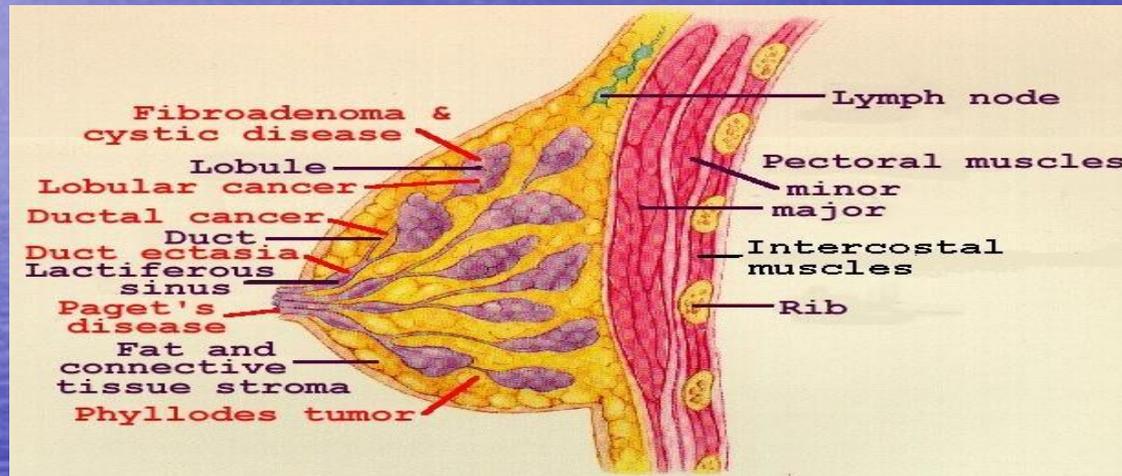




# BREAST ANATOMY

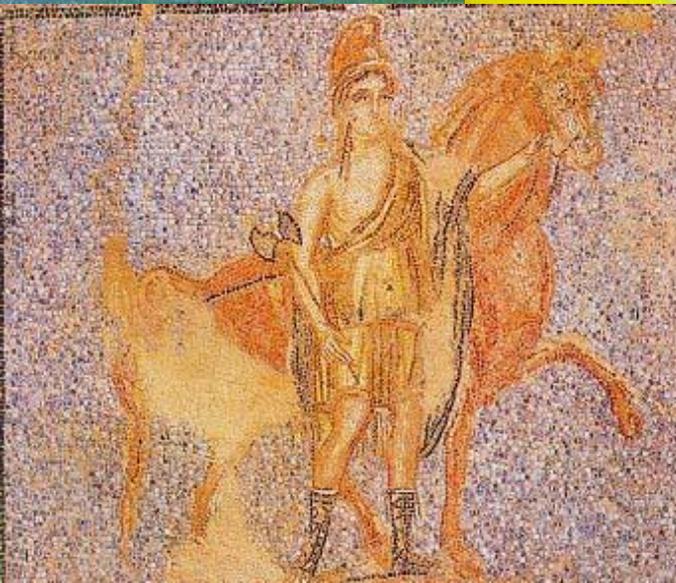
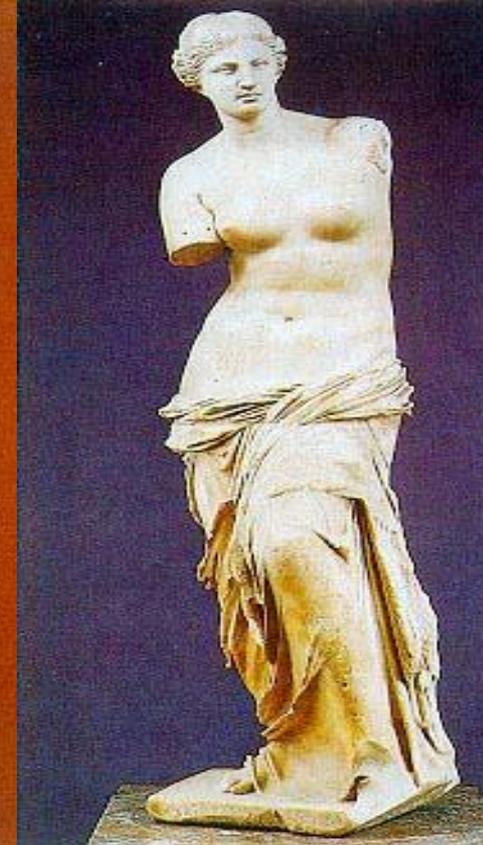
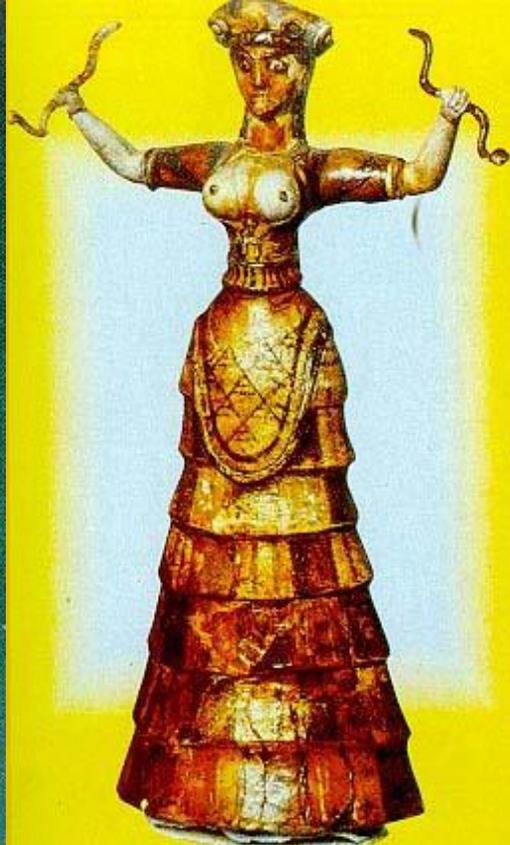


***Dimosthenis Chrysikos***

***Surgeon***

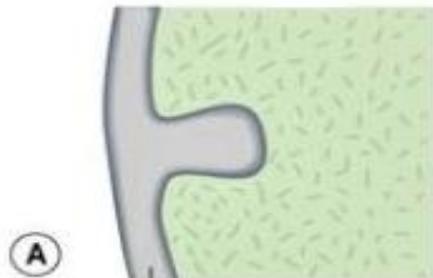
***Assistant Professor***

***Department of Anatomy, School of Medicine, NKUA***



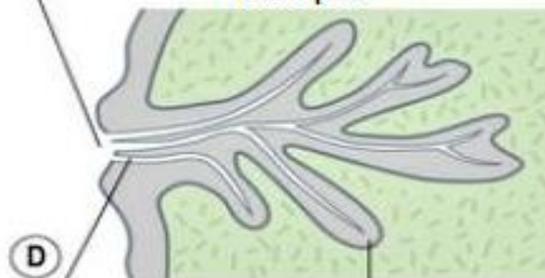
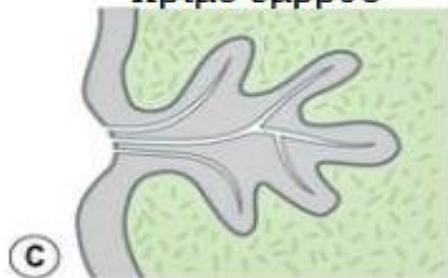
6 εβδομάδες ενδομητρικά

12 εβδομάδες ενδομητρικά



Επιθήλιο  
Μαστικό βοθρίο  
Όριμο έμβρυο

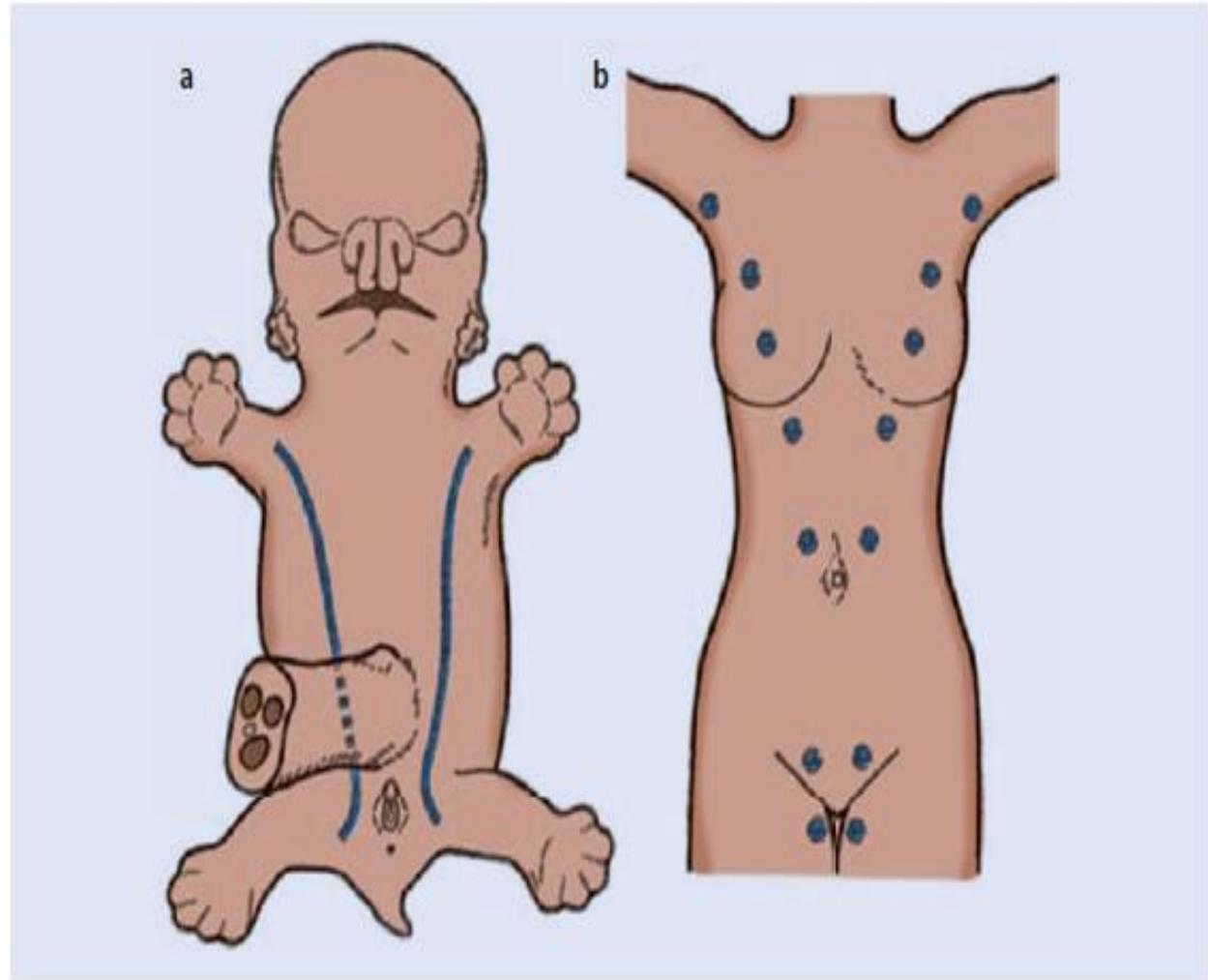
Νεογνό

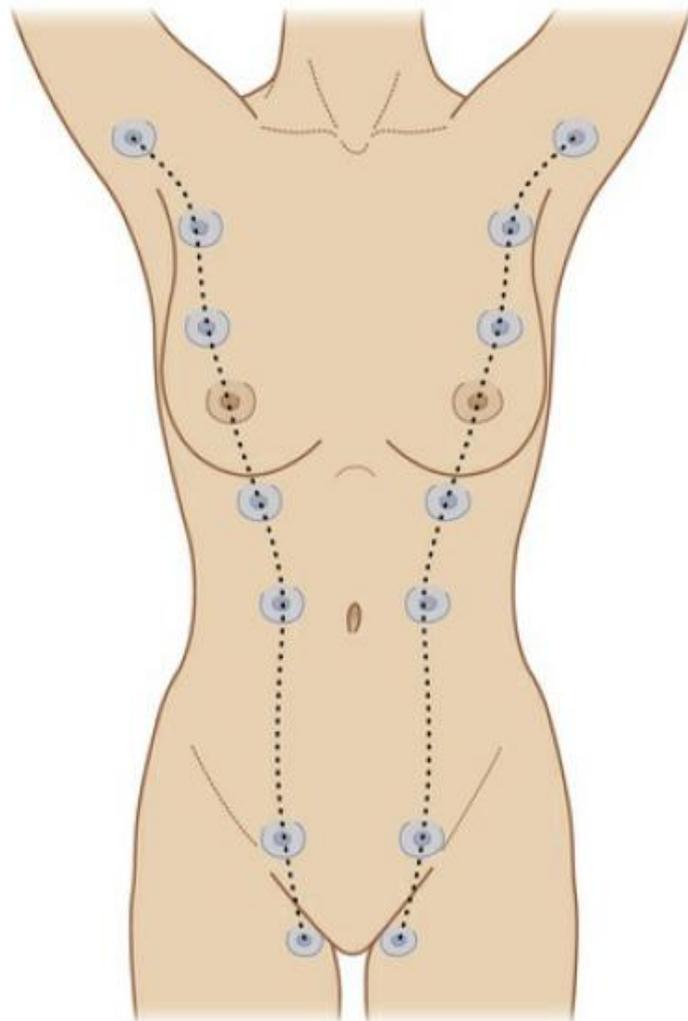


Γαλακτοφόρος πόρος

Εκκριτικό λόβιο

**Fig. 2.1** a The milk lines in a generalized mammalian embryo. Mammary glands form along these lines. b Common sites of formation of supernumerary nipples or mammary glands along the course of the milk line in human (Reproduced from Skandalakis et al. [22]; with permission)





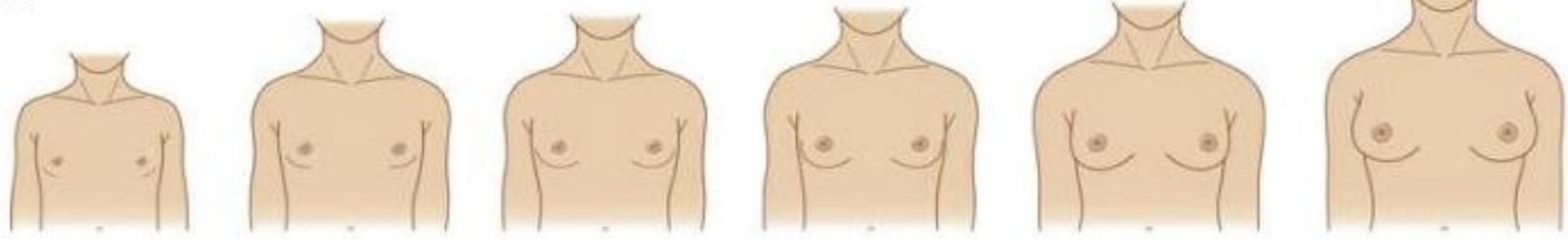
**FIG. 43.3** Milk lines. (From S. Standring (ed.), *Gray's Anatomy*, forty-first ed. © Elsevier, 2016, Fig. 53.28.)

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**TABLE 43.1****Tanner stages of female pubertal breast development**

---

Stage	Description
I	Pre-adolescent, elevation of the nipple only
II	Breast bud stage, glandular subareolar tissue develops, nipple and breast project from the chest wall as a single mound
III	Breast and areola further enlarge as a single mound, areola pigments and increases in diameter; glandular breast tissue proliferates and enlarges
IV	Nipple and areola further enlarge and pigment, and project as a distinct mound above the level of the main breast mound
V	Mature stage, development of smooth contour to the breast with no projection of the areola and nipple above the breast

