Breast 1

(Anatomy, Development and Physiology)

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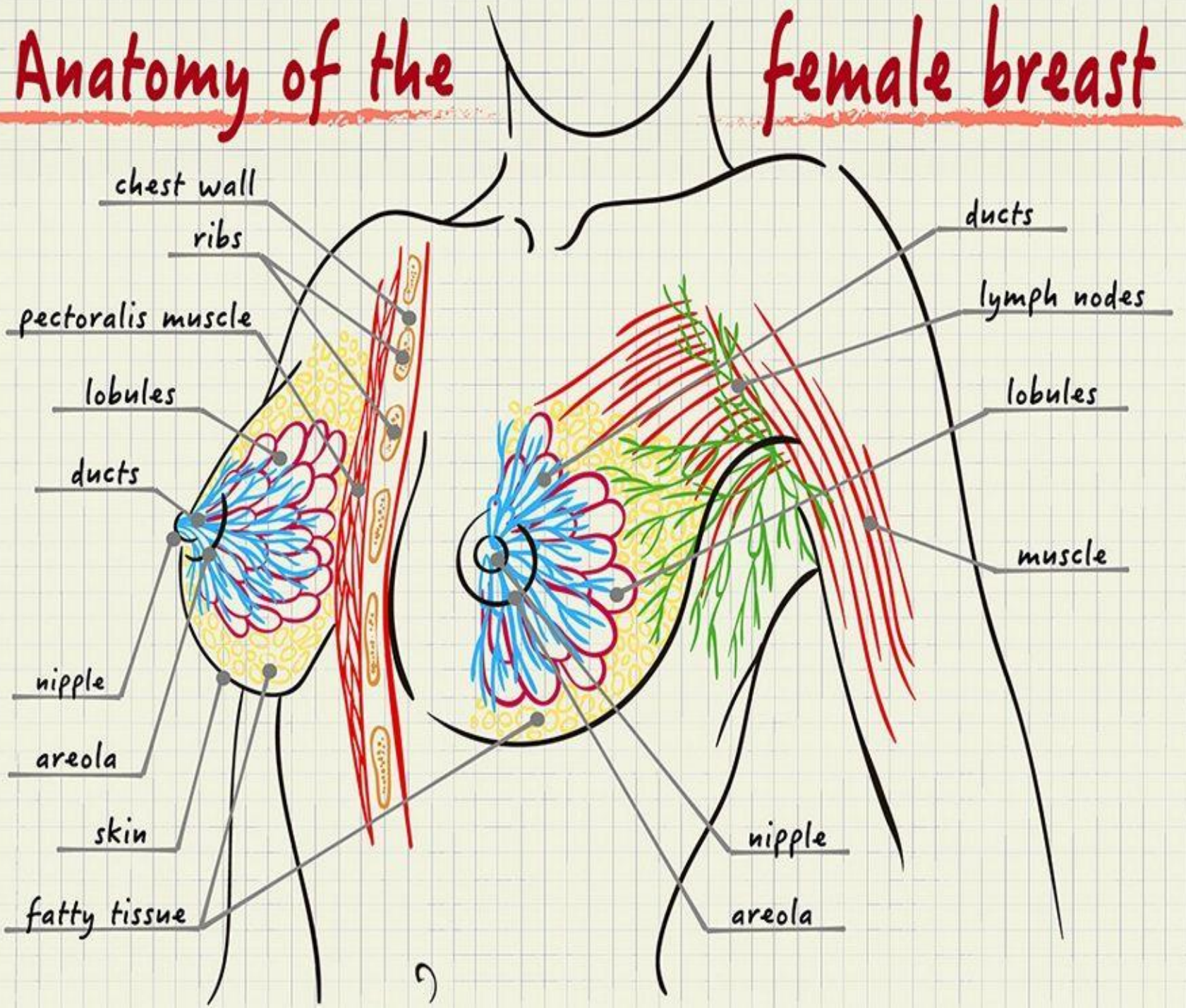
OBJECTIVES

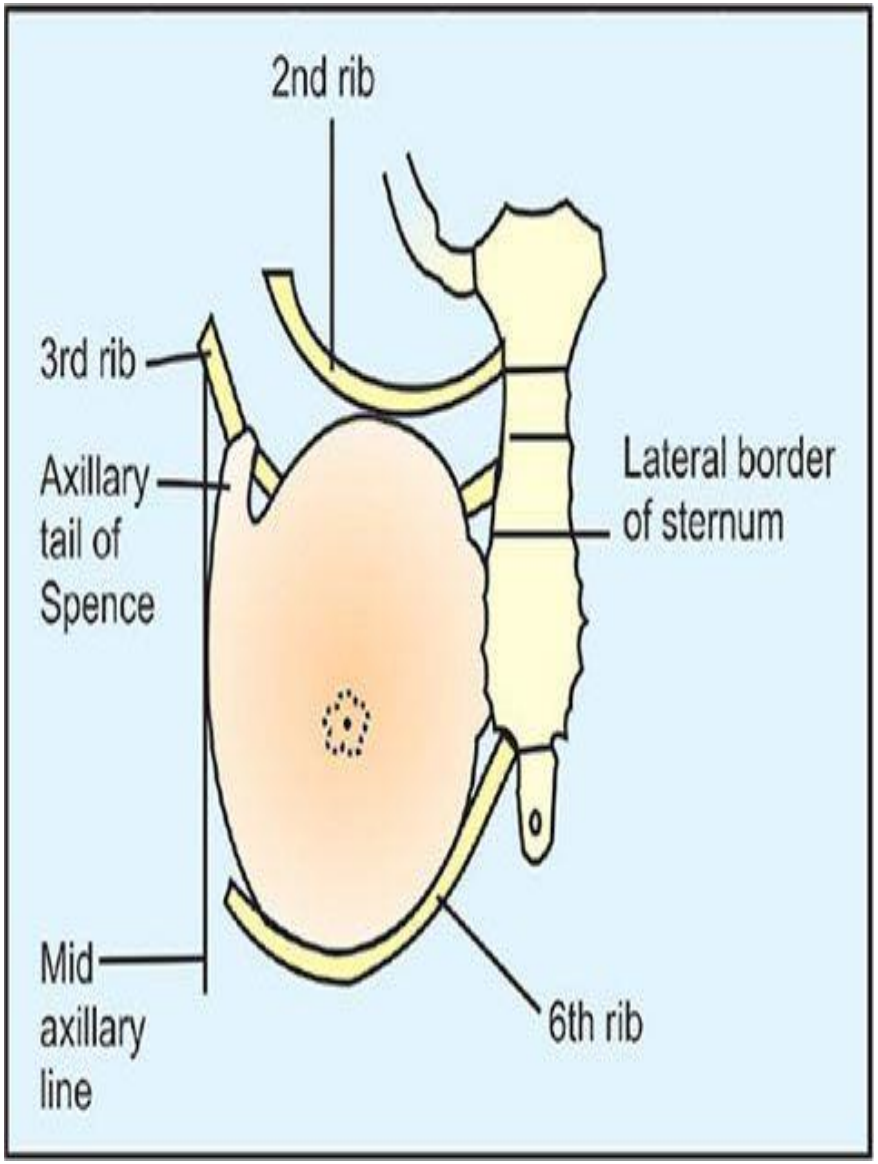
By the end of the lecture, you should be able to identify and describe :

- The **position** of the breast.
- The **structure** of the breast.
- The **blood supply, venous** and **lymphatic drainage** of the breast.
- The **Development** of the Breast during Embryology Life, Puberty, Pregnancy and Lactation.
- The **Physiology** of the Breast, also, **Hormonal Effects** on Breast.

