

The upper limb

ANATOMY OF THE UPPER LIMB

- 1- Bones of the upper limb.**
- 2- Muscles of the upper limb.**
- 3- Vessels of the upper limb.**
- 4- Nerves of the upper limb.**
- 5- Joints of the upper limb.**

❖ The upper limb is a multijointed lever that is freely movable on the trunk at the shoulder joint.

❖ At the distal end of the upper limb is the prehensile organ, the hand. Much of the importance of the hand depends on the pincer like action of the thumb, which enables one to grasp objects between the thumb and index finger.

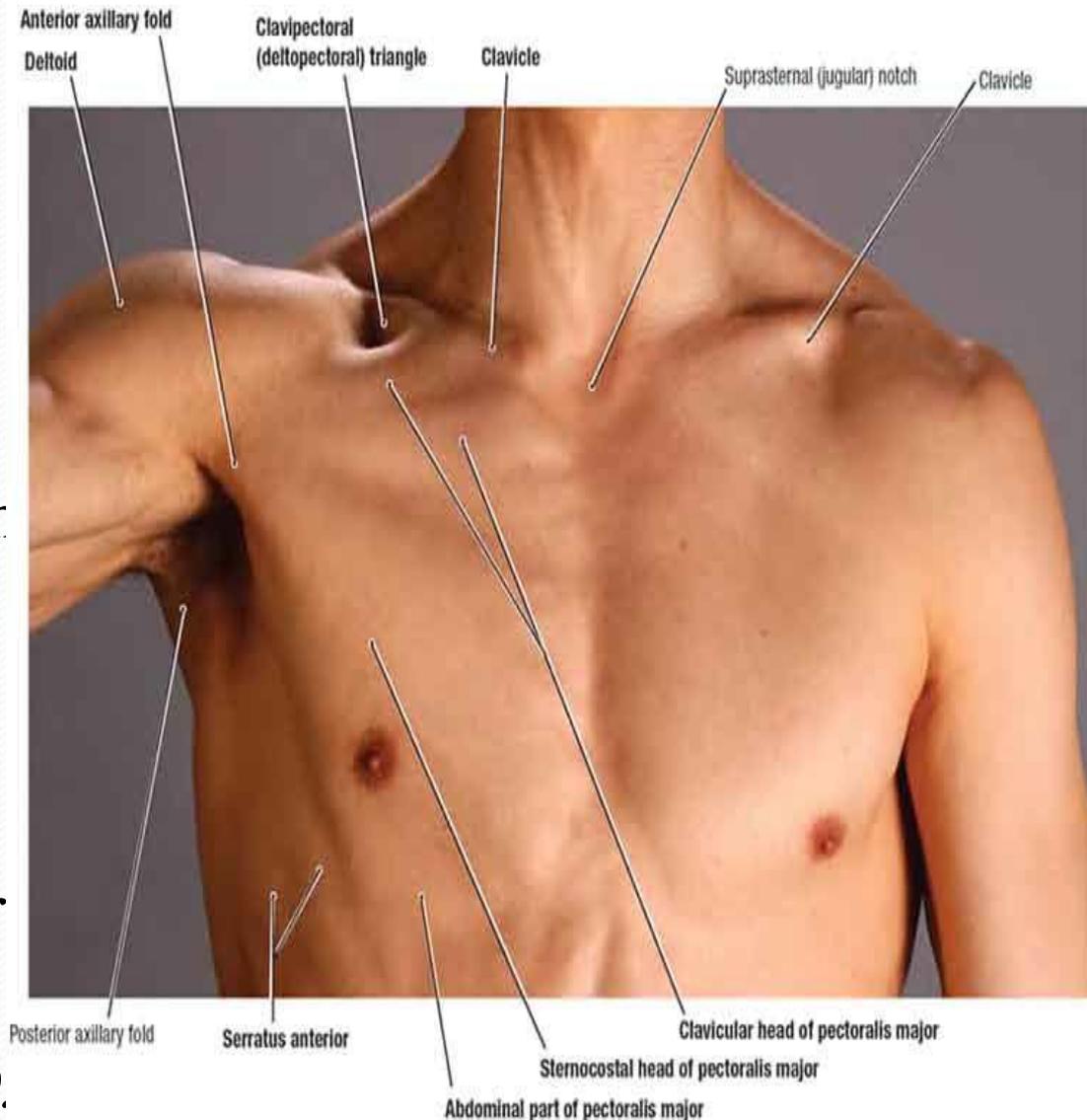


The upper limb is divided into:

Region	Subdivisions	Bones of Region	Joints of Region
Shoulder	Anterior: Pectoral region & breast	Clavicle Scapula	Sternoclavicular Acromioclavicular
	Posterior: scapular region		
	Lateral: axilla		
Arm	Anterior compartment	Humerus	Shoulder (glenohumeral)
	Posterior compartment		
Forearm	Anterior compartment	Radius	Elbow
	Posterior compartment	Ulna	Proximal & distal radio-ulnar
Hand	Wrist (carpus)	Carpal bones (8)	Wrist (radiocarpal)
	Hand proper (metacarpus)	Metacarpal bones (5)	Intercarpal
	Fingers (digits)	Phalanges (14)	Carpometacarpal Metacarpophalangeal Proximal & distal interphalangeal

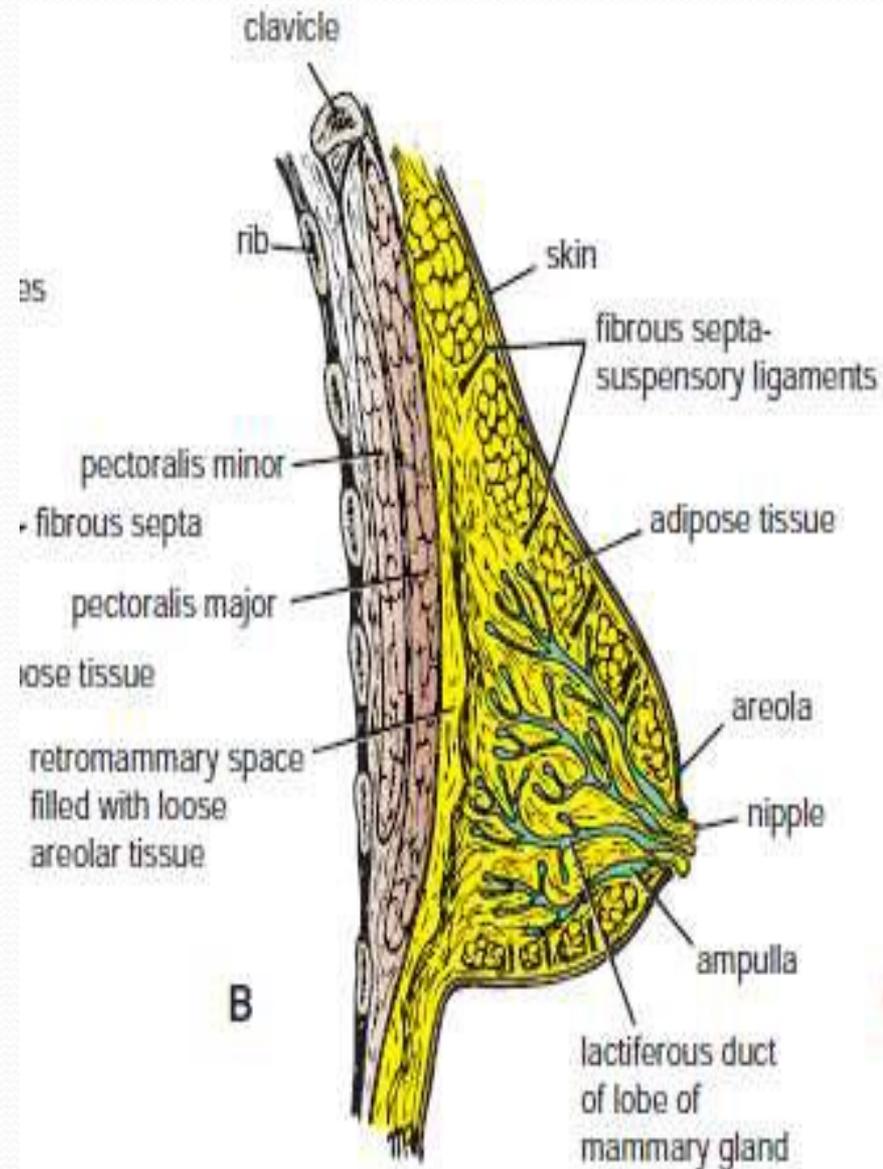
The Pectoral Region

The pectoral region is that part of the trunk extending from the clavicle superiorly to the level of the 7th costal cartilage inferiorly and from midline to the midaxillary line (*an imaginary line that passes longitudinally through the middle of the armpit when the arm is fully abducted*).

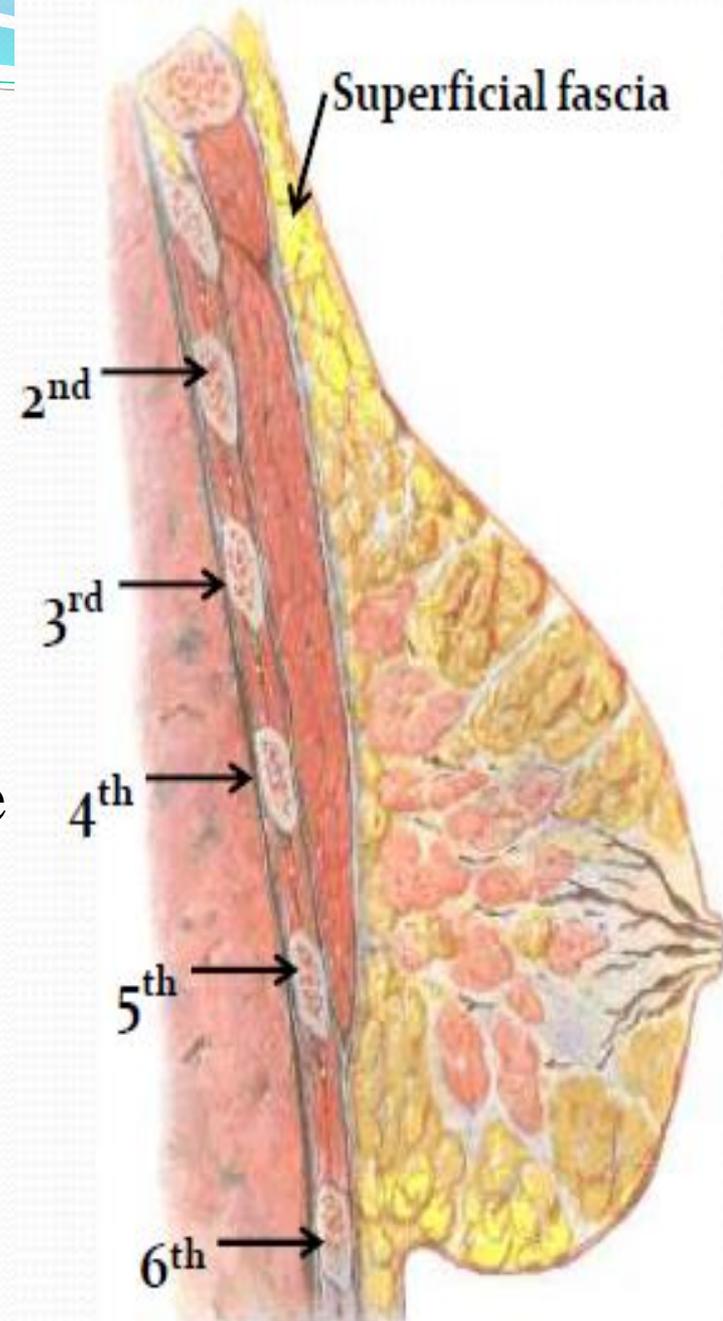


The Breasts

- The breasts are specialized accessory glands of the skin that secrete milk .
- They are present in **both sexes**. In males and immature females, they are similar in structure.
- they are **rudimentary** in male
- The **nipples** are small and surrounded by a colored area of skin called the **areola**.
- The breast tissue consists of a system of ducts embedded in connective that does not extend beyond the margin of the areola.