**A**

Προ-εφηβεία

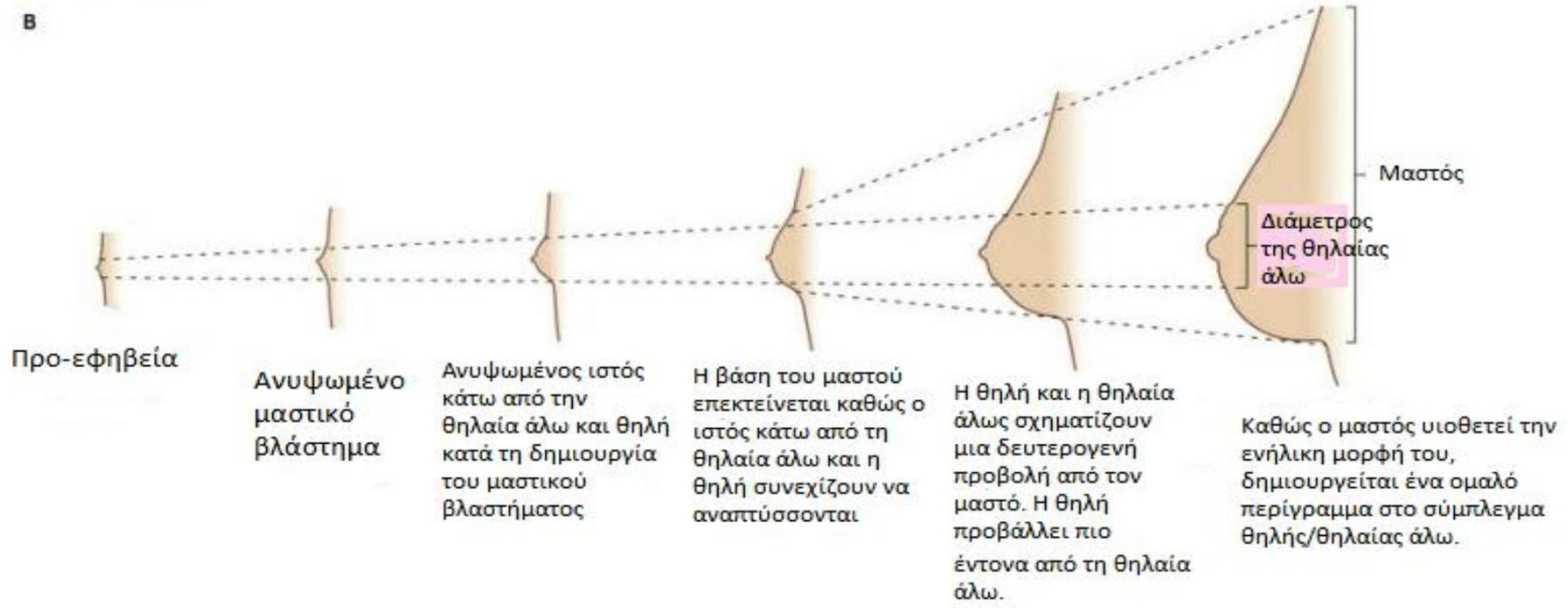
11 έτη

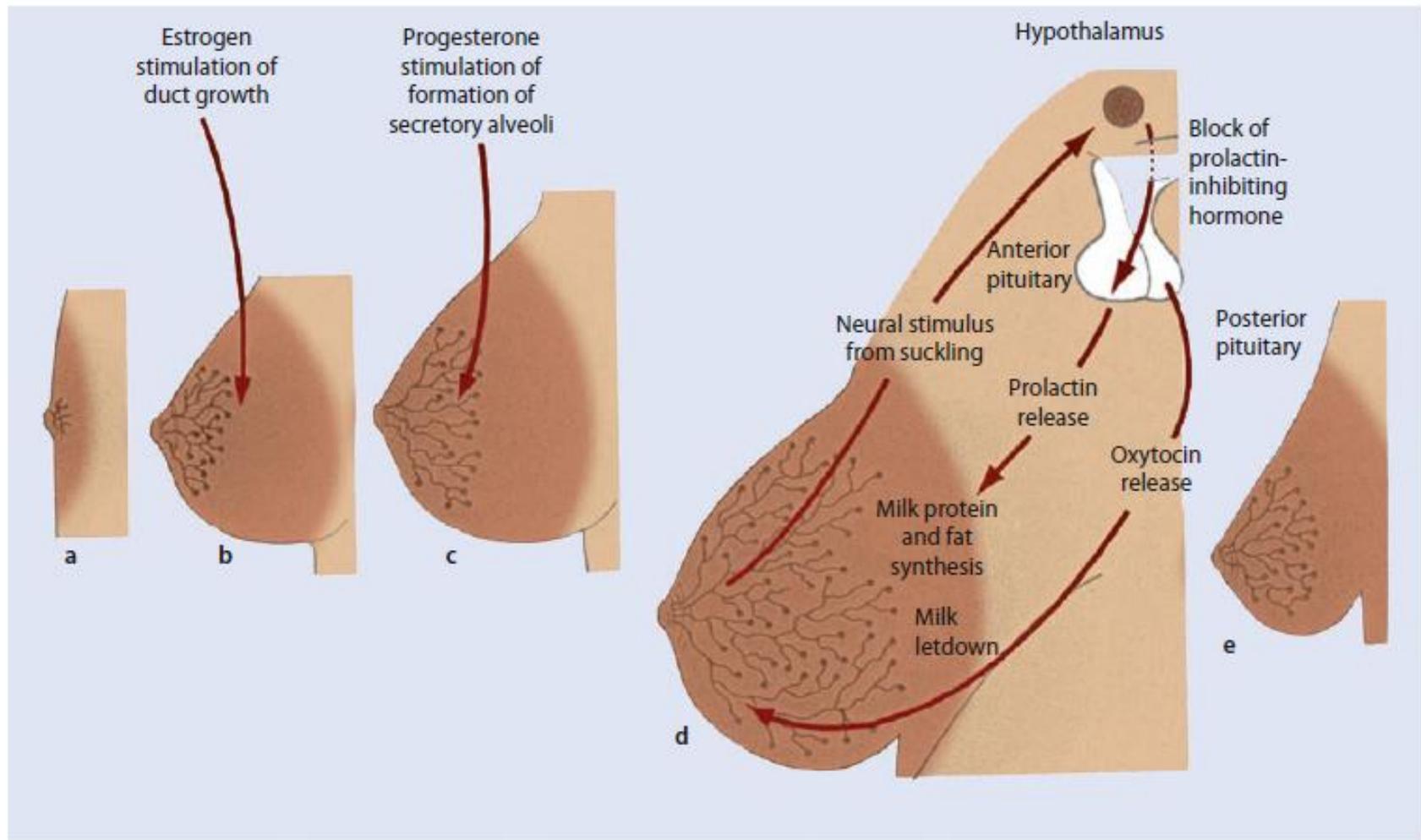
12 έτη

13 έτη

14 έτη

16 έτη

**B**



**Fig. 2.3** Development of the mammary duct and hormonal control of mammary gland development and function. **a** Newborn, the milk lines in a generalized mammalian embryo. Mammary glands form

along these lines. **b** Young adult. **c** Adult. **d** Lactating adult. **e** Postlactation (From Skandalakis et al. [22]; with permission)

# **INTRODUCTION**

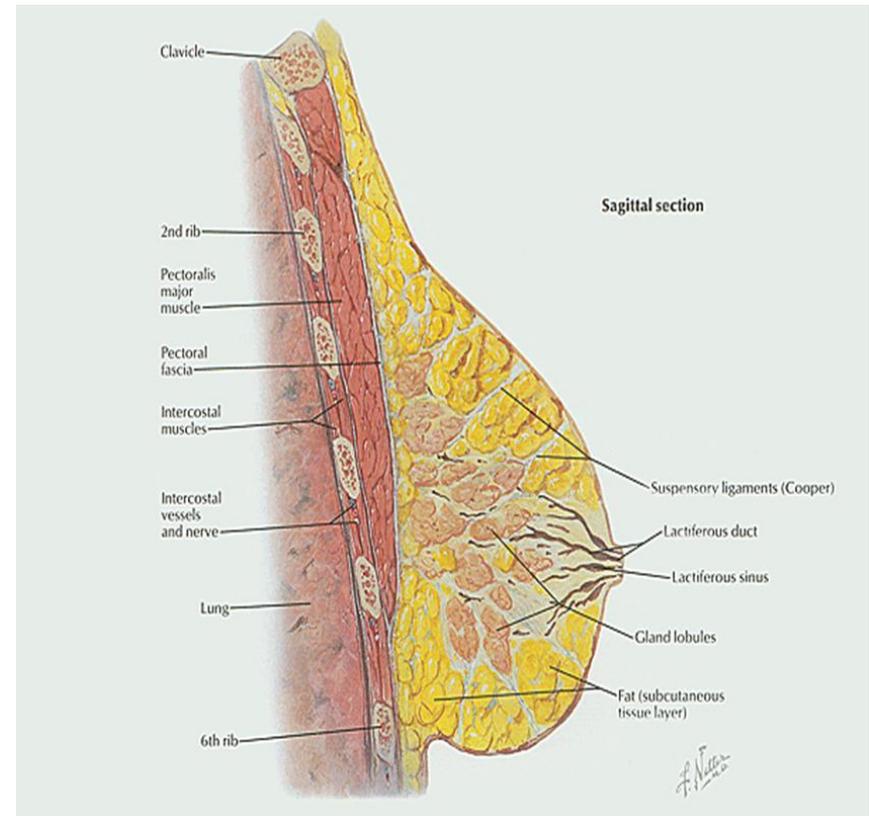
- **Mammary Glands exist in both sexes.**
- **Rudimentary in males throughout life**
- **Start developing at puberty in females**
- **Most of the development occurs during later months of pregnancy and lactation**

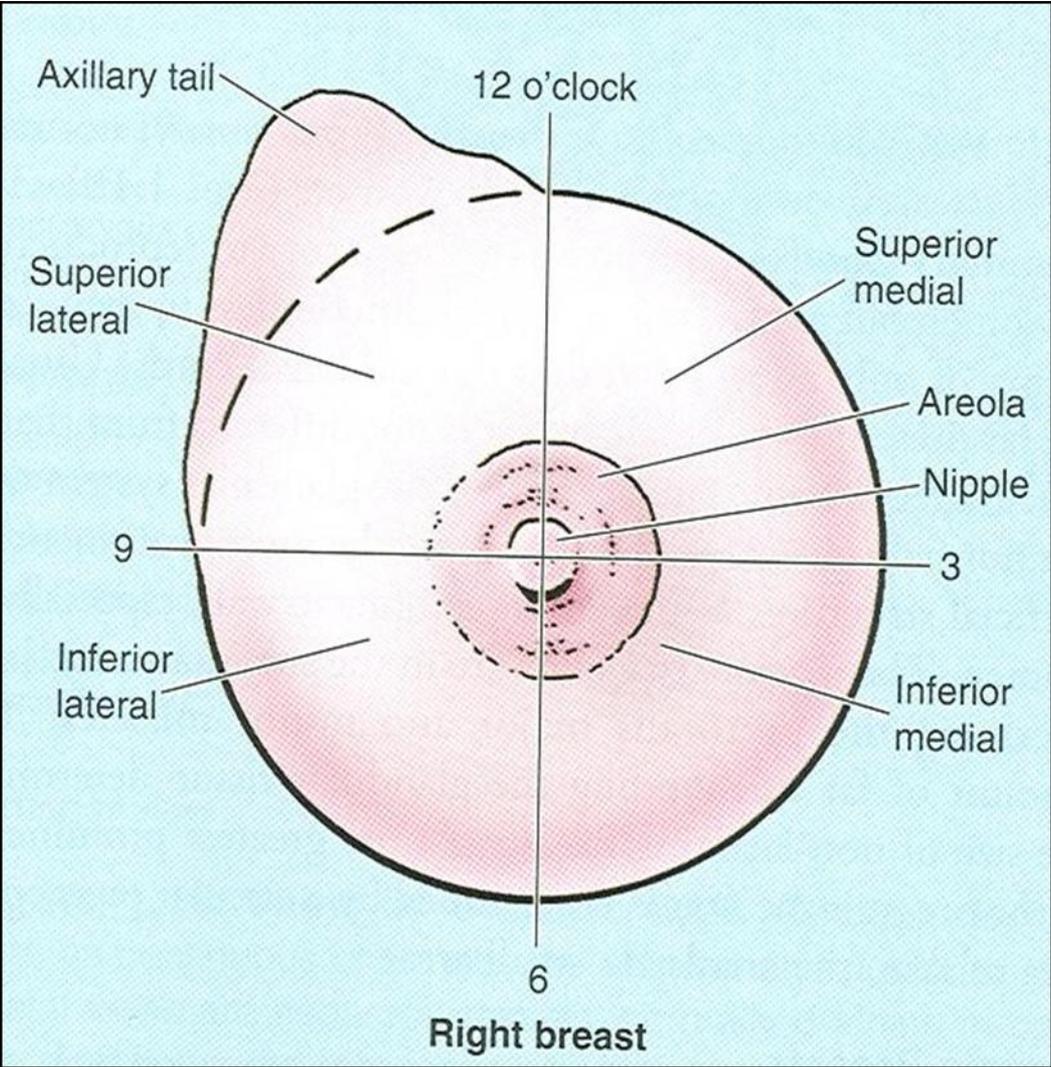
# GROSS ANATOMY OF BREAST

- All mammals have mammary glands.
- The mammary glands are modified skin glands (sweat glands).
- In human beings the functional breast is seen in adolescent females and nursing mothers.
- In some genetic disorder-Klienfelter syndrome males also have gynecomastia.

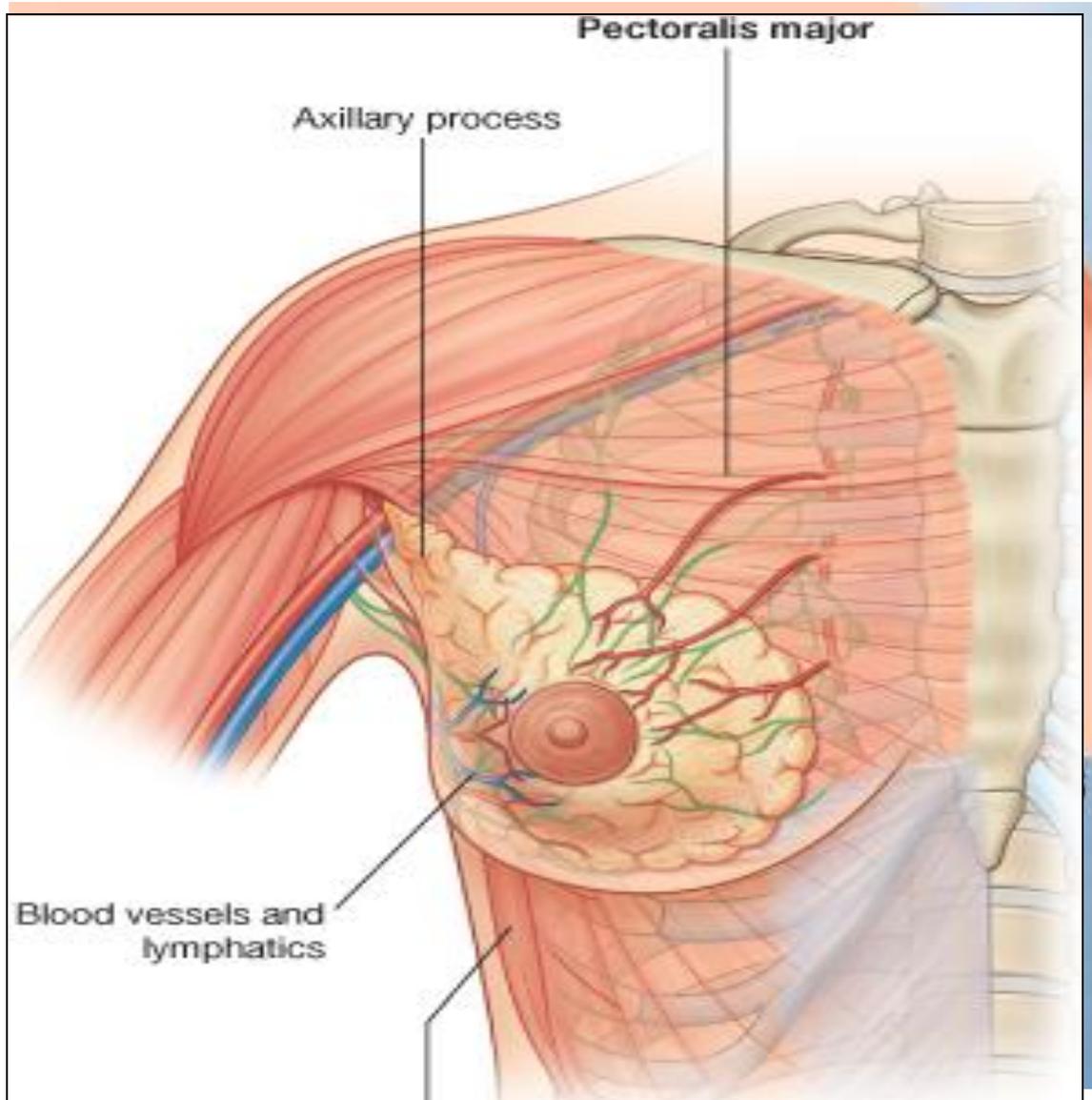
# Parts, Shape & position of the Gland

- It is conical in shape.
- It lies in superficial fascia of the front of chest.
- It has a base, apex and tail.
- Its base extends from 2nd to 6th ribs.
- It extends from the sternum to the midaxillary line laterally.
- It has no capsule.



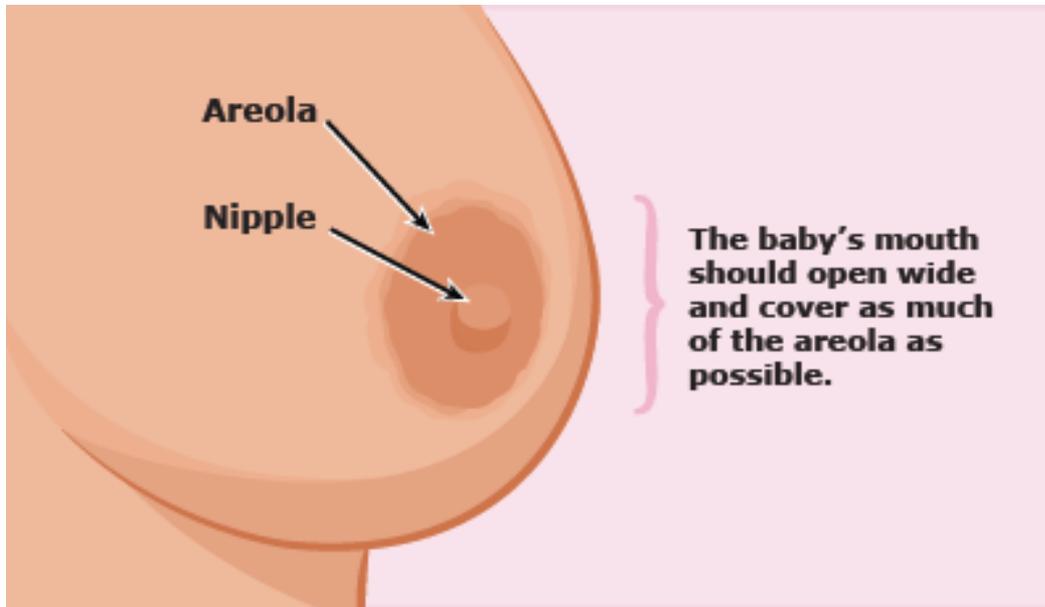


# SHAPE AND POSITION OF FEMALE BREAST



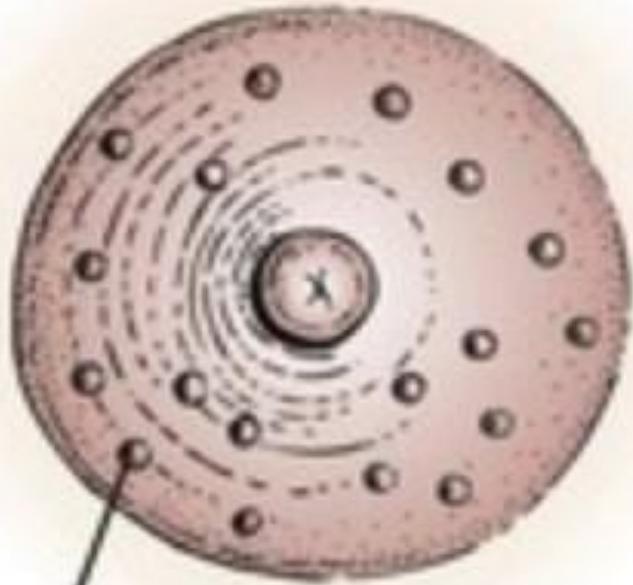
- $\frac{2}{3}$  of its base lies on the pectoralis major muscle, while its inferolateral  $\frac{1}{3}$  lies on:
- Serratus anterior &
- External oblique muscles.
- Its superolateral part sends a process into the axilla called the *axillary tail or axillary process*.

# SHAPE AND POSITION OF FEMALE BREAST



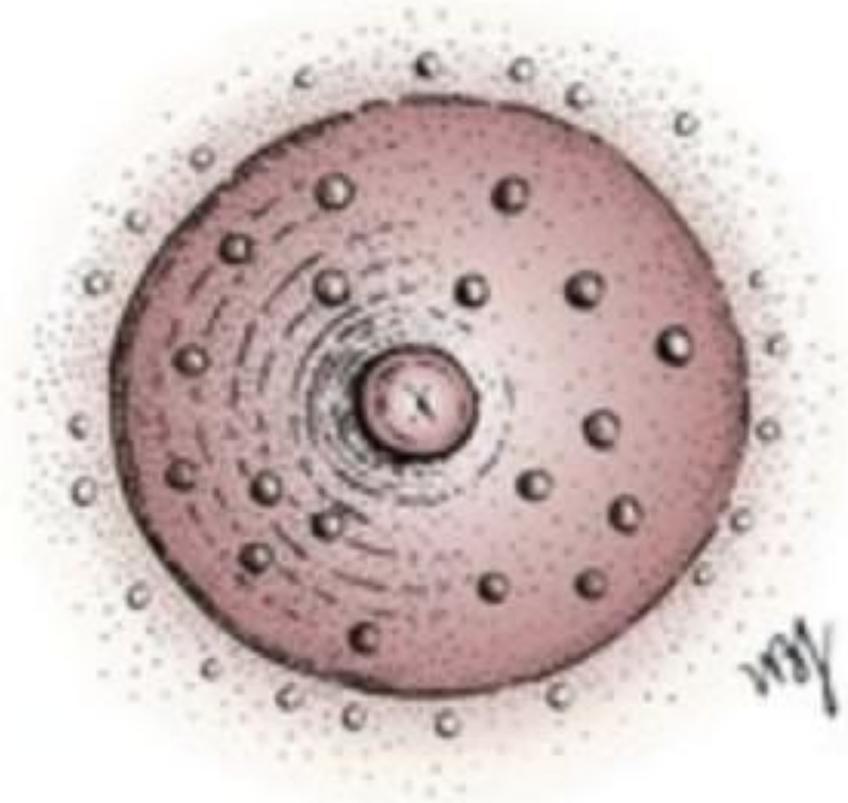
- **Nipple:**
- It is a conical eminence that projects forwards from the anterior surface of the breast.
- The nipple lies opposite 4<sup>th</sup> intercostal space.
- It carries 15-20 narrow pores of the lactiferous ducts.
- **Areola :**
- It is a dark pink brownish circular area of skin that surrounds the nipple.
- The subcutaneous tissues of nipple & areola are devoid of fat.

