

الطب والجراحة
لجنة

Breast 1

Anatomy and physiology

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Done by :
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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.

Breast cancer / on young age → very aggressive.

Radiation is most common predisposing factor of breast cancer.

CT scan increases the risk *400

High risk on female from 12 to 16 years old

Breast formed by

Splitting of Scarpas fascial from 6th to the 2nd Ribs

It lay on pectoralis major

Sarrutus anterior

Medial lower of rectus sheath

Is fixed border on medial and lower

Fixed by coopers ligament on retro mammary space

If there is invasion to coopers ligament there is dembling

مثال قطف البلج

Nipple : هي العود

Lobes : التجمعات 20-15

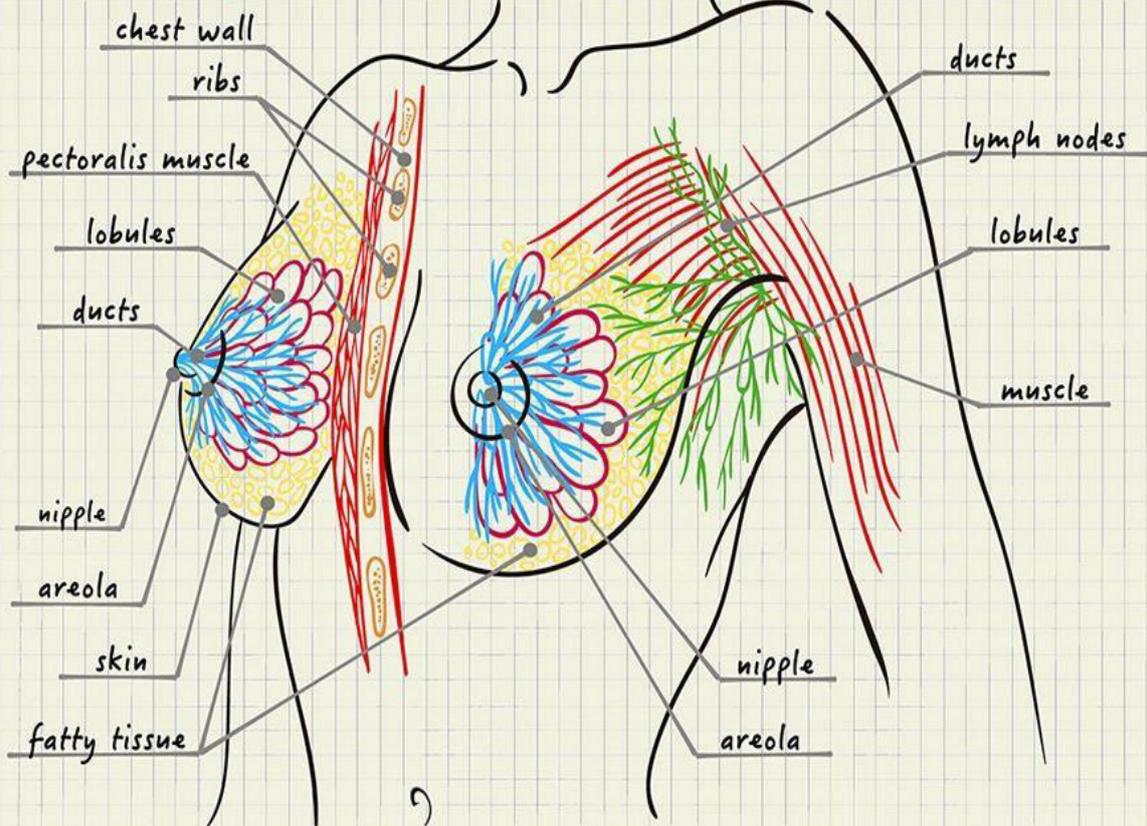
Lobule: الحبات 30-15

Lactiferous duct : العيدان اللي جوا

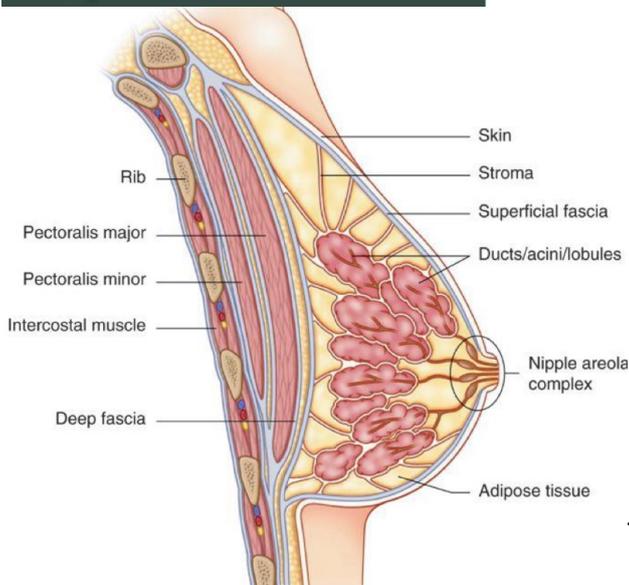
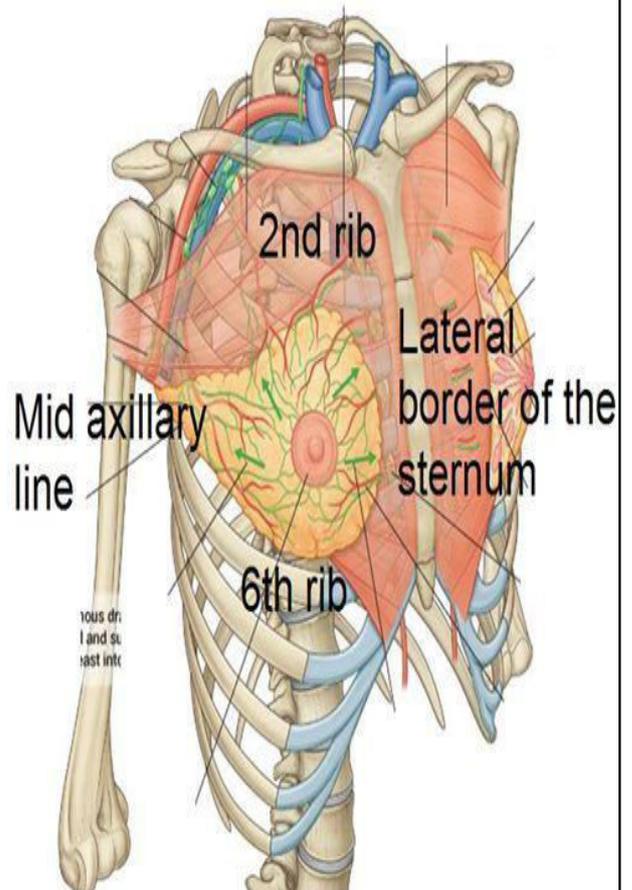
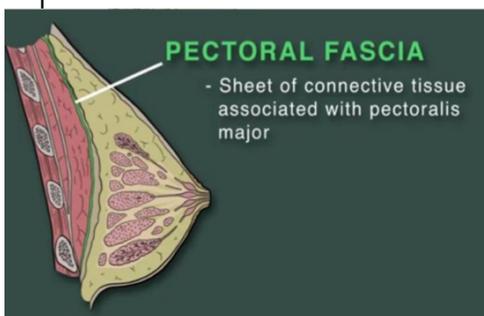
Fat : كانه حطيت القطف بالرمل