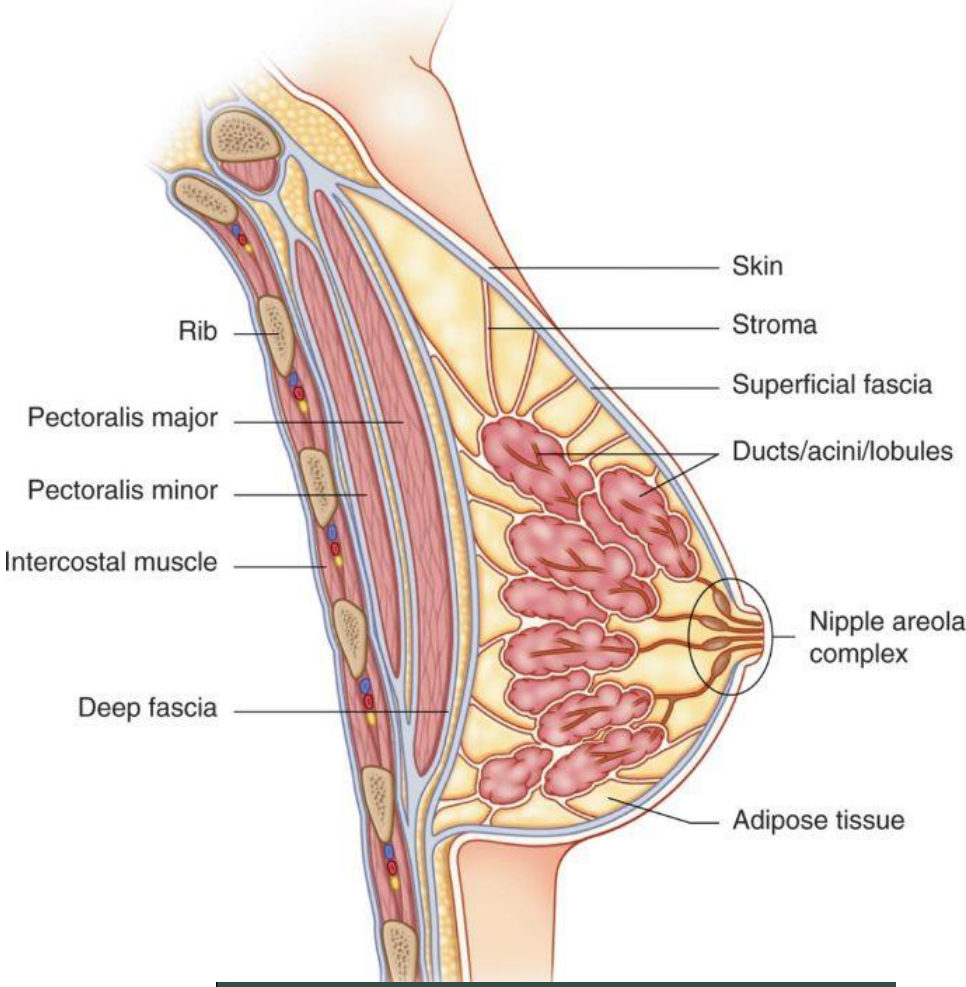
Anatomy of the female breast

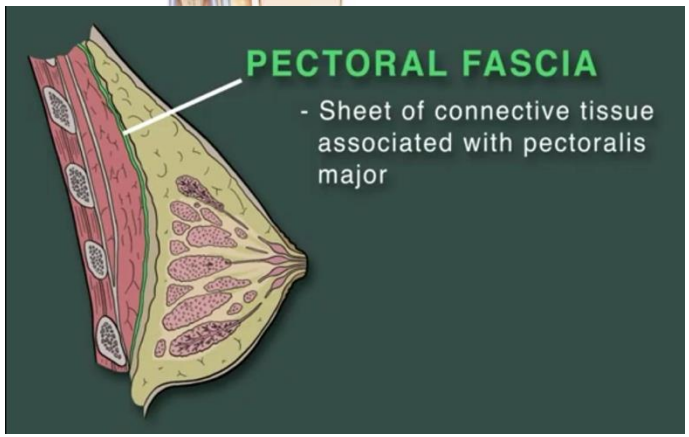


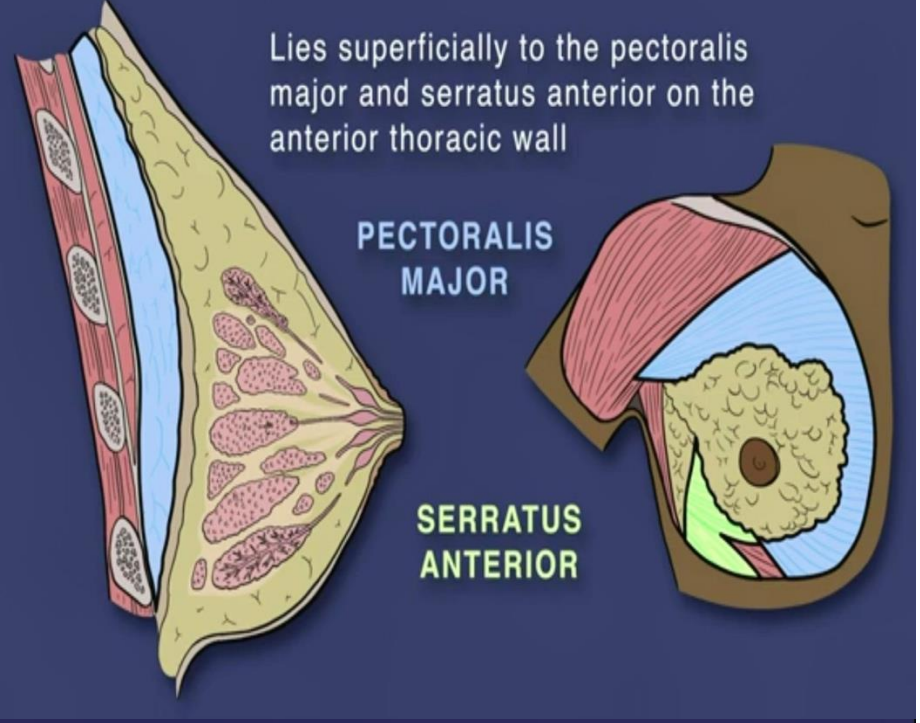
Location & Extent

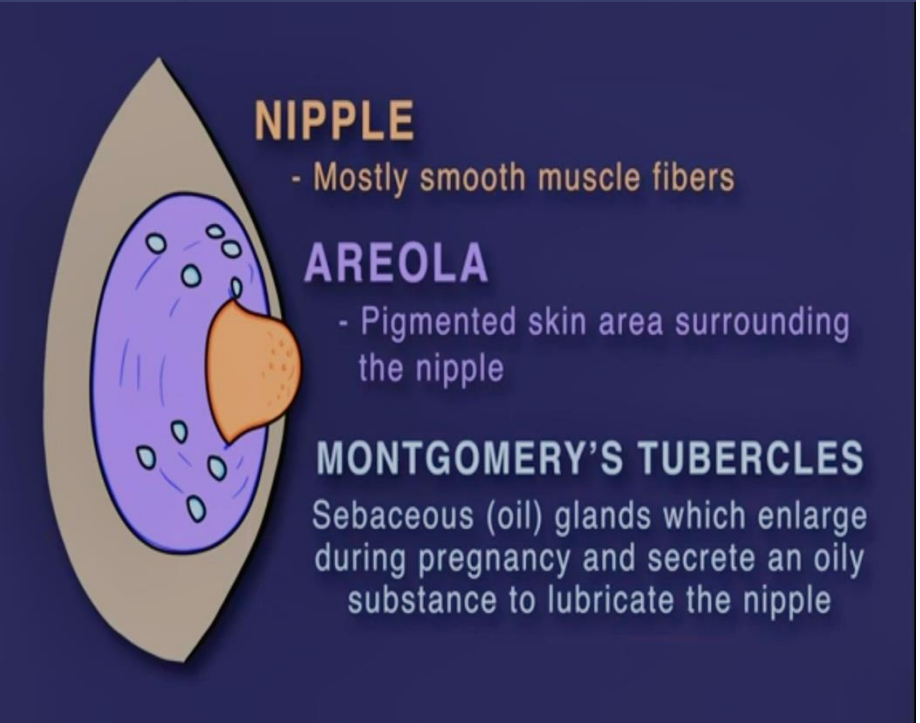


- **Situated within the** superficial pectoral fascia**.**
- **The superficial fascia** splits **to enclose the breast to form the anterior and posterior lamellae.**
- **It has a base, apex and tail.**
- **Its base extends from** 2nd to 6th ribs**.**
- **It extends from the** sternum medially **to** the midaxillary line laterally**.**









* 2/3 of its base (superiomedially) lies on the pectoralis major muscle, while its inferolateral 1/3 lies on:

Serratus anterior & External oblique muscles.

* Its superolateral part sends a process into the axilla called the *axillary tail or axillary process.*

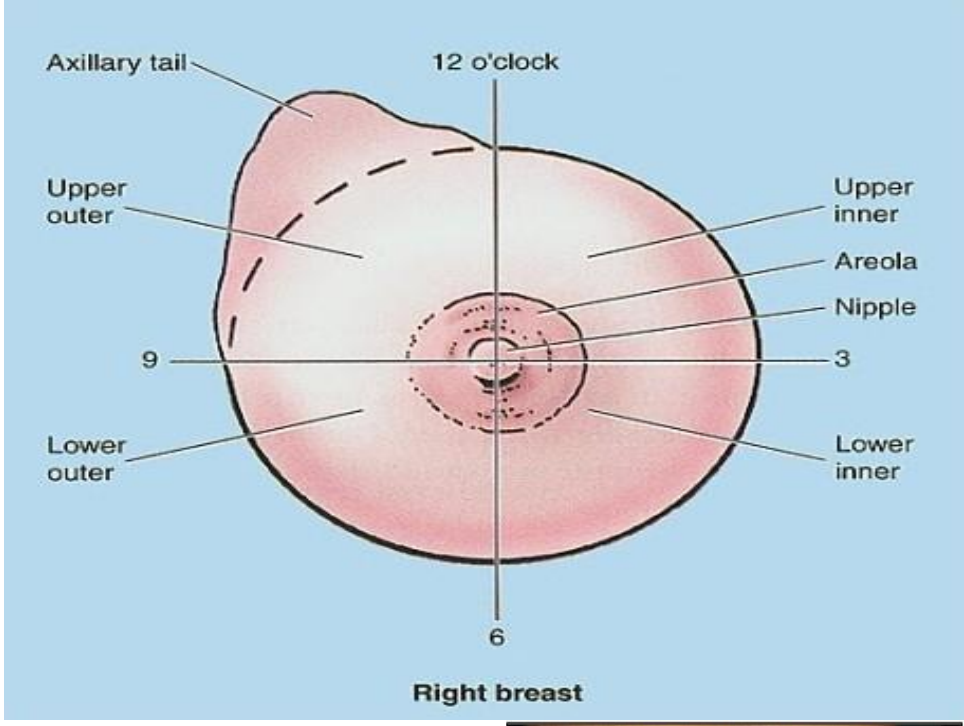
** Nipple: It is a conical eminence that projects forwards from the anterior surface of the breast. The nipple lies opposite 4th intercostal space.*

** Areola :*

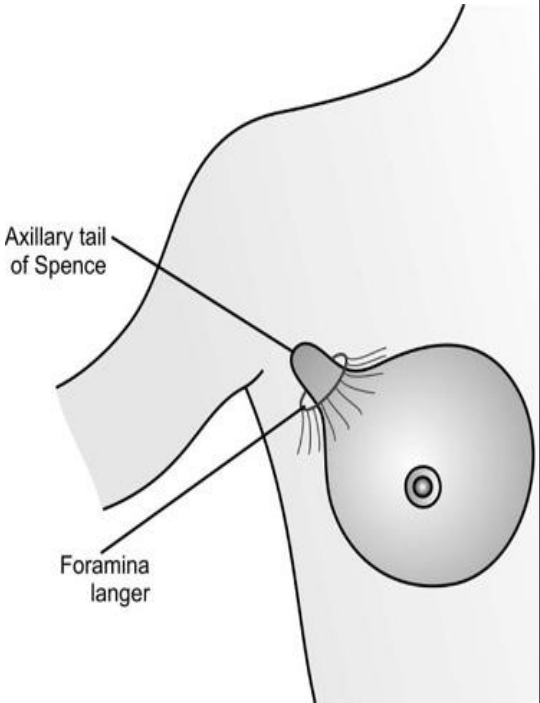
It is a dark pink brownish circular area of skin that surrounds the nipple.

Each breast is divided into four quadrants, with the nipple and areola at the centre:

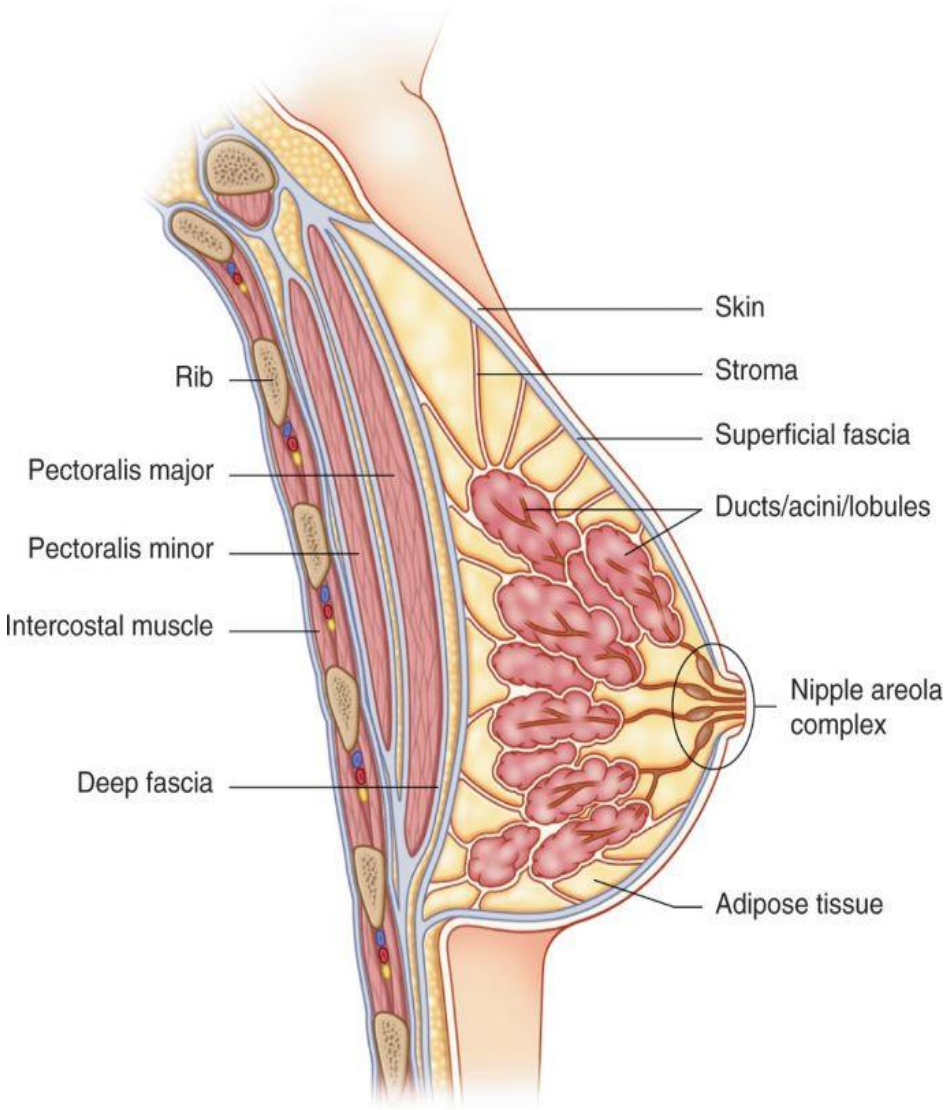
UOQ: Upper outer quadrant (superior and lateral)
LOQ: Lower outer quadrant (inferior and lateral)
LIQ: Lower inner quadrant (inferior and medial)
UIQ: Upper inner quadrant (superior and medial)
Plus
Axillary tail (Tail of Spence)



The axillary tail (tail of Spence) is a prolongation of the upper and outer quadrants of the breast towards the axilla.
This tail *passes under the axillary fascia (through the foramen of Langer) and may be mistaken for enlarged lymph nodes*.