6-8 weeks



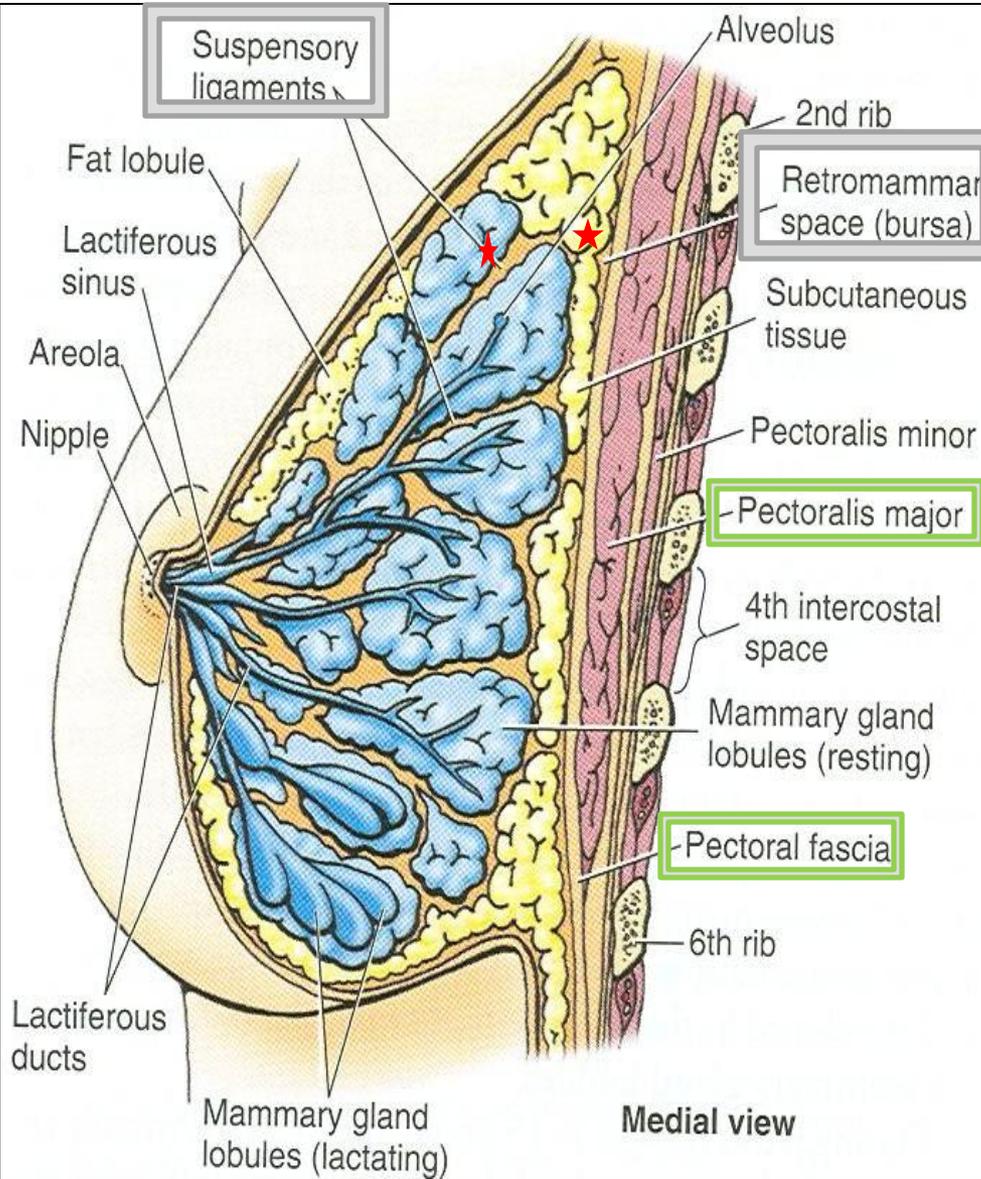
Raised Montgomery's tubercles

16 weeks



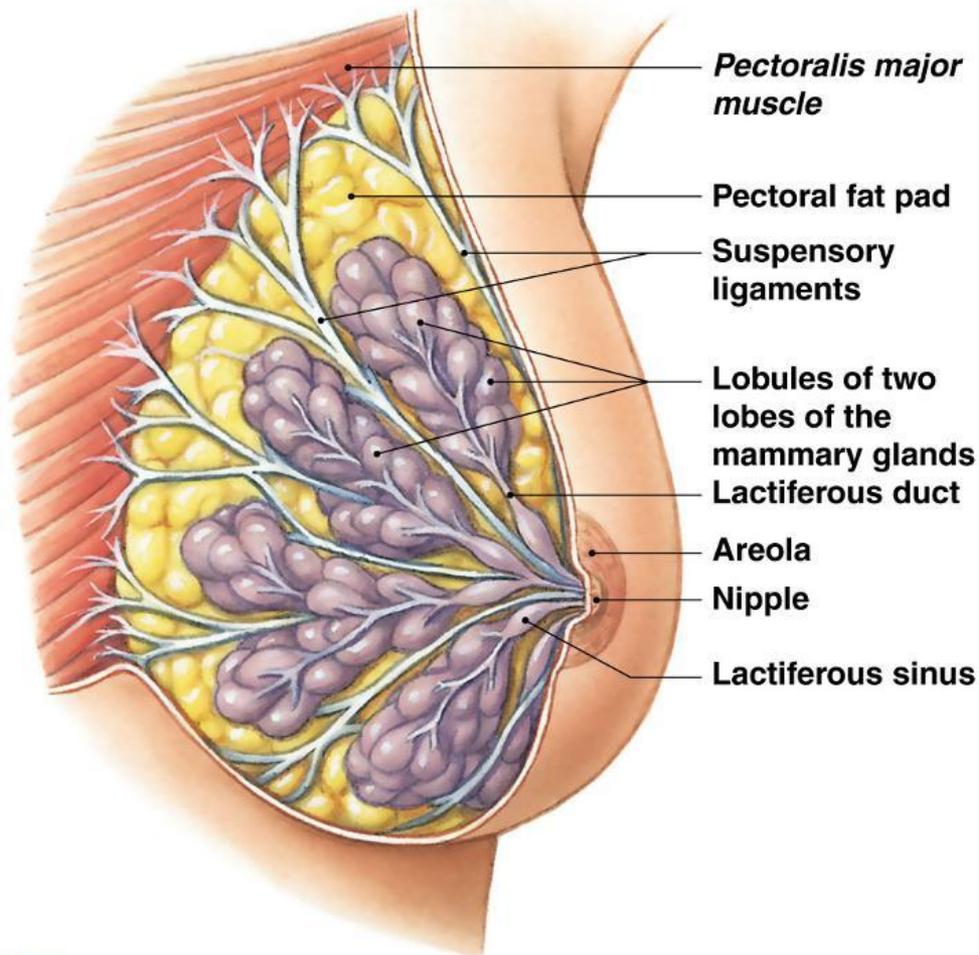
Further pigmentation

# STRUCTURE OF MAMMARY GLAND



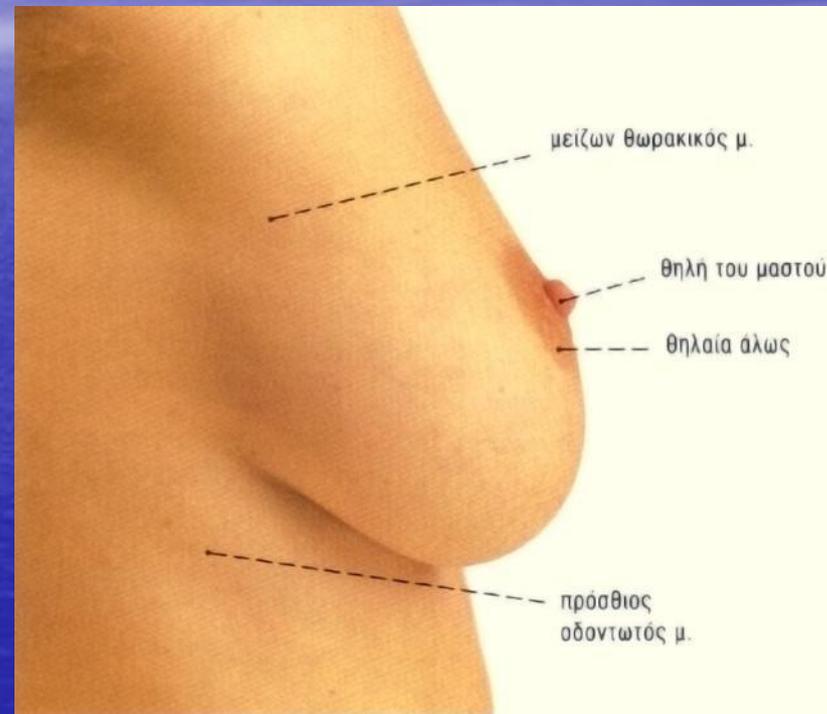
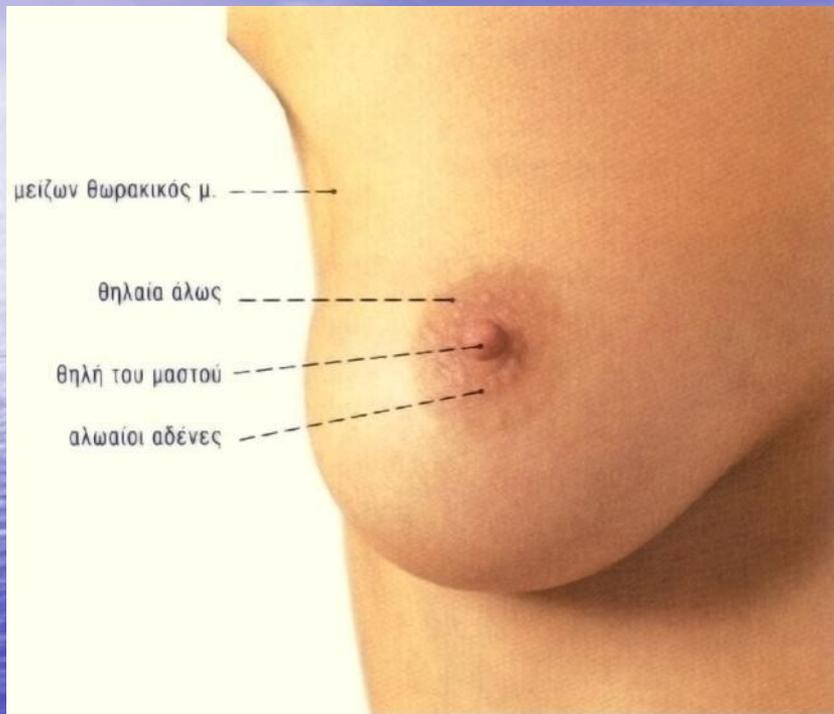
- It is non capsulated gland.
- It has fibrous strands (ligaments of cooper) which connect the skin with deep fascia of pectoralis major.
- Retromammary space.  
What is its Importance?

# STRUCTURE OF MAMMARY GLAND



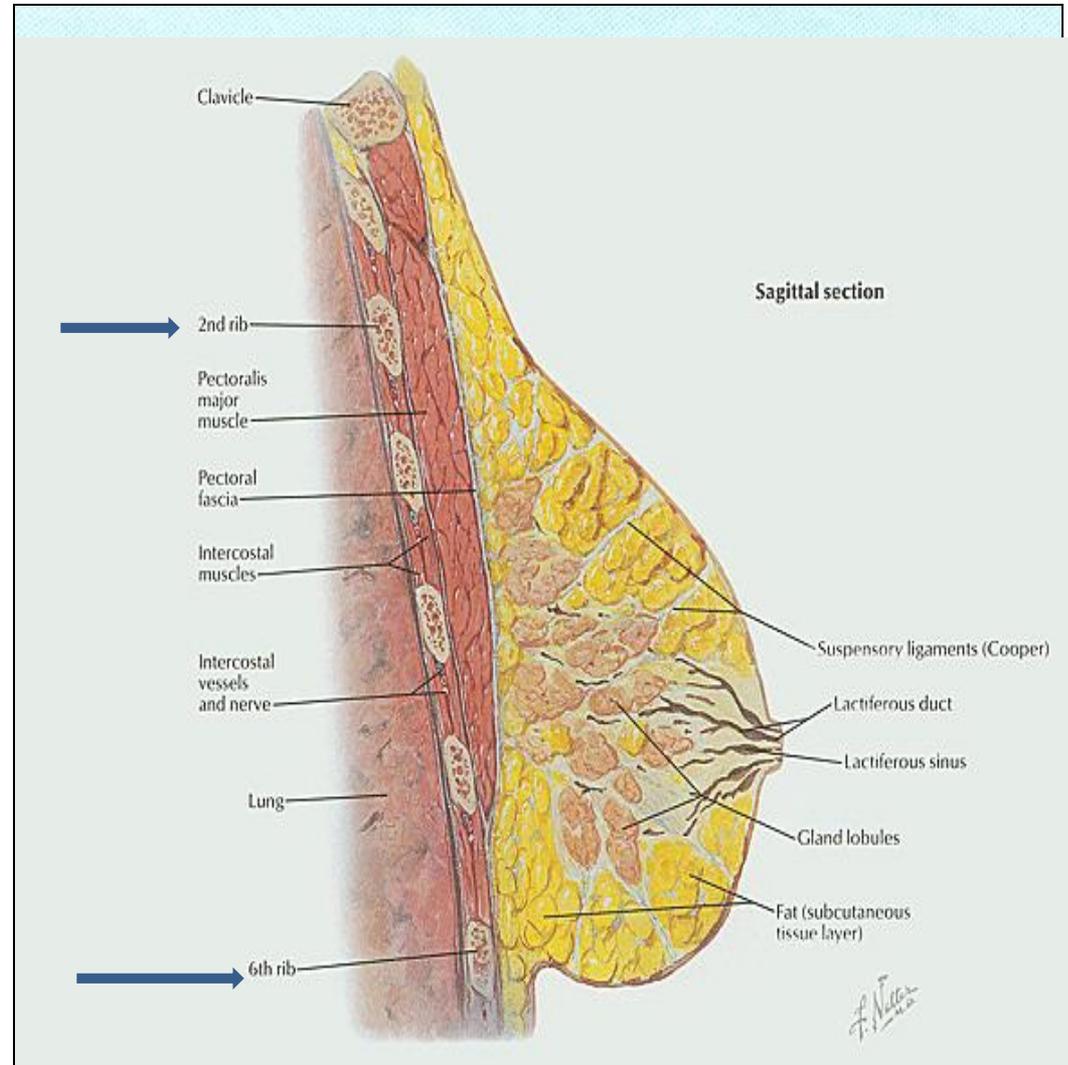
- It is formed of 15-20 lobes.
- Each lobe is formed of a number of lobules.
- It has from 15-20 lactiferous ducts which open by the same number of openings on the summit of the nipple.

**a** The mammary glands of the left breast

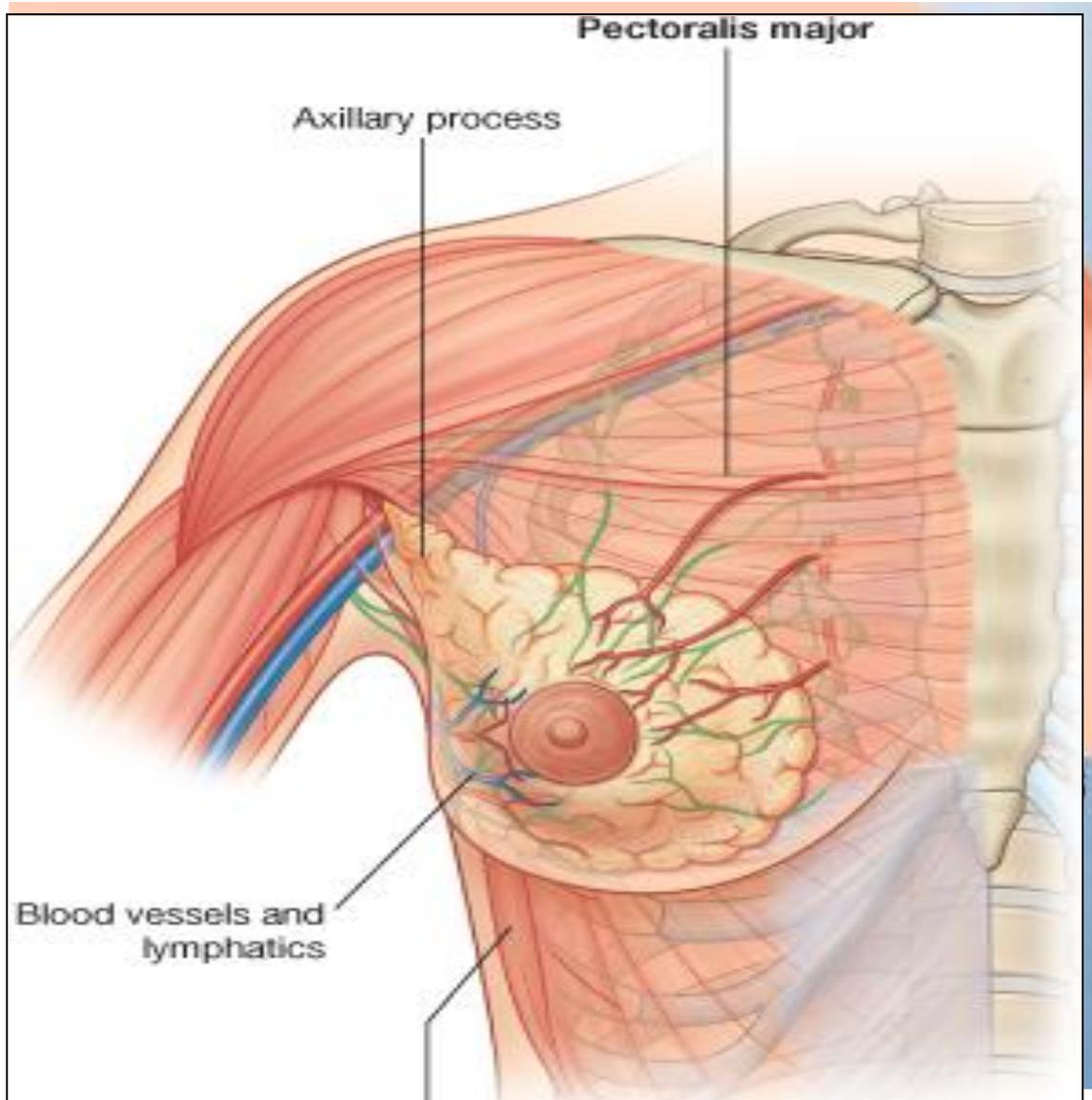


# Parts, Shape & position of the Gland

- It is conical in shape.
- It lies in **superficial fascia** of the front of chest.
- It has a base, apex and tail.
- Its base extends from **2<sup>nd</sup> to 6<sup>th</sup> ribs**.
- It extends from the **sternum** to the **midaxillary line** laterally.
- It has no capsule.