Terminal duct : هاي المهمة في الكانسر

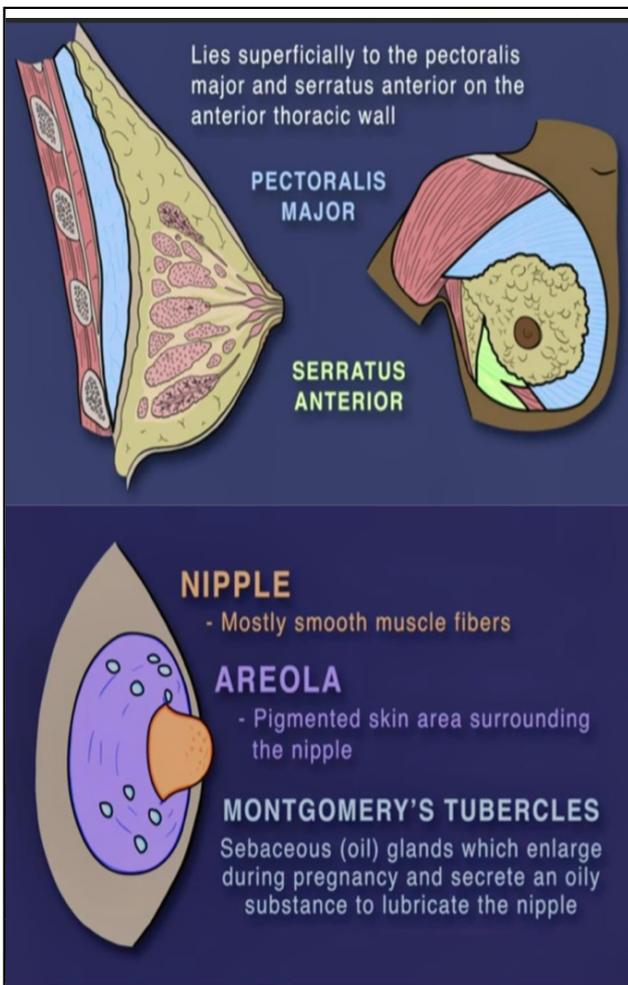
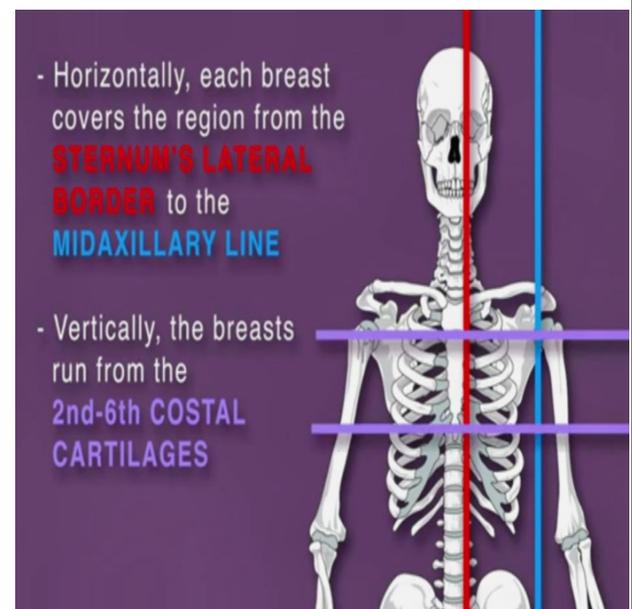
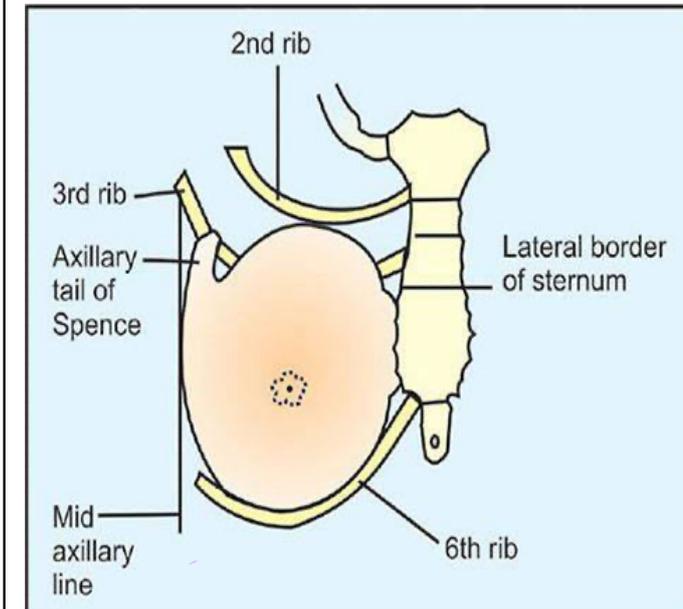
Anatomy of the female breast



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. *may be appears like mass*

* *it is solid => because it pass pectoral fascia.*

* 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.

Land mark => Ribs.