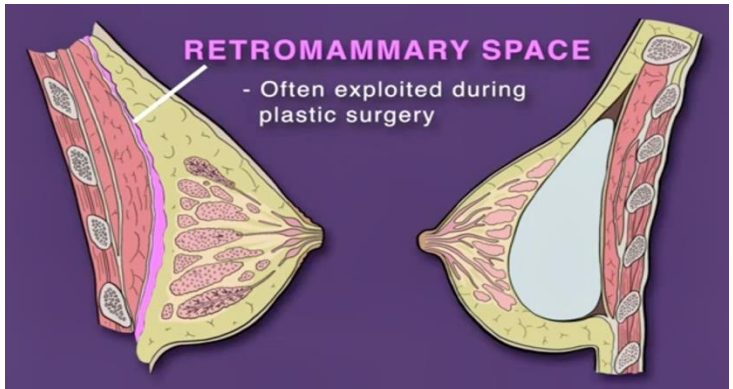


Structure of Breast



It is *non capsulated modified sweat apocrine* gland.

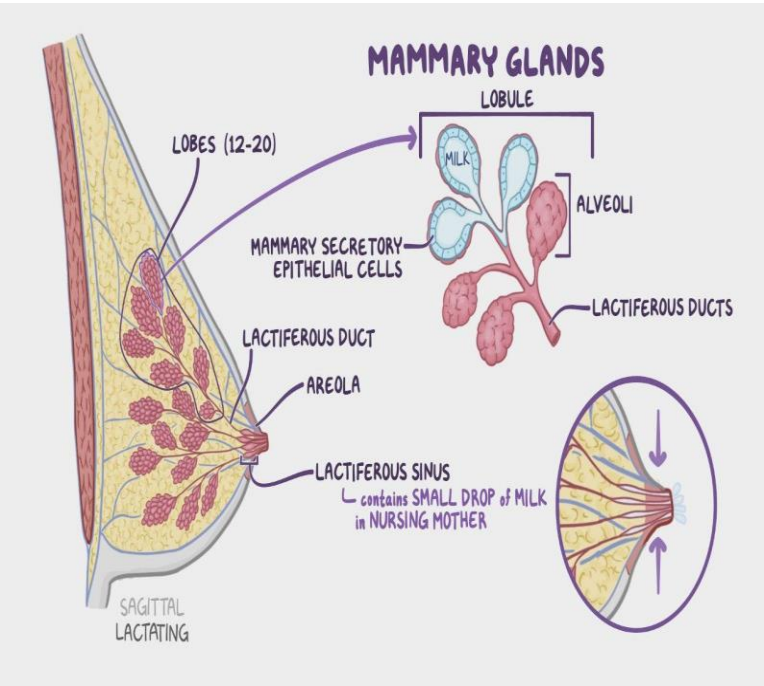
- It consists of lobes and lobules which are embedded in the subcutaneous fatty tissue of superficial fascia.
- It has fibrous strands (ligaments of cooper) which connect the skin with deep fascia of pectoralis major.
- It is separated from the deep fascia covering the underlying muscles by a layer of loose areolar tissue which forms the retromammary space. Its *Importance* is allowing breast to move freely.

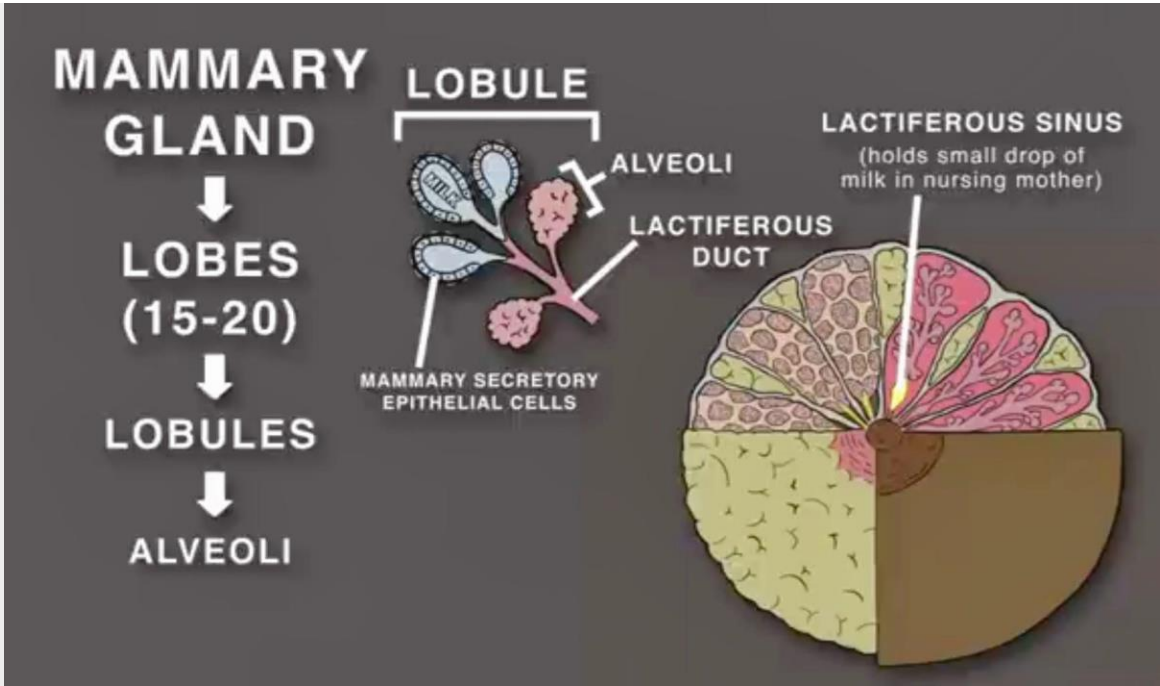


- **Each breast is formed of 12-20 lobes.**
- **Each lobe is formed of a number of lobules.**
- **The lobes and lobules are separated by interlobar and interlobular fibrous & fatty tissue, called** ligaments of Cooper.
- **Importance of** These ligaments give the breasts support by connecting the skin of the breasts to the pectoralis muscles below them **by attaching to deep pectoral fascia.**

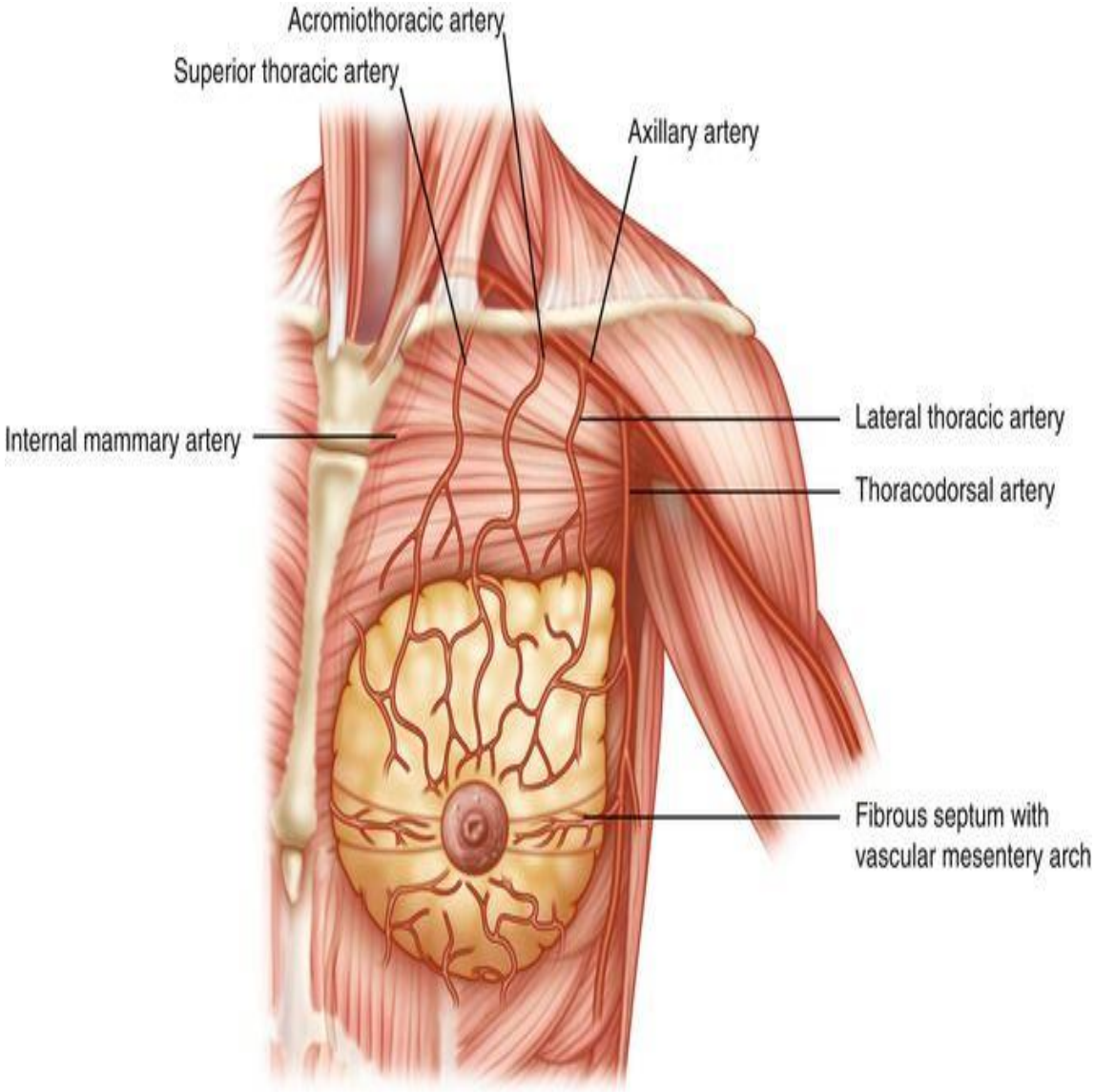
** **So,** *Infiltration of the ligaments of Cooper by breast cancer leads to its shortening giving* ***peaude'orange appearance*** *of the breast.*