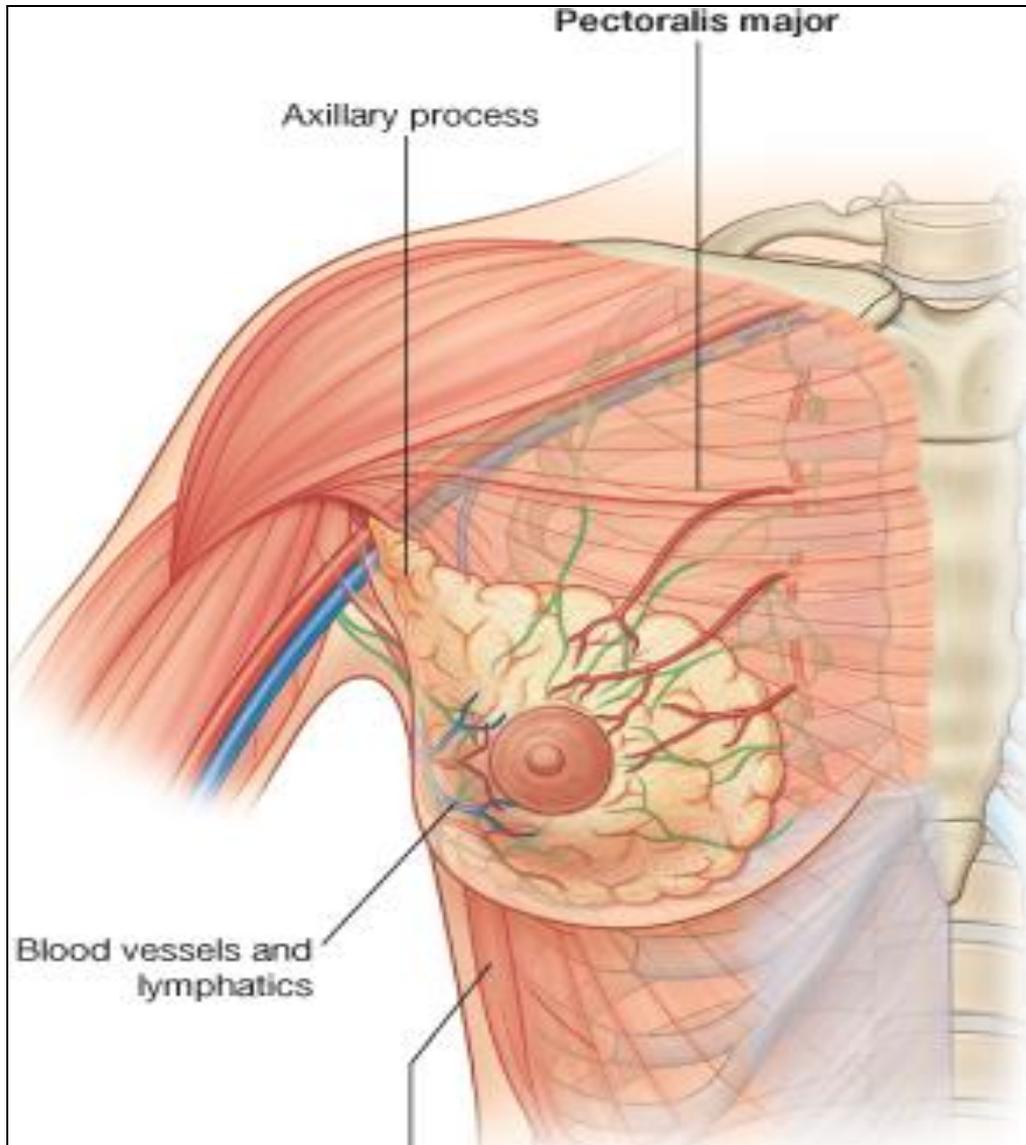


# SHAPE AND POSITION OF FEMALE BREAST



- 2/3 of its base 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.**

# SHAPE AND POSITION OF FEMALE BREAST



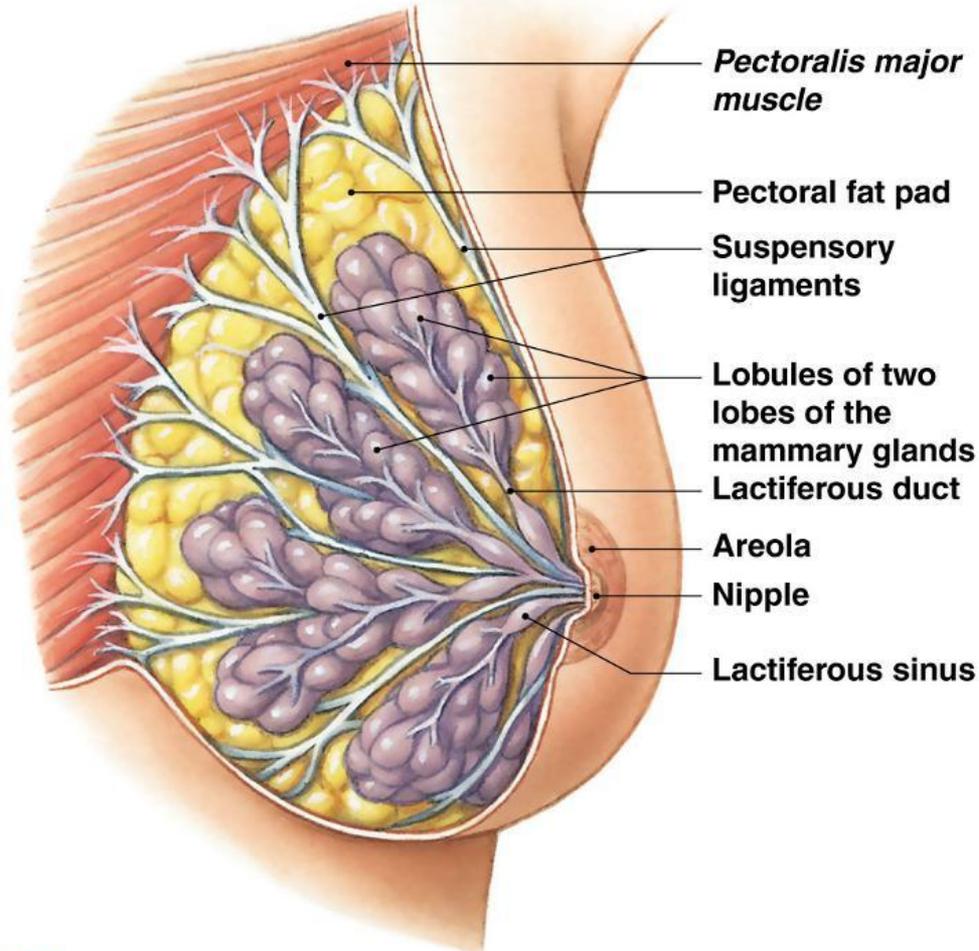
- **Nipple:**
- It is a **conical eminence** that projects forwards from the anterior surface of the breast.
- The nipple lies opposite **4<sup>th</sup> intercostal space**.
- It carries **15-20** narrow pores of the lactiferous ducts.
- **Areola :**
- It is a **dark pink brownish circular area** of skin that surrounds the nipple.
- The **subcutaneous tissues** of nipple & areola are **devoid of fat**.

# STRUCTURE OF MAMMARY GLAND



- It is **non capsulated** 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**. **What is its Importance?** (allows the breast to move freely).

# STRUCTURE OF MAMMARY GLAND



- It is formed of 15-20 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)?** These ligaments give the breasts support by connecting the skin of the breasts to the pectoralis muscles below them.
- It has from **15-20 lactiferous ducts** which open by the same number of openings on the summit of the nipple.

**a** The mammary glands of the left breast

Σμιγματογόνος αδένας

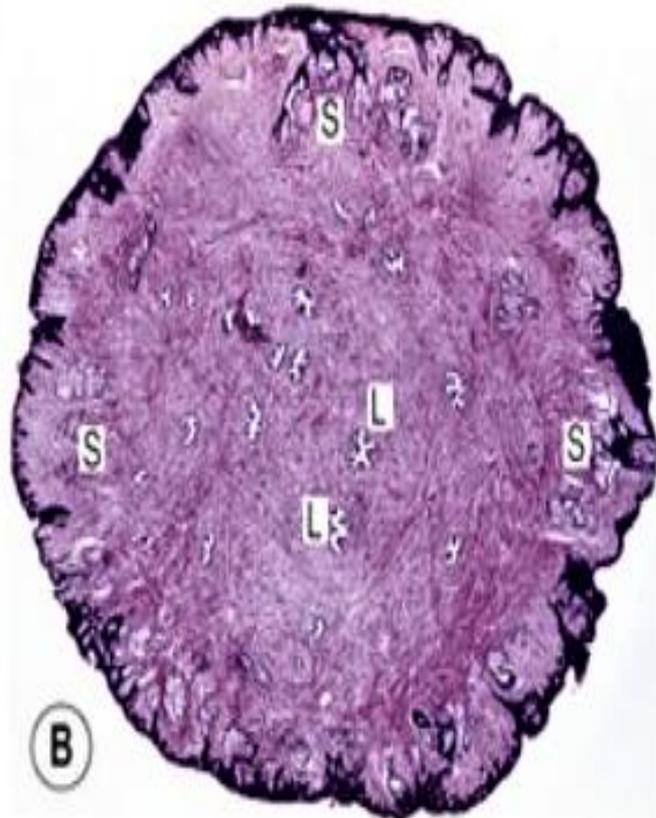
Στρογγυλός λείος μυς

Γαλακτοφόρος πόρος

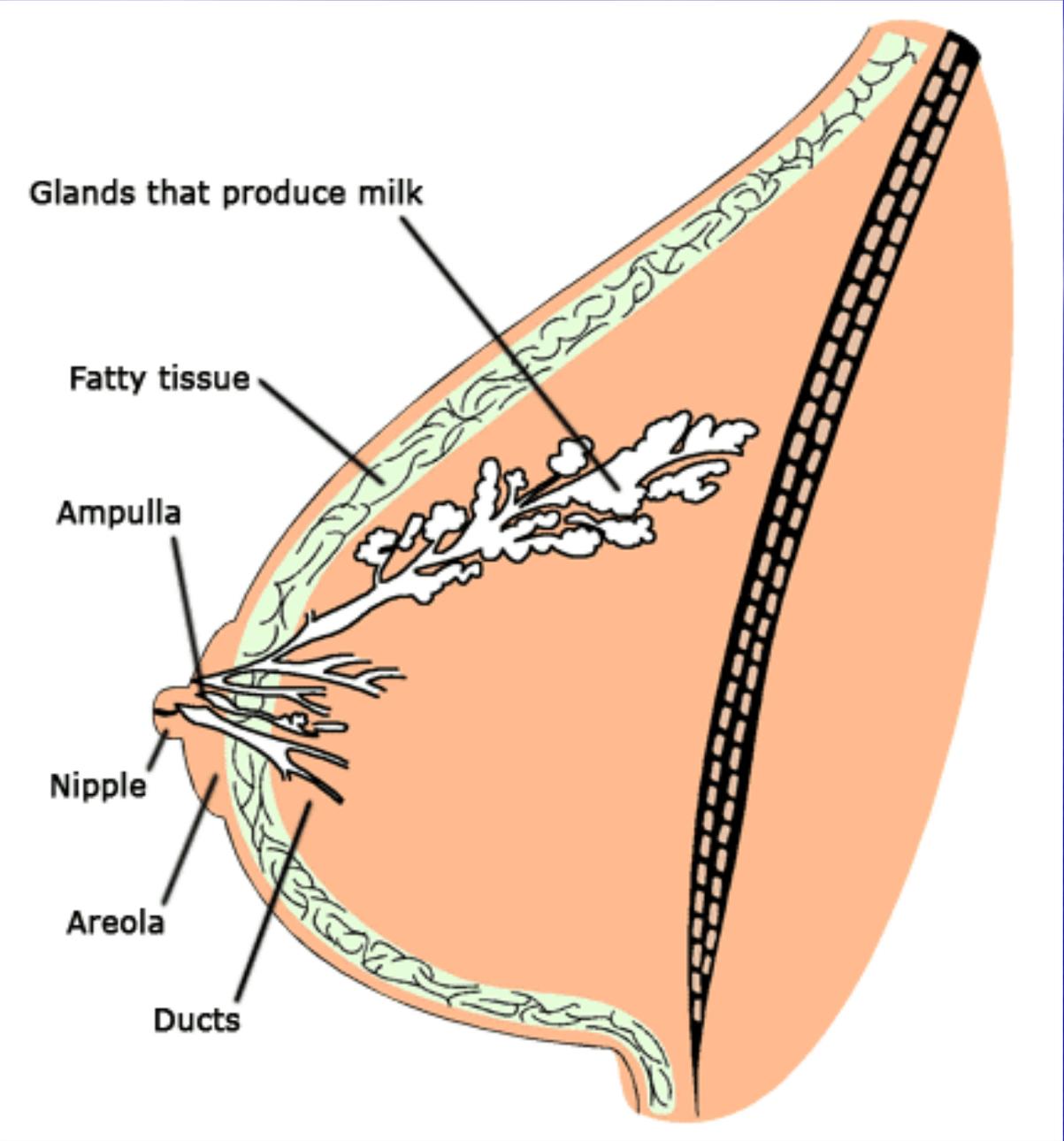
Βοηθητικός αδένας  
(Φυμάτιο του Montgomery)