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 other breast

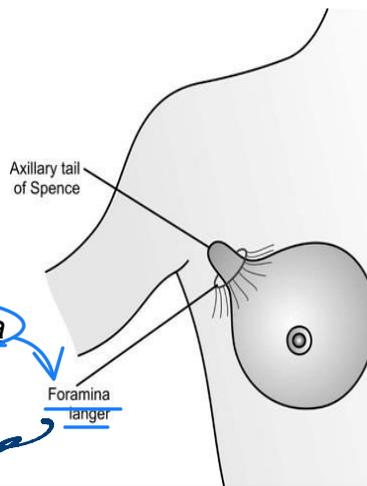
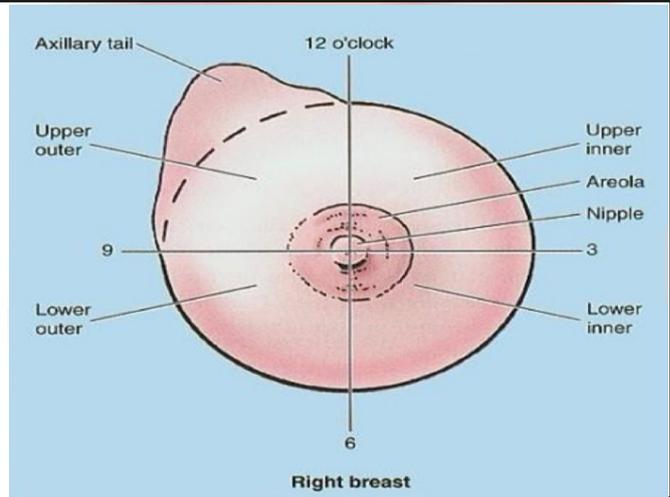
Axillary tail (Tail of Spence)

*The worst place for surgeons to be Cancer
=> inner upper quadrant. because scar will be obvious

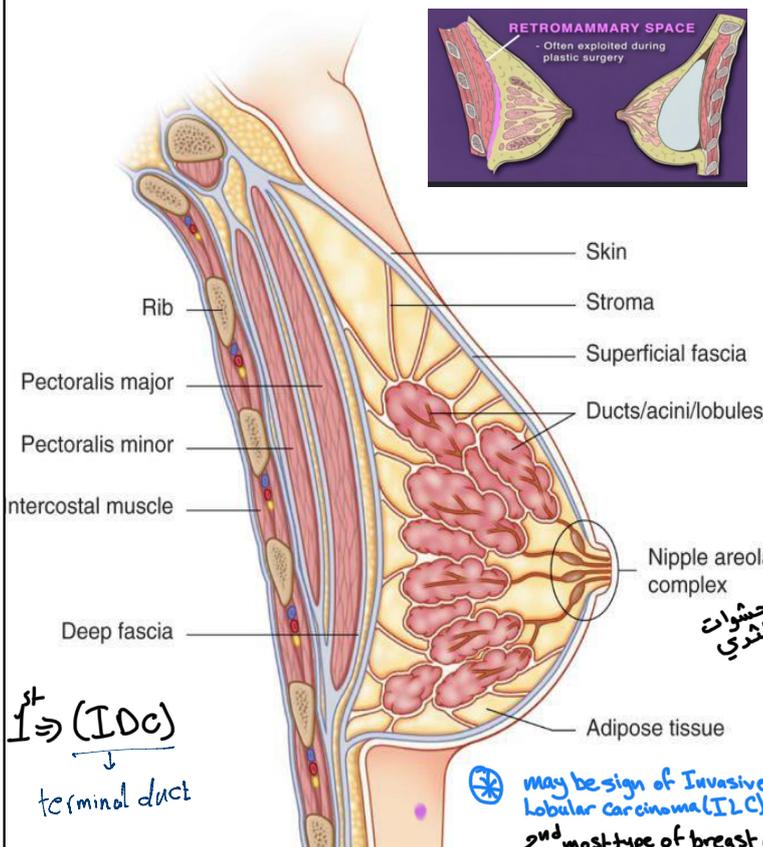
The axillary tail (tail of Spence) is a prolongation of the upper and outer quadrants of the breast towards the axilla.

This tail passes under the axillary fascia (through the foramen of Langer) and may be mistaken for enlarged lymph nodes.

Or foramin of Spence



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.

* Breast movable:-

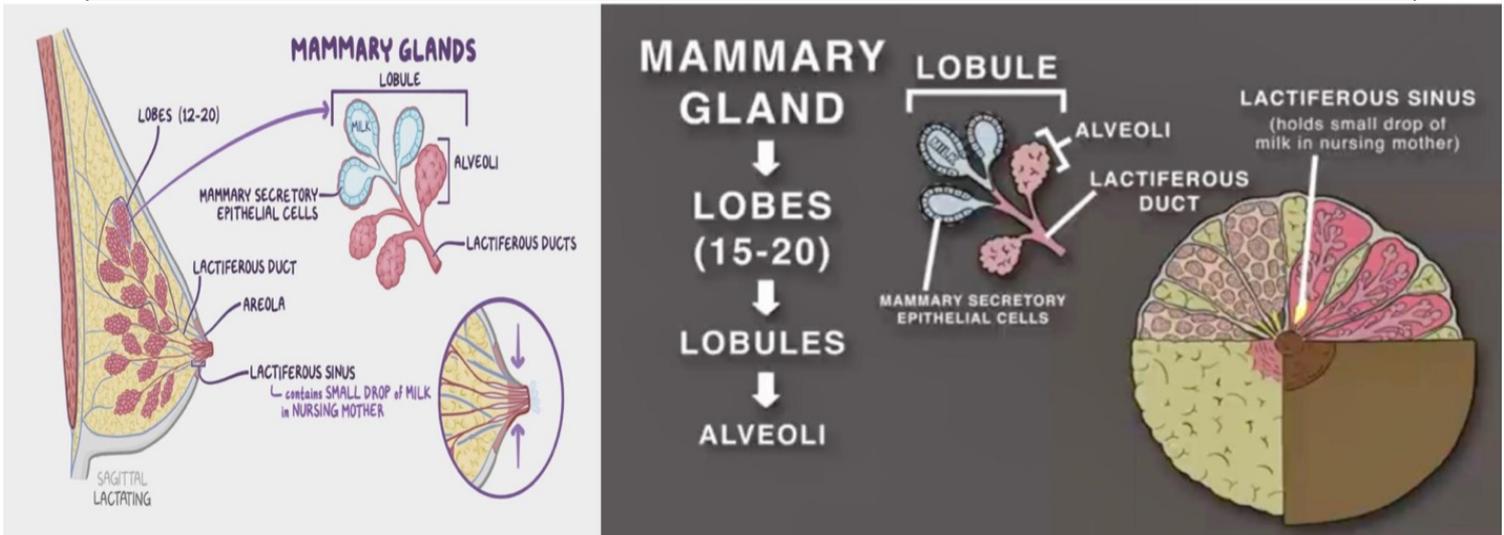
=> Sliding on deep pectoral fascia and return back to its site due to persistence of ligaments of Cooper.