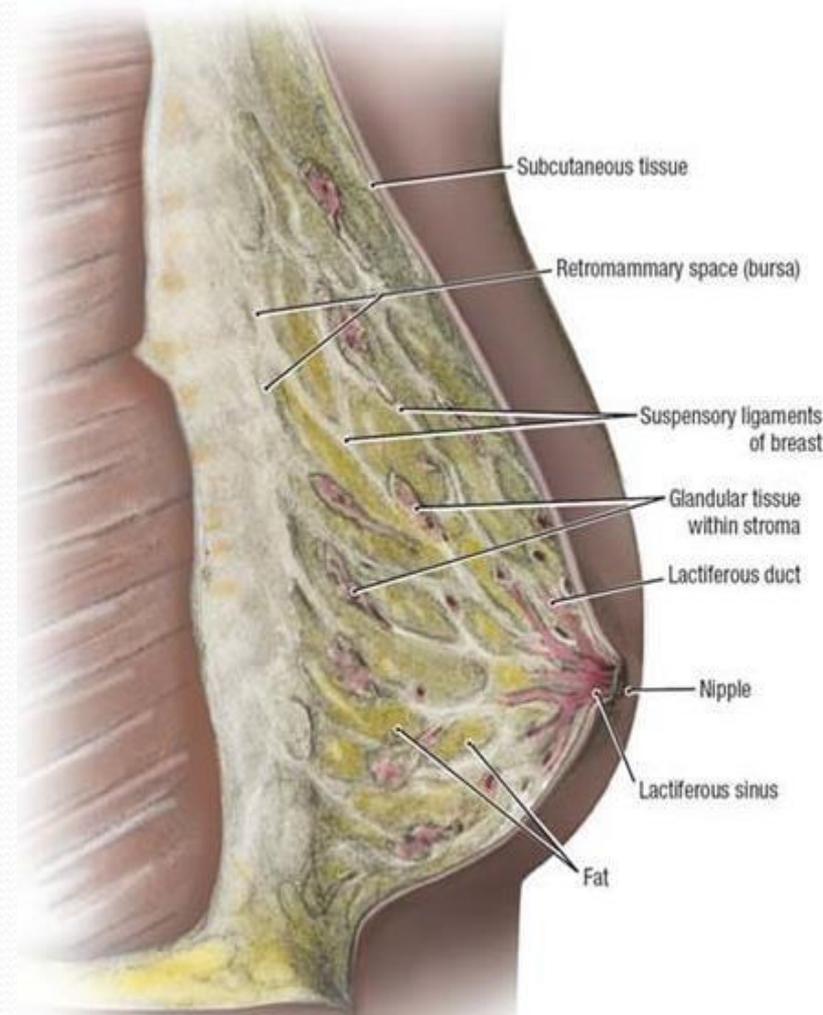


- The breast extends from **2nd to 6th** ribs & from **lat. margin of sternum** to **mid-axillary line**.
- It's greater part lies in **superficial fascia** except axillary tail which extend upward & laterally to pierce deep fascia at lower border of pectoralis major muscle and enter the axilla & come into close relationship with axillary vessels.



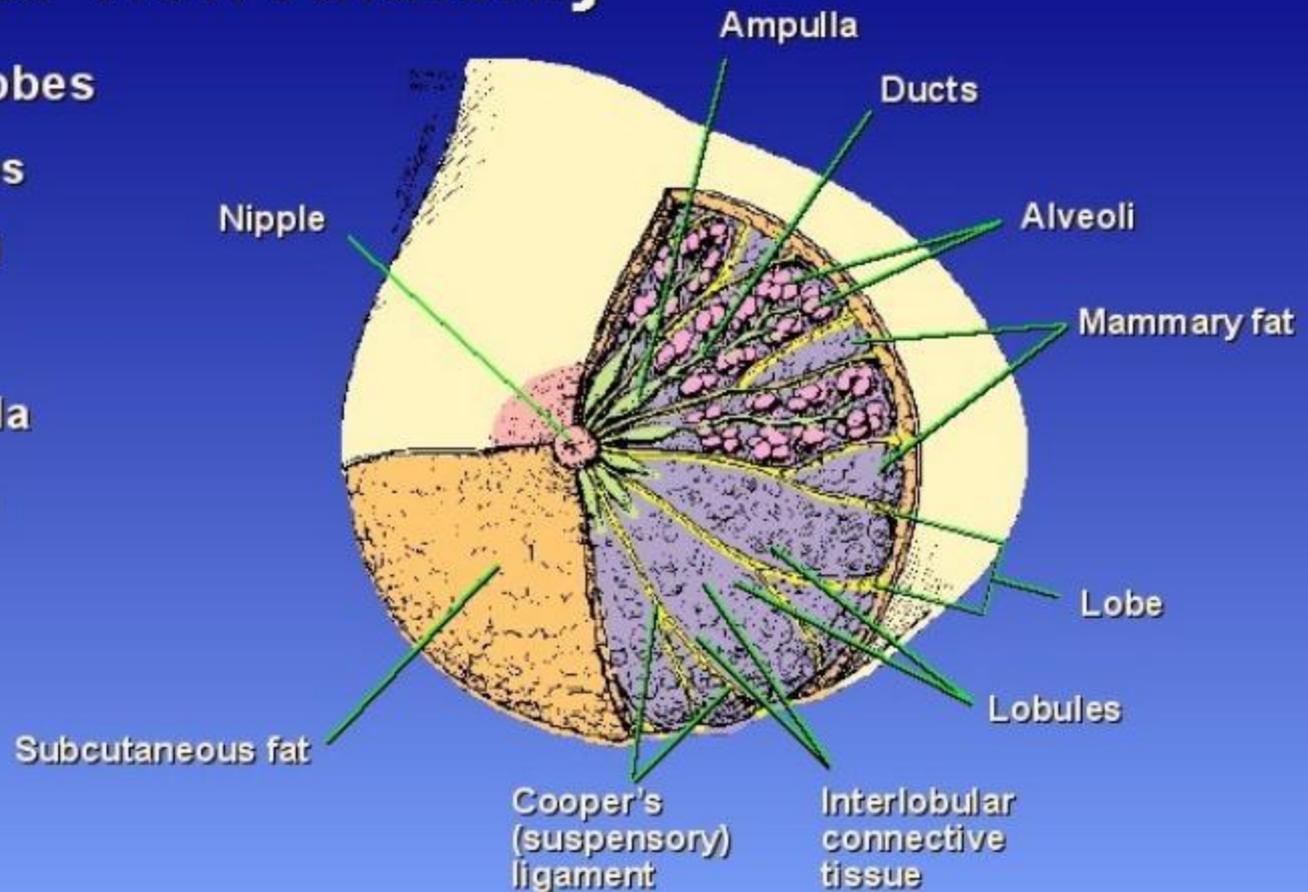
Location and Description

- Each breast consists of 15 to 20 lobes. The main duct from each lobe opens separately on the summit of the nipple and possesses a dilated ampulla.
- The lobes of the gland are separated by fibrous septa (suspensory ligaments).
- The breasts are separated from the deep fascia by retro mammary space



Frontal View Anatomy

- 15-20 lobes
 - Lobules
 - Alveoli
 - Ducts
 - Ampulla
 - Nipple

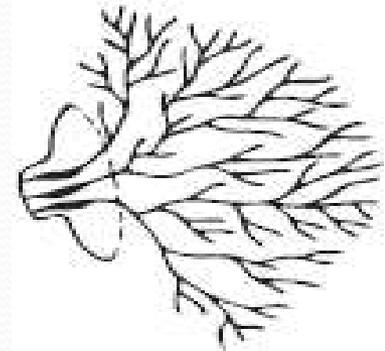


- At puberty, in female, they gradually enlarge & assume their **hemispherical** shape under influence of ovarian hormones.
- In early months of **pregnancy**, there is a rapid **increase in length & branching** in duct system.

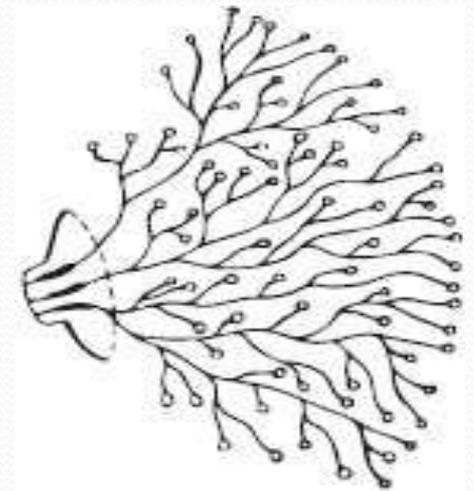
Vascularity of CT. also increases to provide adequate nourishment for developing gland.

The secretory **alveoli** develop at the ends of the smaller ducts, & the CT. becomes filled with expanding & budding secretory alveoli.

