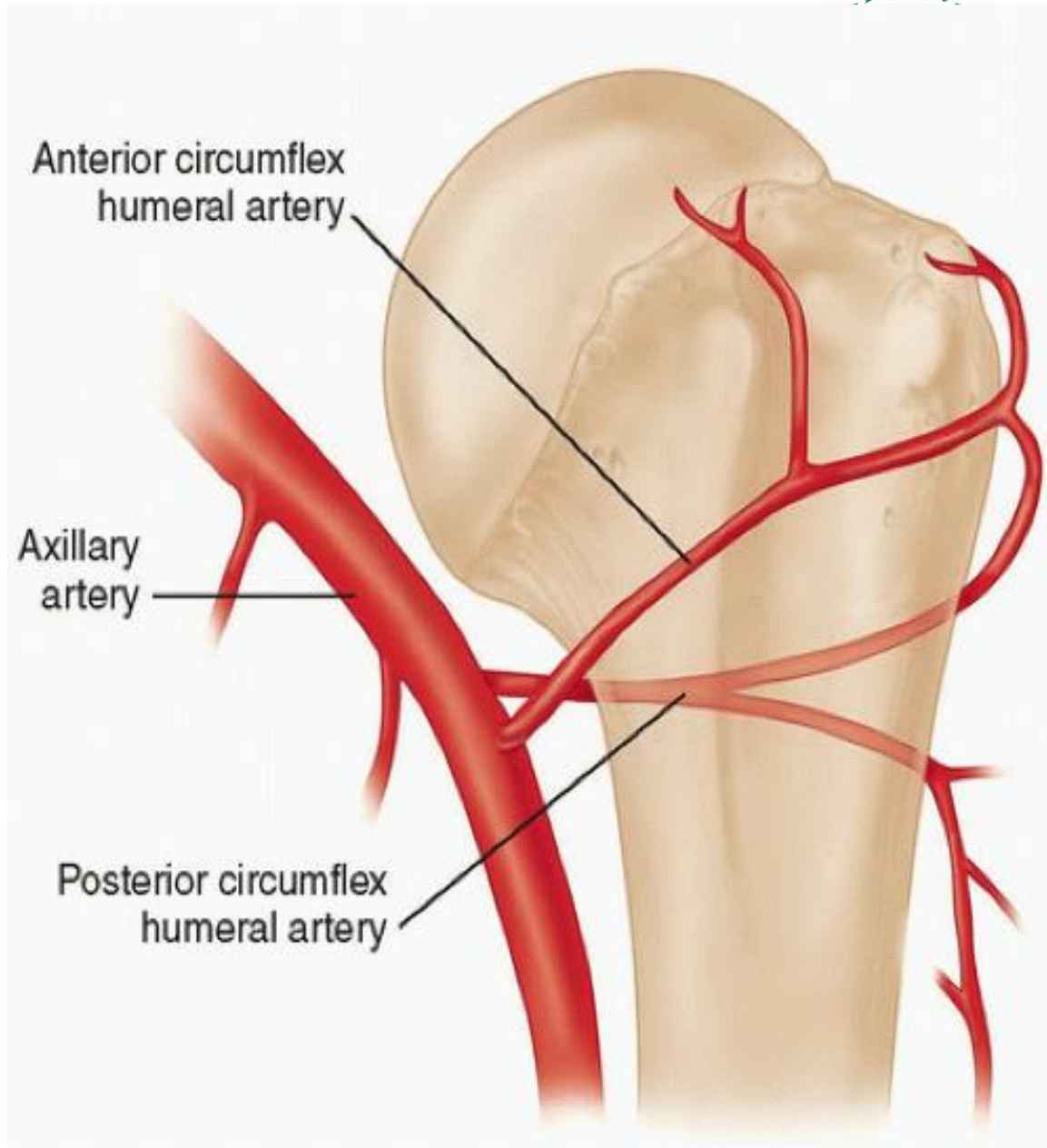
The glenohumeral joint is innervated by the subscapular nerve (C5-C6), a branch of the posterior cord of brachial plexus. The joint capsule is supplied from several sources:

- 1) suprascapular nerve supplies the posterior and superior aspects
axillary nerve innervates the anteroinferior part of the capsule
- 2) lateral pectoral nerve supplies the anterosuperior part and the rotator capsule

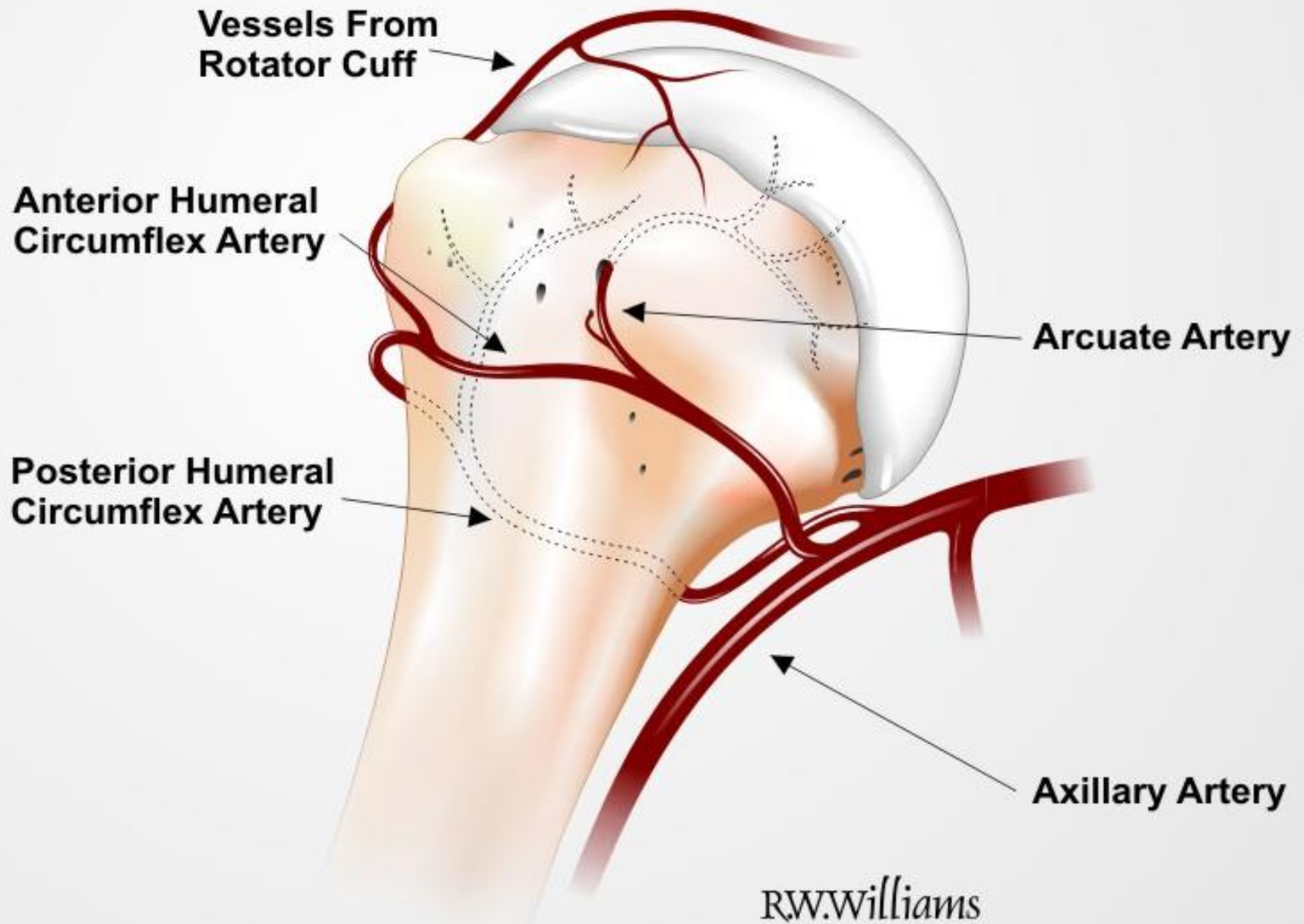
Shoulder region: Shoulder joint

Blood supply

Blood supply to the shoulder joint comes from the anterior and posterior circumflex humeral, circumflex scapular and suprascapular arteries.