* Dimpling of breast:-

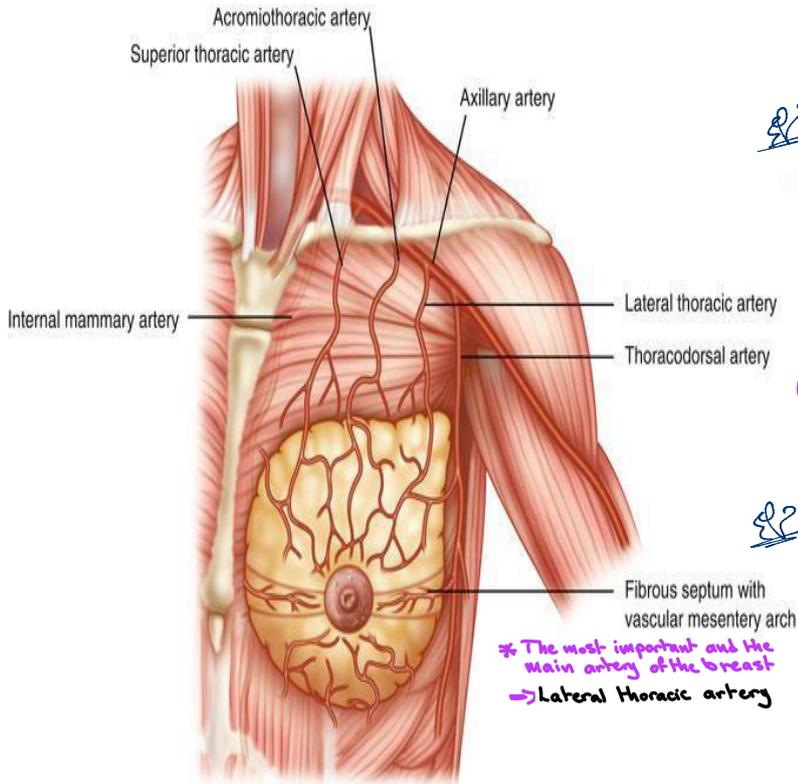
=> due to inflammation of this ligament

- 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.



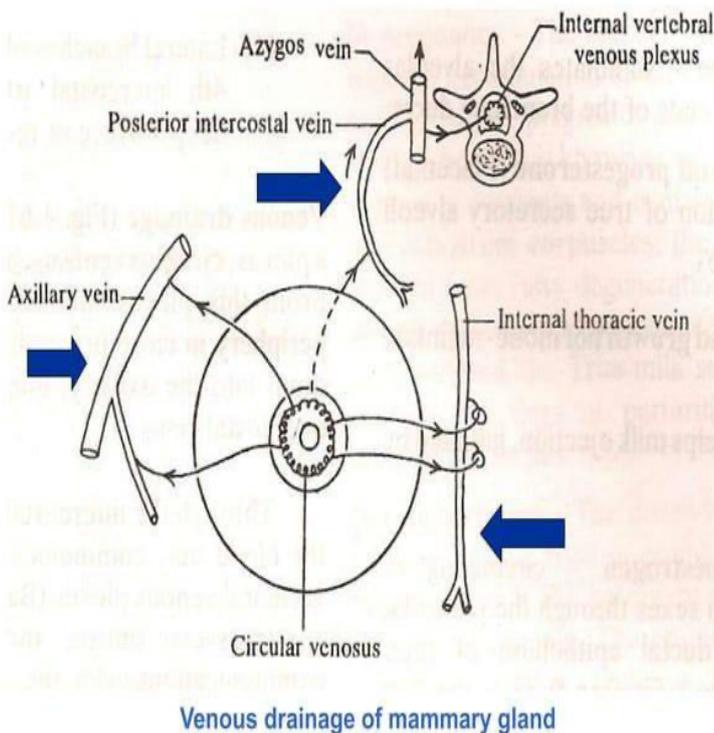
Arterial Supply of Breast



• Arterial supply by :

1. Perforating branches of internal thoracic (internal mammary) artery. → To medial side
2. Mammary branches of superior thoracic Artery, of axillary artery. ①
3. Pectoral branches of thoracoacromial artery, of axillary artery. ②
4. Mammary branches of lateral thoracic artery, of axillary artery. → To lateral side ③
5. Mammary branches of Intercostal arteries.

Venous drainage of Breast



* 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.

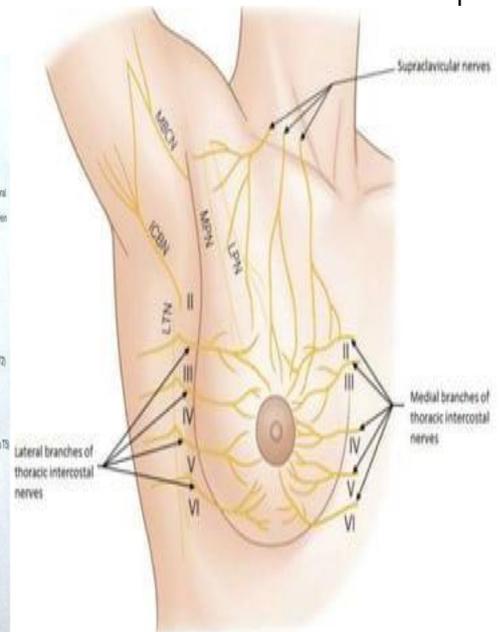
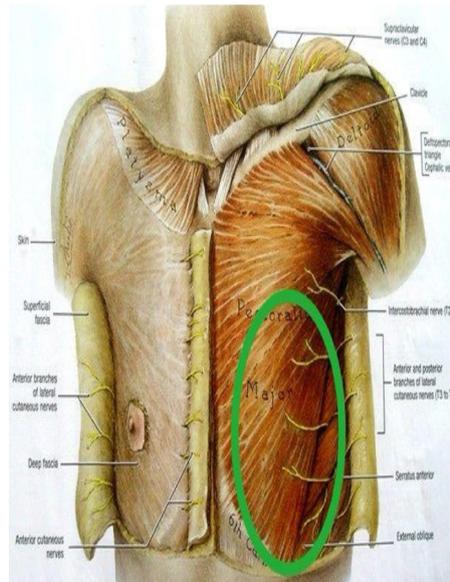
⇒ *Most common metastasis of breast cancer.*
→ *Vertebral column*