Nipple enlarges, & **areola becomes darker** & areolar glands enlarge & become more active



female at puberty



pregnant female

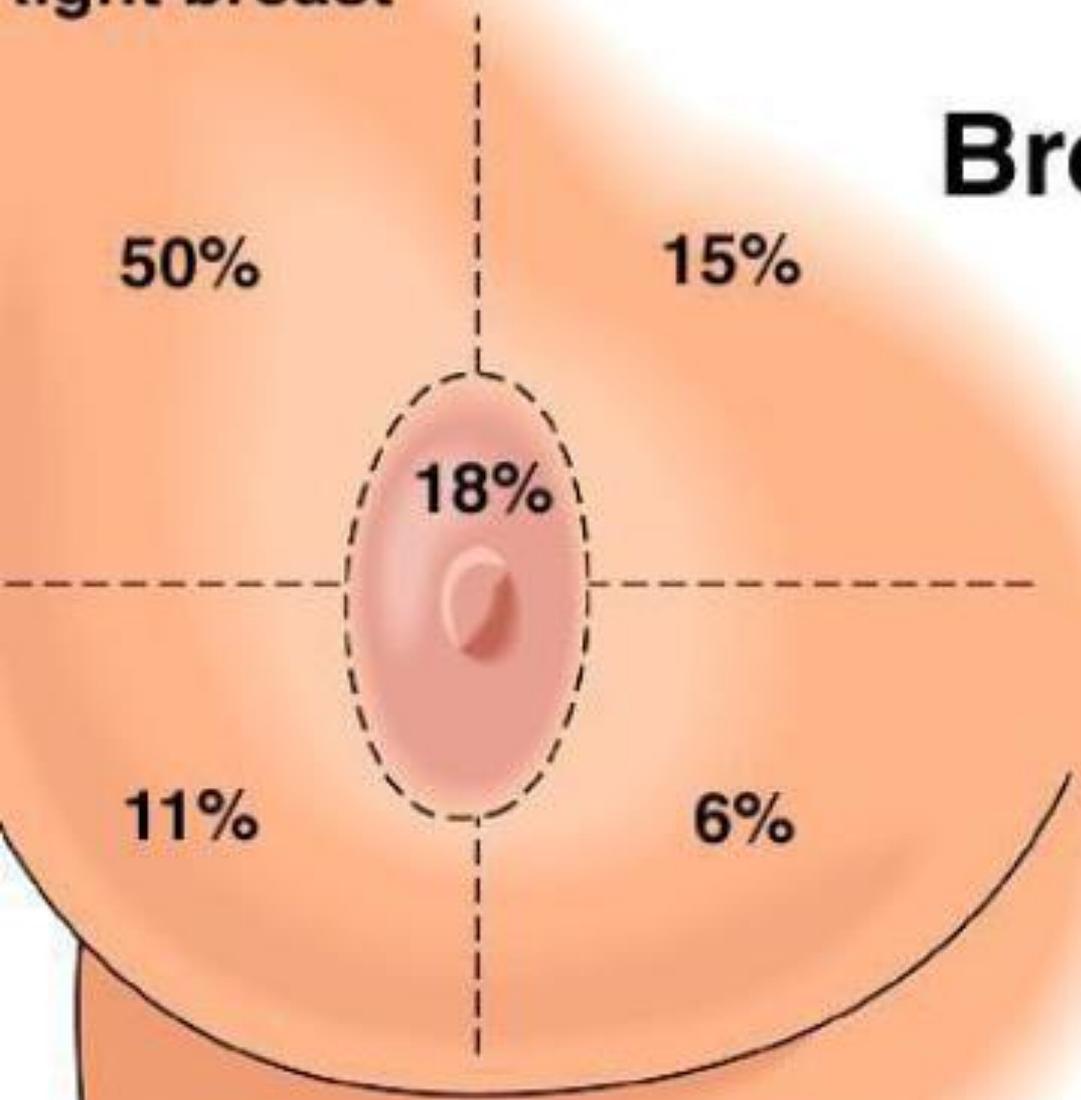
- After menopause, the **breast atrophies**. Most of secretory alveoli disappear, leaving behind the ducts. The amount of adipose tissue may **increase or decrease**. Breasts tend to **shrink** in size & become more **pendulous**. Atrophy after menopause is caused by absence of ovarian estrogens & progesterone.



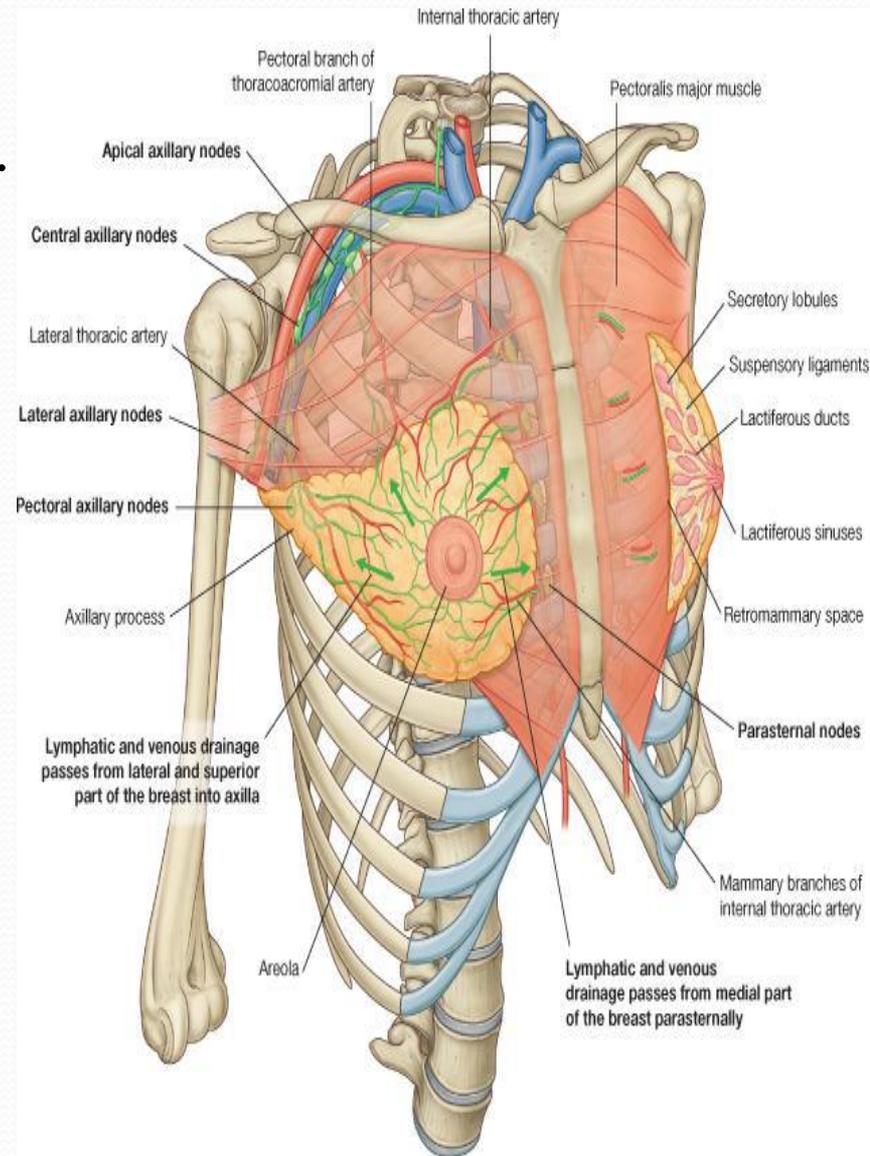
Female after menopause

Breast Quadrants and Breast Cancers

Right breast



- **Arterial supply** is achieved by:
 1. Perforating branches of **int. thoracic a.**
 2. **Intercostal** arteries.
 3. Axillary artery also supplies mammary gland through its **lateral thoracic** & **thoracoacromial** branches.
- **Venous drainage:** It corresponds to arterial supply.



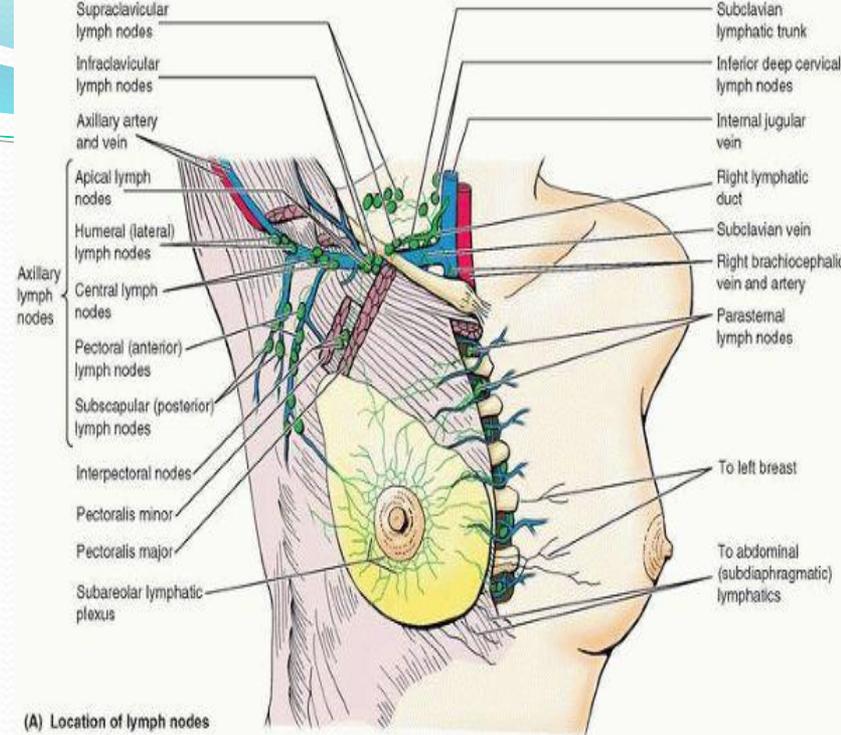
● **Lymph drainage:**

1. **Lat. quadrants** of breast drains into **ant. axillary LN.**

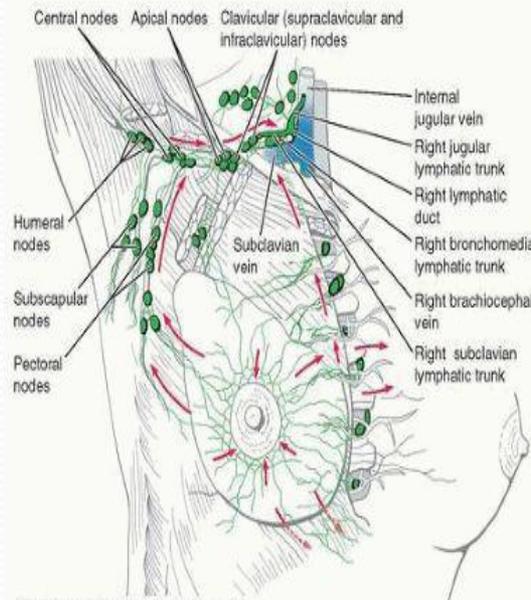
2. **Med. quadrants** of breast drains into internal thoracic group lying along course of int. thoracic a. (**parasternal LN**)