It has from 15-20 lactiferous ducts **which open by the same number of openings on the summit of the nipple.**





Arterial Supply of Breast



- Arterial supply by :

1. Perforating branches of **internal thoracic (internal mammary) artery.**

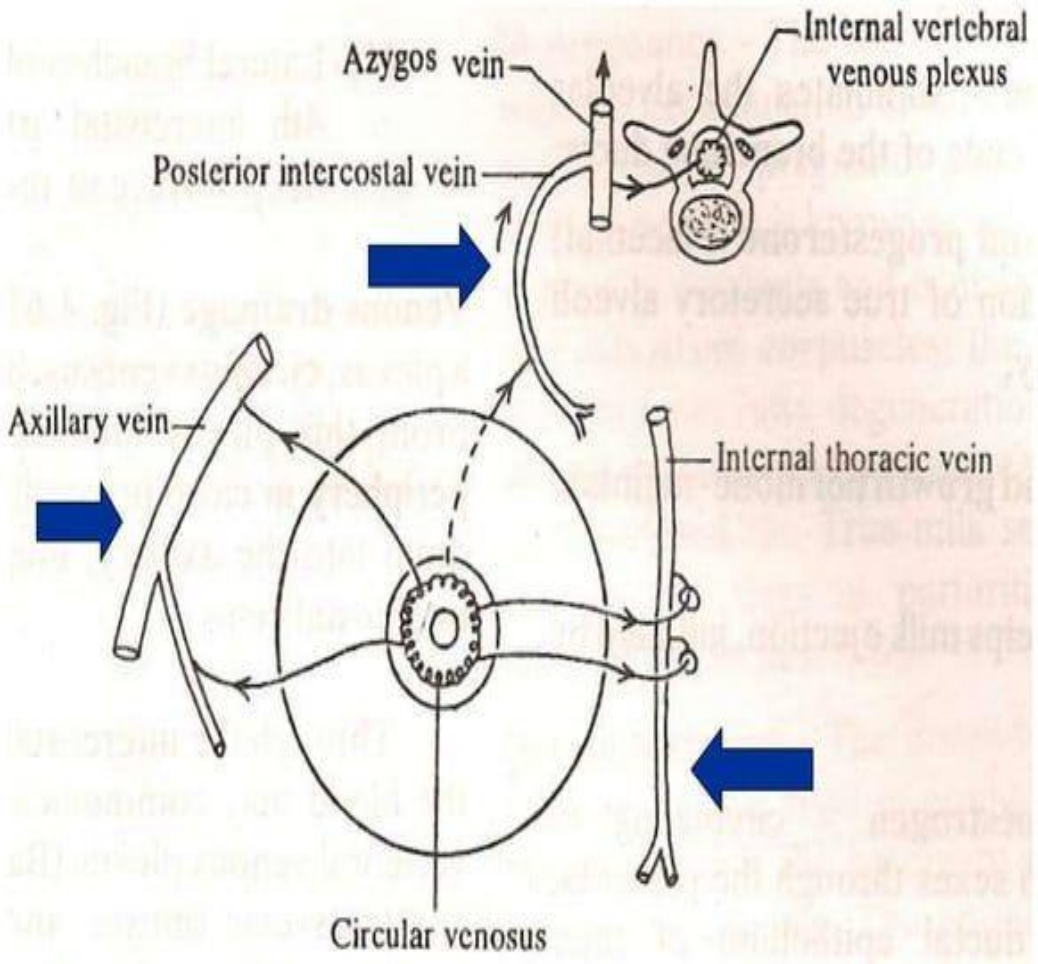
2. Mammary branches of superior thoracic Artery, of **axillary artery**.

3. Pectoral branches of thoracoacromial artery, of **axillary artery.**

4. Mammary branches of lateral thoracic artery, of **axillary artery**.

5. Mammary branches of **Intercostal arteries.**

Venous drainage of Breast



Venous drainage of mammary gland

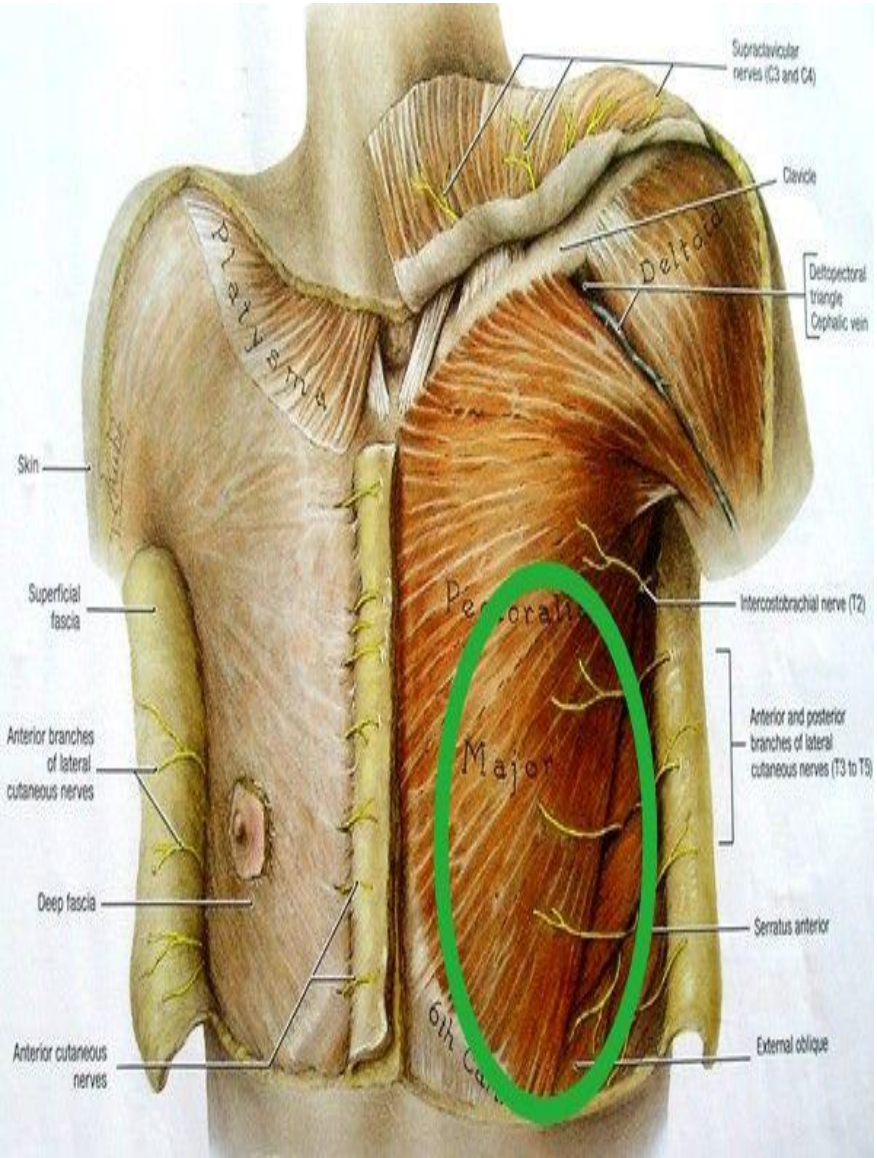
* Venous drainage by :

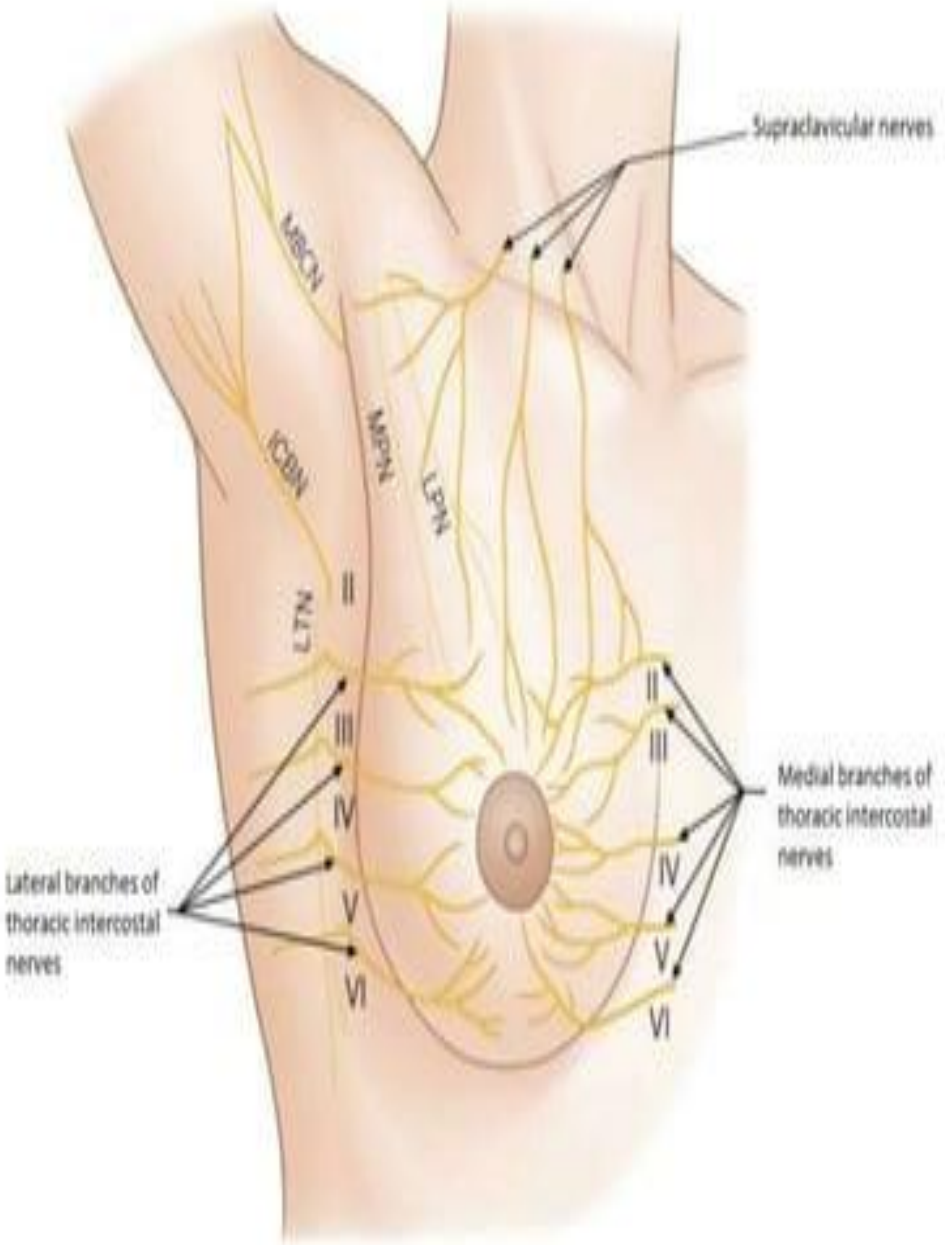
**** Veins are corresponding to the arteries.***

* Circular venous plexus are found at the base of nipple.