Nerve Supply of Breast

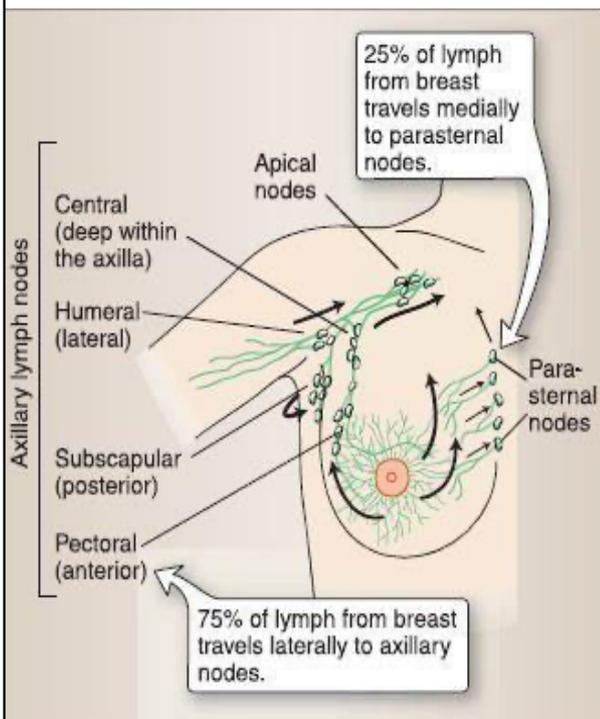
Innervation of breast

II - VI medially
III - VI laterally

* Lateral branch of 4th of thoracic intercostal nerve
=> Sensation of nipple (breast feeding)



Lymphatic Drainage Of Breast



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

- * **Subareolar** plexus (Sappey plexus): 90% of breast
Lies beneath the areola.
- * **Deep** lymphatic plexus:
Lies on the deep fascia covering pectoralis major.
→ Axilla.

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

1) **Axillary** (Lateral) Pathway (25% 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):

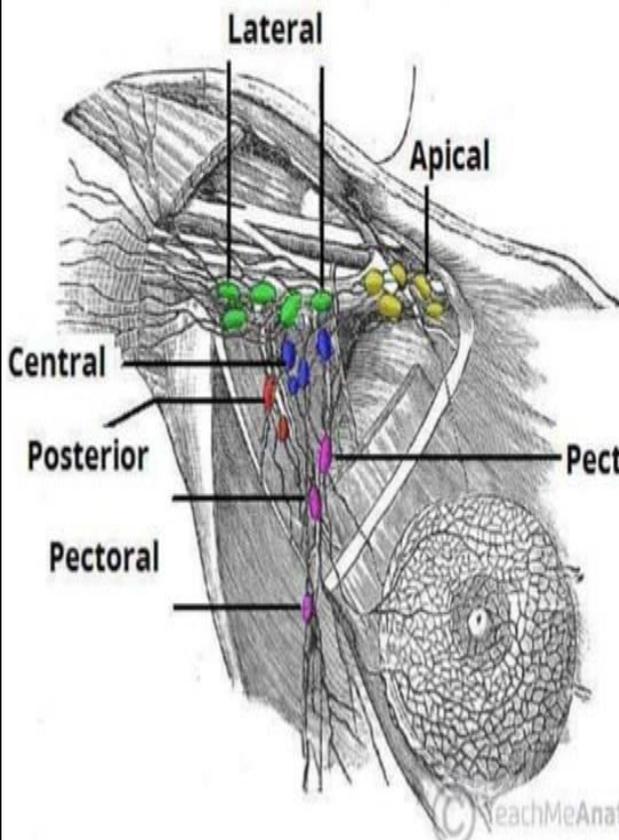
The lymphatics originate from both the lateral and medial halves of the breast and pass through the pectoralis major to drain to the **parasternal nodes**.

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**.

→ In lymph nodes examination: we should relax the muscle (contraction will hide the mass).

Axillary Lymph Nodes



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

→ First station = 70percent

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. *↳ Rarely mets*

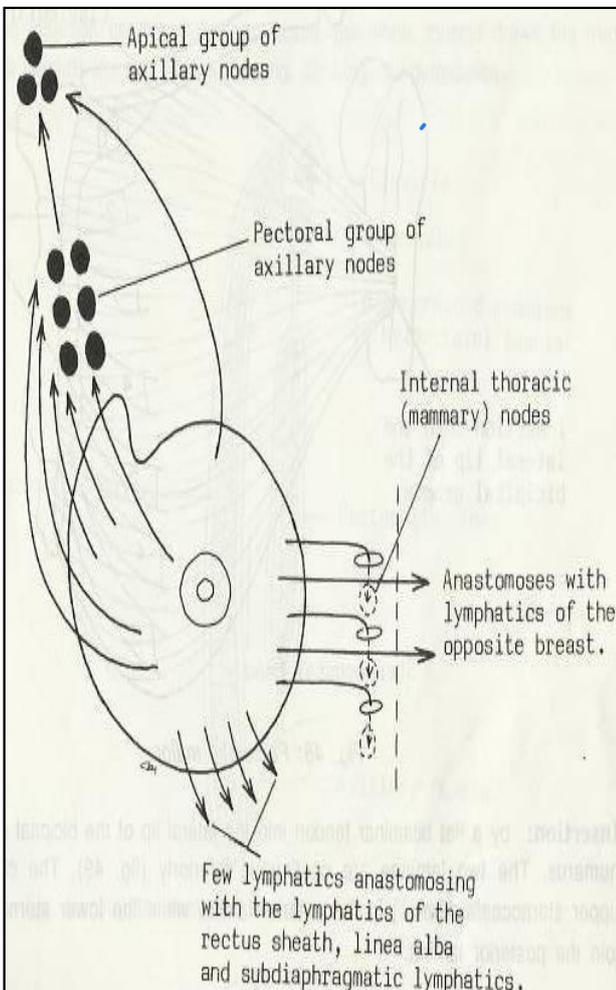
Central group : lies in axillary fat at the base of axilla.