3. Few lymph vessels follow post. intercostal arteries & drain post. into **post. intercostal nodes.**

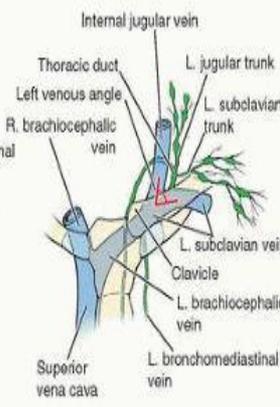
4. Other lymph vessels **communicate with lymph vessels of the opposite breast & with those of the ant. abdominal wall.**



(A) Location of lymph nodes



(B) Pattern of lymphatic drainage of axillary lymph nodes



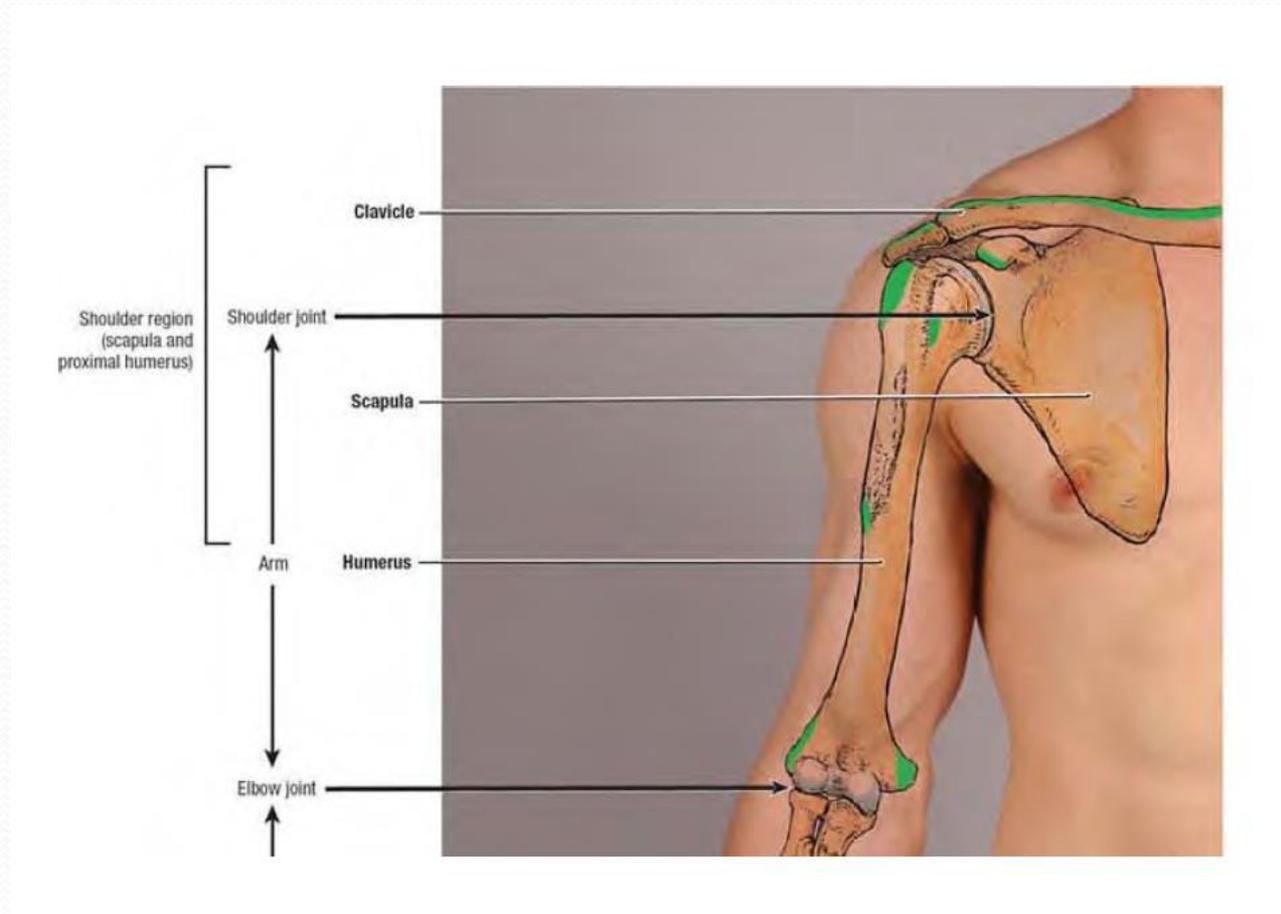
(C) Left venous angle Anterior view

Anterior (and slightly oblique) view

Clinical conditions related to mammary gland:

- **Witch's milk in newborn:** maternal & placental hormones cross placental barrier & cause **proliferation of duct epithelium** & the surrounding CT. This proliferation may cause swelling of breast in 1st week of life; in some cases a **milky fluid**, called **witch's milk**, may be expressed from nipples. It resolved spontaneously as maternal hormone levels in the child fall
- **Breast abscess:** infection of mammary gland occurs during **lactation**. Bacteria gain entrance to breast tissue through a crack in nipple. Because of presence of fibrous septa, infection remains localized to one lobe at which it begins. Abscesses should be drained through a **radial incision** to avoid spreading of infection into neighboring compartment .

Bones of the Shoulder Girdle and Arm

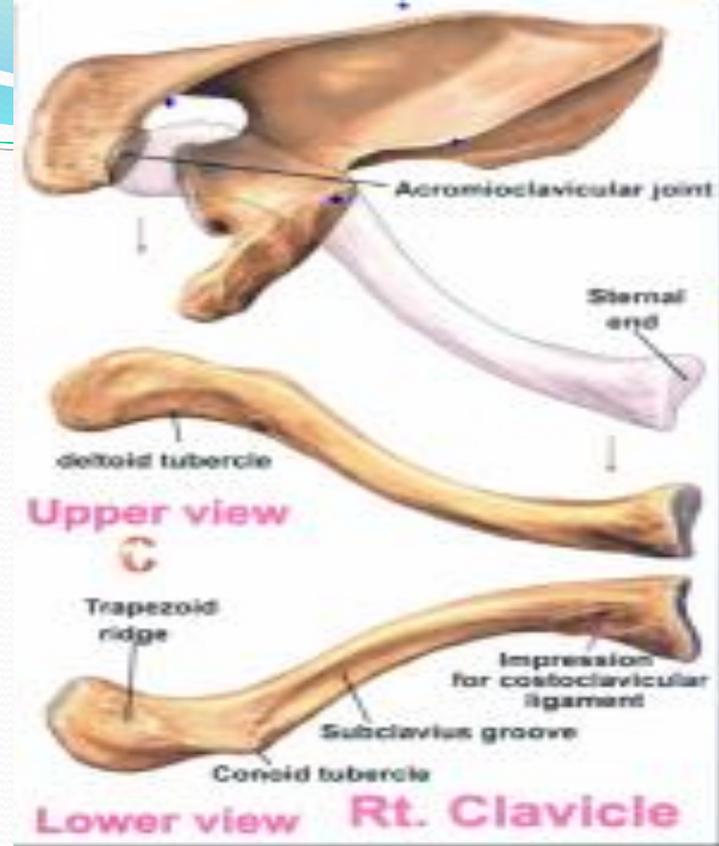


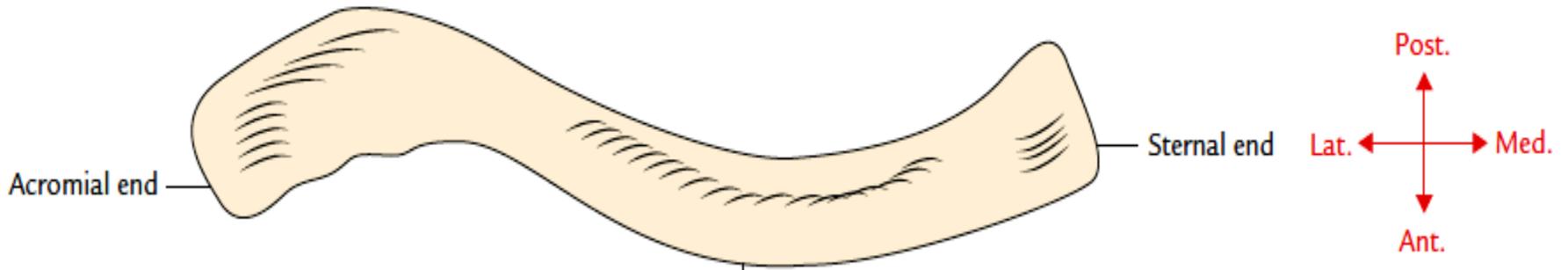
CLAVICLE

- The clavicle is a long, slender bone that lies horizontally across the root of the neck just beneath the skin.
- It articulates with the sternum and first costal cartilage medially and with the acromion process of the scapula laterally .
- The medial two thirds of the clavicle is convex forward and its lateral third is concave forward.

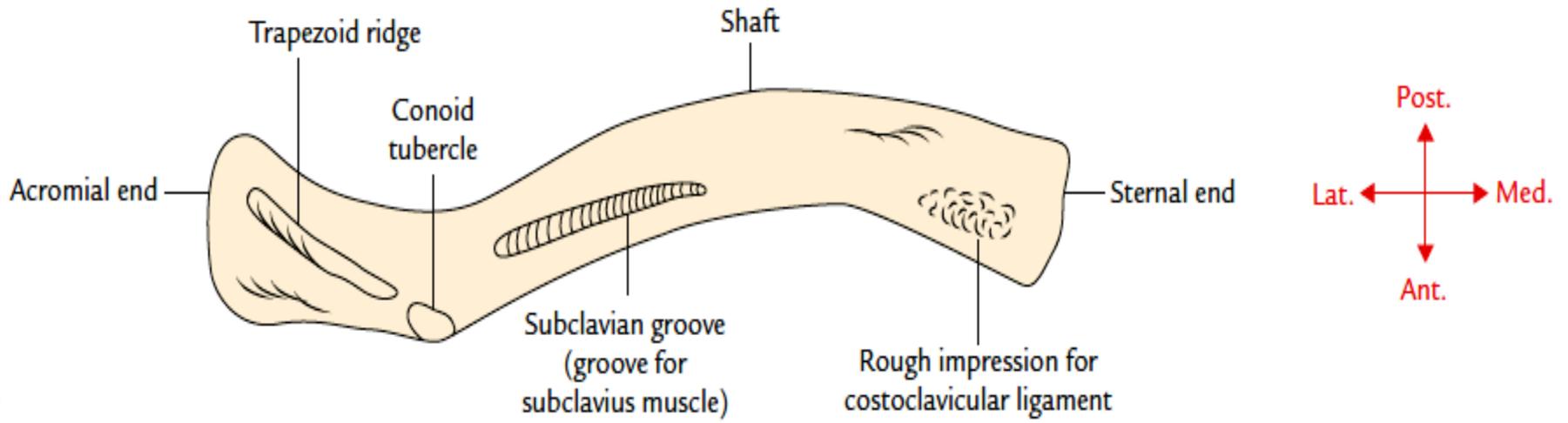
- The Clavicle (the collar bone)
- Site: It lies transversely at the root of the neck forming the anterior bone of the shoulder girdle .
- Is atypical long bone, as it is the only long bone which:
 - 1- Lies transversely in the body. Can be felt all through subcutaneously.
 - 2- Has no medullary cavity (the best design for force transmission).
 - 3- First bone to ossify by membranous ossification .
 - 4- The commonest bone to be fractured.