Shoulder region: Shoulder joint



Dislocation of glenohumeral joint



Because of its freedom of movement and instability, the glenohumeral joint is commonly dislocated by direct or indirect injury. Most dislocations of the humeral head occur in the downward (inferior) direction but are described clinically as anterior or (more rarely) posterior dislocations, indicating whether the humeral head has descended anterior or posterior to the infraglenoid tubercle and the long head of triceps.

Dislocation of glenohumeral joint



Anterior dislocation of the glenohumeral joint occurs most often in young adults, particularly athletes. It is usually caused by excessive extension and lateral rotation of the humerus. The head of the humerus is driven infero-anteriorly, and the fibrous layer of the joint capsule and glenoid labrum may be stripped from the anterior aspect of the glenoid cavity.

Dislocation of glenohumeral joint



A hard blow to the humerus when the glenohumeral joint is fully abducted tilts the head of the humerus inferiorly onto the inferior weak part of the joint capsule. This may tear the capsule and dislocate the joint so that the humeral head comes to lie inferior to the glenoid cavity and anterior to the infraglenoid tubercle.

Dislocation of glenohumeral joint



Subsequently, the strong flexor and adductor muscles of the glenohumeral joint usually pull the humeral head anterosuperiorly into a subcoracoid position. Unable to use the arm, the person commonly supports it with the other hand. The axillary nerve may be injured when the glenohumeral joint dislocates because of its close relation to the inferior part of the capsule of this joint.

Dislocation of glenohumeral joint



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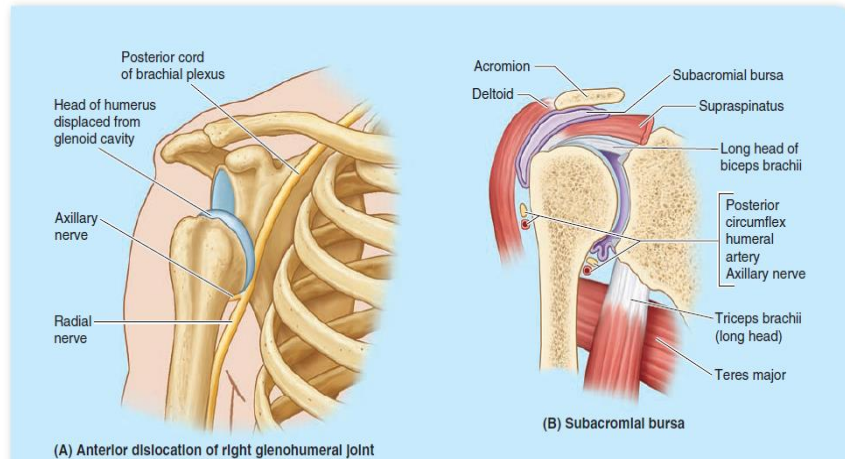


FIGURE B6.20. Dislocation of glenohumeral joint.

and falls because of the weight of the upper limb. Dislocation of the AC joint makes the acromion more prominent, and the clavicle may move superior to the acromion.

Dislocation of Glenohumeral Joint

Because of its freedom of movement and instability, the glenohumeral joint is commonly dislocated by

Calcific Supraspinatus Tendinitis

Inflammation and calcification of the subacromial bursa result in pain, tenderness, and limitation of movement of the glenohumeral joint. This condition is also known as *calcific scapulohumeral bursitis*. Deposition of calcium in the supraspinatus tendon may irritate the overlying subacromial bursa, producing an inflammatory reaction,

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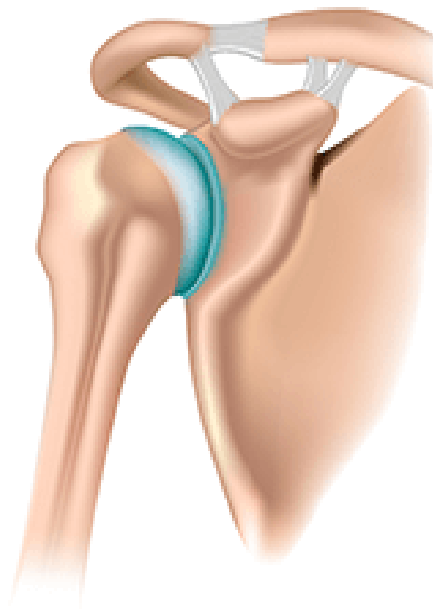
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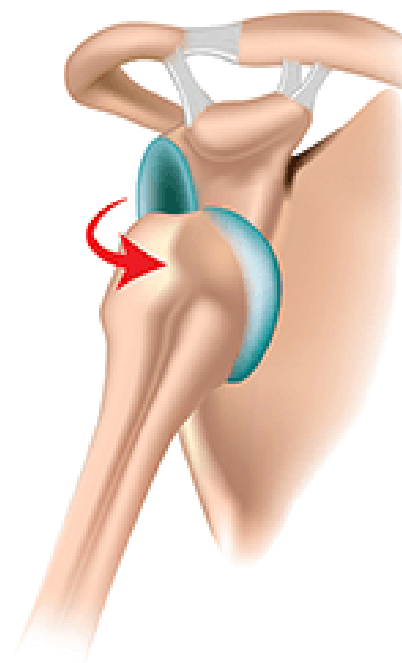
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Dislocation of glenohumeral joint

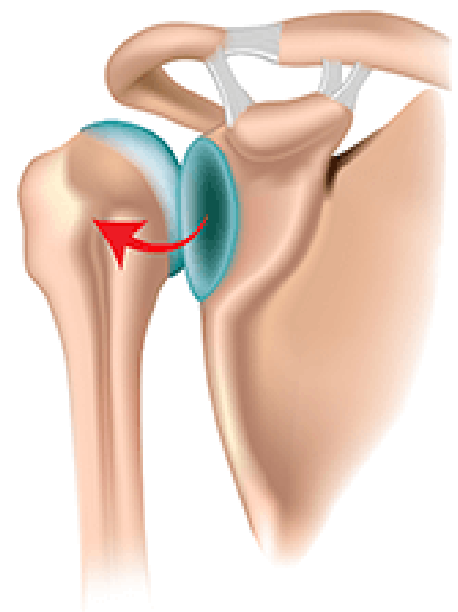
Shoulder Dislocation



Normal anatomy



Anterior dislocation

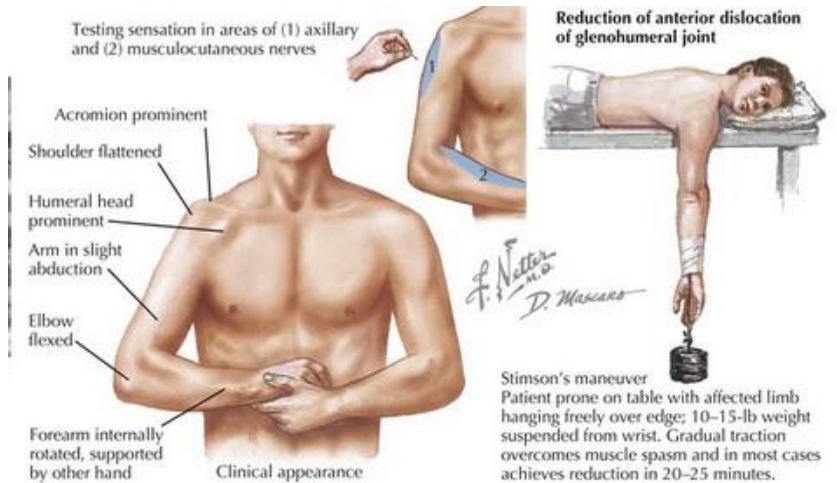


Posterior dislocation

Dislocation of glenohumeral joint



Anterior Dislocation



Stimson's maneuver
Patient prone on table with affected limb hanging freely over edge; 10-15-lb weight suspended from wrist. Gradual traction overcomes muscle spasm and in most cases achieves reduction in 20-25 minutes.