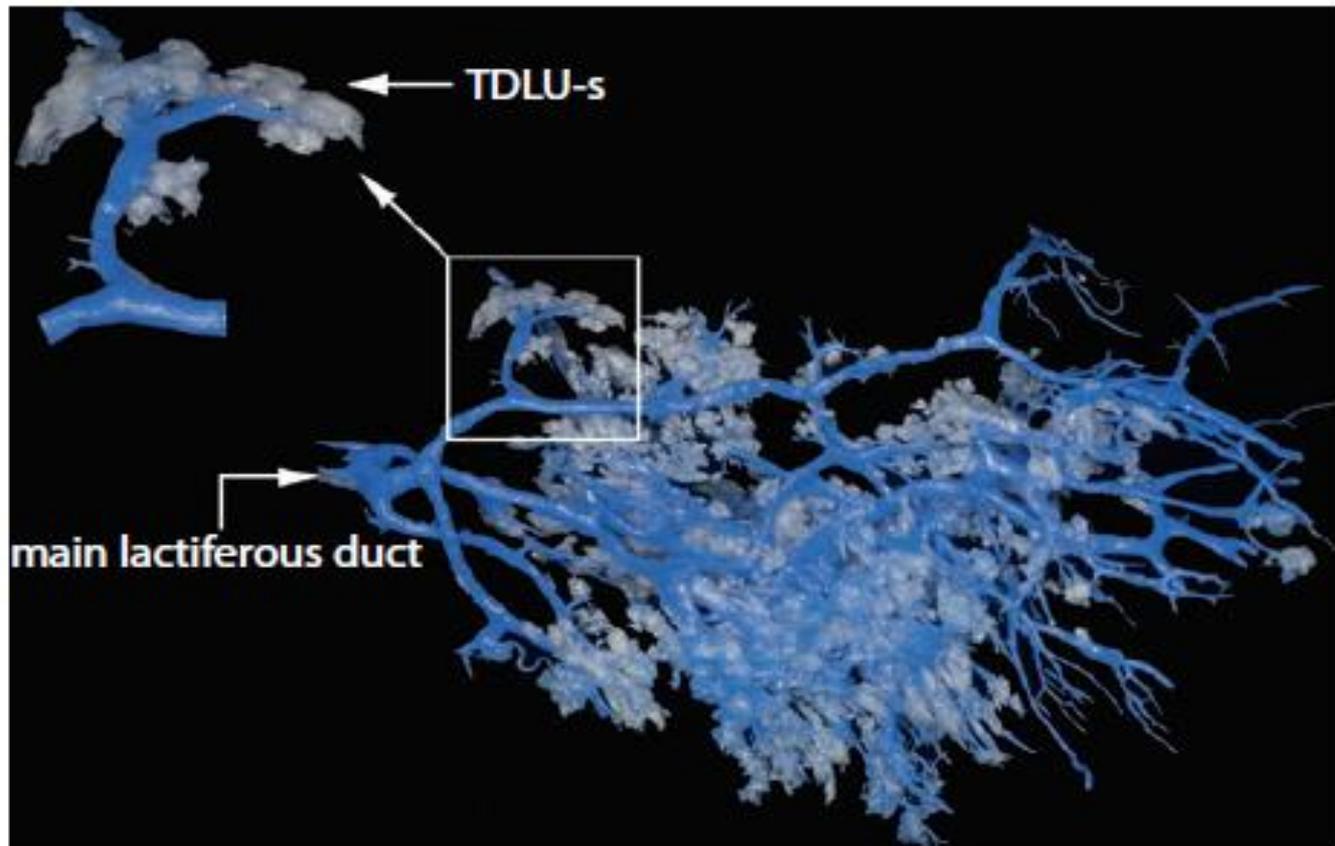
Θηλαία άλω

**A**

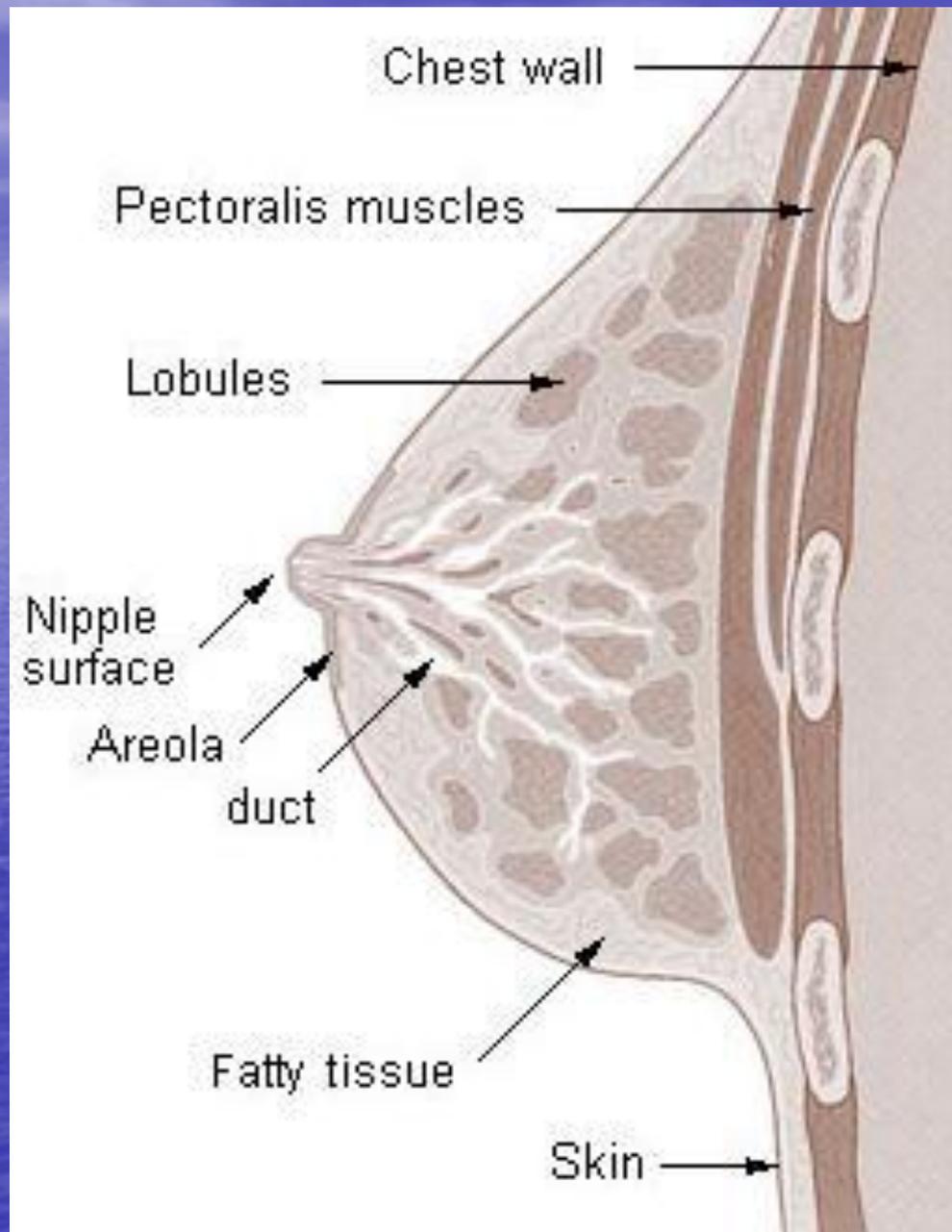


**B**



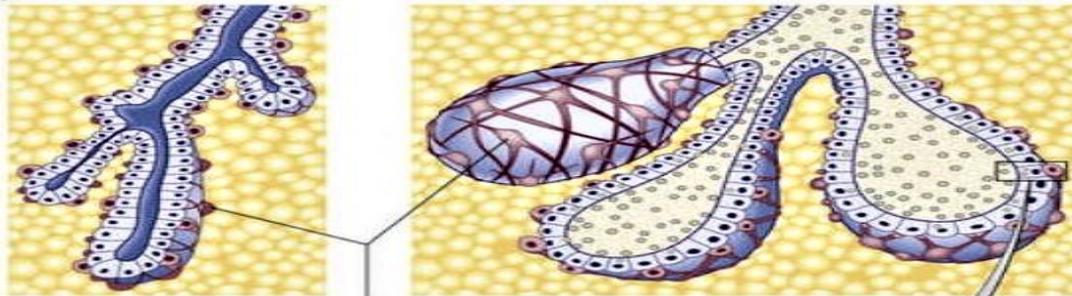


■ Fig. 1.1 The lactiferous ducts of a premenopausal breast lobe are filled with plastic. *Blue colour* indicates the ductal structure, while *white colour* indicates the TDLUs



# Micro-anatomy

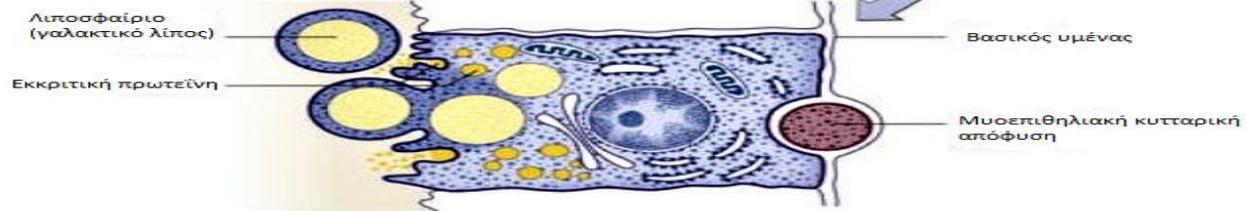
A



Μη γαλουχία  
(άτεκνος)

Μυοεπιθηλιακό  
κύτταρο

Γαλουχία



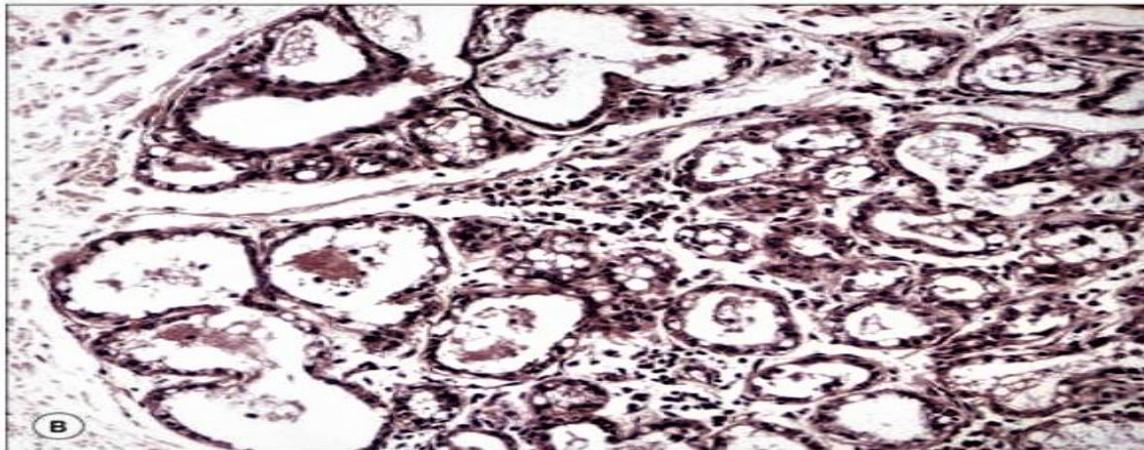
Λιποσφαίριο  
(γαλακτικό λίπος)

Εκκριτική πρωτεΐνη

Βασικός υμένας

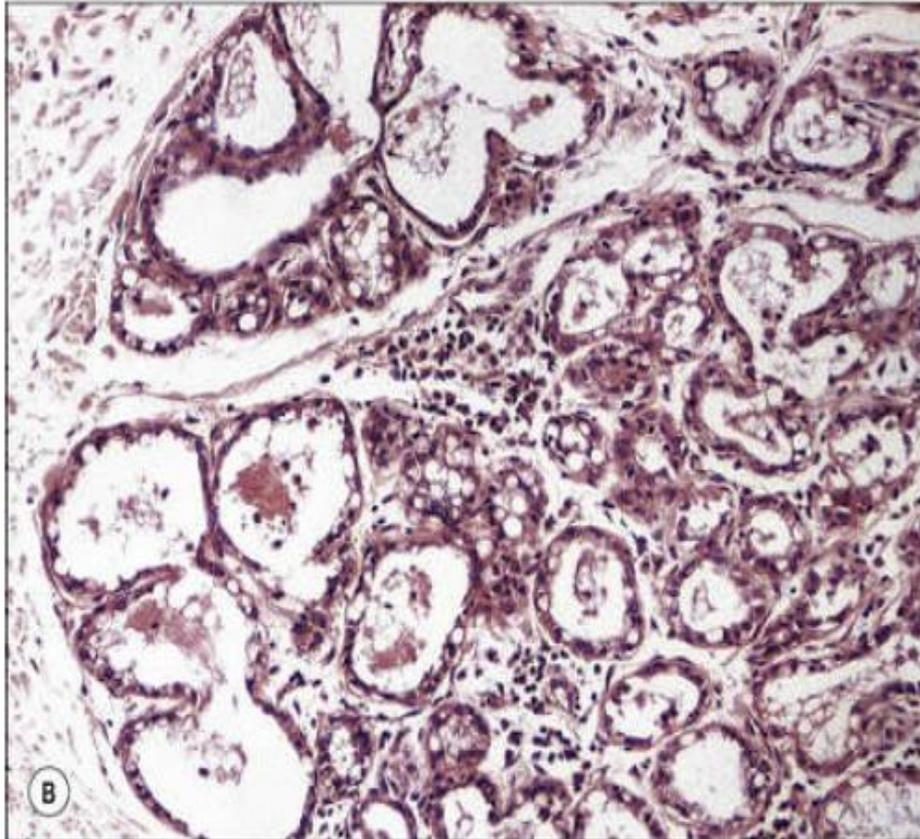
Μυοεπιθηλιακή κυτταρική  
απόφυση

Υπερδομή του εκκριτικού κυττάρου



B

# Histology



**FIG. 43.7** The microstructure of breast epithelium. **A**, Note that the myoepithelial process is actually about half the relative size of that shown in the lower diagram. **B**, The peripheral part of a lactating breast lobule enclosed by a connective tissue septum (left). The alveoli are distended by milk secretion. Milk protein appears as eosinophilic material in the lumen and milk fat as pale cytoplasmic vacuoles in the

# Ligaments of Cooper

- *Their deep segment anchors the breast to the pectoral fascia, so total removal of the gland is facilitated by removal of the pectoral fascia.*



- Cooper's ligaments have significant oncologic importance.
- A tumor may also infiltrate these ligaments causing skin retraction, which is an important diagnostic sign of breast cancer

# Breast Fascia

- The superficial fascia of the breast encases the glandular tissue with its anterior and posterior lamella.
- The anterior lamella is located superficial to the gland at varying distances from the dermis. The anterior lamella has clinical significance during skin-sparing mastectomies.
- The posterior lamella covers the undersurface of the gland and continues as Scarpa's fascia inferiorly.
- Between the posterior lamella and the pectoral fascia, the retromammary space (Chassaignac's bursa) can be found
- This space contains fine areolar tissue, which can be dissected bluntly



- **Superficial fascia**

- The superficial fascia enveloping the breast is continuous with the superficial abdominal fascia (of Camper) below, and the superficial cervical fascia above.

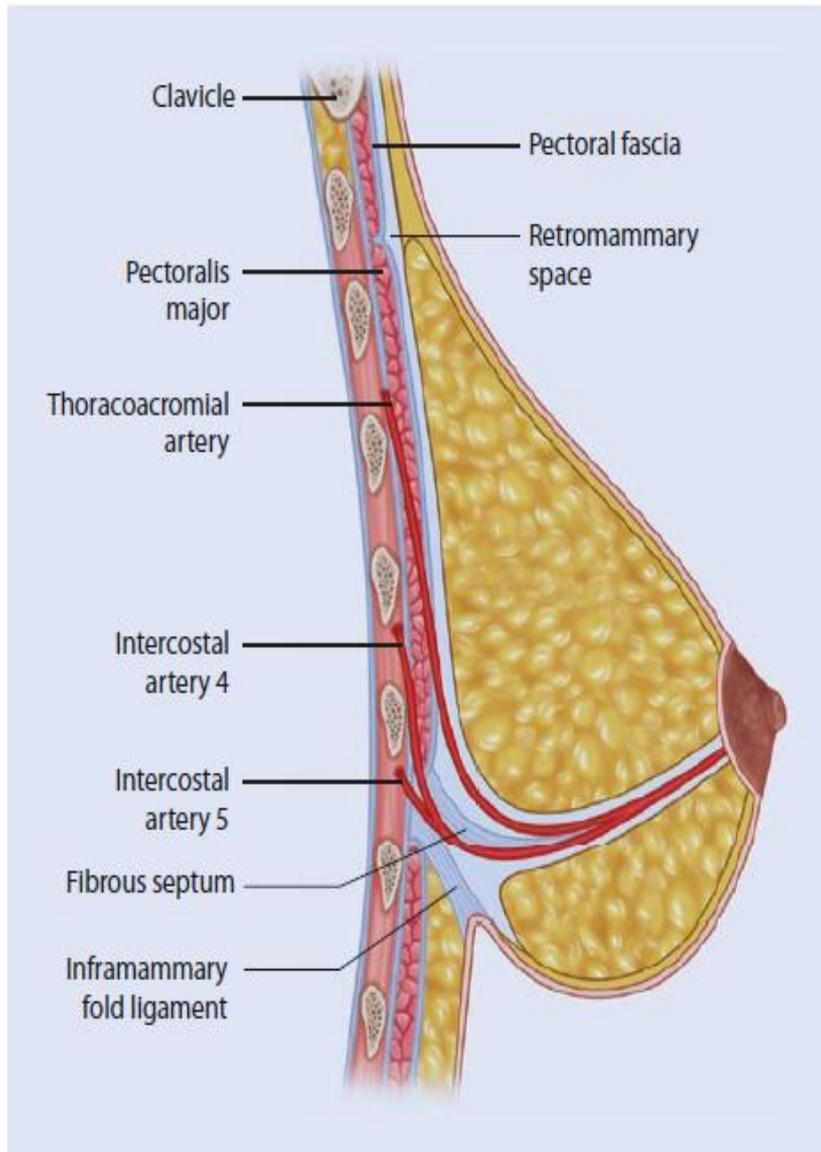
- **Deep fascia 1**

- Envelops the pectoralis major muscle and is continuous with the deep abdominal fascia below. It attaches to the sternum medially and to the clavicle and axillary fascia above and laterally. It forms the so-called suspensory ligament of the axilla.

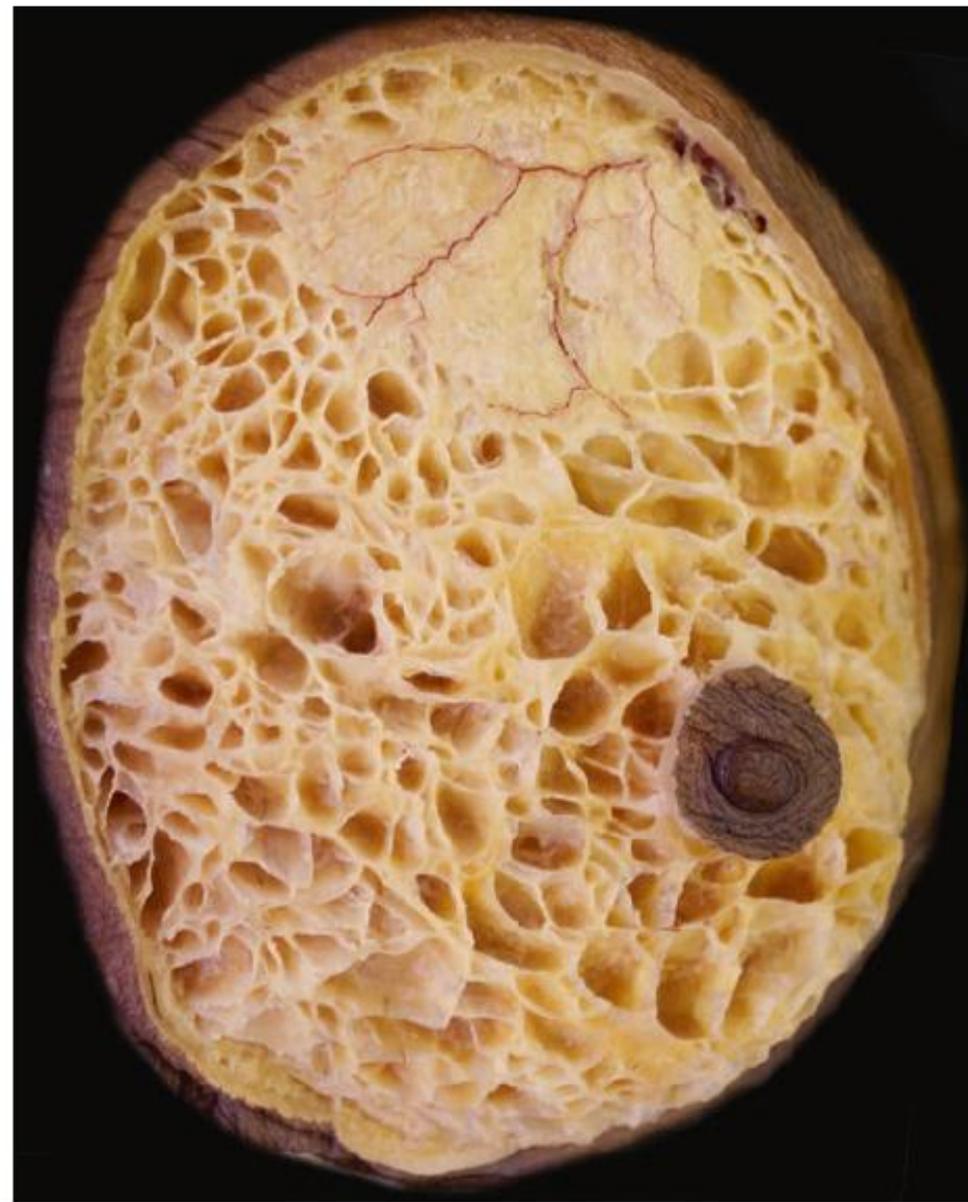
- **Deep fascia 2**

- Envelops the pectoralis minor muscle, deep to the pectoralis major muscle, the clavipectoral fascia and part of the subclavius muscle and attaches to the inferior aspect of the clavicle

- There is a **clinically important** fibrous septum in the breast, called the **septum fibrosum**. It is located horizontally **at the level of the fifth rib** towards the **nipple**. It divides the glandular tissue into an upper and lower part. It is reinforced medially and laterally by vertical horns.
- **The septum fibrosum contains neurovascular structures supplying the NAC and gland.** The thoracoacromial and deep branches of the lateral thoracic artery travel on the cranial side of this septum, while the fourth – rarely the fifth and sixth – intercostal artery perforator travels on the caudal side of it. The lateral cutaneous branches of the fourth intercostal nerve travel also along this septum.
- The breast can be dissected bluntly along this septum from the posterior side, so the blood supply can be preserved to the NAC during surgery.