- **General features:** It has two ends and a shaft.
- A- Medial (sternal) end:
 - - Is large and prism-shaped.
 - - It articulates with manubrium sterni & 1st costal cartilage at the sternoclavicular joint.
- B- Lateral (acromial) end: It is flat, and articulates with the medial margin of acromion at acromioclavicular joint.
- c- The shaft: is divided into 2 parts:
 - a) The medial 2/3: It is cylindrical and convex forwards forming a room for passage of large vessels & nerves.
 - It has:
 - Anterior surface: Convex forwards.
 - Posterior surface: Concave backwards.
 - Superior surface: Is smooth.
 - Inferior surface: Has subclavius groove, costoclavicular tubercle & nutrient foramen.
 - b) The lateral 1/3: It is flat and concave forwards.
 - It has:
 - Anterior border: Concave forwards, it has deltoid tubercle.
 - Posterior border: convex backwards.
 - Superior surface: Smooth.
 - Inferior surface: Has conoid tubercle and trapezoid ridge (line)





A



B

Functions of the clavicle

- 1- It transmits weight of the limb to axial skeleton.
- 2- It protects vessels and nerves.
- 3- It carries UL away from the trunk to swing freely.
- How to determine the side:

We put the clavicle in anatomical position:

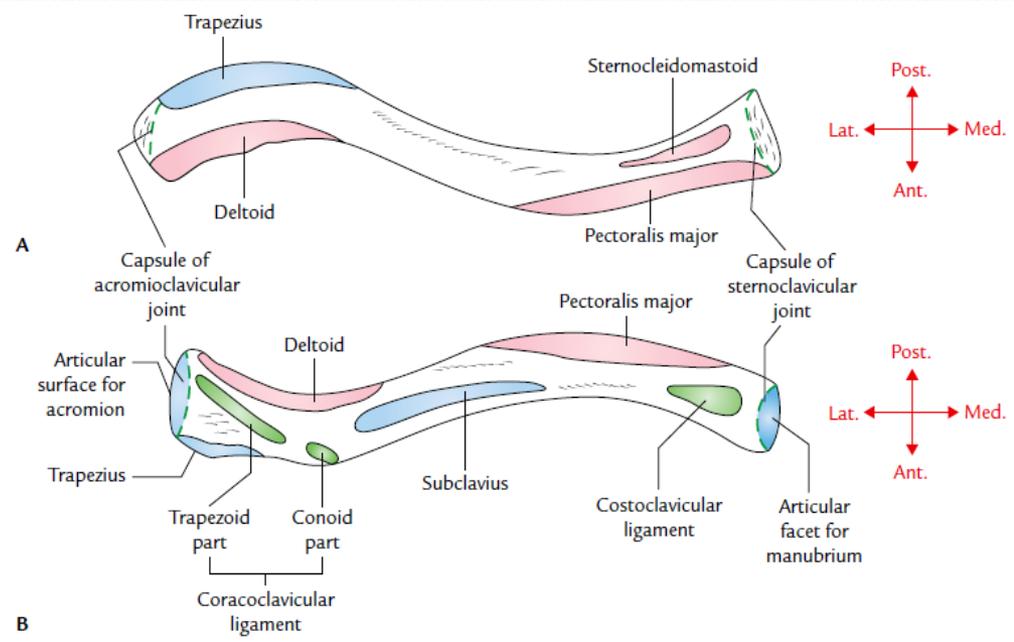
- Medial end is thick. - Lateral end is flat.
- Upper surface is smooth.
- Lower surface is rough.
- Medial 2/3 is convex anteriorly.
- Conoid tubercle is posterior

Applied anatomy :

- - The clavicle is the commonest bone to be fractured in the body.
- - The most common cause of fracture is indirect force as falling on outstretched hand.
- - The site of fracture is the junction of medial 2/3 & lateral 1/3: of the shaft. It is the weakest point as:
 - * It is a junction between 2 curvatures.
 - * It is a junction between 2 different cross sections.
 - * It is weakened by subclavius groove & nutrient foramen.
- - If fracture is medial to the coracoclavicular ligament, it is accompanied by drawing of the lateral fractured fragment downwards, the upper limb falls down.

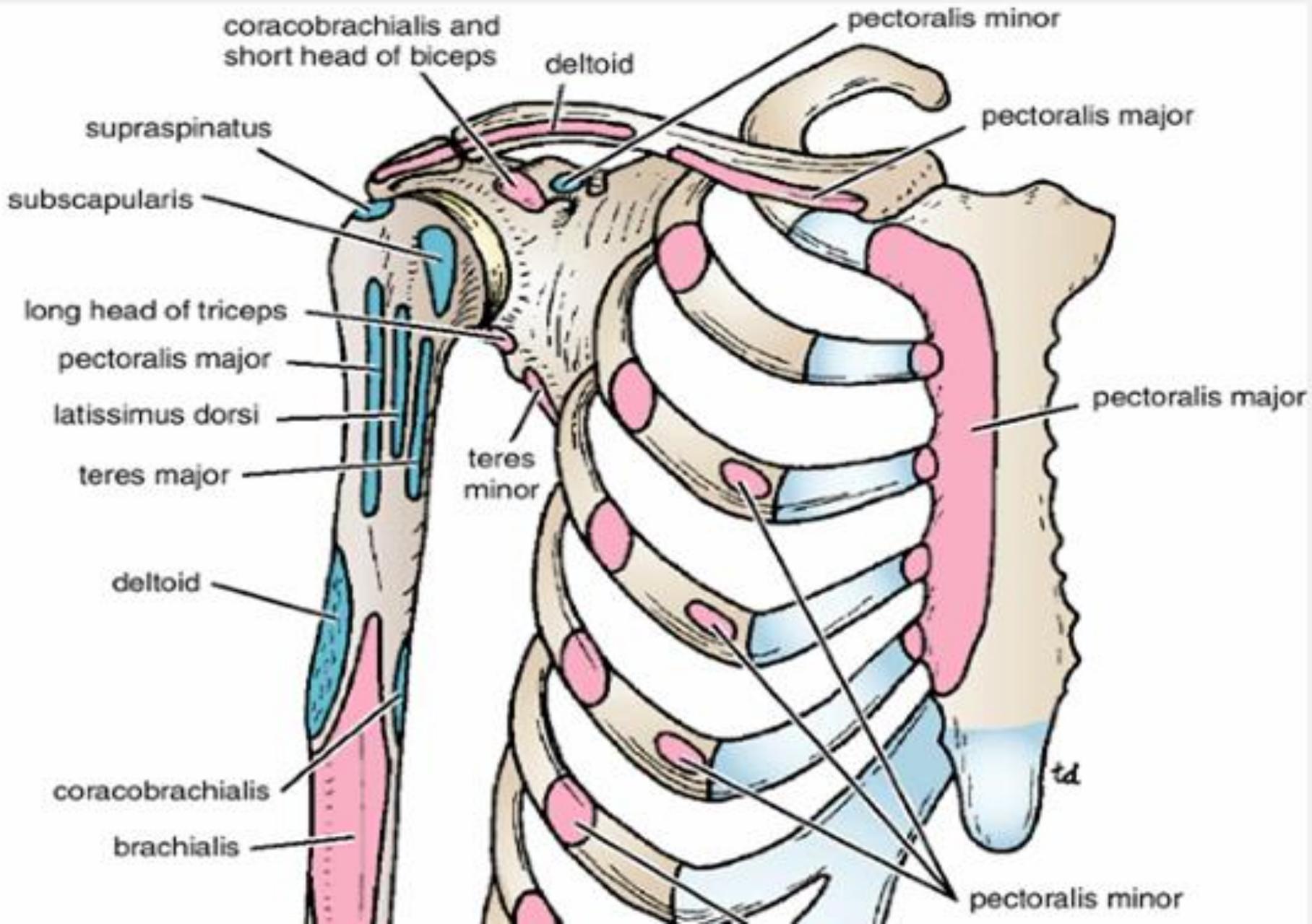
Muscular and ligamentous attachments

- **Three muscles take origin from the clavicle :**
 1. **Sternocleidomastoid**; from the superior surface medially.
 2. **Pectoralis major**; from the medial ½ of the shaft.
 3. **Deltoid**; from the lateral part of the shaft.



- **Two muscles are inserted:**
 1. **Trapezius**; to the posterior border laterally.
 2. **Subclavius**; to the inferior surface medially.