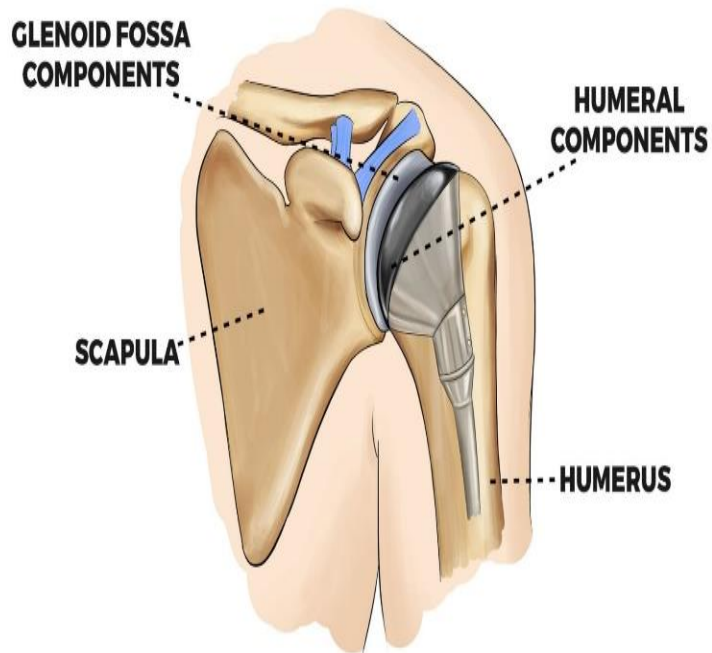
Posterior Dislocation



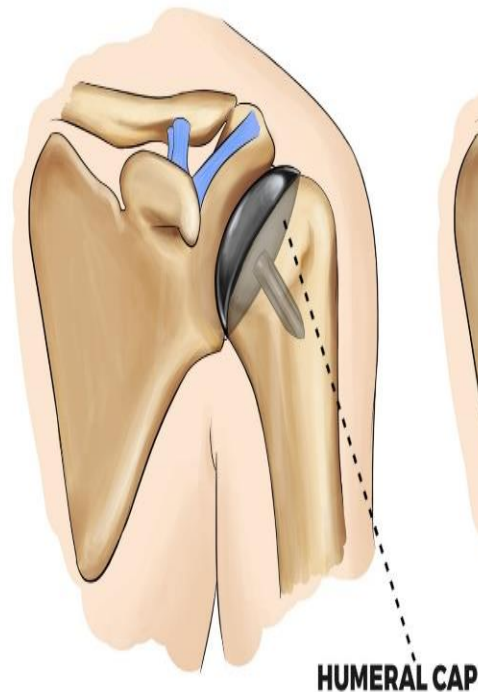
Types of shoulder replacement



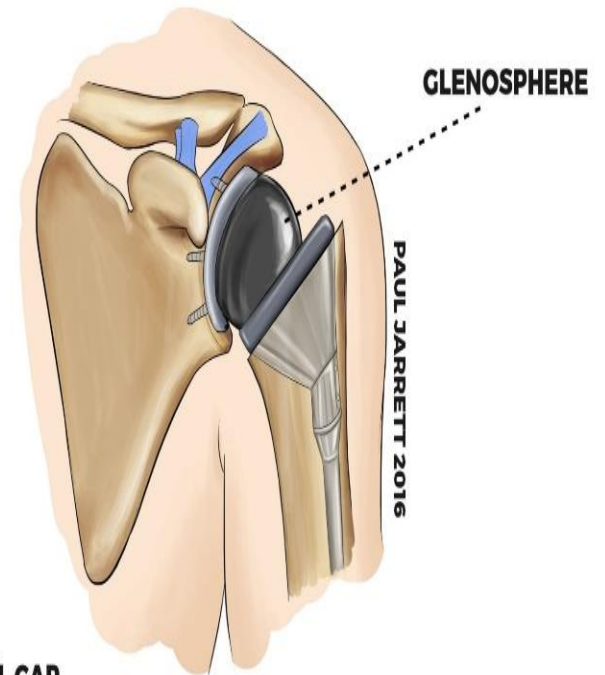
TOTAL SHOULDER REPLACEMENT (TSR)



RESURFACING HEMIARTHROPLASTY



REVERSE TSR



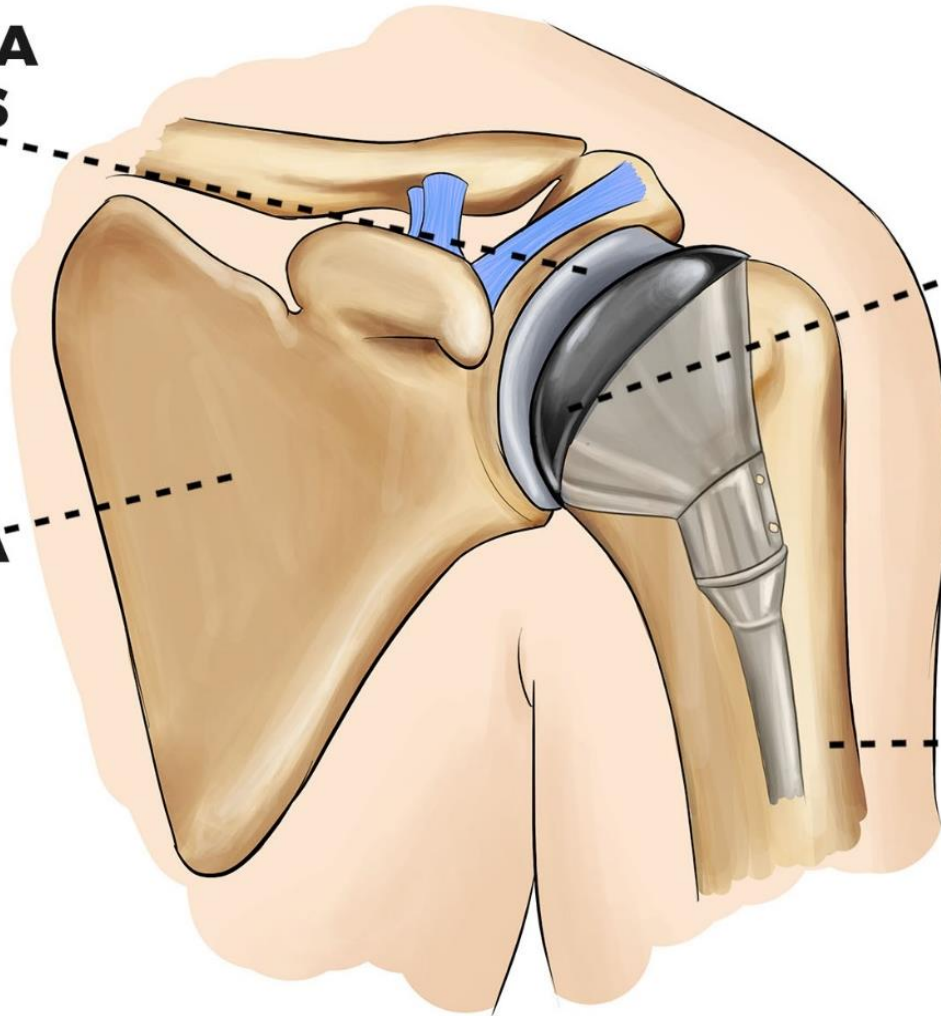
TOTAL SHOULDER REPLACEMENT (TSR)