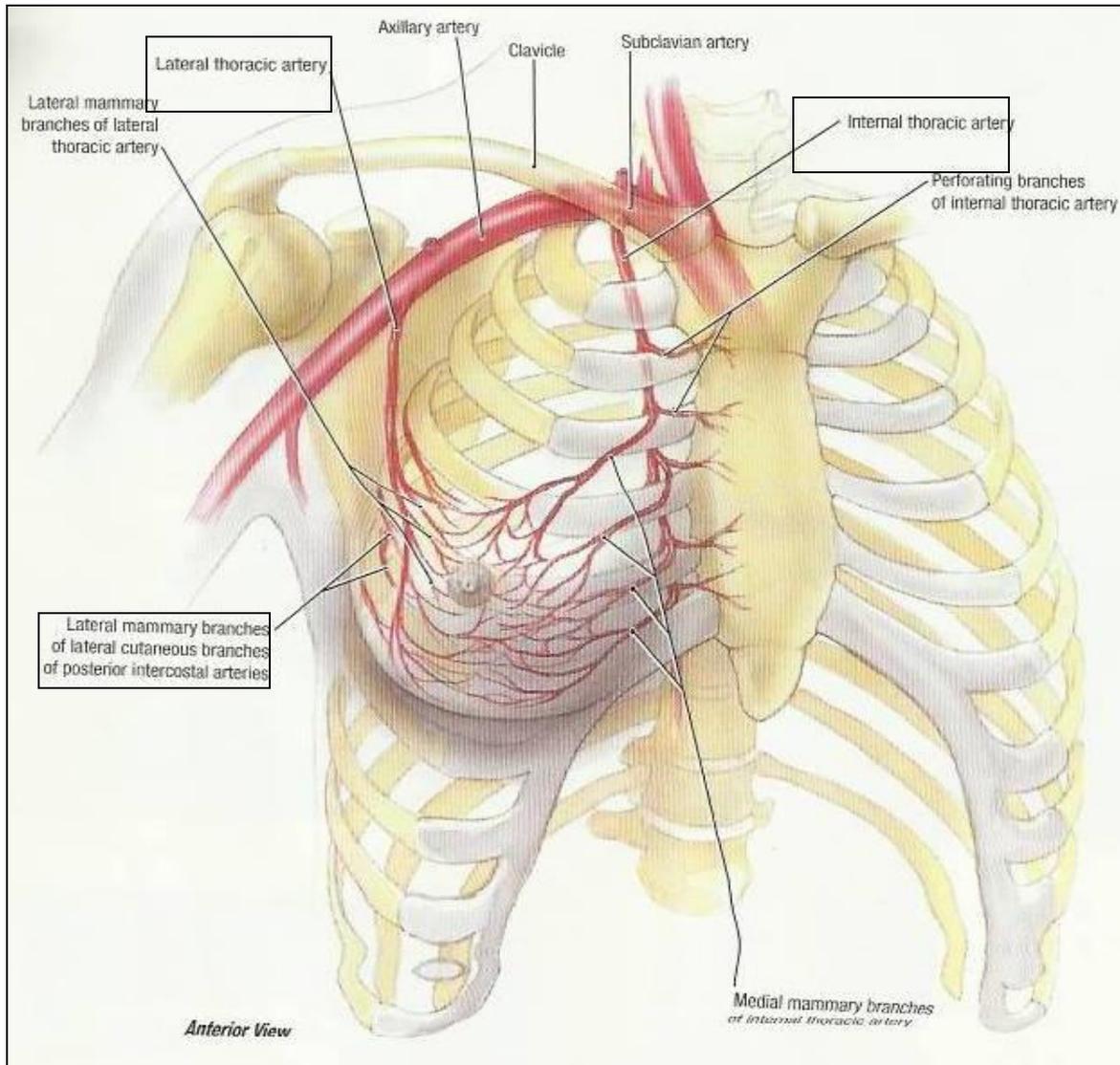
■ Fig. 1.3 Schematic representation of a lateral cross-sectional view of the fibrous septum of the breast



■ Fig. 1.2 Ligaments in between the skin and the anterior lamella of the superficial fascia of the breast. A superficial branch of the second internal mammary artery perforator is also seen

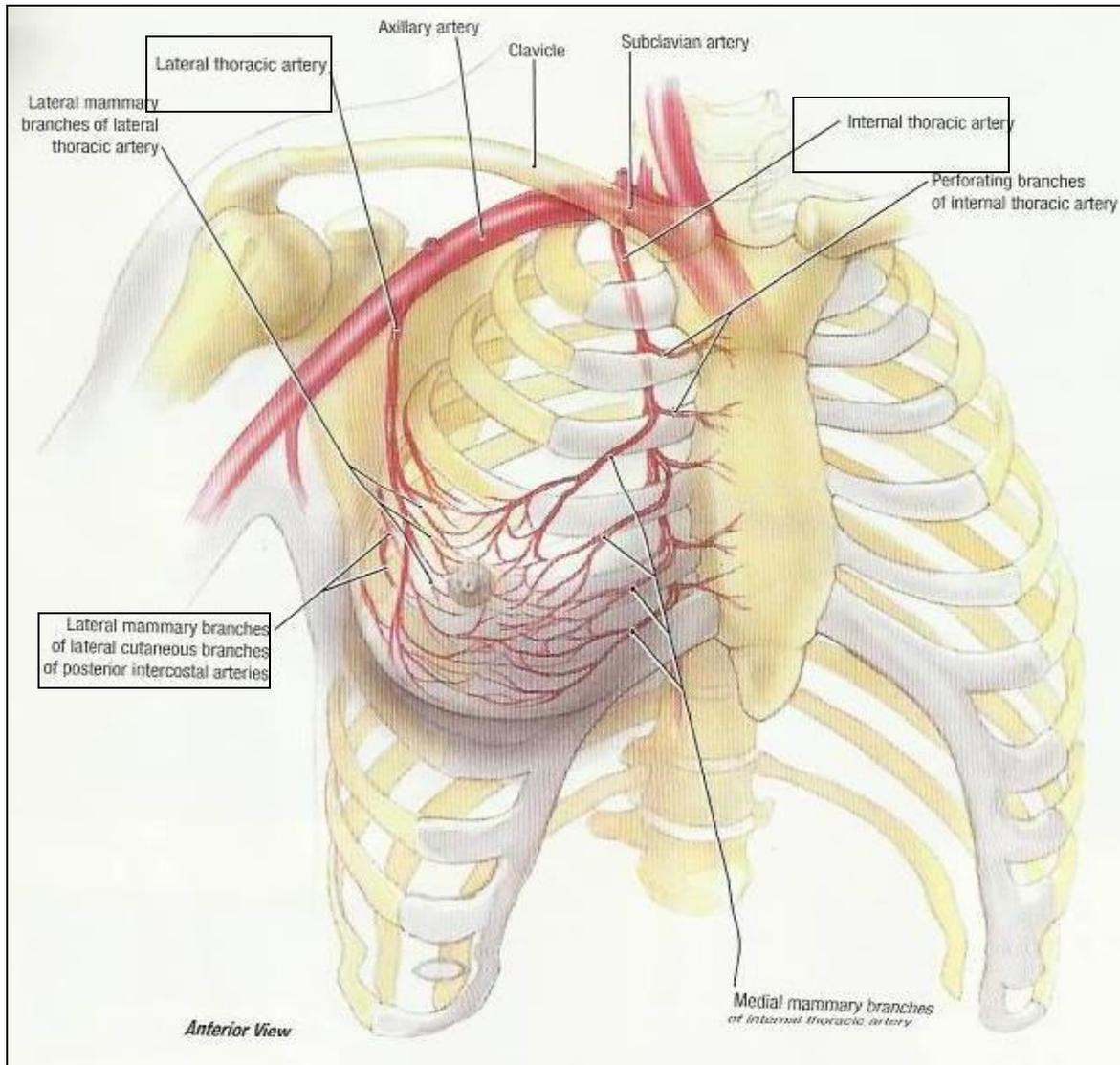


# ARTERIAL SUPPLY



- **1. Perforating branches of internal thoracic (internal mammary) artery.**
- **2. Mammary branches of lateral thoracic artery.**
- **3. Mammary branches of Intercostal arteries.**

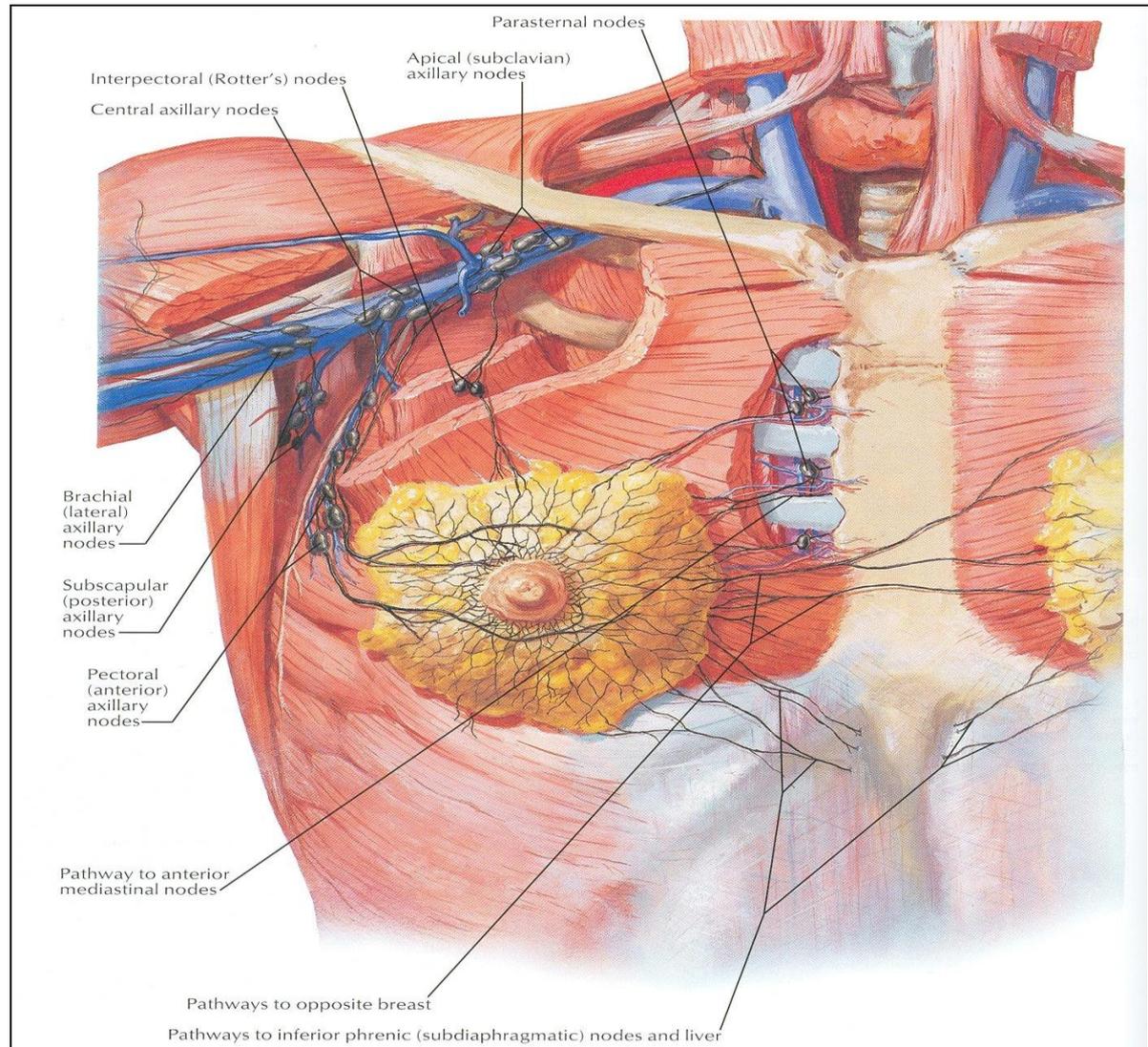
# ARTERIAL SUPPLY



- **1. Perforating branches of internal thoracic (internal mammary) artery.**
- **2. Mammary branches of lateral thoracic artery.**
- **3. Mammary branches of Intercostal arteries.**

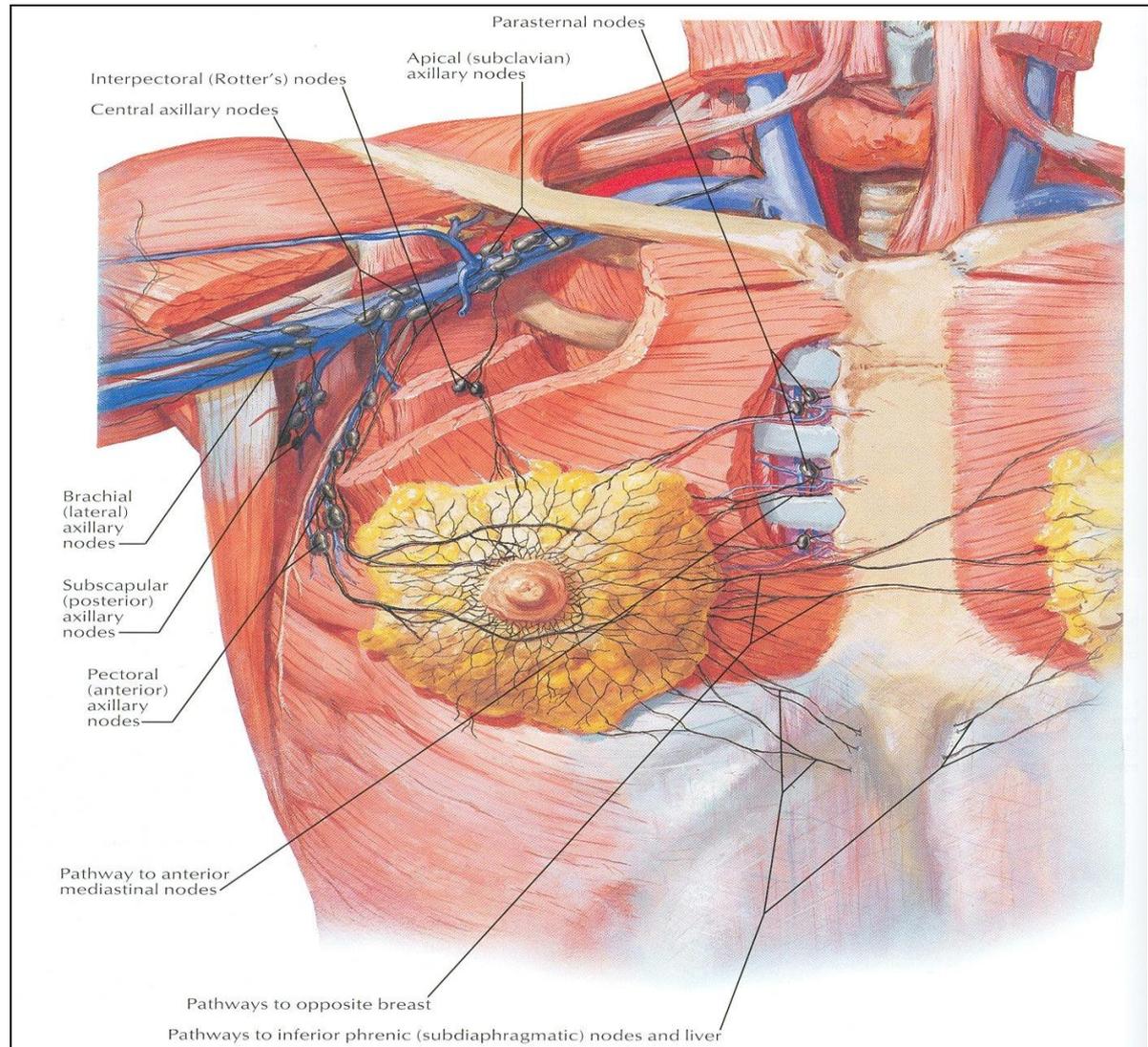
# VENOUS SUPPLY

- 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 veins.



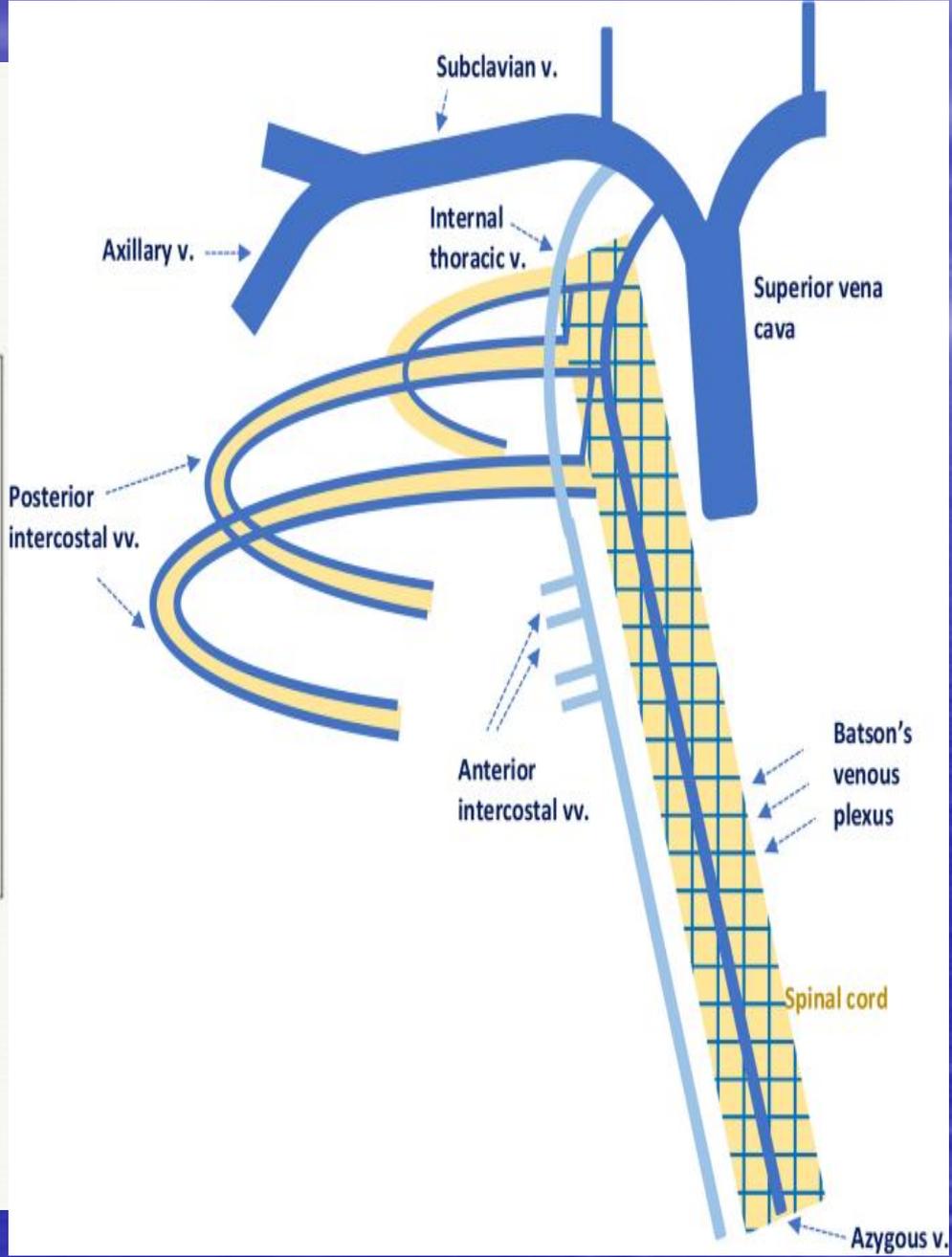
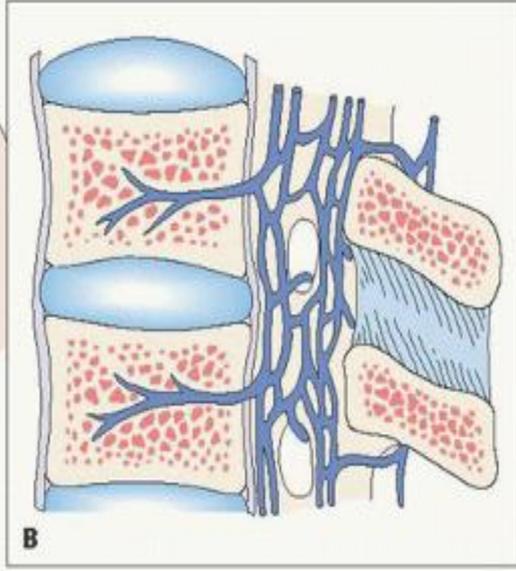
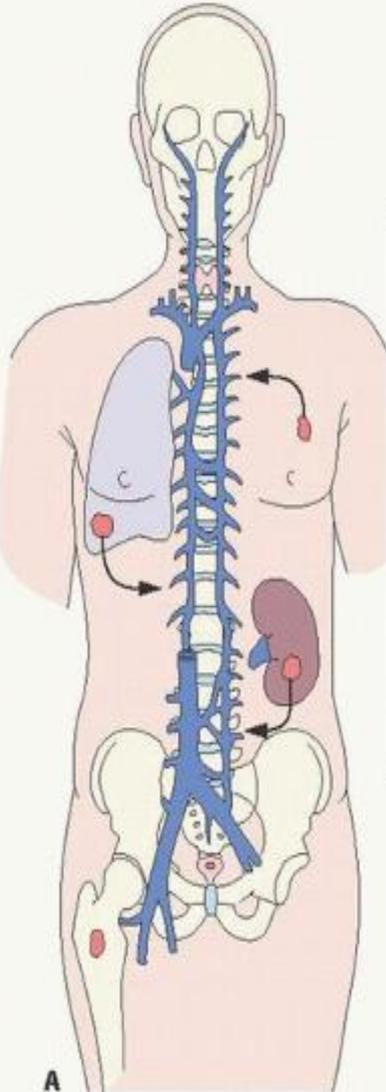
# VENOUS SUPPLY