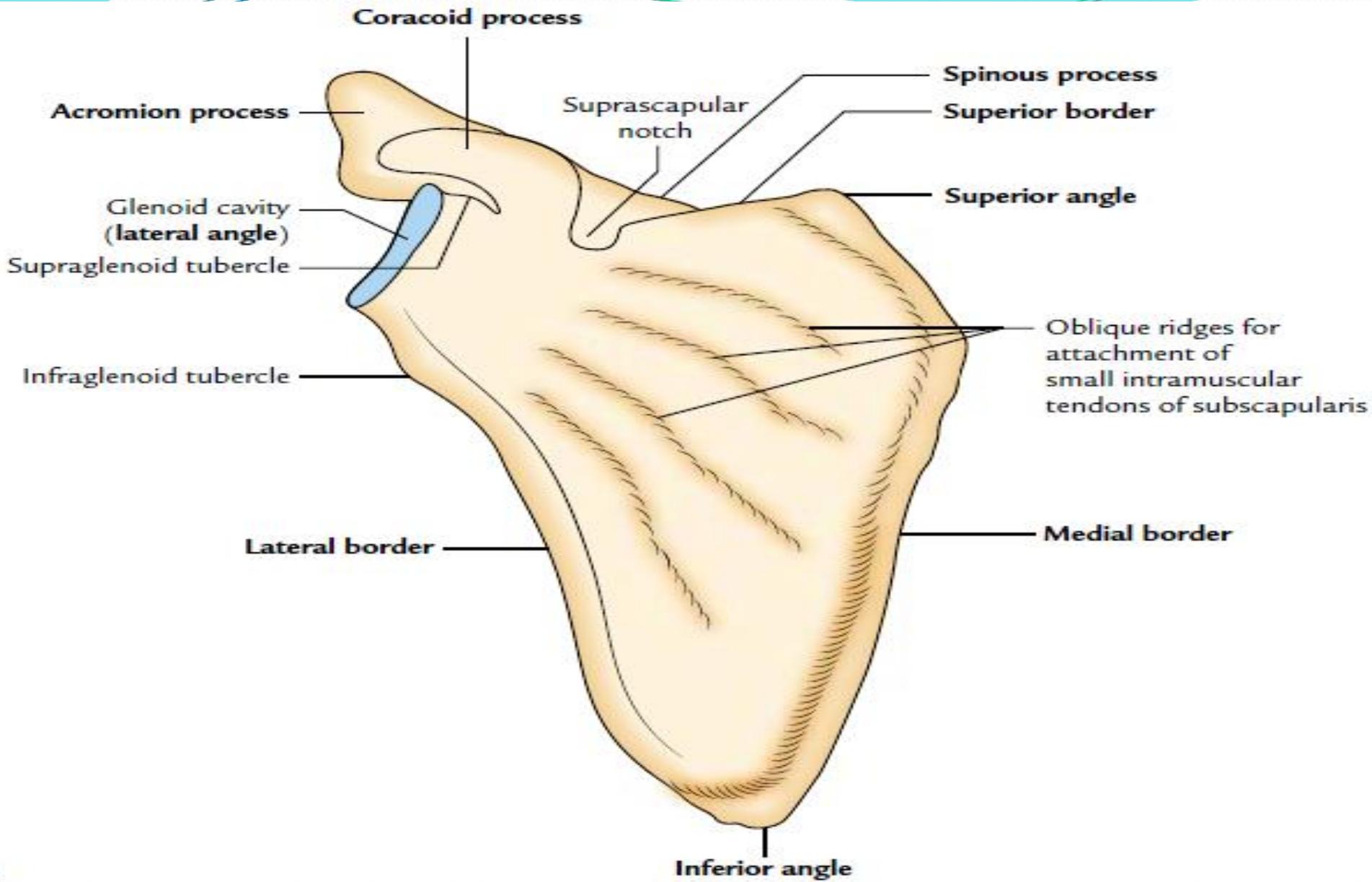
- **Two ligaments attach to the clavicle :**
 1. The **costoclavicular ligament** from the first costal cartilage.
 2. The **coracoclavicular ligament** consists of 2 parts;
 - The **trapezoid part** attaches to the inferior surface laterally .
 - The **conoid part** attaches to the **conoid tubercle**.

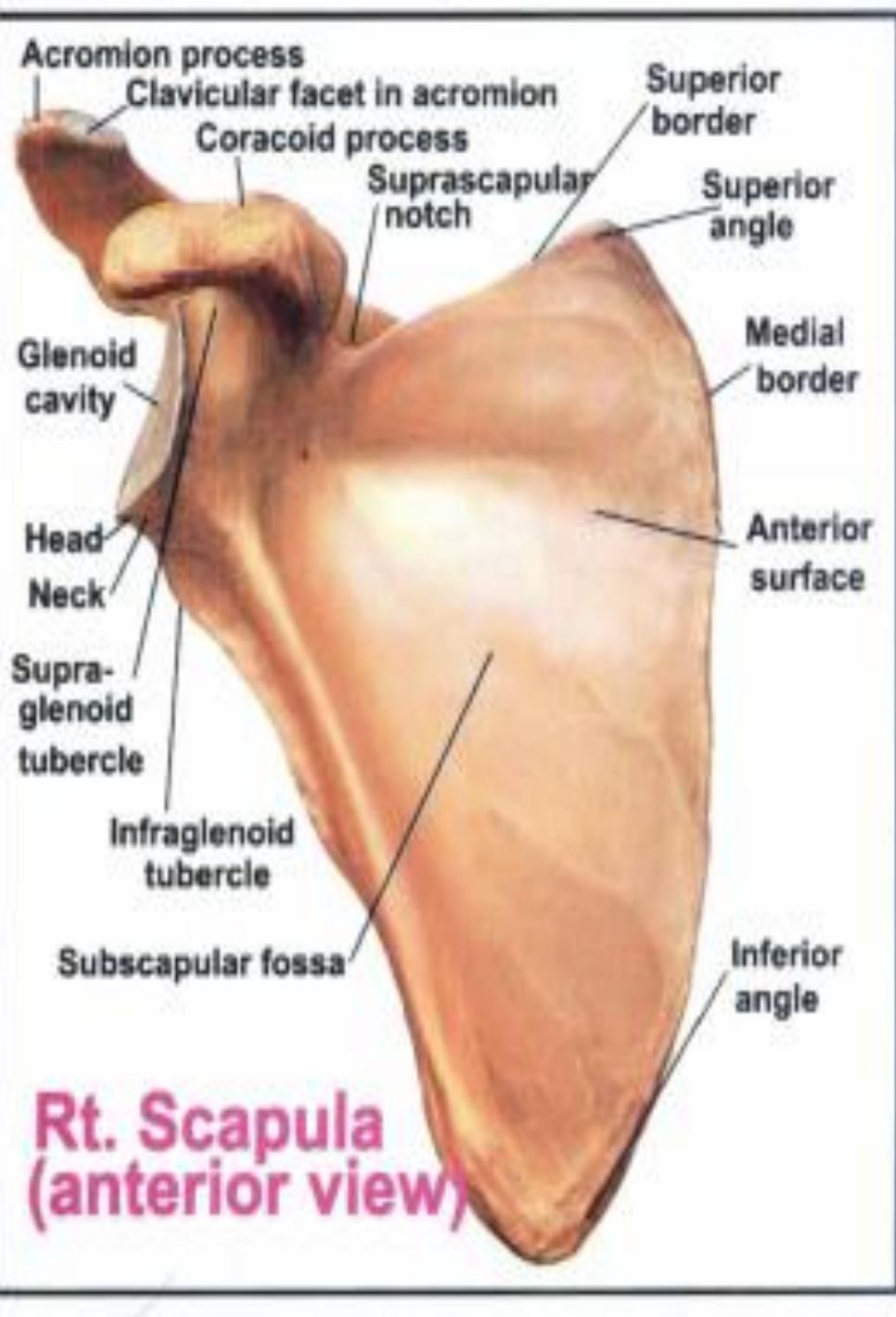
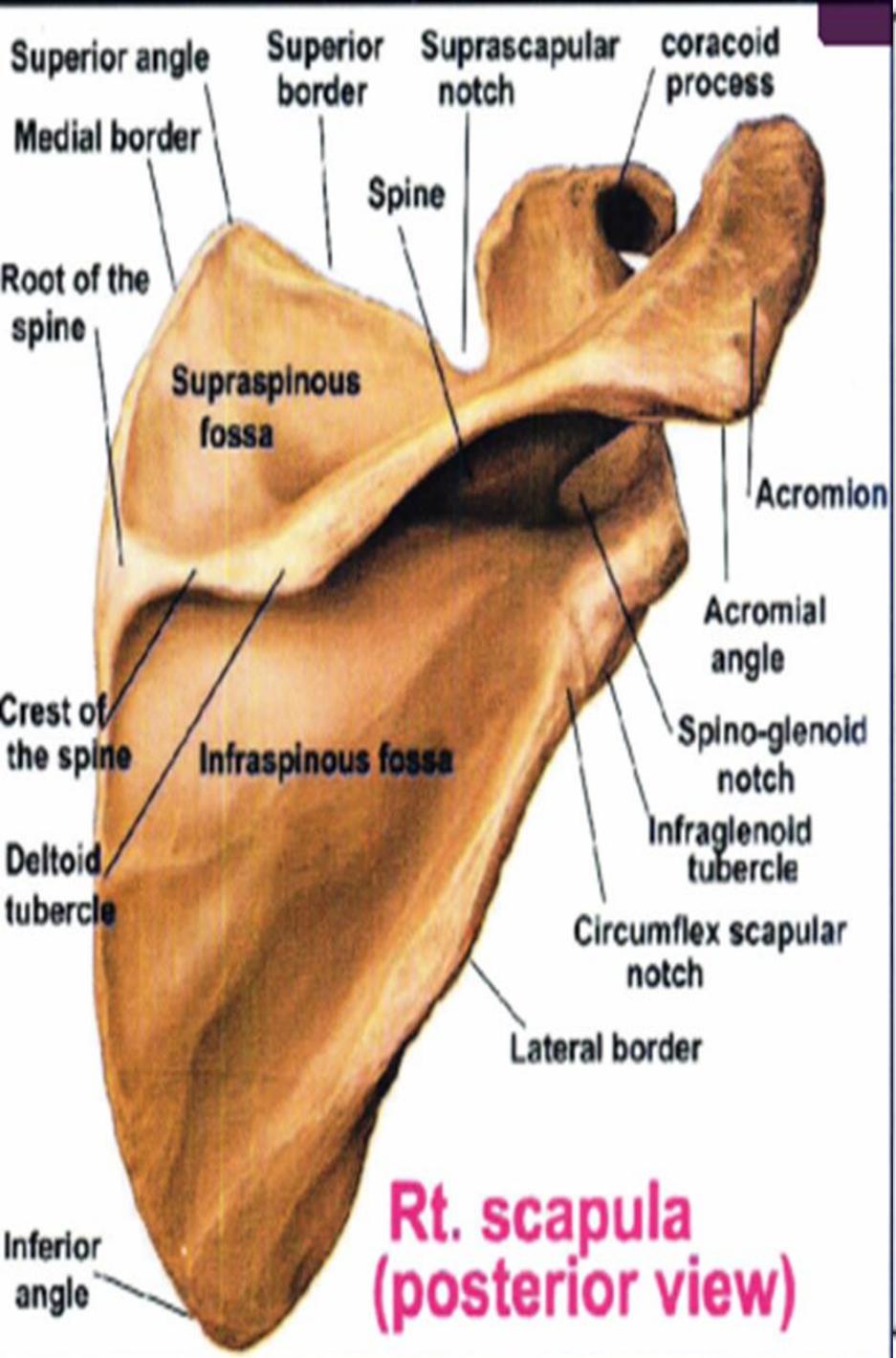