GLENOID FOSSA COMPONENTS

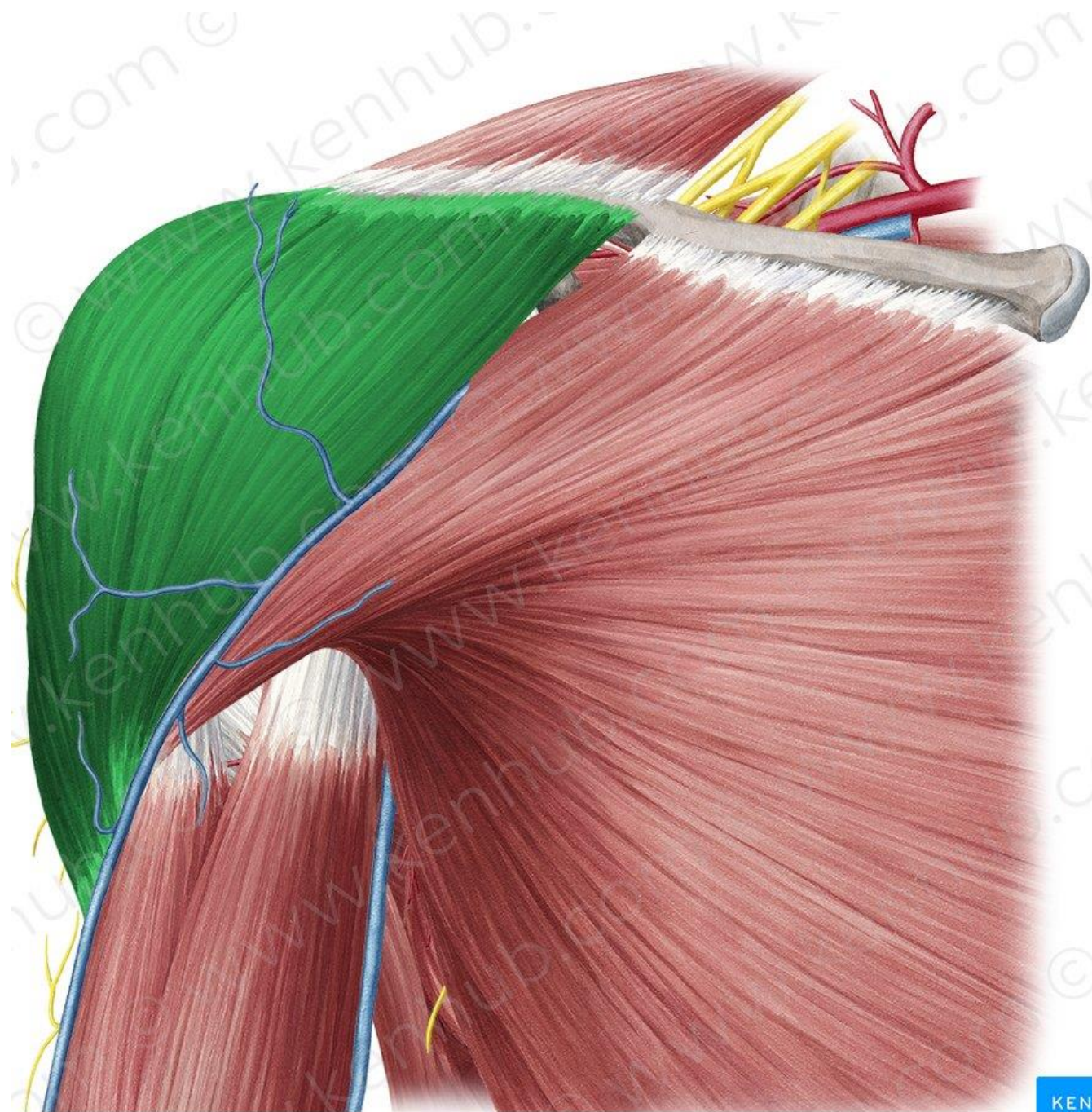
HUMERAL COMPONENTS

SCAPULA

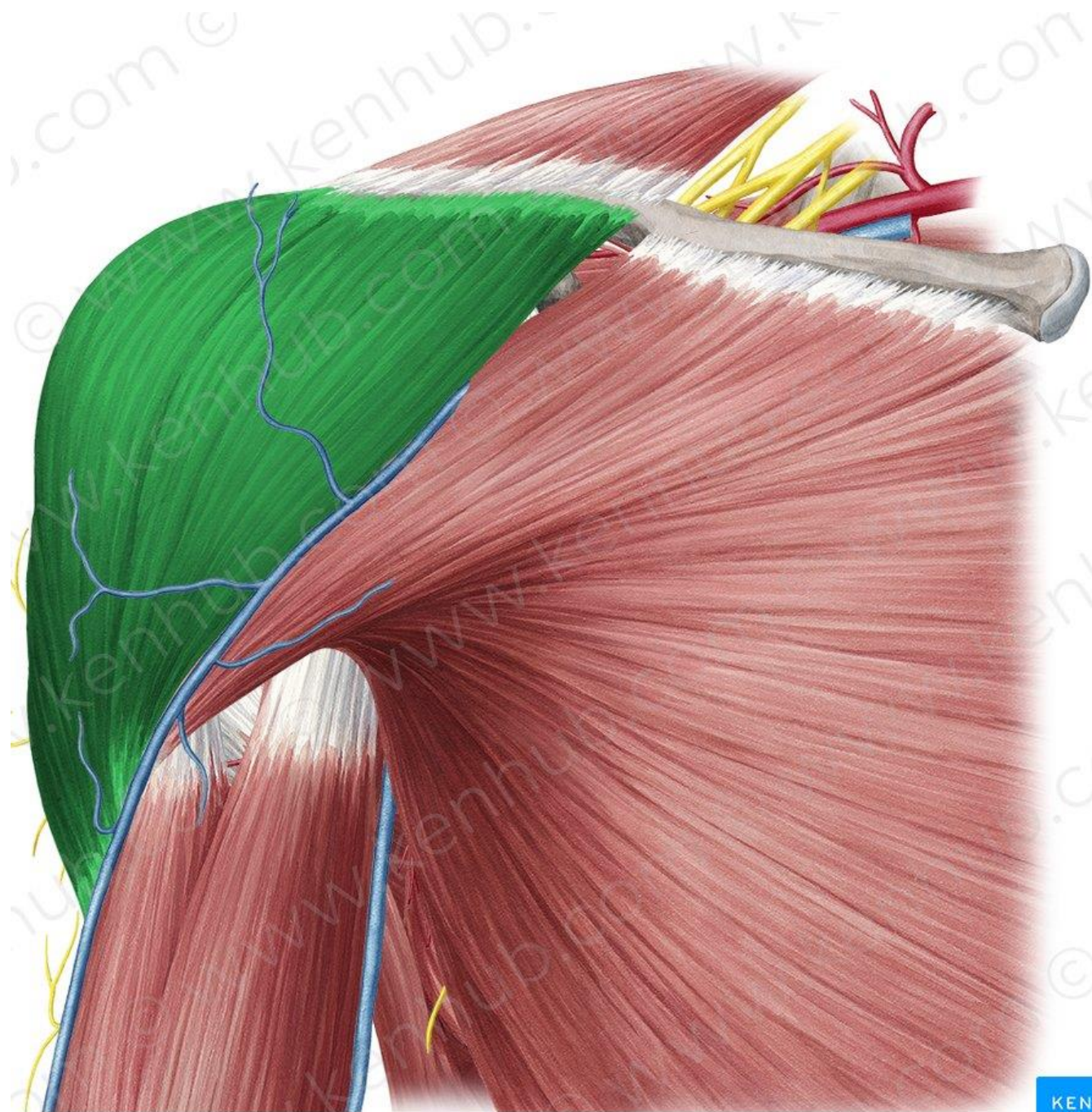
HUMERUS



The deltoid is a thick, triangular shoulder muscle. It gets its name because of its