Apical group : lies at apex of axilla. *↳ infra clavicular lymph node على الاغلب نفسها*

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.

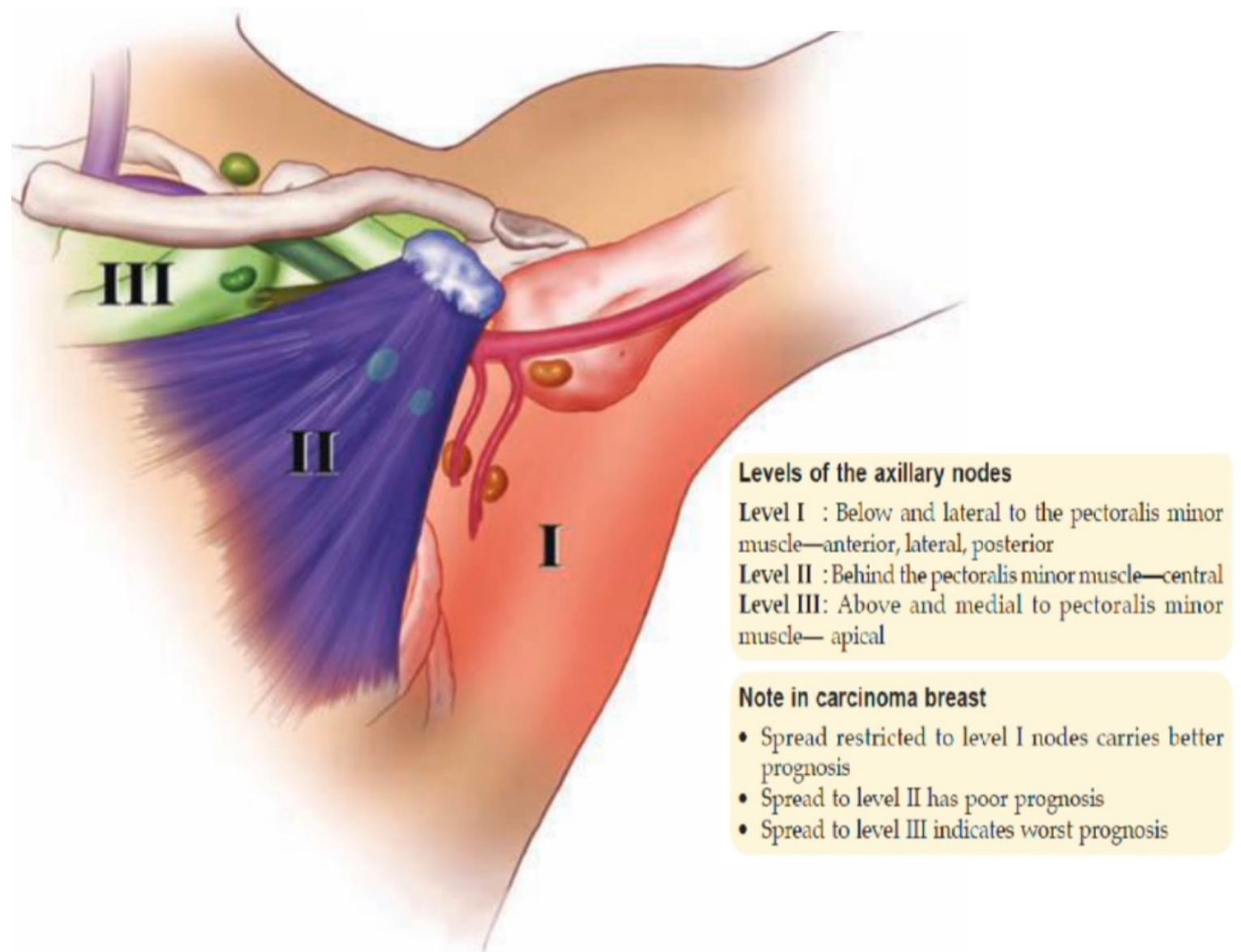
**The most important structure in axilla?
⇒ Axillary vein.*



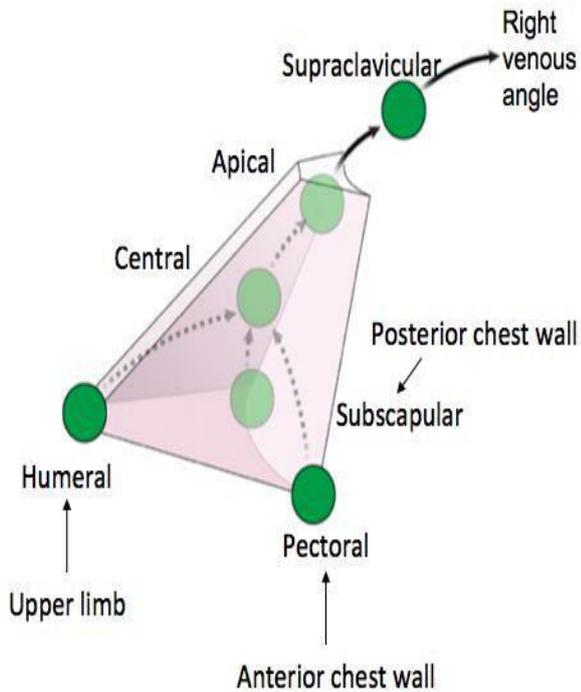
You must take these facts :

- **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**.