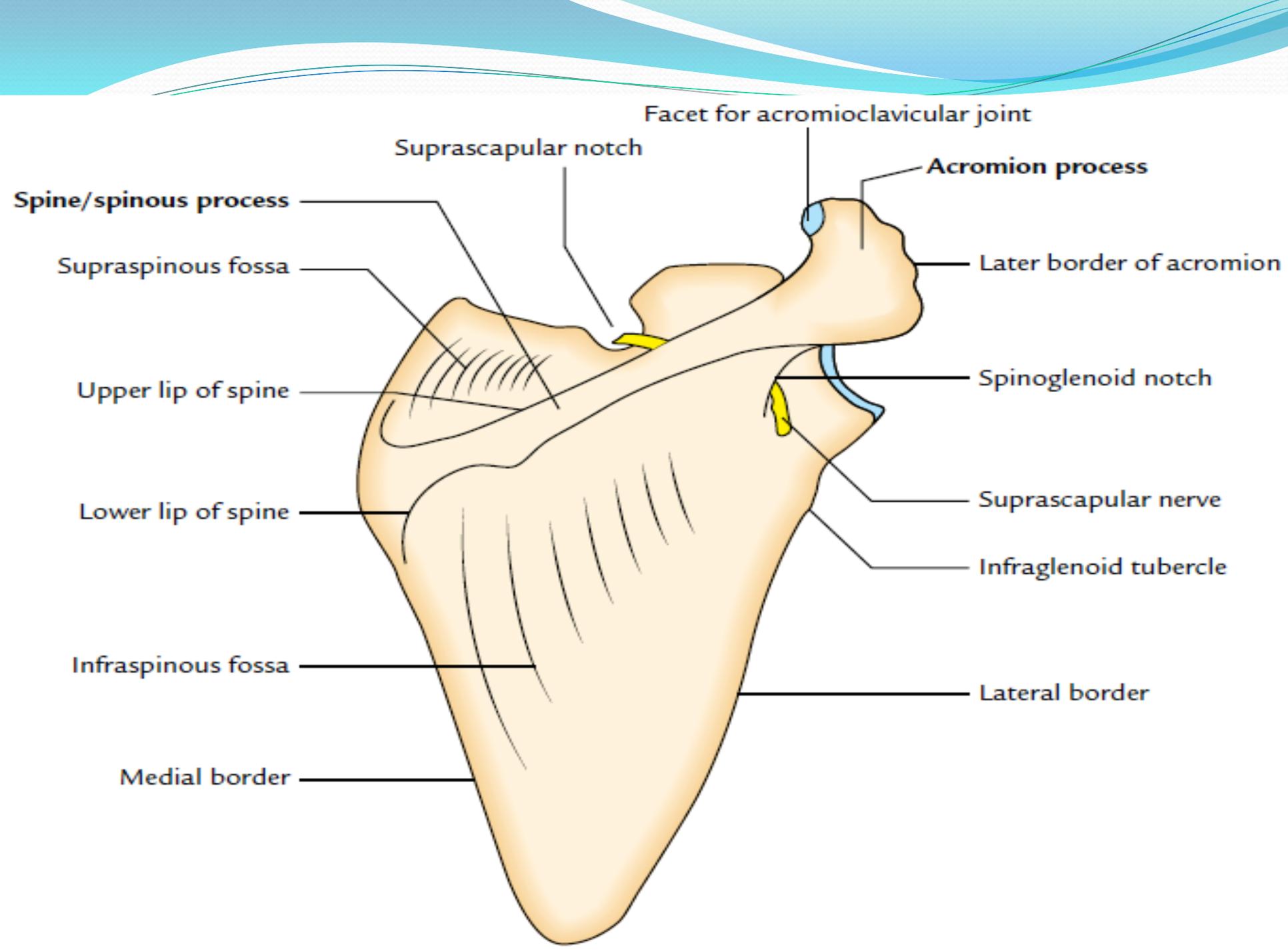
Scapula

- The scapula is a **flat triangular** bone that lies on the **posterior** chest wall between the **2nd** and **7th** ribs. Scapula consist of :
 - 2 surface(anterior or costal surface) directed forward medially and (posterior or dorsal surface) directed backward laterally
 - 3 border(sharp and short upper border), thin medial or vertebral border) and (thick lateral border)
 - 3 angle[Superior angle opposite(2nd rib or 2nd thoracic spine), (inferior angle opposite(7th rib or 7th intercostal space) and lateral angle
 - 3 fossae(supscapular, supraspinatus and infraspinatus)fossae
 - 3 bony process (spine ,coracoid and acromion)process
 - 3 notches(suprascapular, spinoglenoid and circumflex scapular notch
 - 3 tubercle(supraglenoid tubercle, infraglenoid tubercle and deltoid tubercle

- On its posterior surface, the **spine** of the scapula projects backward. The lateral end of the spine is free and forms the **acromion process**, which articulates with the clavicle at the **acromioclavicular** joint.
- The superolateral angle of the scapula forms **glenoid cavity**, which articulates with the head of the humerus at the **shoulder** joint.
- The **coracoid** process projects upward and forward above the glenoid cavity and provides attachment for muscles and ligaments.
- Medial to the base of coracoid process is the **suprascapular** notch.
- The **anterior** surface of the scapula is **concave** and forms the shallow **subscapular** fossa.
- The **posterior** surface of the scapula is divided by the spine into the **supraspinous** fossa above and an **infraspinous** fossa below







Muscular and ligamentous attachments

- Muscles inserted into scapula (from trunk to medial border)

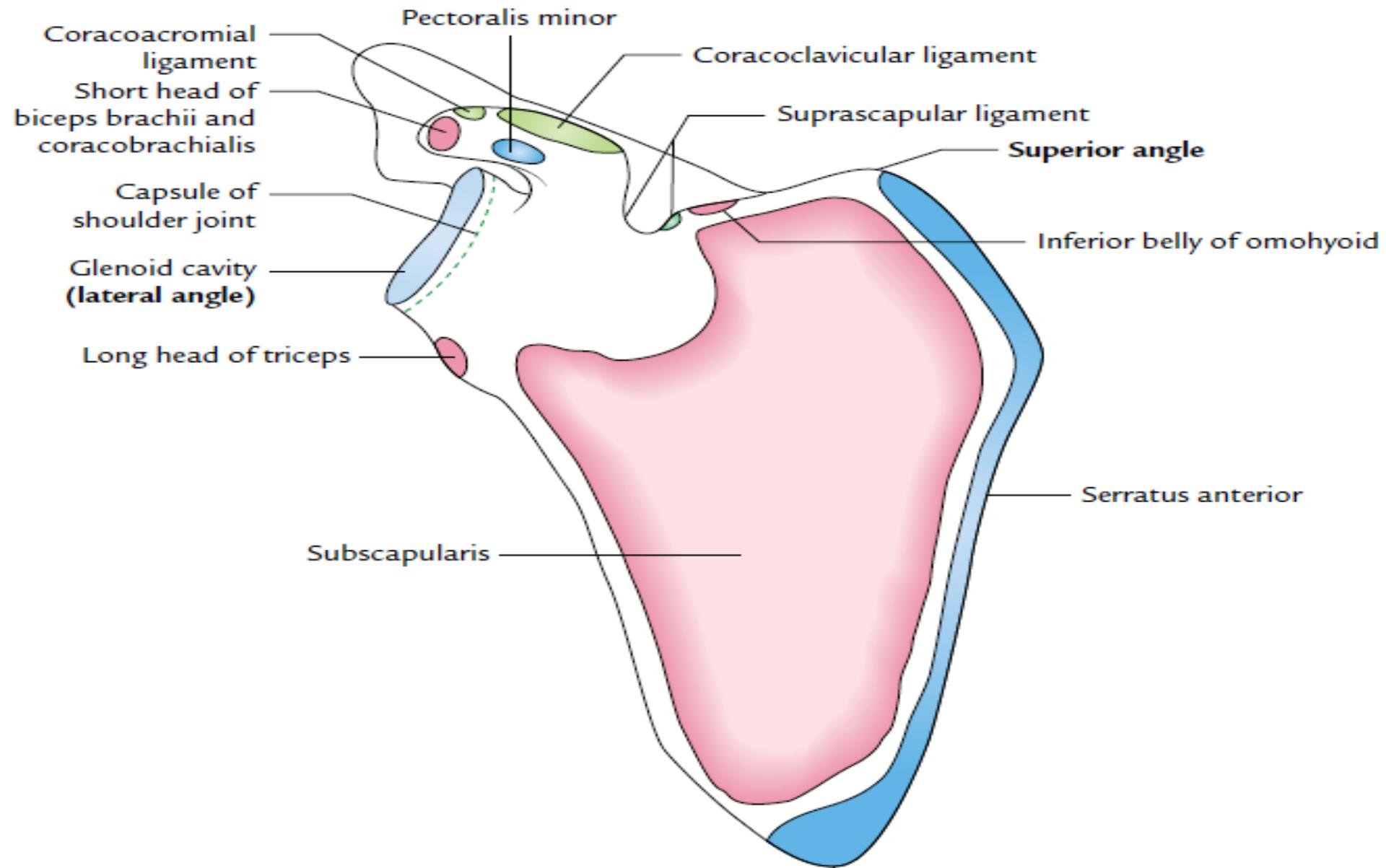
- Serratus anterior.
- Levator scapulae.
- Rhomboid minor.
- Rhomboid major.
- Trapezius.
- Pectoralis minor.
- Latissimus dorsi.