similar shape to the Greek letter 'delta' (Δ).

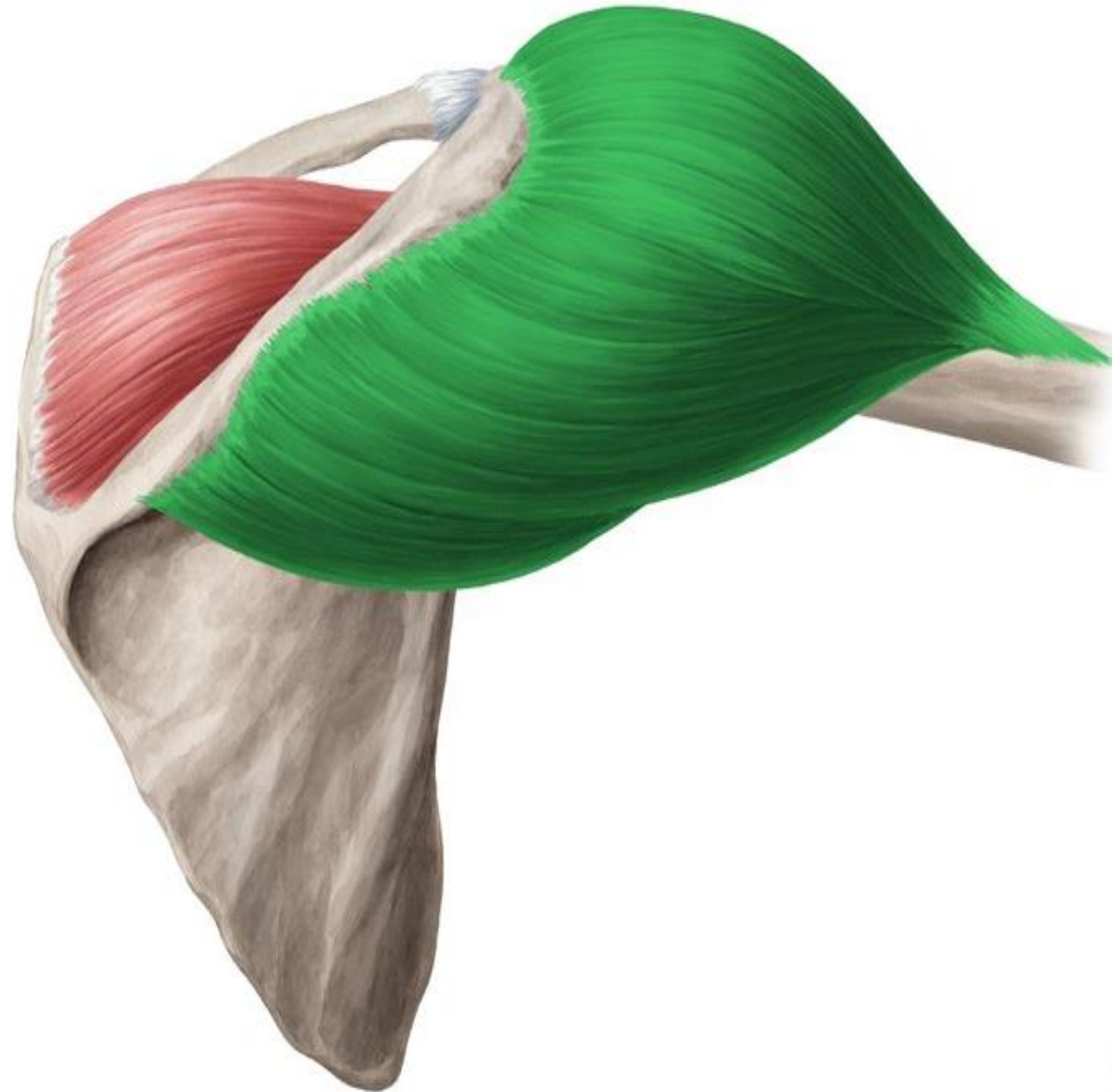


The deltoid fascia invests the deltoid and is continuous with the pectoral fascia anteriorly and the dense infraspinous fascia posteriorly.