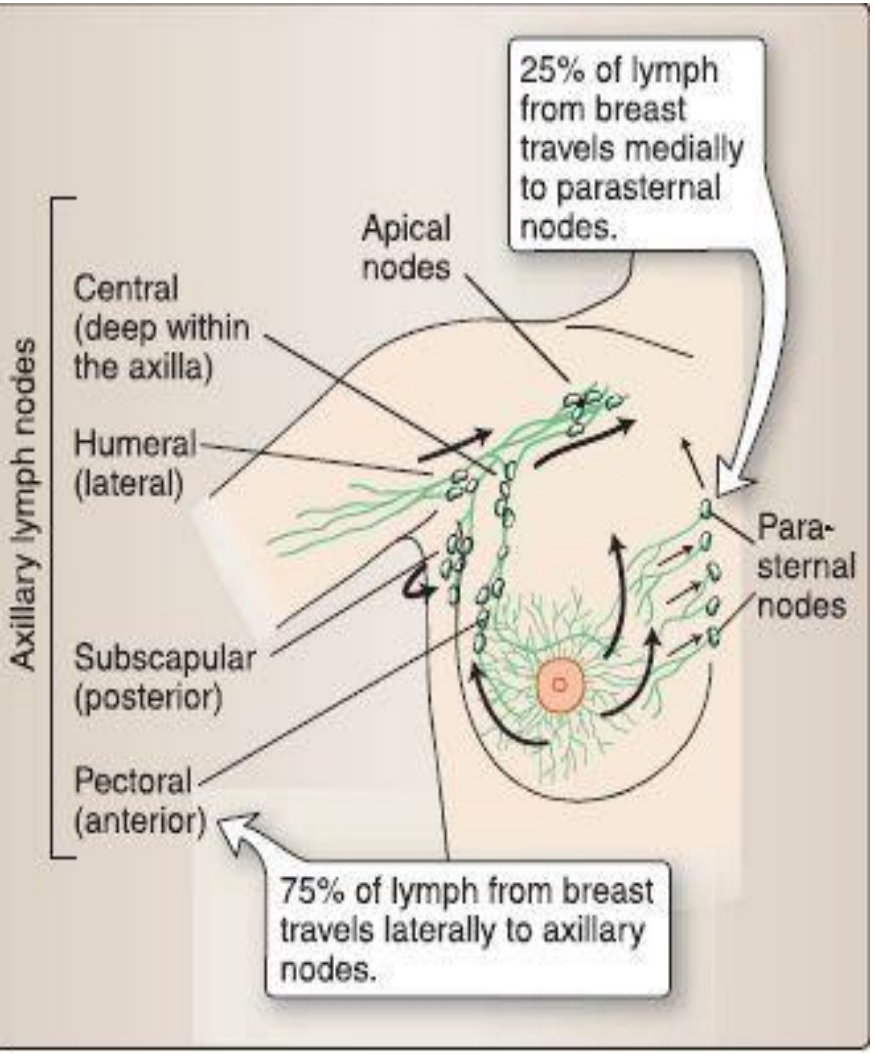
* Finally, veins of this plexus drain into ***axillary , internal thoracic and posterior intercostal veins.***

Nerve Supply of Breast





Lymphatic Drainage Of Breast



The lymphatic drainage of the breast originates from the breast lobules and flows into:

* Subareolar plexus (Sappey plexus) :
  Lies beneath the areola.
* Deep lymphatic plexus :
  Lies on the deep fascia covering pectoralis major.

Both plexuses radiate in many directions and drain into different lymph pathways:

1) ***Axillary*** (Lateral) Pathway (***75%*** of the breast lymphatic drainage) :

The lymph channels extend along the inferior edge of the pectoralis major to reach the pectoral group of the axillary nodes. The lymphatics further drain to the central and apical **axillary nodes and finally to the deep cervical and the subclavian nodes.**

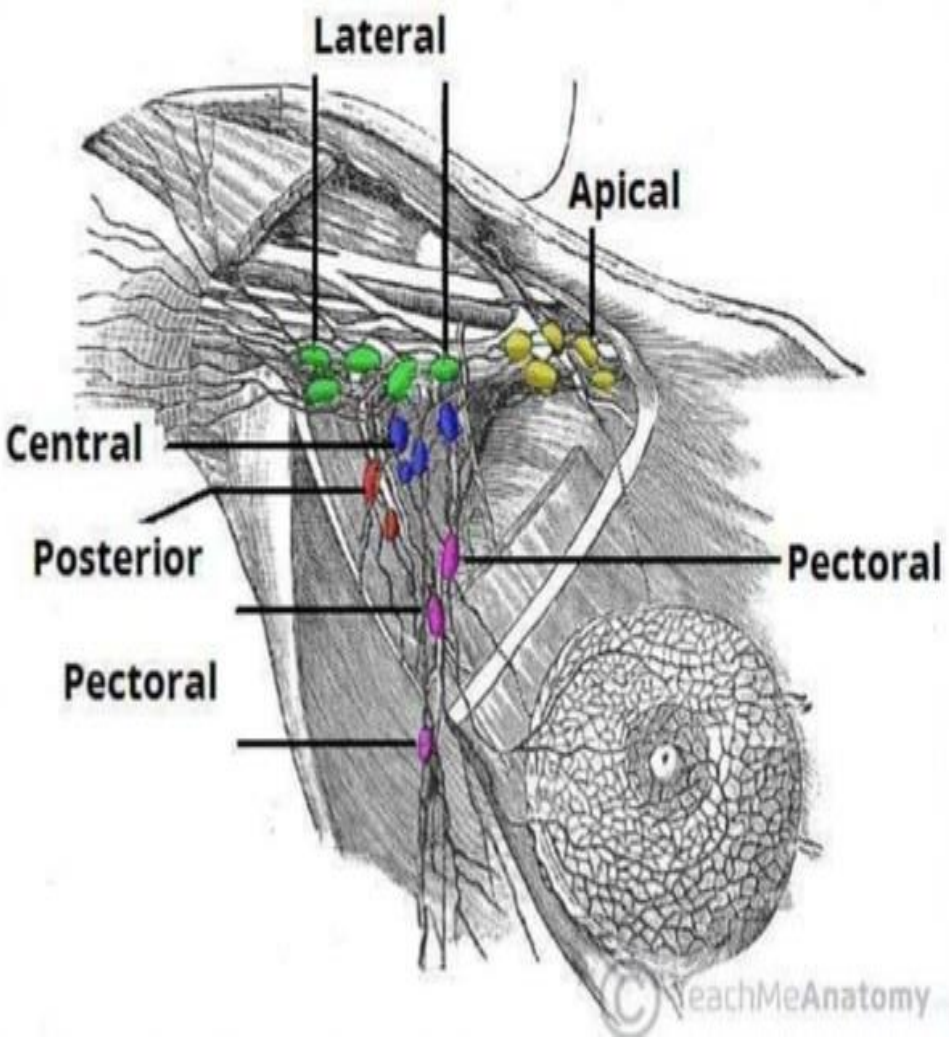
2) ***Internal mammary*** pathway (***20%*** of the breast lymphatic drainage) :

The lymphatics originate from both the lateral and medial halves of the breast and pass through the pectoralis major to drain to the **parasternal nodes.**

3) ***Retromammary*** pathway (***5%*** of the breast lymphatic drainage) :

The lymphatic drainage comes from the posterior portion of the breast. The lymphatics may reach the **sheath of the rectus abdominis and the subperitoneal and subhepatic plexuses.**

Axillary Lymph Nodes

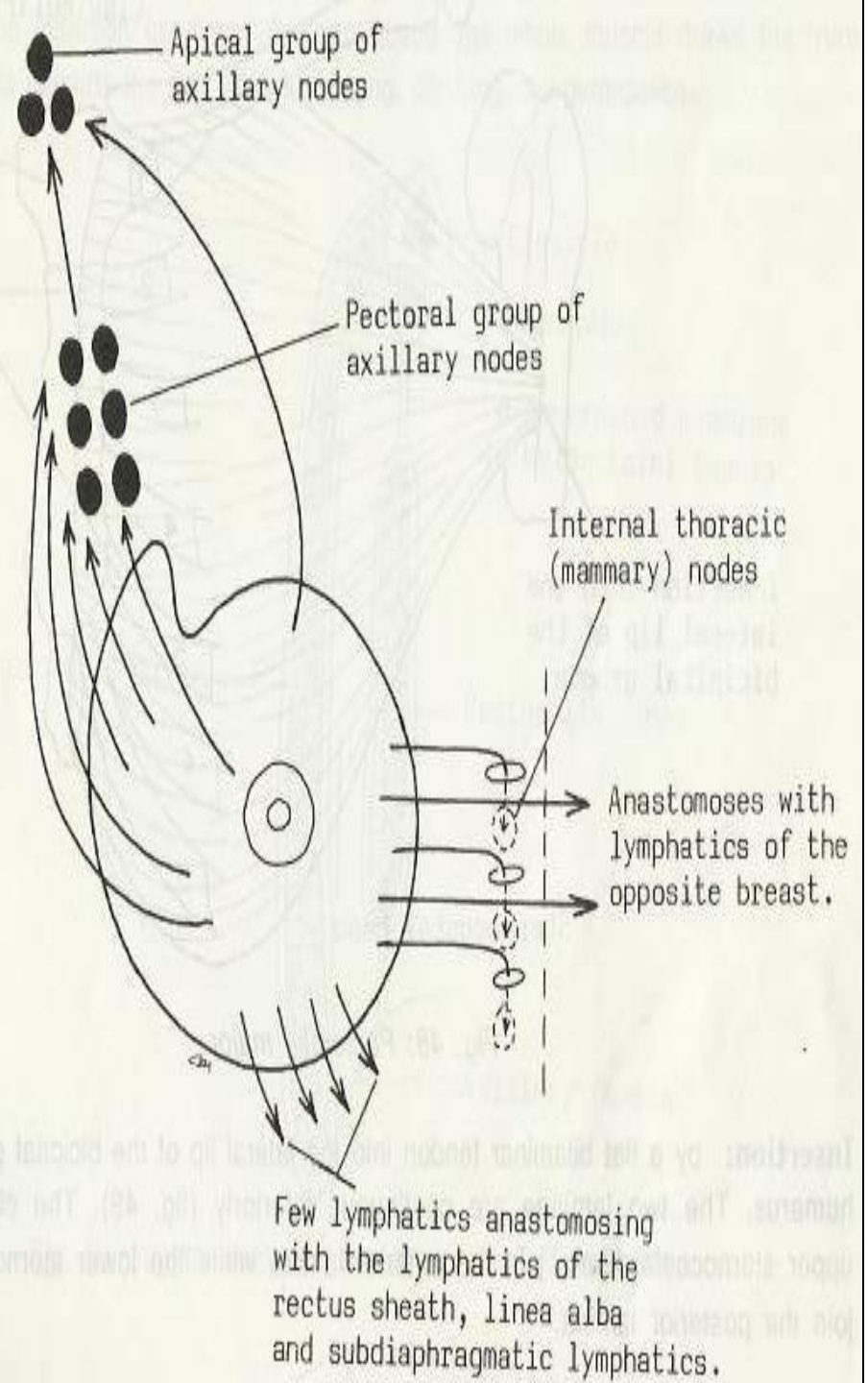


They are arranged into ***5 groups*** which lie in axillary fat :

- **Pectoral (Anterior) group** : which lies on the pectoralis minor along lateral thoracic vessels.
- **Subscapular (Posterior) group** : which lies on posterior wall of axilla on lower border of subscapularis along subscapular vessels.
- **Brachial (Lateral) group** : lies on lateral wall of axilla along 3rd part of axillary vessels.
- **Central group** : lies in axillary fat at the base of axilla.
- **Apical group** : lies at apex of axilla.