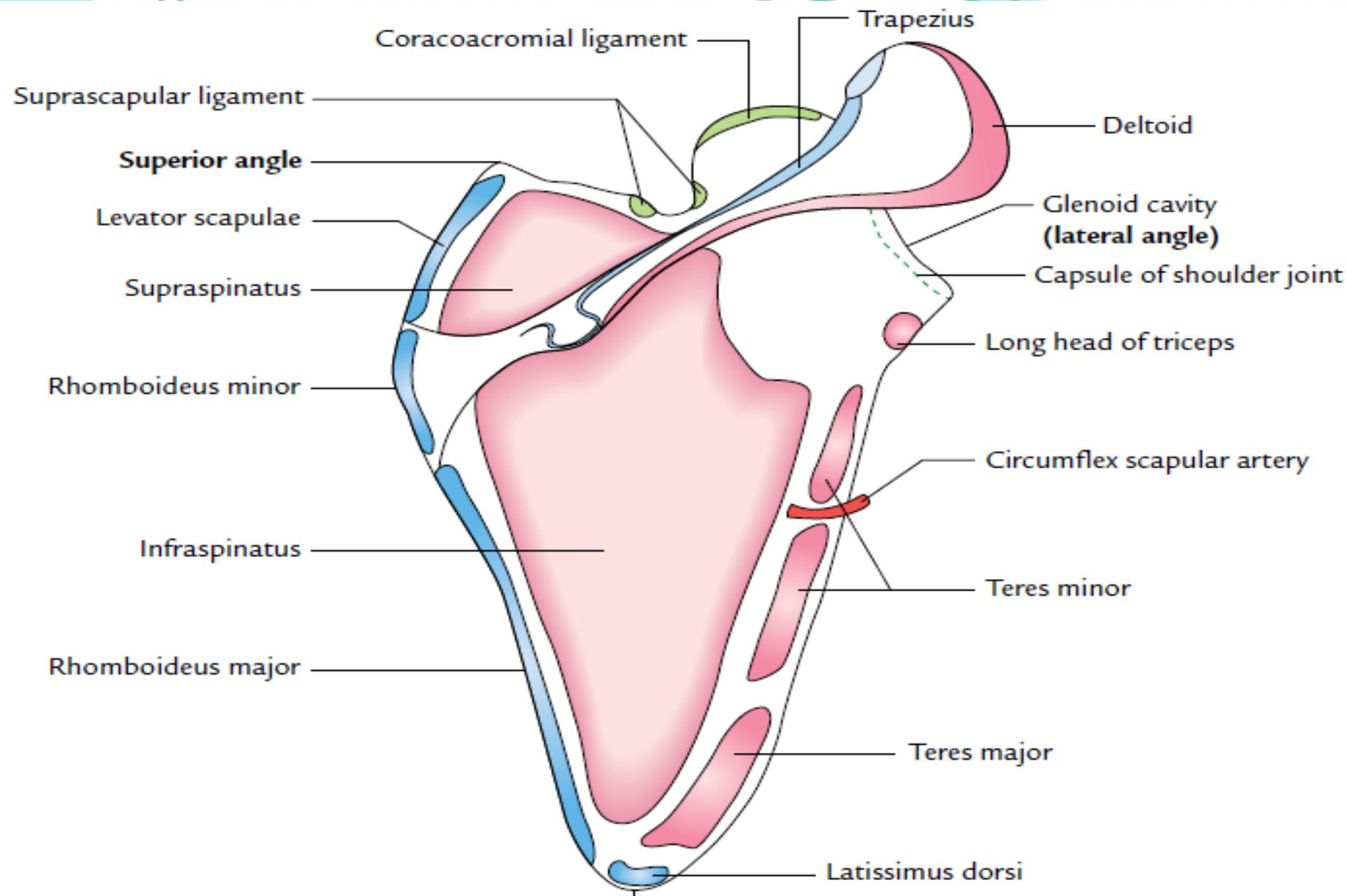
- Muscles origin from scapula (surfaces and lateral border)

- Subscapularis.
- Supraspinatus.
- Infraspinatus.
- Teres minor. Teres major.
- Long & Short head of biceps.
- Long head of triceps. Deltoid.
- Coracobrachialis. Omohyoid.

- Ligaments attached to the scapula include;

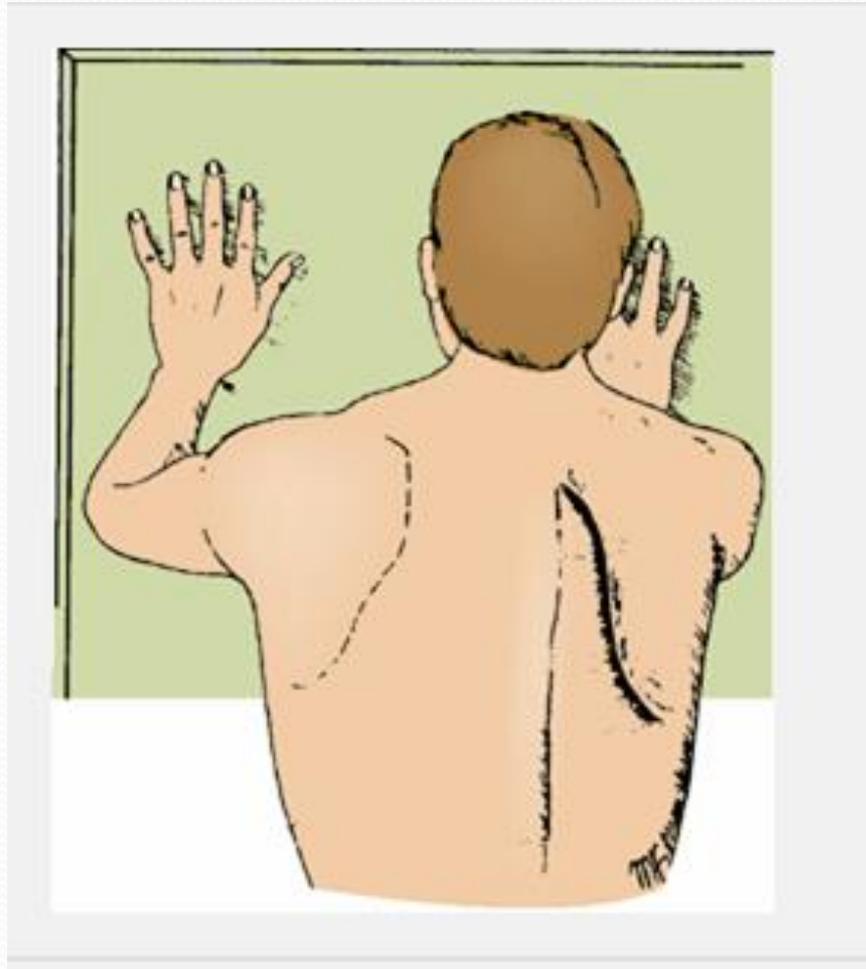
- Coracoclavicular ligament; from coracoid process to the clavicle.
- Glenohumeral ligaments.
- Coracohumeral ligament.
- Coracoacromial ligament; between coracoid process and acromion.





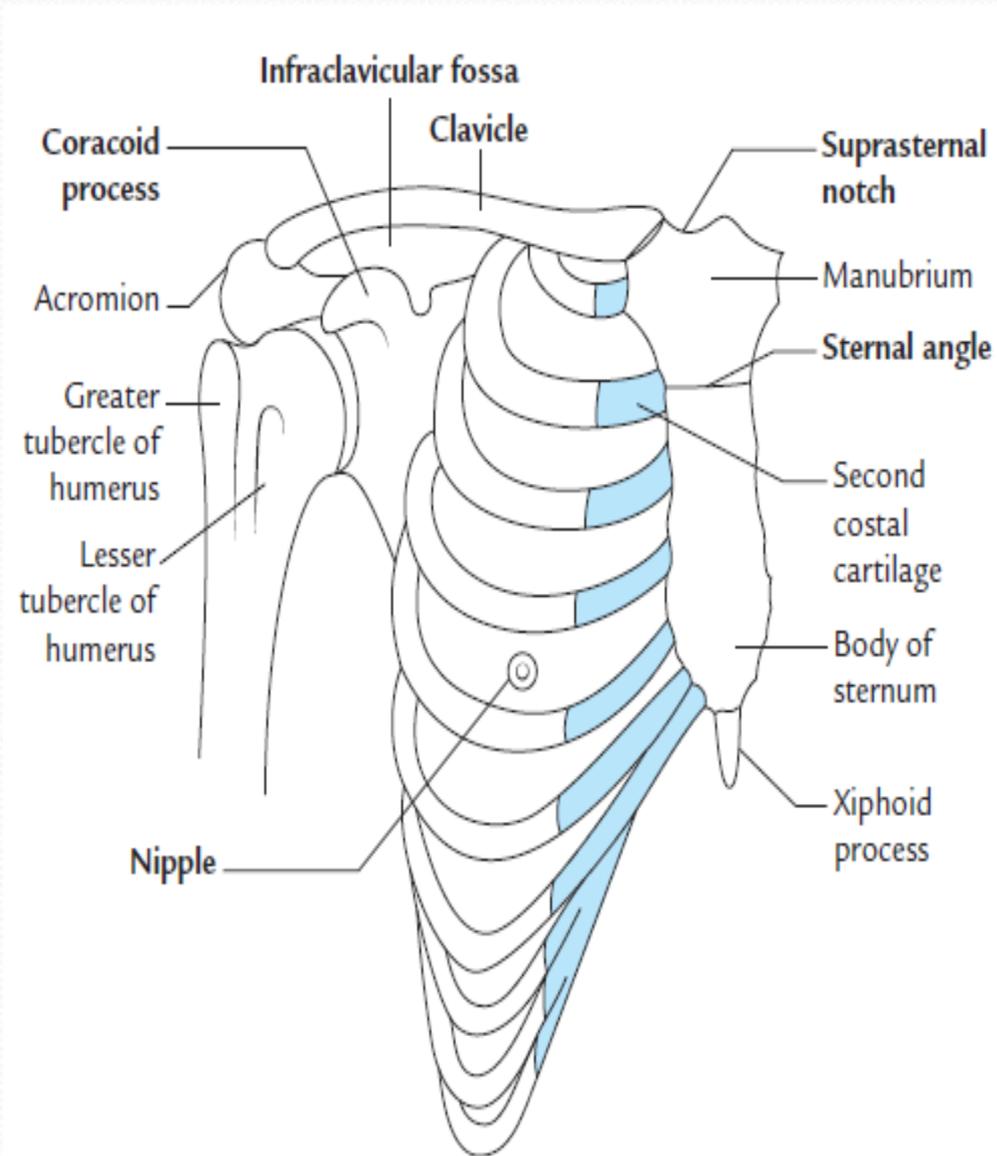
Clinical Notes

- **Fractures of the Scapula**
- Fractures of the scapula are usually the result of severe trauma, such as occurs in run-over accident victims or in occupants of automobiles involved in crashes. Injuries are usually associated with fractured ribs. Most fractures of the scapula require **little treatment** because the muscles on the anterior and posterior surfaces adequately splint the fragments.
- **Dropped Shoulder and Winged Scapula**
- The position of the scapula on the posterior wall of the thorax is maintained by the tone and balance of the muscles attached to it. If one of these muscles is paralyzed, the balance is upset, as in dropped shoulder, which occurs with paralysis of the **trapezius**, or winged scapula, caused by paralysis of the **serratus anterior**. Such imbalance can be detected by careful physical examination.



The following landmarks can be felt on the surface of the body in the pectoral region

1. **Clavicle** is palpable.
2. **Suprasternal notch** (jugular notch).
3. **Infraclavicular fossa** is a triangular depression below the junction of middle and lateral third of the clavicle.
4. **Coracoid process:** The tip of coracoid process is felt in the infraclavicular fossa, 2.5 cm below clavicle.
5. **The acromion.**
6. **Nipple.**



Thank You & Good Luck