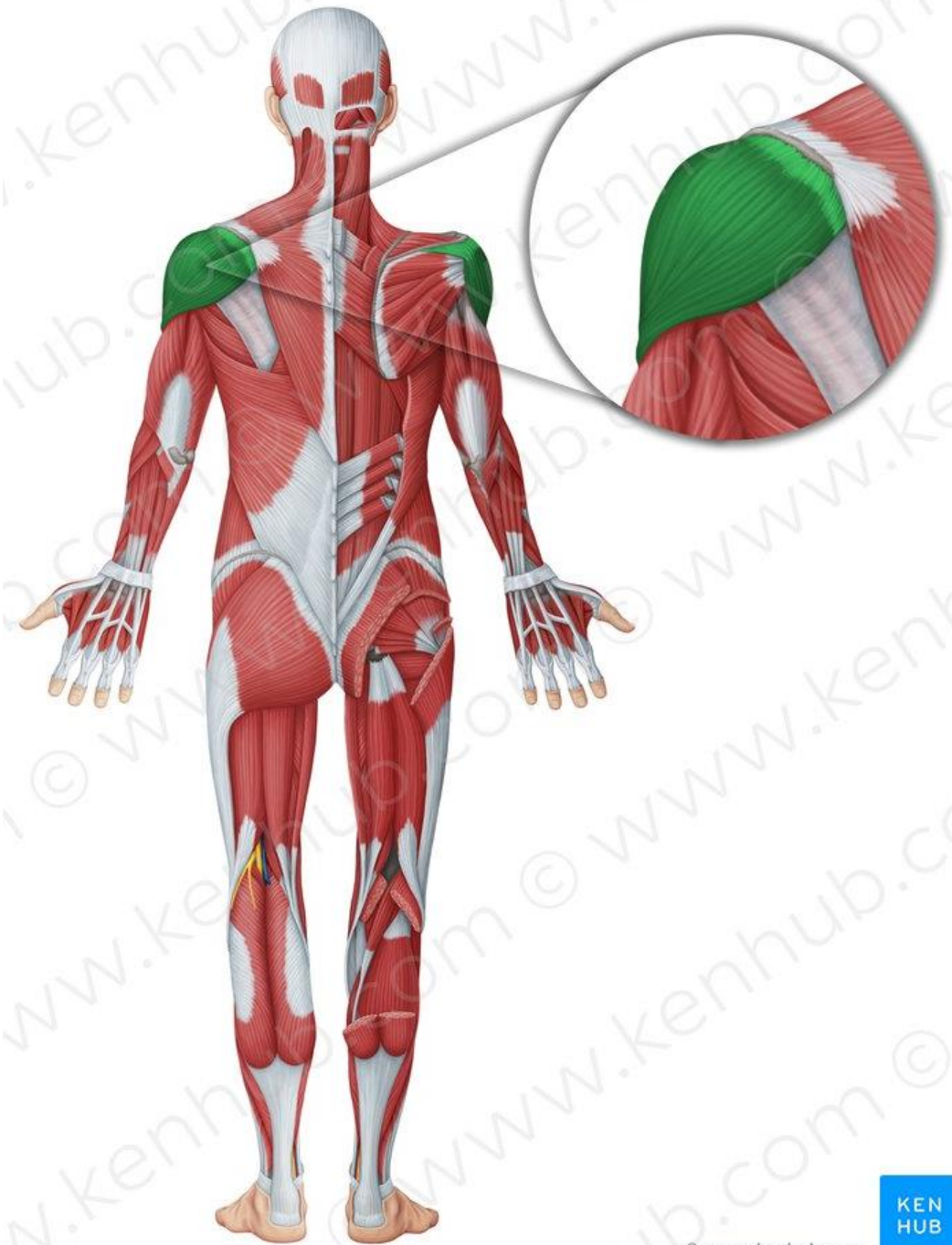
Deltoid muscle

The muscle has a wide origin spanning the clavicle, acromion and spine of scapula. It passes inferiorly surrounding the glenohumeral joint on all sides and inserts onto the humerus.



Deltoid region.

The deltoid is a superficial muscle of the shoulder, thus it lies deep only to its overlying fascia, the platysma muscle and skin. Due to its superficial nature, the deltoid can be easily observed and palpated.



Deltoid region.



The deltoid overlies a number of other muscular structures: the **rotator cuff muscles** (supraspinatus, infraspinatus, teres minor, subscapularis), the **pectoralis major** and the tendon of **pectoralis minor**, as well as tendons of **coracobrachialis**, **both heads of biceps brachii** and **long and lateral heads of the triceps brachii** muscle. The deltoid also covers the coracoacromial ligament, subacromial bursa, bony structures (coracoid process and proximal humerus), and neurovascular structures (the axillary nerve and anterior and posterior circumflex humeral vessels) of the shoulder region.

Injury to axillary nerve



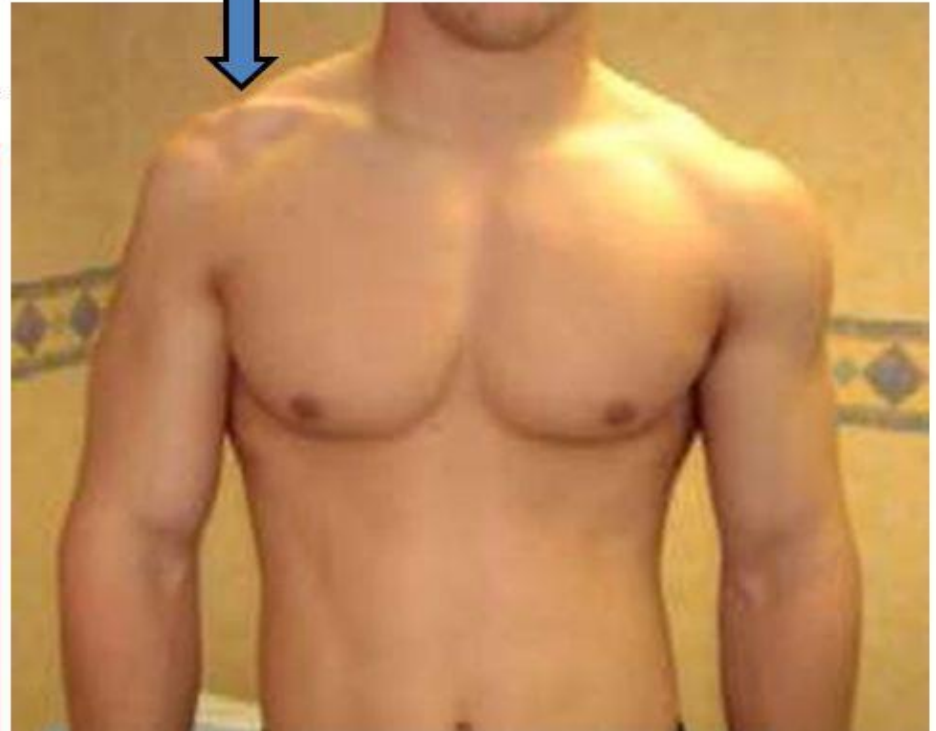
Atrophy of the deltoid occurs when the axillary nerve (C5 and C6) is severely damaged (e.g., as might occur when the surgical neck of the humerus is fractured). As the deltoid atrophies unilaterally, the rounded contour of the shoulder disappears, resulting in visible asymmetry of the shoulder outlines. This gives the shoulder a flattened appearance and produces a slight hollow inferior to the acromion.

Injury to axillary nerve

Axillary Nerve Lesion

Affects:

- **Motor:**
 - Paralysis of the deltoid and teres minor muscles.
 - Impaired abduction of the shoulder from (30 to 90°).
 - The paralyzed deltoid wastes rapidly.
 - As the deltoid **atrophies**, the rounded contour of the shoulder is lost and becomes flattened compared to the intact side.
- **Sensory:** Loss of sensation over the lateral side of the proximal part of the arm.