Modern classification :



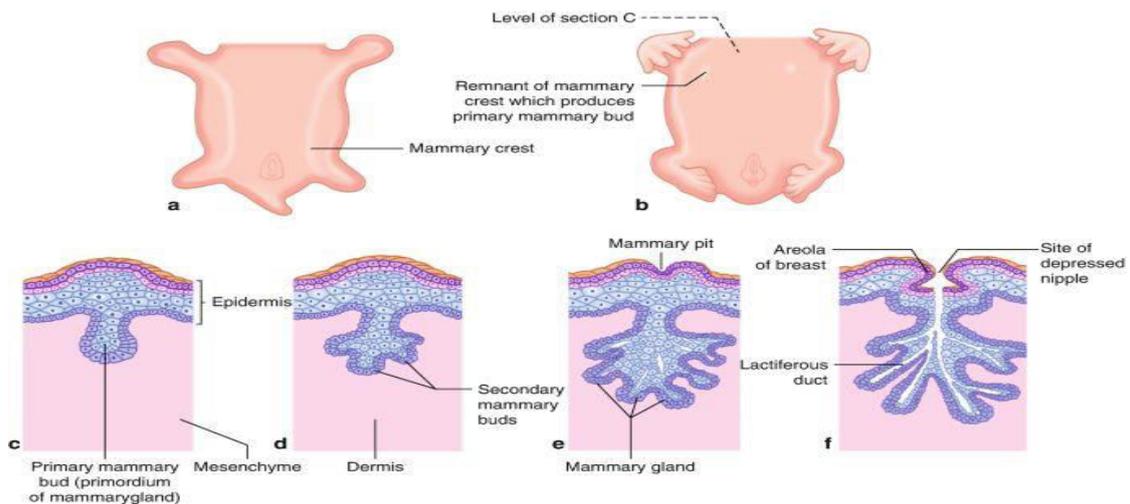
Level three is removed when there is significant large mets.



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.

Development of the Breast

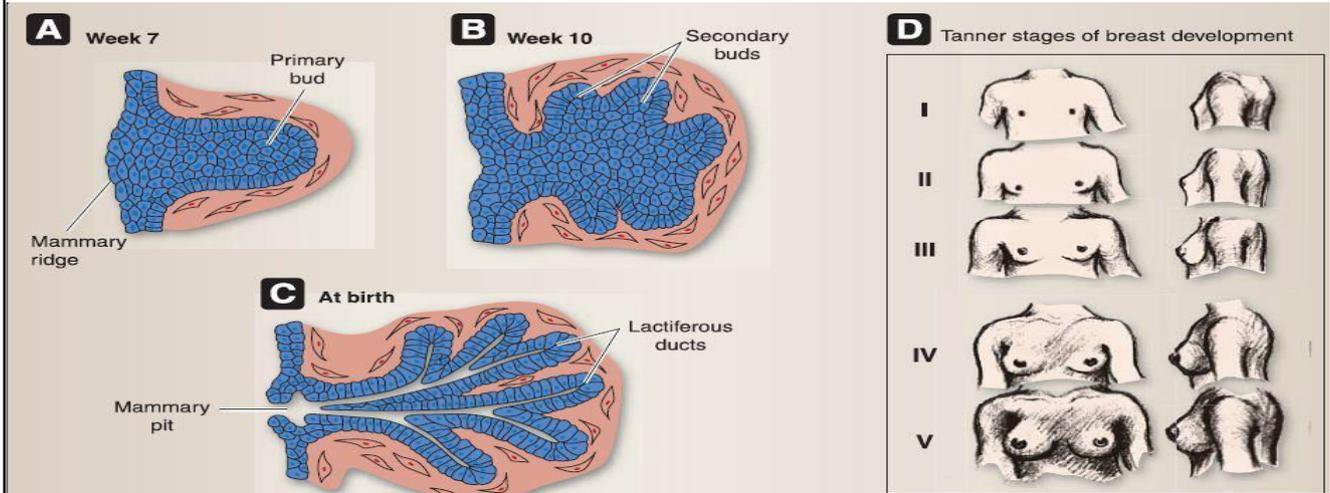
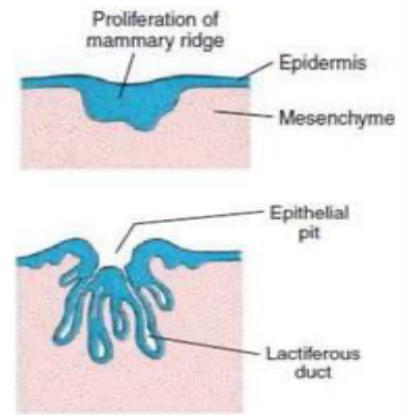


* The breast is a **modified apocrine sweat gland**.

* 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** → at birth.



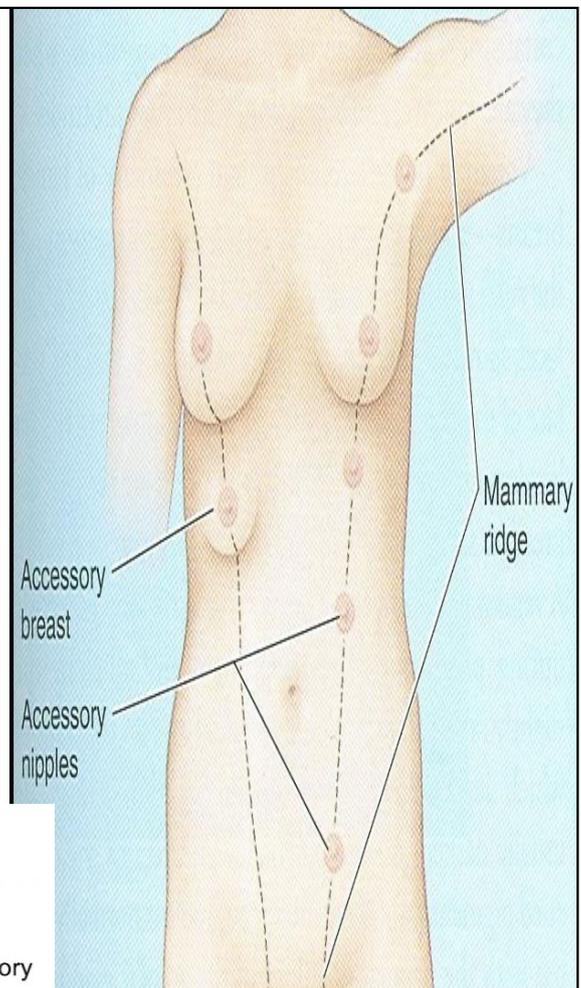
* **Mammary ridge** extends from the axilla to the inguinal region.