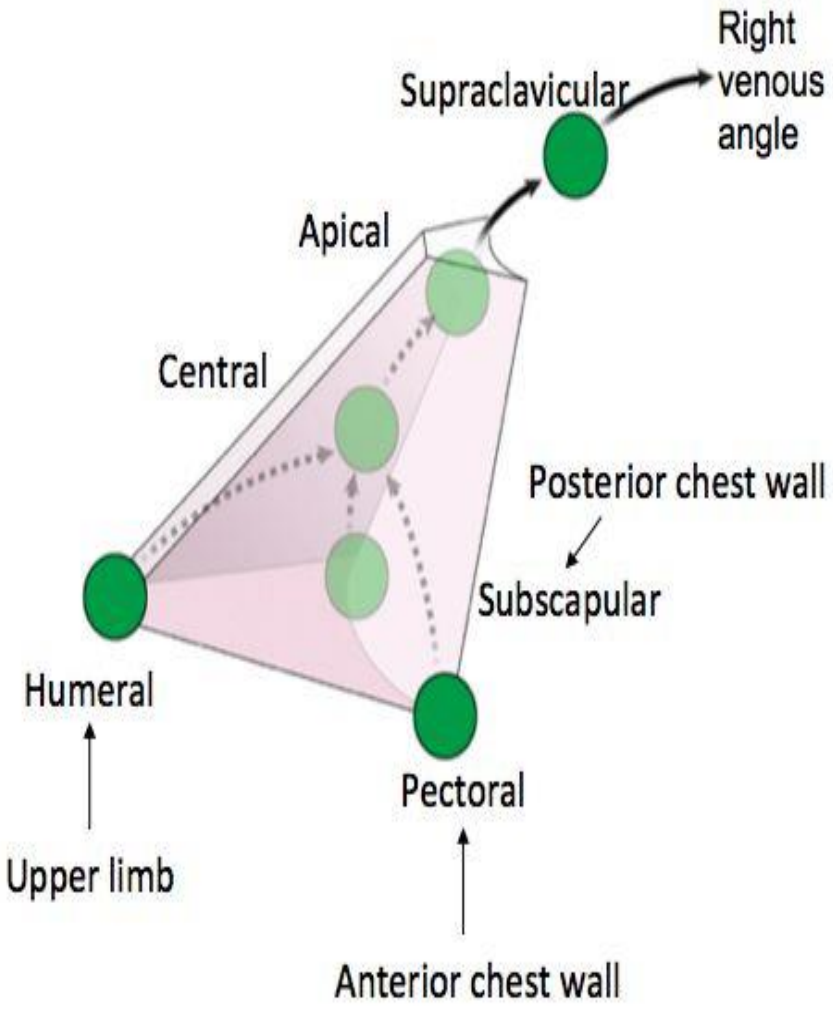
Subclavian lymph trunk:

it is formed by union of efferent lymph vessels of apical group. It usually opens in subclavian vein. On the left side it usually opens into thoracic duct.



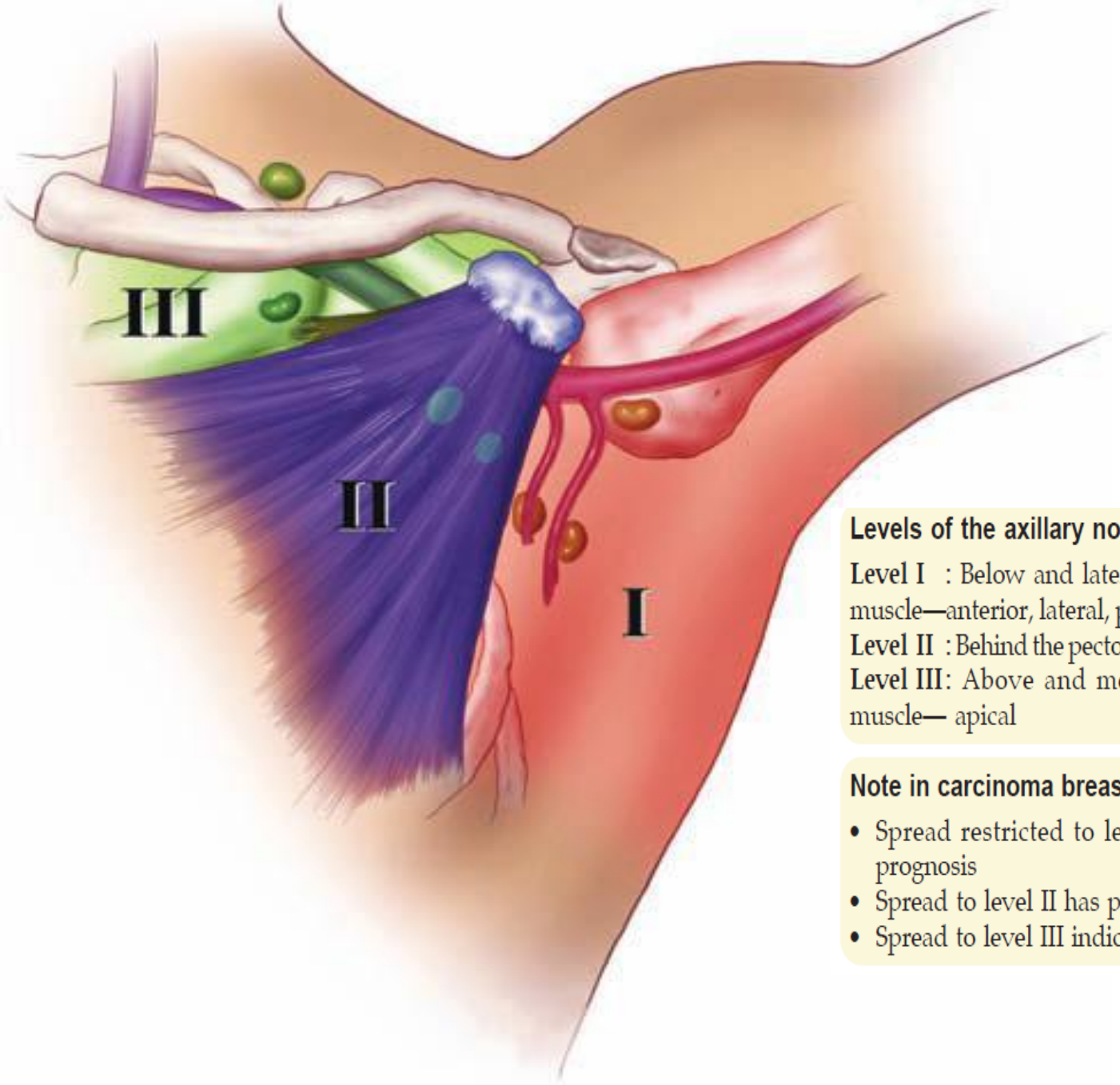
You must take these facts :

- ***Central & lateral parts*** of the gland (75%) drain into pectoral group of axillary lymph nodes.
- ***Upper part*** of the gland drains into apical group of axillary lymph nodes.
- ***Medial part*** drains into internal thoracic (parasternal) lymph nodes, forming a chain along the internal thoracic vessels.
- Some lymphatics from the ***medial part*** of the gland pass ***across the front of sternum*** to anastomose with that of ***opposite side.***
- Lymphatics from the ***inferomedial part*** anastomose with lymphatics of ***rectus sheath & linea alba,*** and some vessels pass deeply to anastomose with the ***subdiaphragmatic lymphatics***.



 # Also,

- ***60% of carcinomas*** of breast occur in the upper lateral quadrant.
- ***75% of lymph*** from the breast drains into the axillary lymph nodes.
- In case of carcinoma of one breast, the ***other breast and the opposite axillary lymph nodes*** are affected because of the anastomosing lymphatics between both breasts.



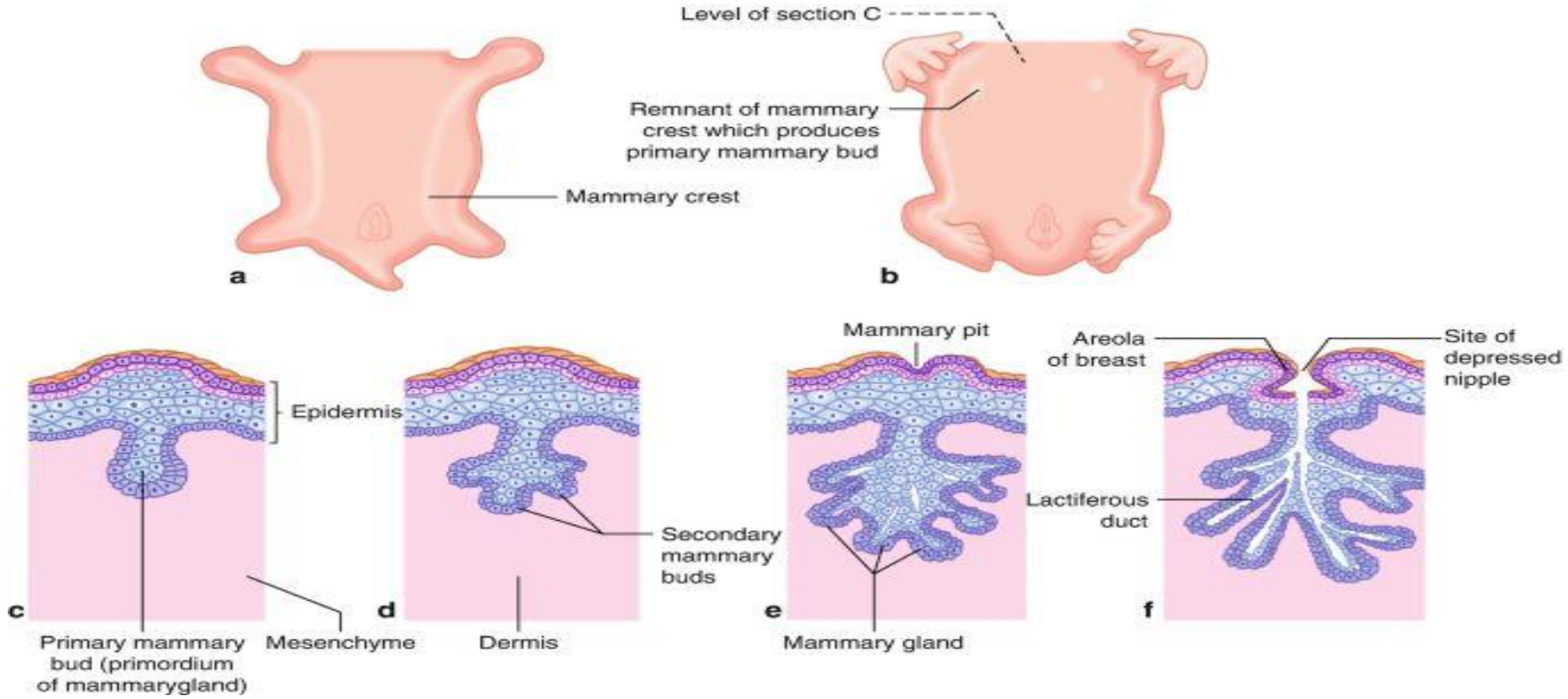
Levels of the axillary nodes

Level I : Below and lateral to the pectoralis minor muscle—anterior, lateral, posterior
Level II : Behind the pectoralis minor muscle—central
Level III: Above and medial to pectoralis minor muscle— apical