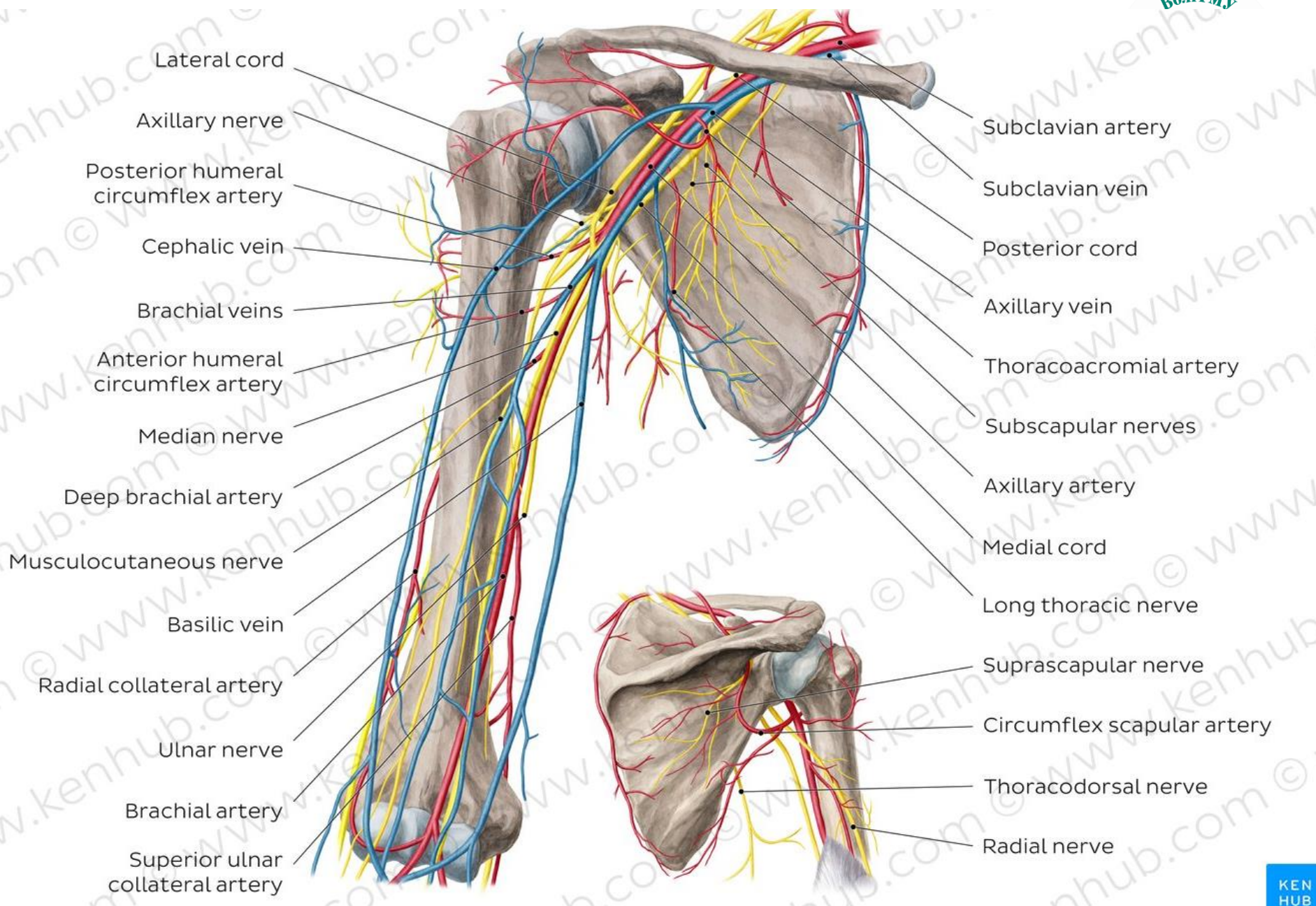
Injury to axillary nerve



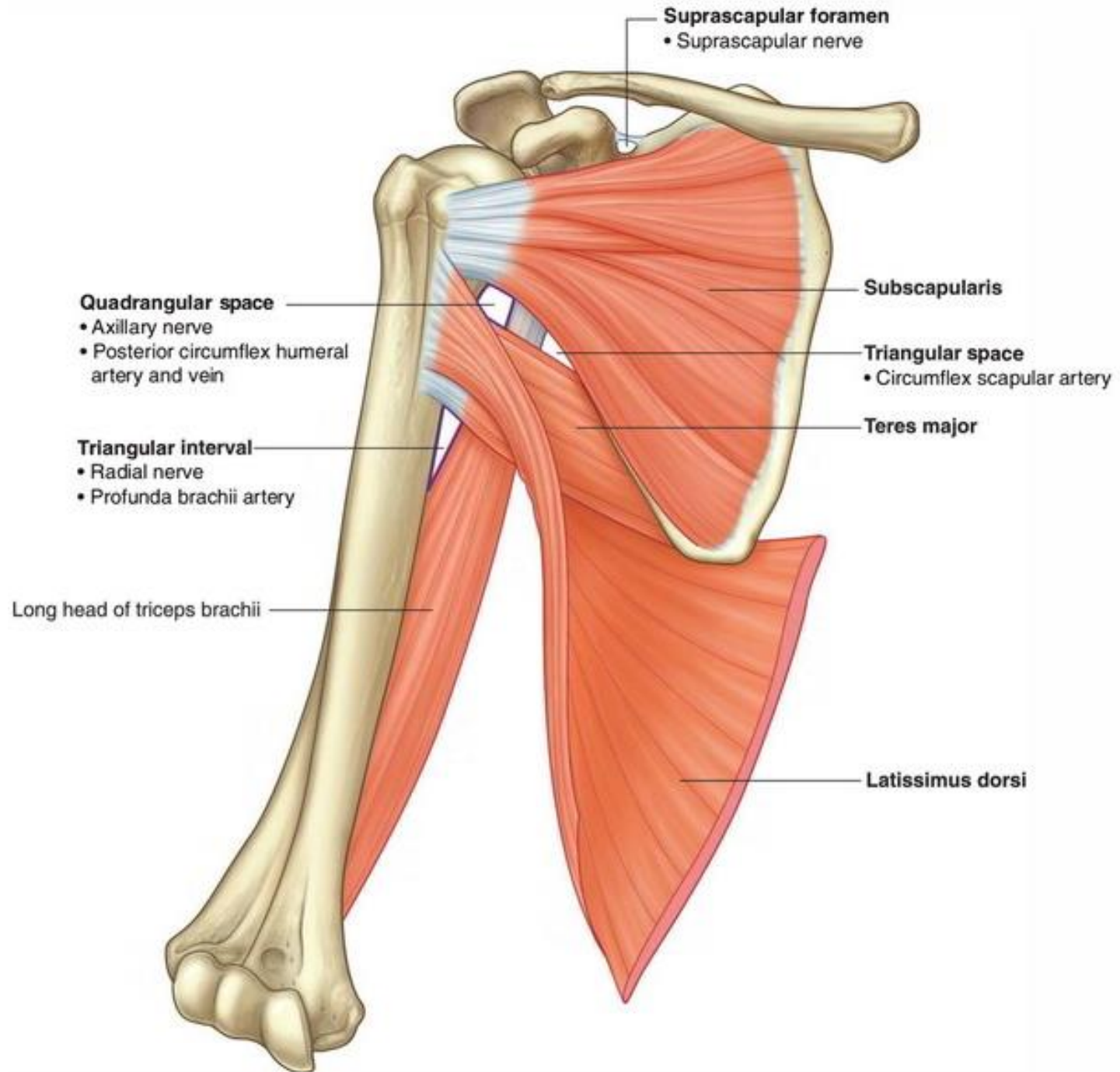
A loss of sensation may occur over the lateral side of the proximal part of the arm, the area supplied by the superior lateral cutaneous nerve of the arm. To test the deltoid (or the function of the axillary nerve), the arm is abducted, against resistance, starting from approximately 15 degrees.