* **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.

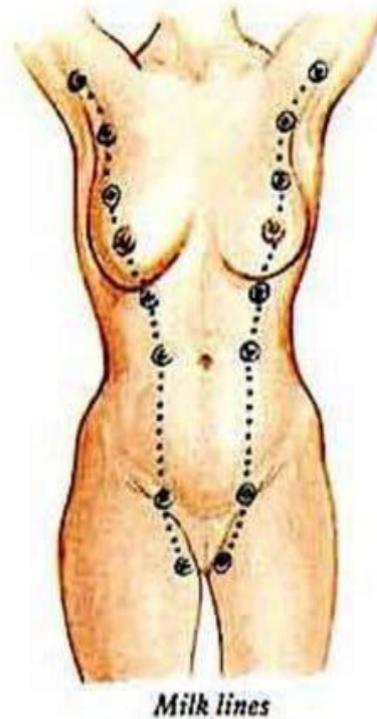


Accessory Nipple +
Ectopic / third nipple

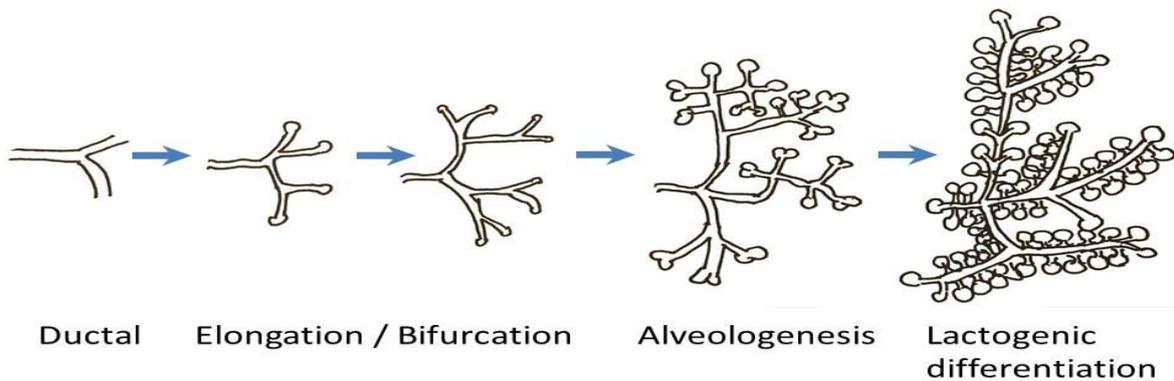
Congenital anomalies



- **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



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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.

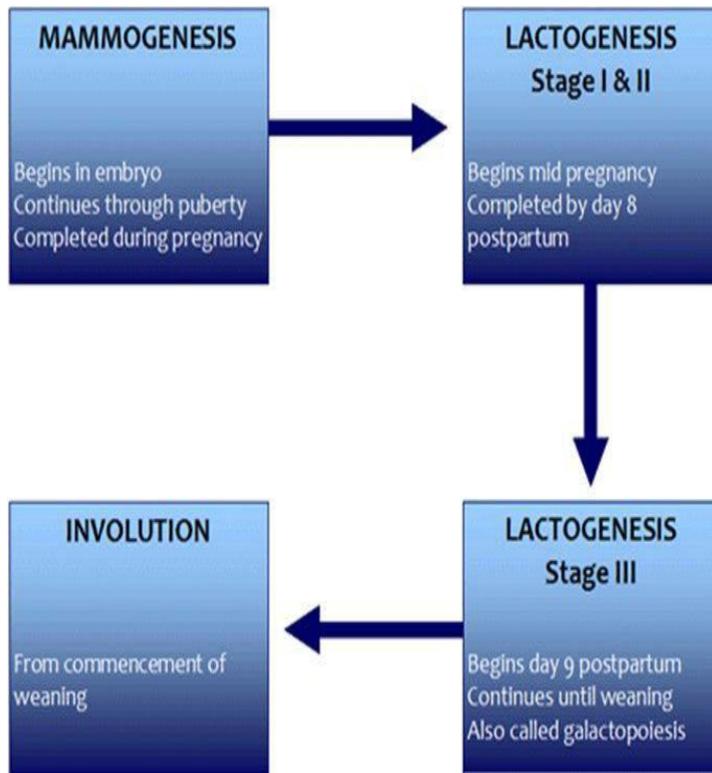
A complex **tree-like** structure develops, with branching ducts, **TDLUs**, and **lobules** surrounded by connective tissue.

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

↑estrogen without ↑progesteron
⇒ ↑ Risk of Cancer.



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:

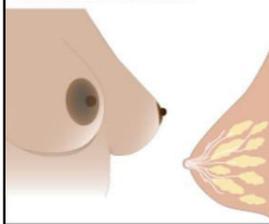
- > Lactogenesis stage 1&2
- > Lactogenesis stage 3

Pregnancy and the Breast

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



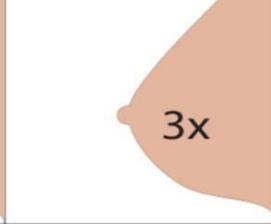
1st Trimester
Estrogen causes ducts to sprout and lobes to enlarge. The breasts enlarge therefore overall. **NAC darkens**.



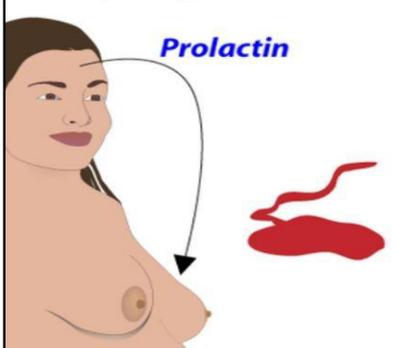
2nd Trimester
Progesterins cause **colostrum production**.



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.