- Veins are corresponding to the arteries.
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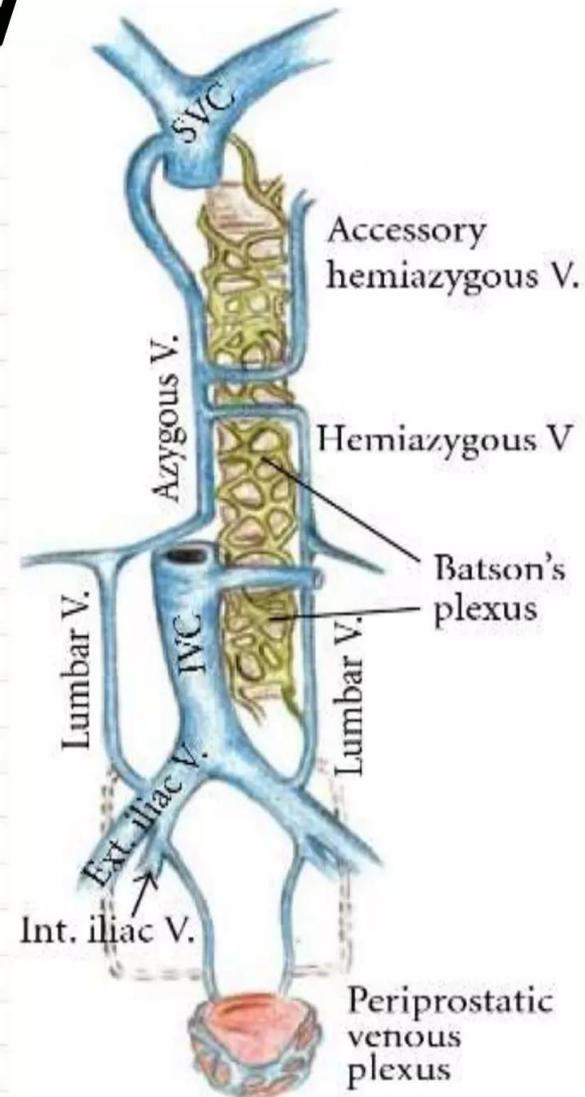
Batson's Vertebral Vein System



# Anatomy

## Communication of Batson Venous Plexus and:

- Scalp, Skull, and Face
- Thoracoabdominal Wall
- Azygous, Pulmonary and Caval Venous Systems
- *Pelvic, Prostatic and Sacral Veins*



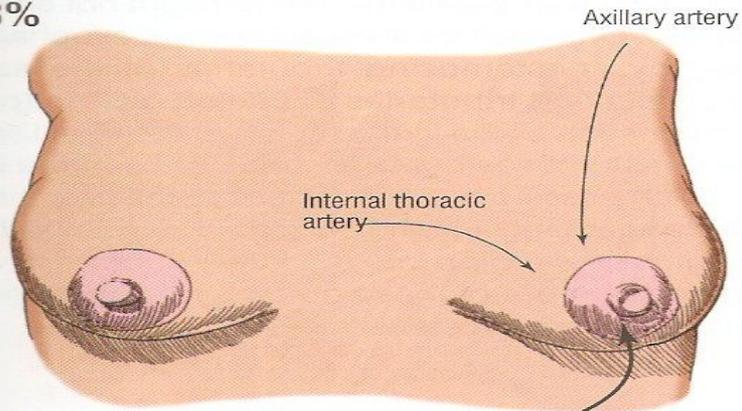
## **The Blood Supply to the Nipple–Areola Complex of the Human Mammary Gland**

Petrus V. van Deventer, M.B.Ch.B., Hons.B.Sc., M.Med.Sc., M.Med.Plast. & Rekons  
Tygerberg, South Africa

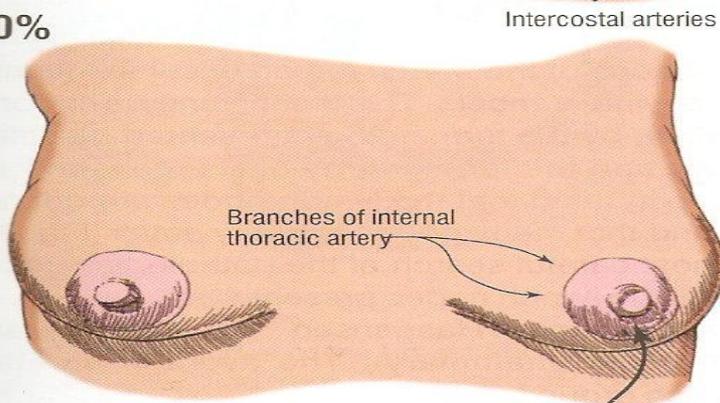
- For successful breast surgery, knowledge of the blood supply to the breast, particularly the supply to the nipple-areola-complex (NAC) is of the utmost
- importance. Although the blood supply to the human mammary gland is well documented, the specific supply to the NAC still is obscure and not described in text books. Therefore, the complication of NAC necrosis still is found, even in the hands of the most competent surgeons.

1. A ring anastomoses with the internal mammary artery as the dominant supplier (74%)
2. A loop anastomoses with the lateral thoracic artery as the dominant supplier (20%)
3. A radial pattern characterized by a lack of anastomoses in 6% of cases.

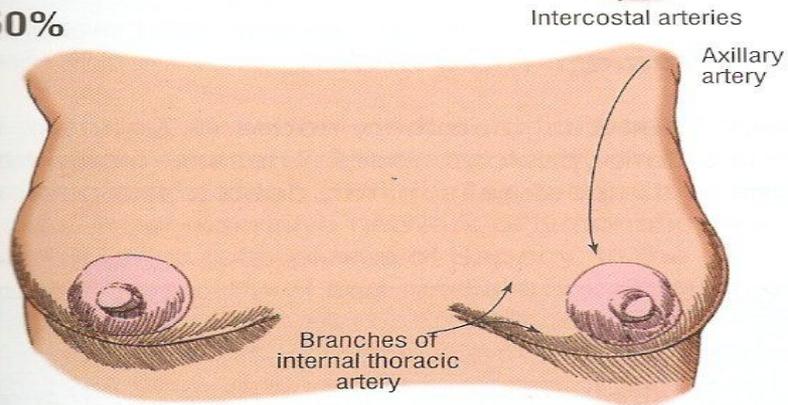
**A 18%**



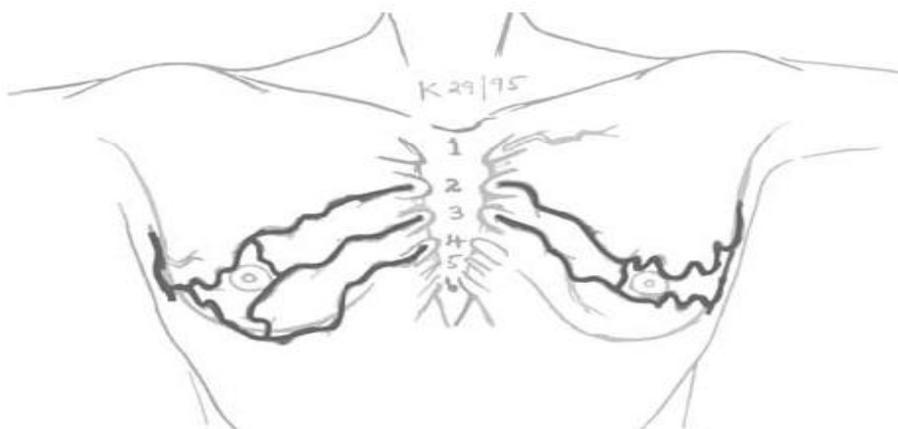
**B 30%**



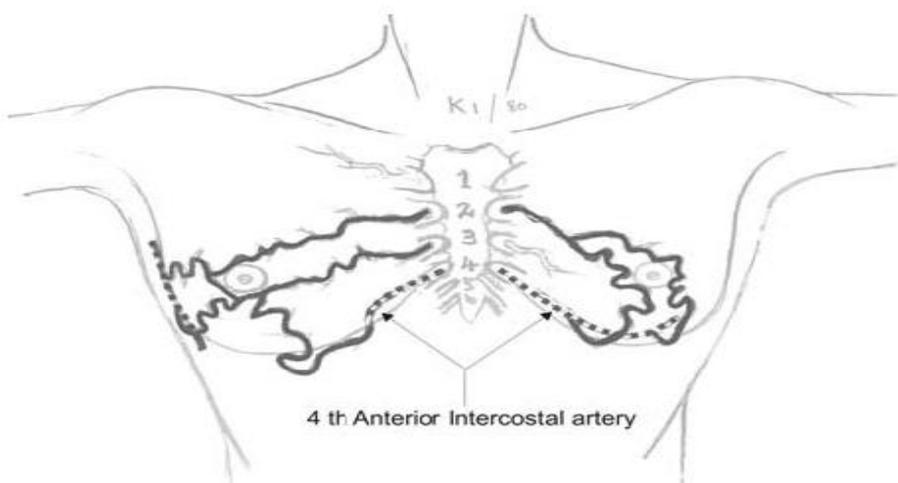
**C 50%**



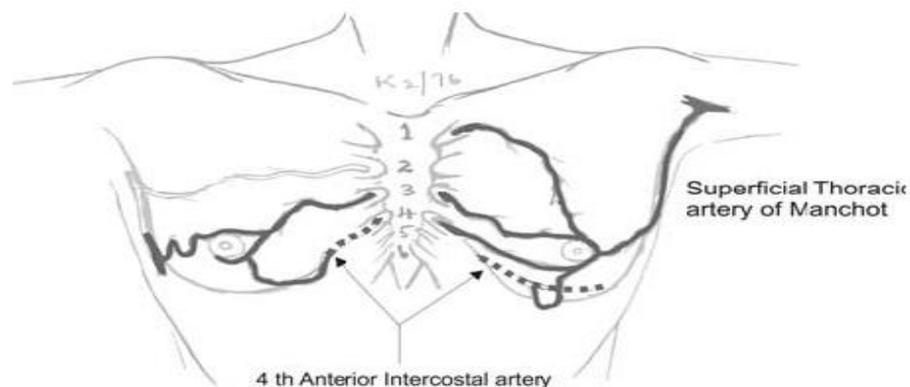




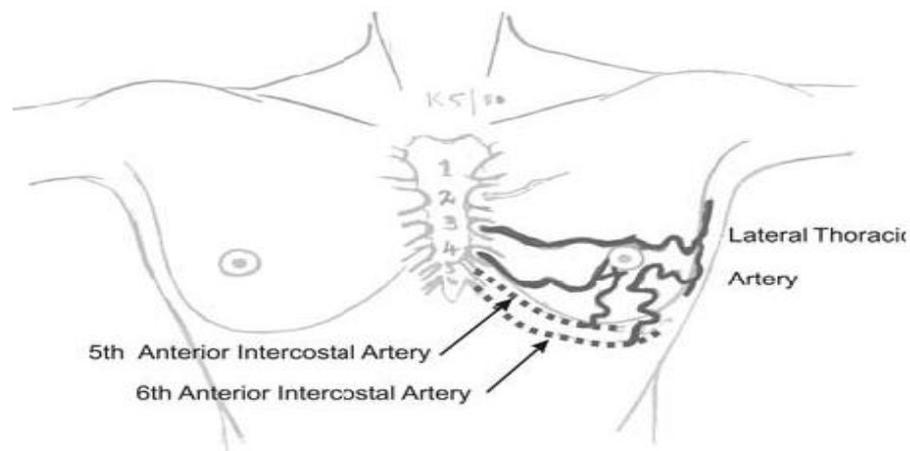
**Fig. 2.** Basic segmental pattern of blood supply to the nipple-areola complex (NAC) by means of anastomoses between the internal and lateral thoracic arteries. Note that an inferior pedicle in the left breast would be considered a random flap.



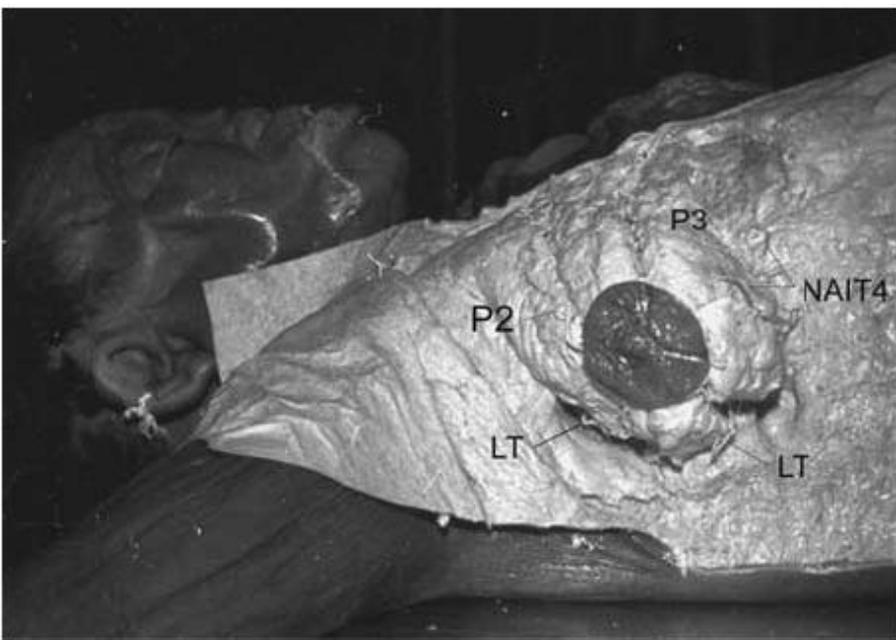
**Fig. 3.** Inferior input to the segmental pattern of blood supply to the nipple-areola (NAC) by means of ascending branches from the fourth anterior intercostal arteries. Note that a lateral pedicle in the left breast would be considered a random flap.



**Fig. 4.** The superficial thoracic artery described by Manchot, originating from the axillary artery in the left breast, which is not identical to the lateral thoracic artery. The blood supply to the nipple-areola complex (NAC) from inferior in the left breast is via a branch from anterior intercostal artery 4, and in the right breast via an artery directly from the internal thoracic artery (posterior medial mammary artery of Salmon or nipple-areolar branch of the internal thoracic artery).



**Fig. 5.** Anastomoses between anterior intercostal artery 6 and the lateral thoracic artery. Note that a medial, inferior, and lateral pedicle would be arterialized, but a superior pedicle would be a random flap.



**Fig. 6.** Cadaver dissection. Lateral view of the right breast, illustrating the segmental blood supply pattern resulting from anastomoses between the perforators of the internal thoracic artery and branches of the lateral thoracic (LT) artery. The second perforator (P2) superior to and the third perforator (P3) inferior to the nipple. A branch from intercostal space 4 (NAIT4) ascends from the submammary area to join the inferior loop. These branches have their origin from the internal thoracic artery or could be branches from the anterior intercostal arteries.



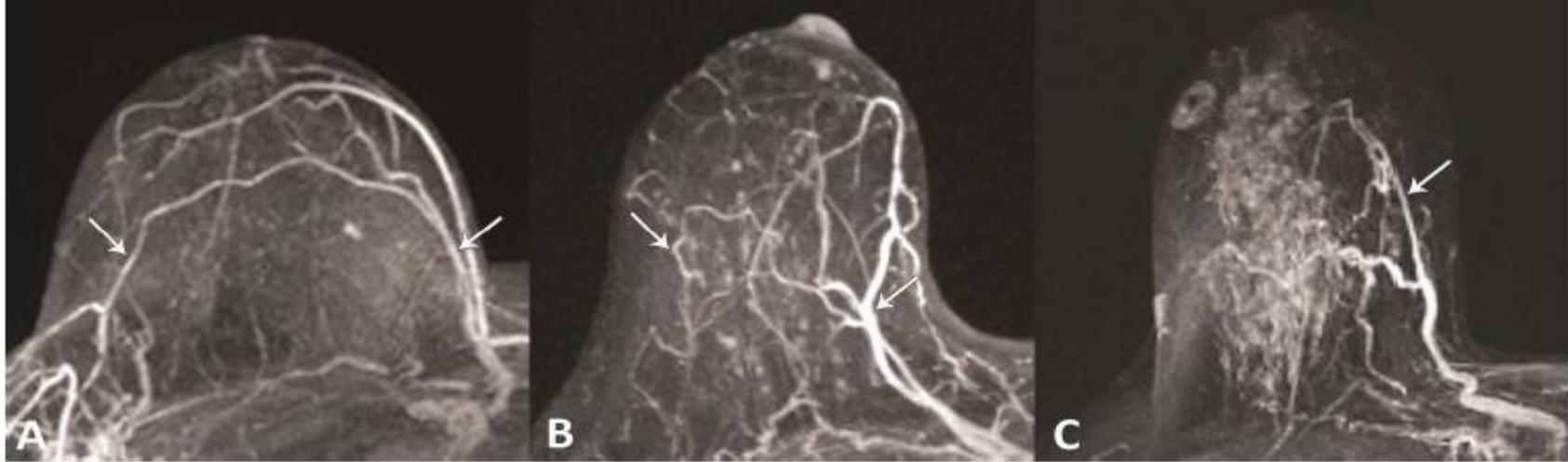
**Fig. 8.** Frontal view of a right breast. The nipple-areola complex (NAC) supplied from the inferior submammary region by means of a branch originating from the internal thoracic artery and traversing intercostal space 4 (nipple-areolar branch of the internal thoracic artery NAIT4).