Note in carcinoma breast

- Spread restricted to level I nodes carries better prognosis
- Spread to level II has poor prognosis
- Spread to level III indicates worst prognosis

Development of the Breast

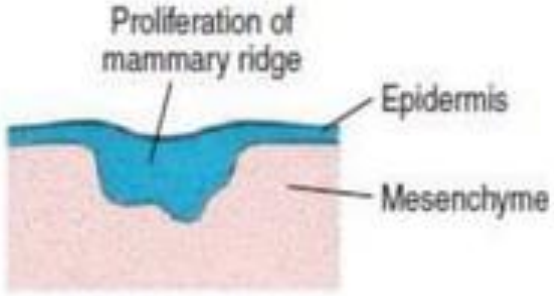


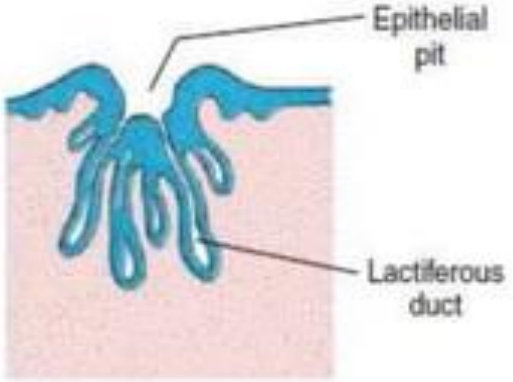
* The breast is a **modified apocrine sweat gland.**

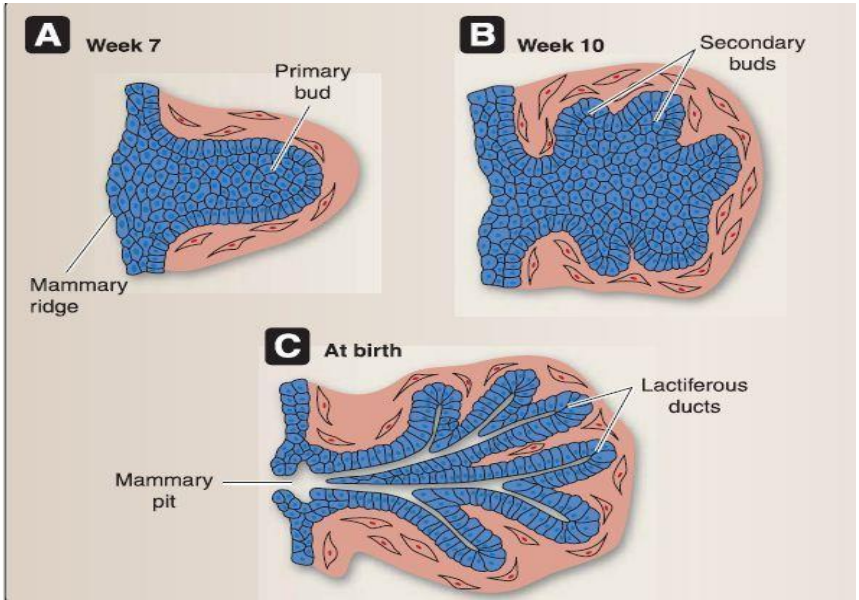
* The breasts develop from the **bilateral mammary ridges of the embryo** that extend along the ventral surface from the base of the forelimb bud to a point medial to the base of the hindlimb bud.

* The ***breast buds*** *develop from the middle portion of the upper third of the mammary ridges,* and the rest of the ridges disappear.

- Modified sweat glands.
- 5th - 6th WOG: b/l band of thickened epidermis.
- 7th WOG: mammary lines or ridges.
- Part of the mammary line persists only in the thoracic region.
- 16- 24 sprouts- give rise to small solid buds– canalize – lactiferous ducts.







* ***Mammary ridge*** extends from the axilla to the inguinal region.

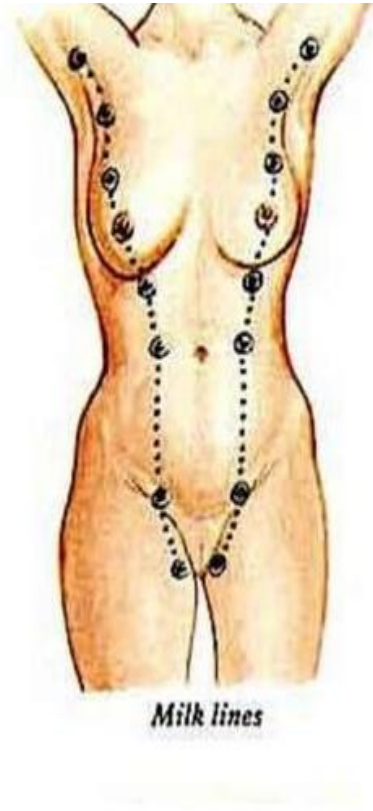
* ***In human,*** the ridge disappears ***EXCEPT*** *for a small part in the* ***pectoral region****.*

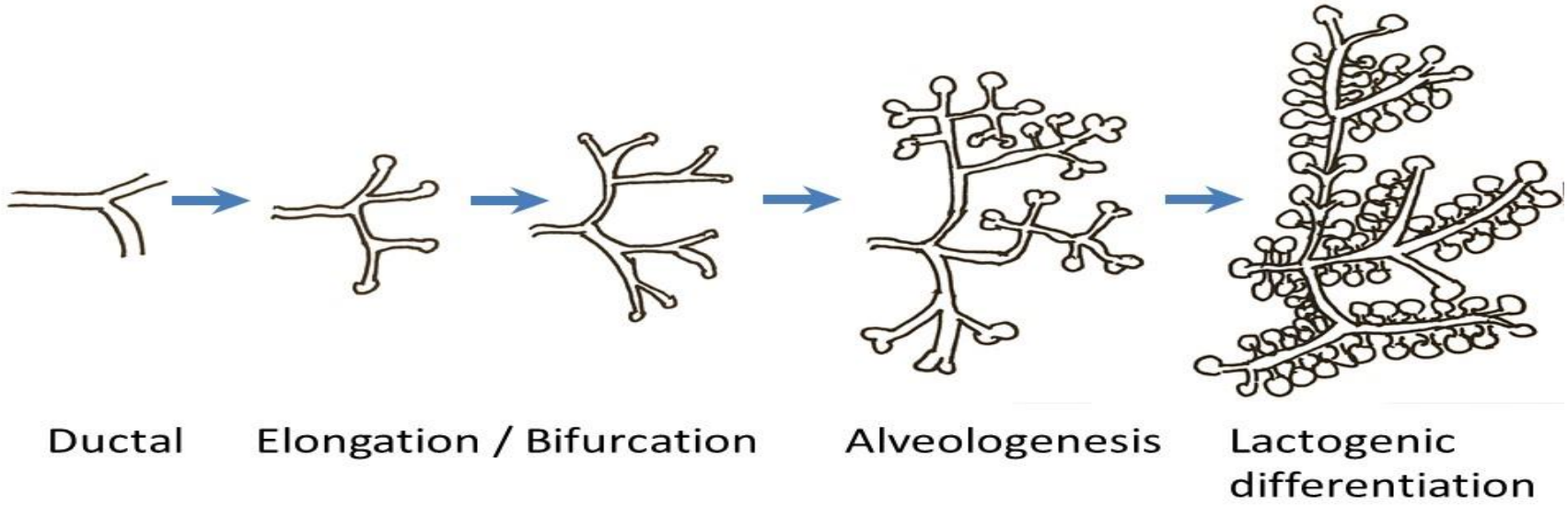
* Failure of portions of the ridge to involute may result in **accessory breast tissue** anywhere along the *milk line* (the line along which the mammary ridges extend in embryonic life), extending from the axilla to the inguinal region.

* At birth, only a rudimentary duct tree is present in both the sexes.

* *In animals,* several mammary glands are formed along this ridge.

- **Polythelia**
  - Supernumery nipples over breast
- **Athelia**
  - No nipple over breast (mainly accessory breast)
- **Polymastia**
  - Accessory breast along milk ridge
- **Amastia**
  - No breast development
- **Amazia**
  - Nipple developed, no breast development





At *puberty*, levels of **estrogen** and **progesterone** hormones increase to initiate breast development from the rudimentary duct tree.

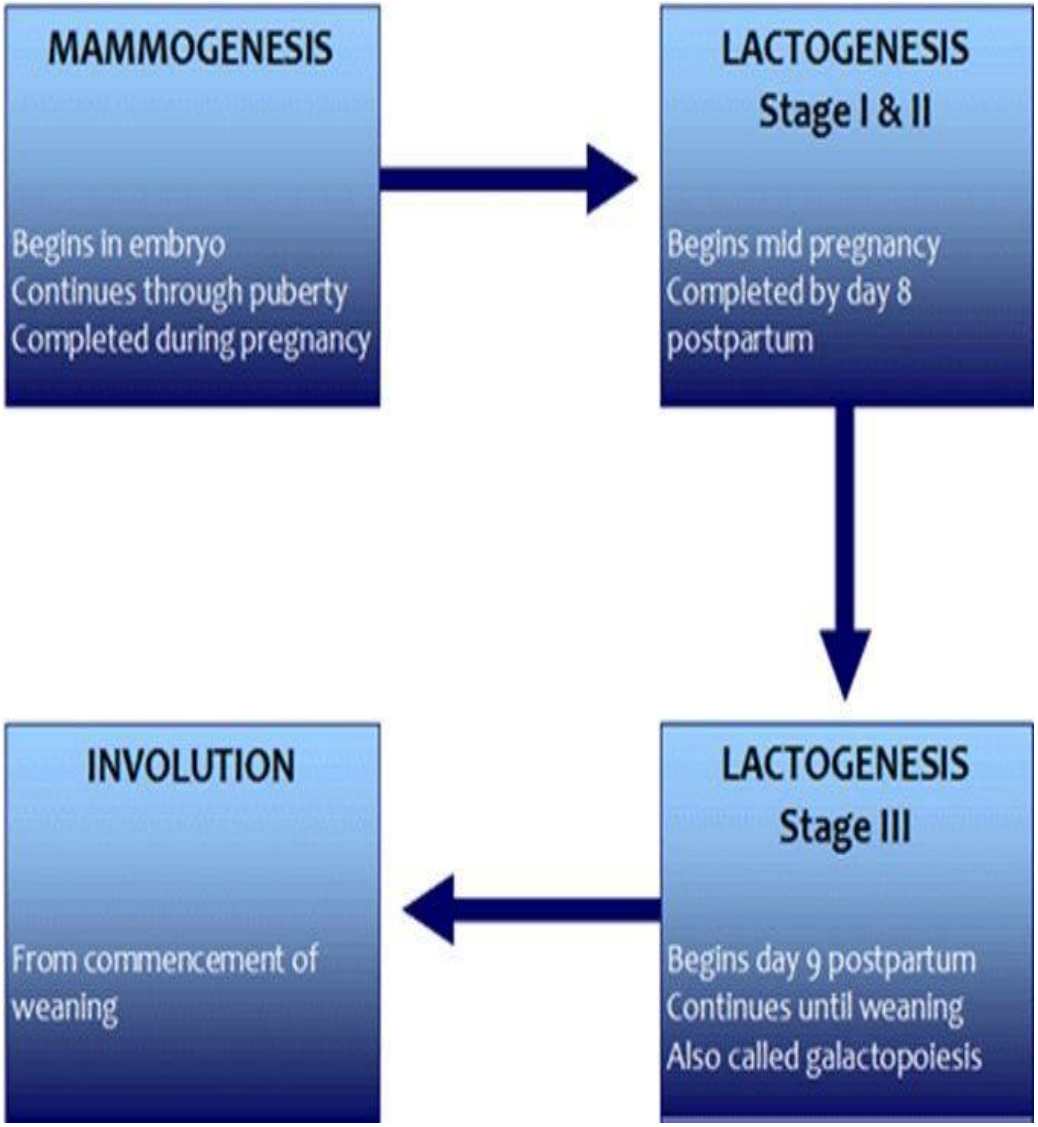
The ductal elements proliferate and the terminal buds at the ends of the branching ducts differentiate into tufts of blind-ending ductules.