Neurovasculature of the arm and the shoulder

ВолГМУ



Three anatomical spaces

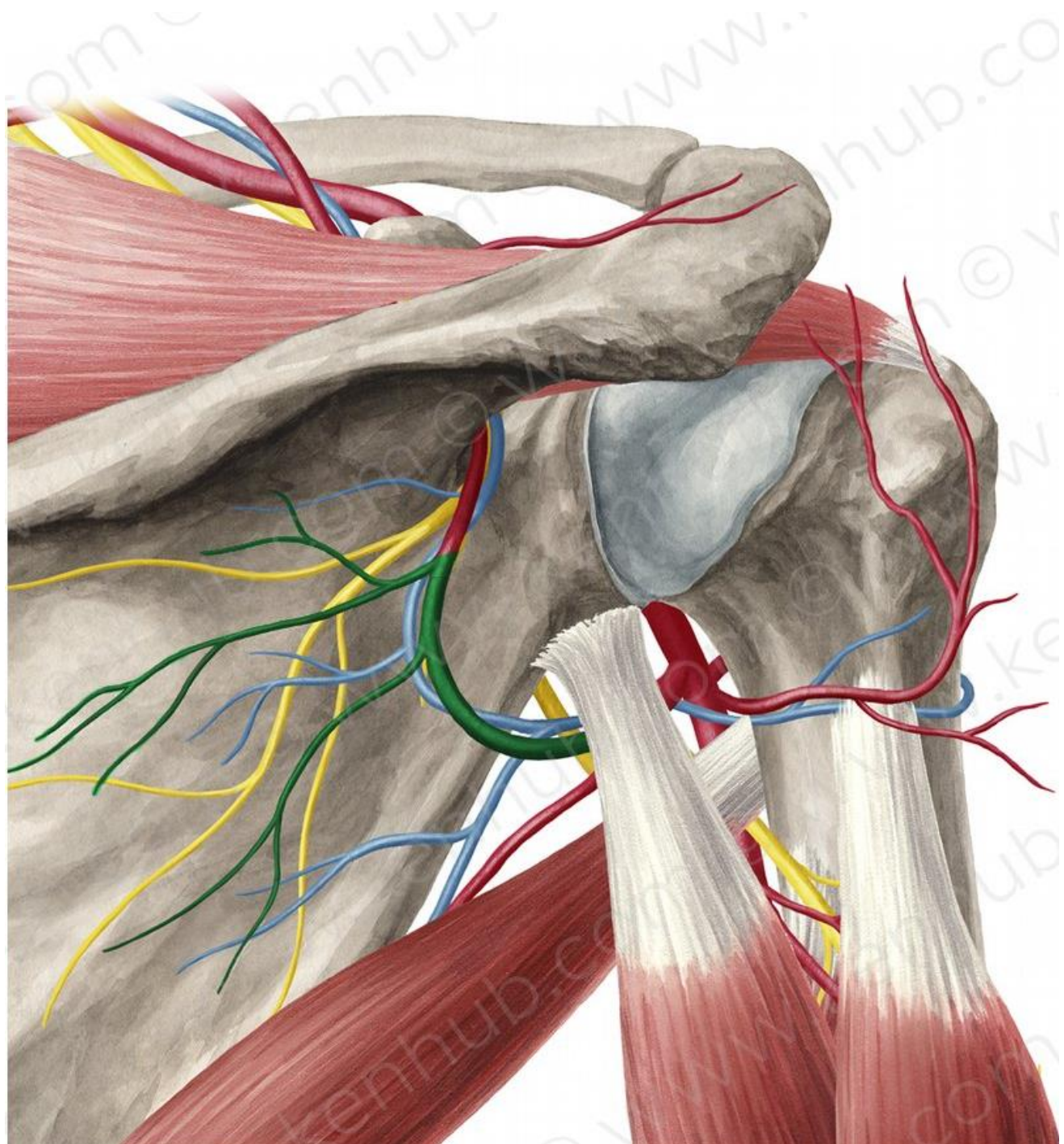


Three anatomical spaces



The upper triangular space, also called the triangular interval, is bounded by teres minor and subscapularis superiorly, teres major inferiorly and the long head of triceps laterally. This space allows the passage of the circumflex scapular artery and vein from the axillary region to the scapular region.

Circumflex
scapular artery
(Arteria
circumflexa
scapulae)
and
**three anatomical
spaces**

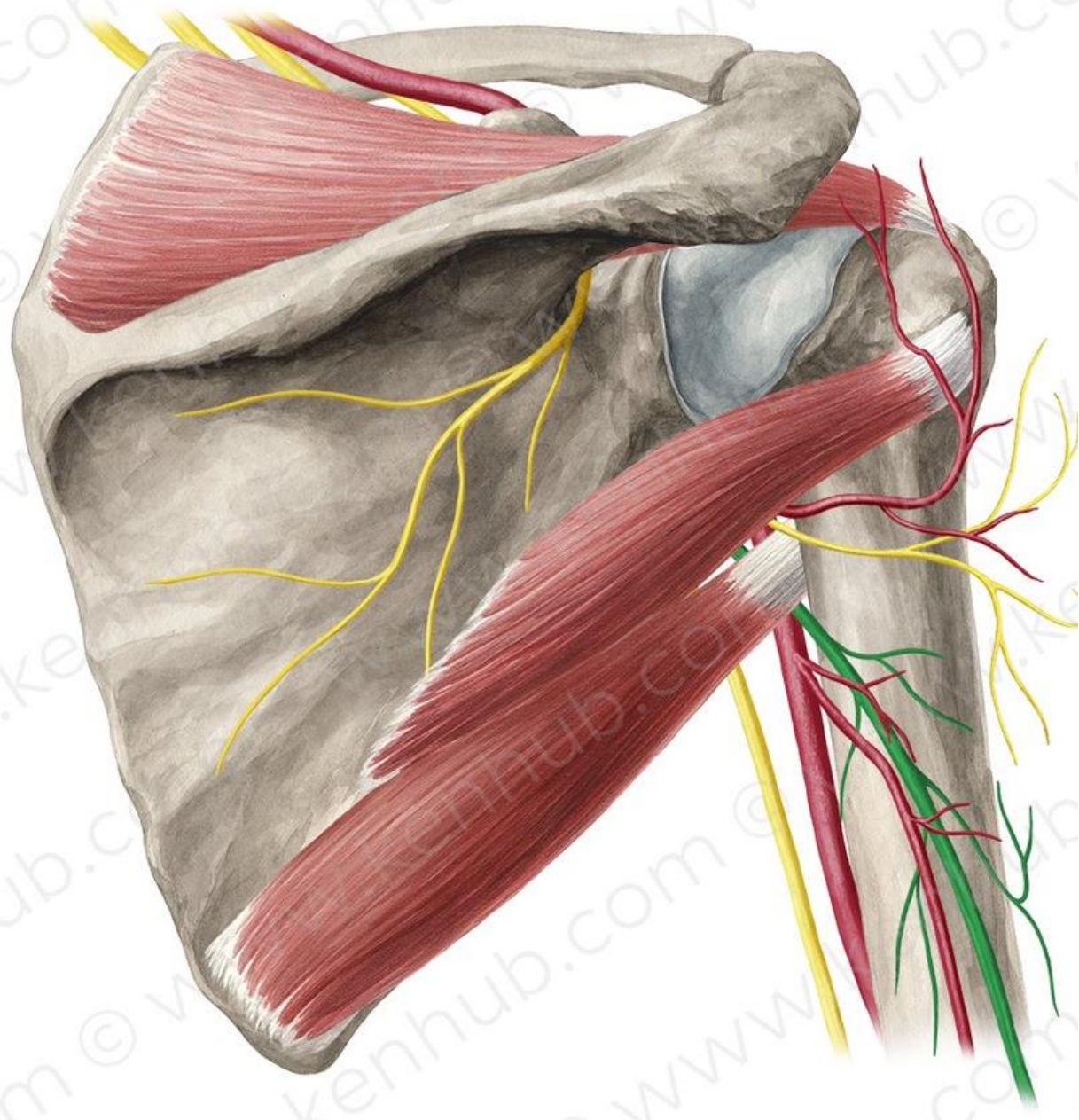


Three anatomical spaces



The **lower triangular space** is bounded by teres major superiorly, the long head of triceps medially and the humerus laterally. This space is a conduit between the posterior and anterior compartments of the arm, which allows passage of the radial nerve and the deep brachial vessels.

Radial nerve
(Nervus radialis)



Three anatomical spaces



The **quadrangular space** is a horizontal cleft or tunnel bordered by subscapularis and teres minor superiorly, teres major inferiorly, long head of triceps medially, and the surgical neck of humerus laterally. This space allows the axillary nerve and the posterior circumflex humeral artery and vein to pass from the axillary region to the posterior region of the shoulder.

The quadrangular space

Posterior circumflex humeral artery
(Arteria circumflexa posterior humeri)
and axillary nerve