A complex **tree-like** structure develops, with branching ducts, ***TDLUs***, and ***lobules*** surrounded by connective tissue.

Hormones and growth factors act upon stromal and epithelial cells to regulate mammary gland development, maturation, and differentiation.

Estrogen mediates development and elongation of ductal tissue. (Proliferation)
progesterone facilitates ductal branching and lobulo-alveolar development. (Differentiation)
Prolactin hormone regulates milk secretion during and after pregnancy.

Physiology of the Breast



Mammogenesis :

Breast development by continuing proliferation, maturation and differentiation.

Full complete Mammogenesis occurs only by 1st pregnancy.

Lactogenesis:

Cellular changes by which mammary epithelial cell **switches** from a growing non secretory tissue to a secreting non-growing tissue (initiation of milk secretion).

Change is **endocrine mediated**.

Involves 3 stages:

> Lactogenesis stage 1&2

> Lactogenesis stage 3

Pregnancy and the Breast

The breasts enlarge during pregnancy as a result of ...
engorgement of vessels; ***proliferation*** of epithelial ; ***accumulation*** of colostrum.

1st Trimester

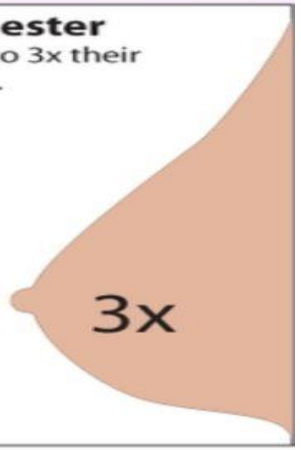
Oestrogen causes ducts to sprout and lobes to enlarge. The breasts enlarge therefore overall. ***NAC darkens***.

2nd Trimester

Progestins cause ***colostrum production***.

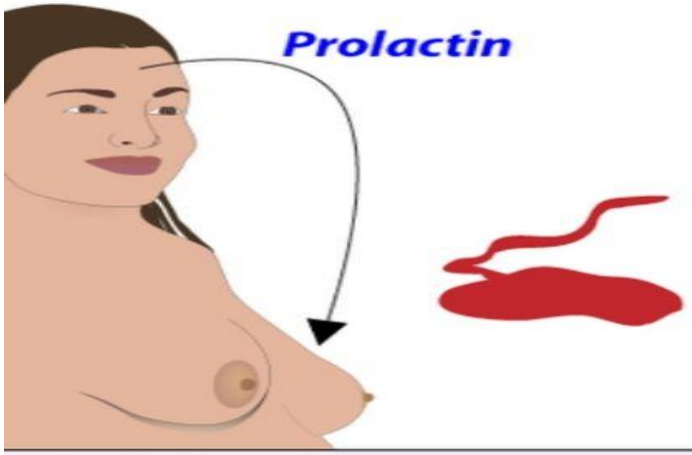
3rd Trimester

Breasts up to 3x their normal size.



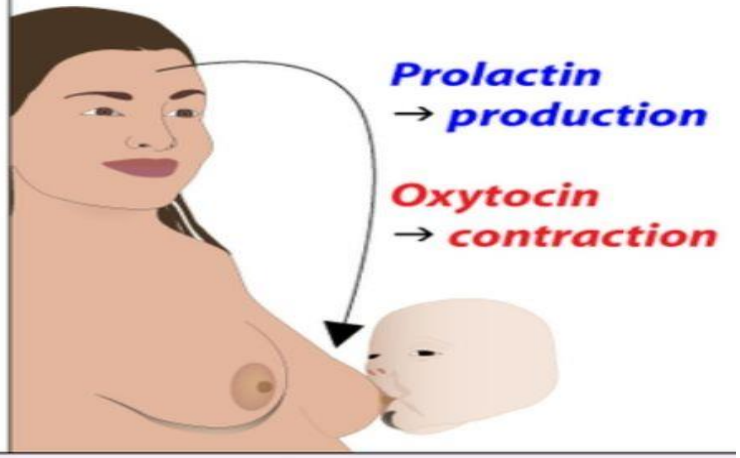
Delivery

Withdrawal of ***placental lactogen***. Breast now predominantly influenced by ***prolactin*** (released from the ***anterior pituitary***).

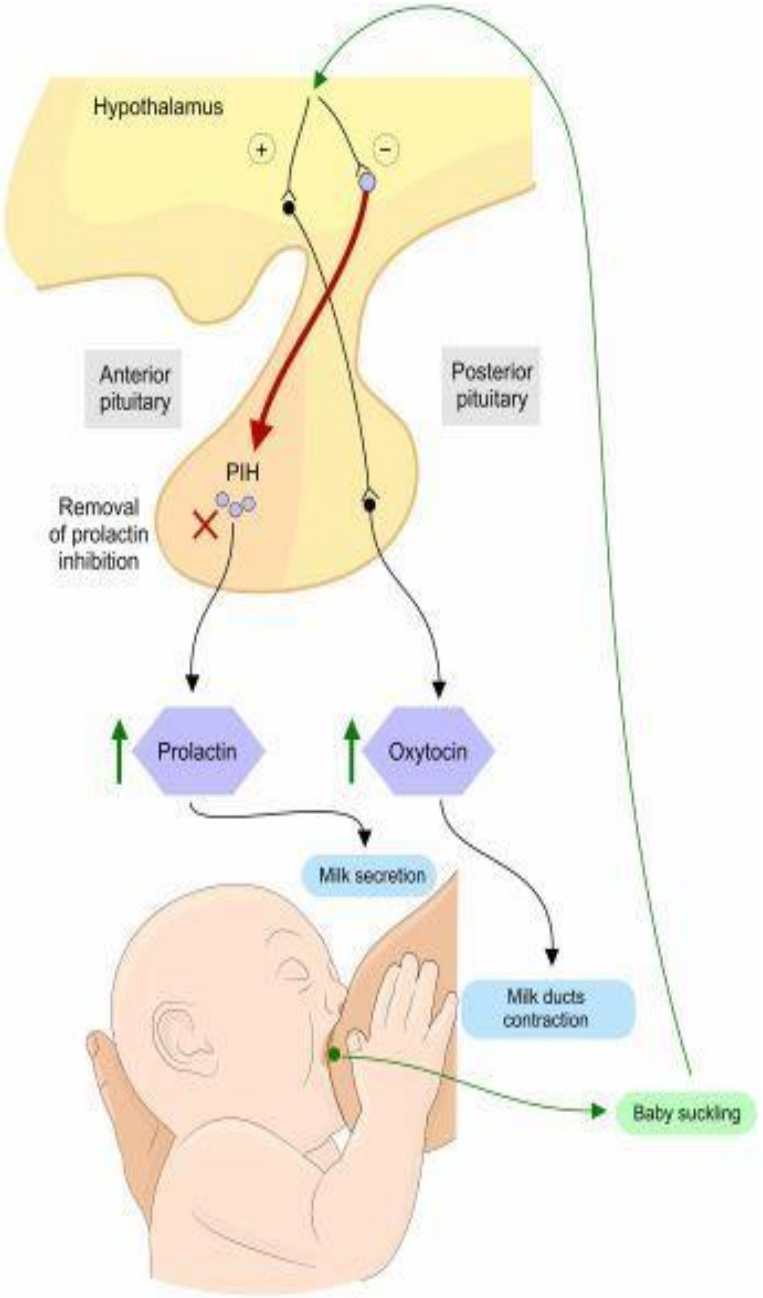


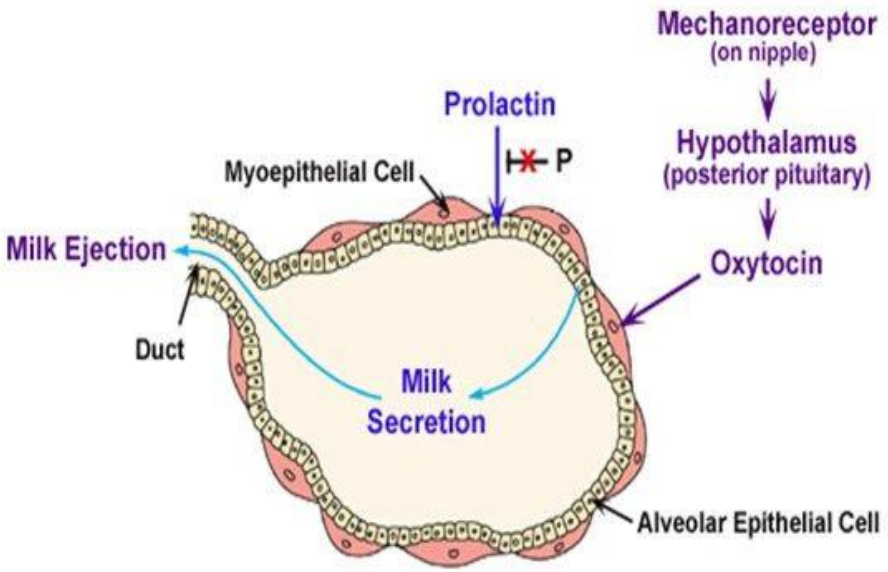
Nursing

The sucking infant stimulates release of pituitary hormones.
Prolactin (from anterior pituitary) stimulates milk production & secretion.
Oxytocin (from posterior pituitary) causes lobular contraction and milk ejection.



Involution Begins ~ **3mths** after breastfeeding has stopped. Extra-lobular stroma regresses.





Alveolus of Mammary Gland

God bless
all Mothers & Babies.

Thank you