«In the Hall of Dissection, death teaches life »

500 years ago in (Napoli)



**Can Vascular Patterns on Preoperative MRI Help Predict Skin Necrosis after Nipple-Sparing Mastectomy?**

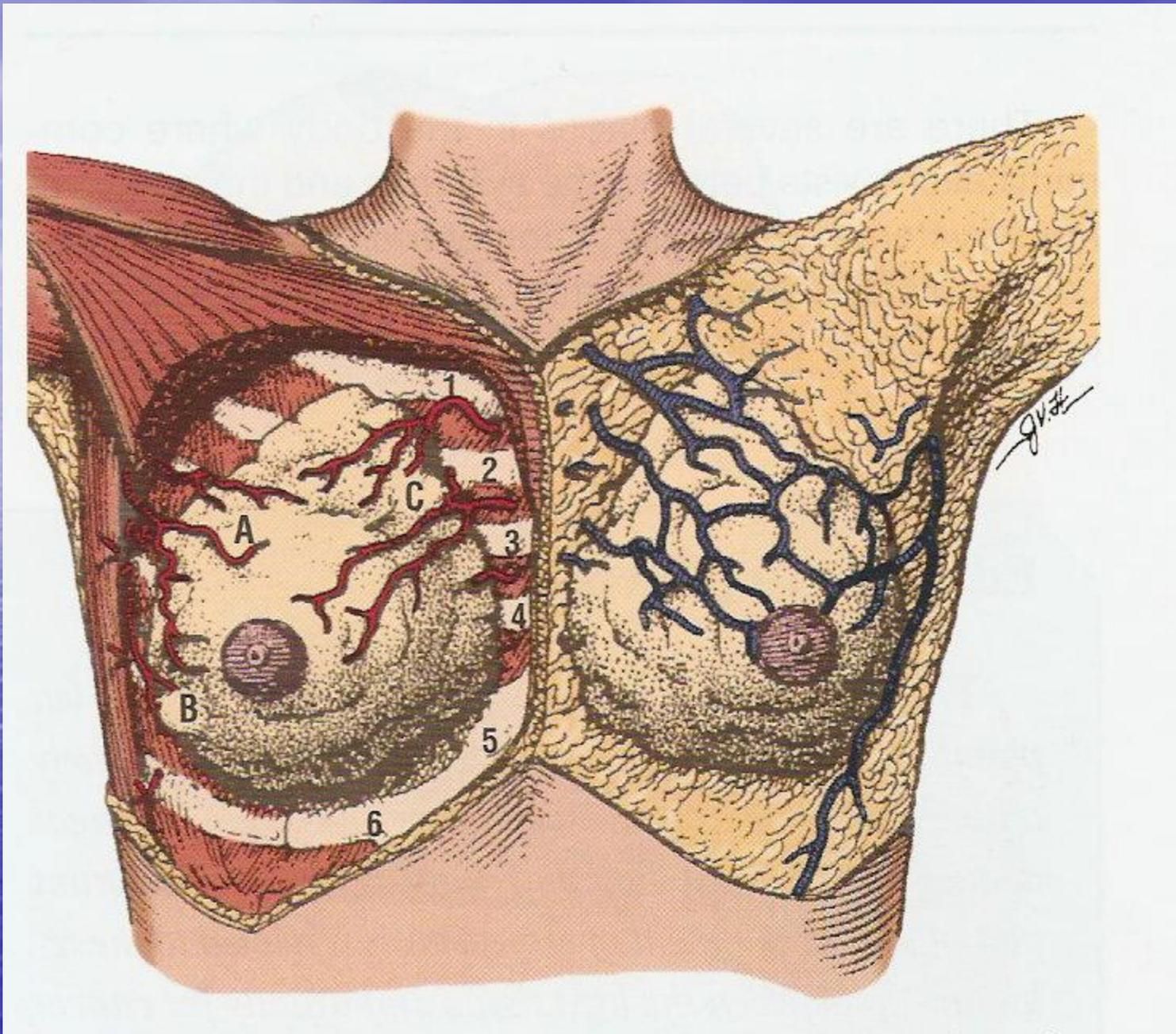
Manisha Bahl, MD, MPH, Irene J. Pien, MD, Kate J. Buretta, MD, E Shelley Hwang, MD, MPH, Rachel A. Greenup, MD, MPH, Sujata V. Ghate, MD, Scott T. Hollenbeck, MD, FACS

PII: S1072-7515(16)30143-0

DOI: [10.1016/j.jamcollsurg.2016.04.045](https://doi.org/10.1016/j.jamcollsurg.2016.04.045)

Reference: ACS 8352

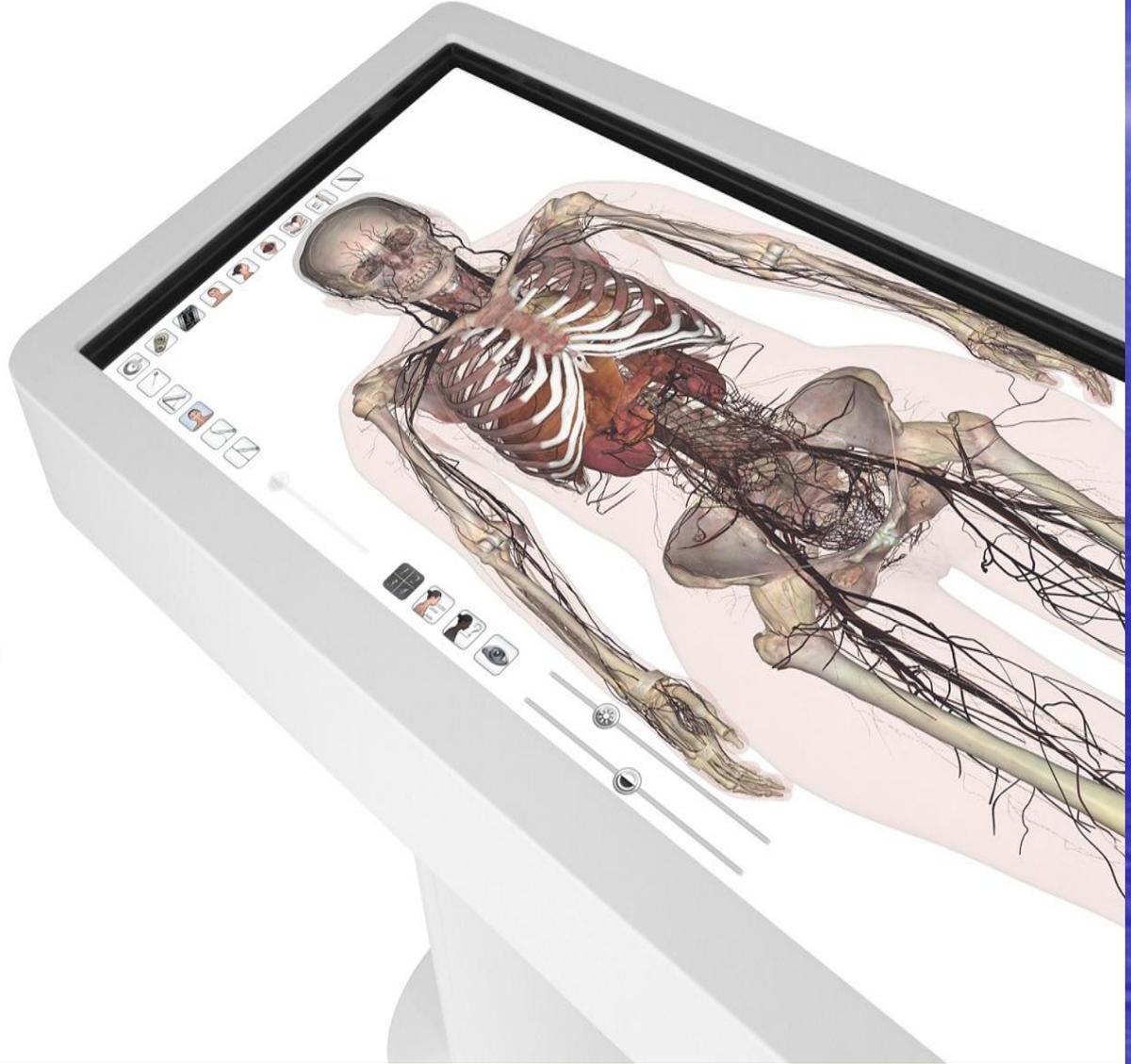
To appear in: *Journal of the American College of Surgeons*



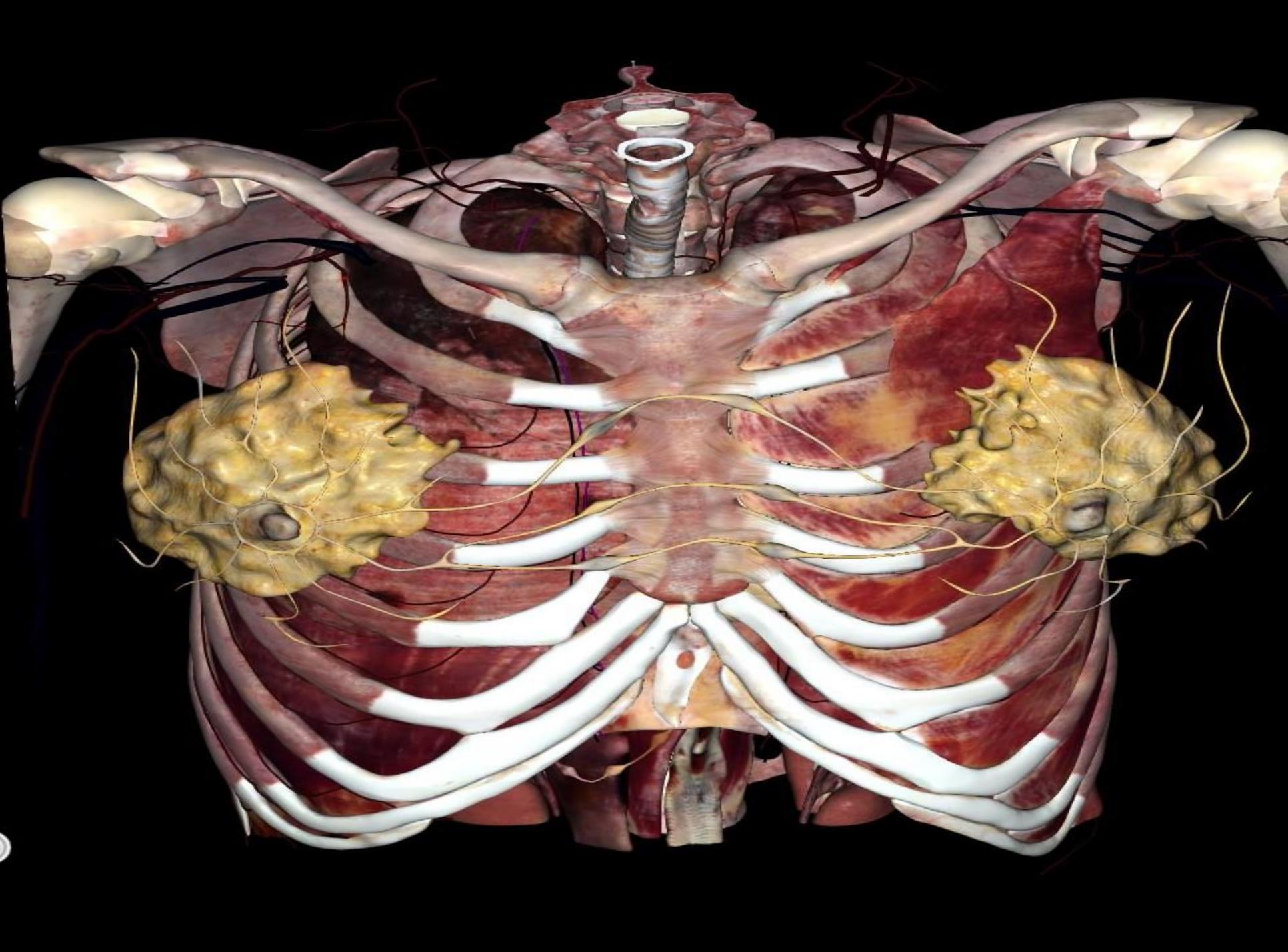


**Fig. 1.4** Blood supply of the breast. Superficial and deep branches of the lateral thoracic vessels (A), second and third internal mammary vessel perforators (B, C), fourth intercostal vessel perforators (D)

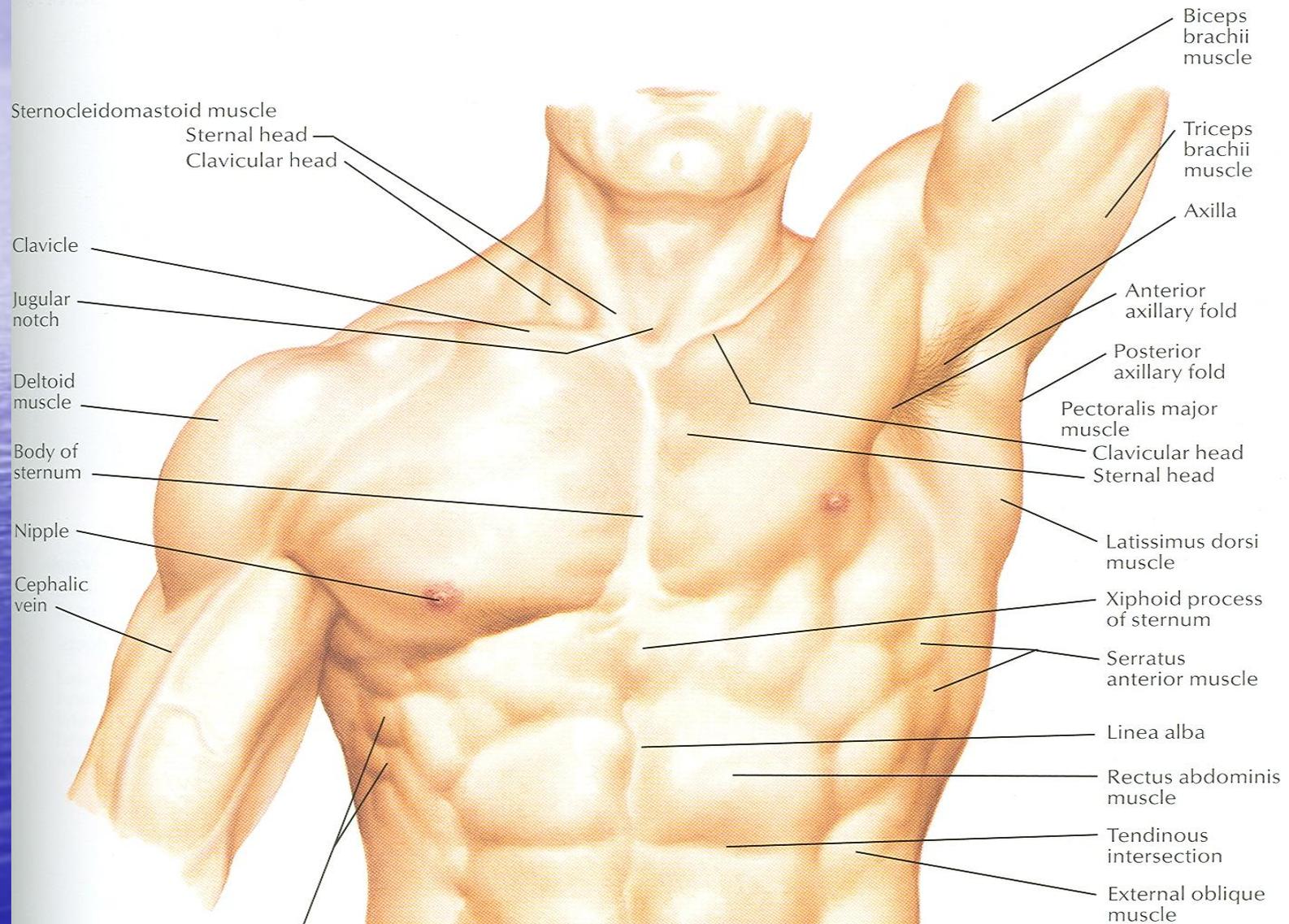
# *Anatomage* TABLE



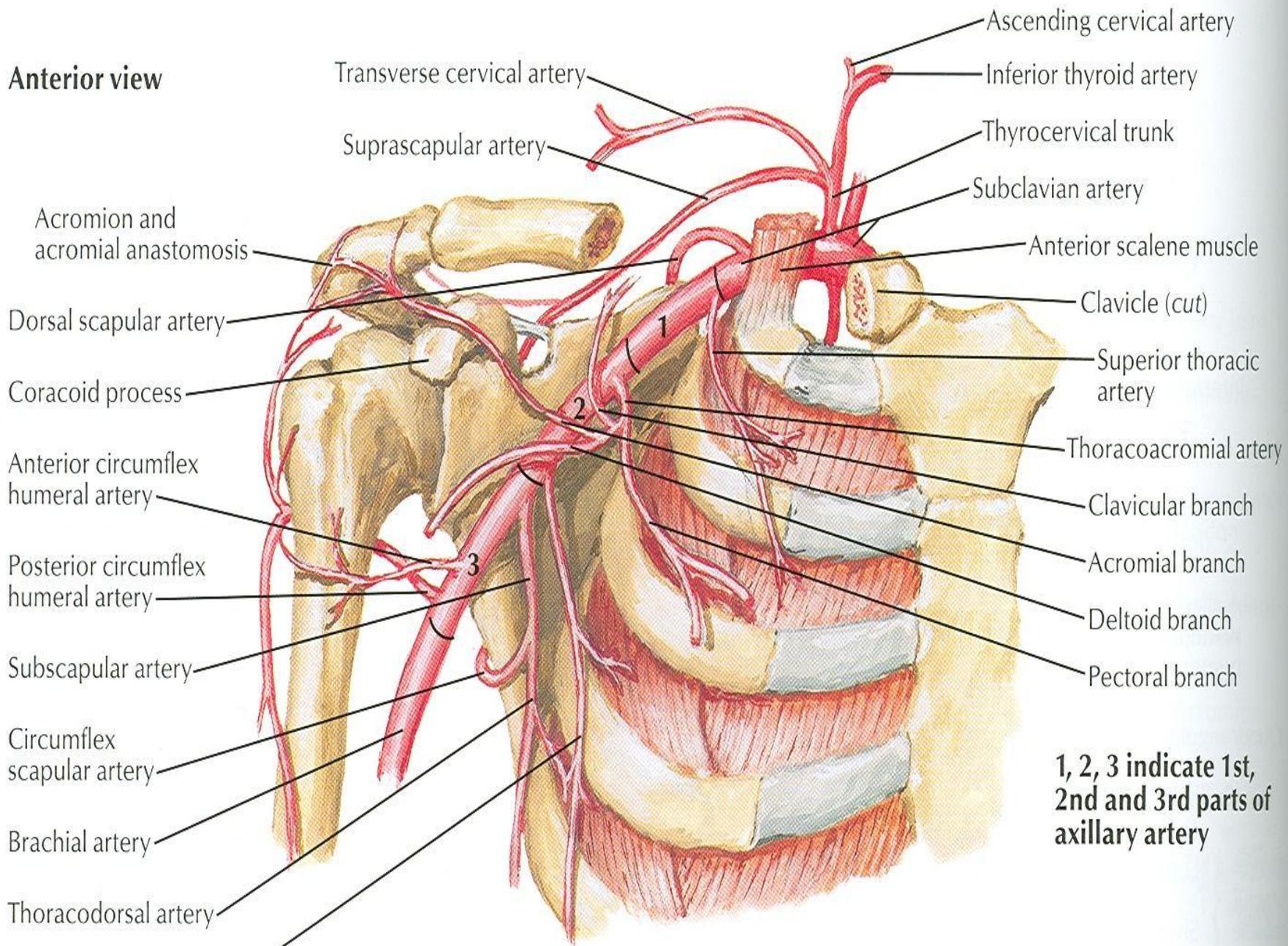




# AXILLARY CAVITY



**Anterior view**



**1, 2, 3 indicate 1st, 2nd and 3rd parts of axillary artery**

- Ascending cervical artery
- Inferior thyroid artery
- Thyrocervical trunk
- Subclavian artery
- Anterior scalene muscle

Acromion and acromial anastomosis

Dorsal scapular artery

Coracoid process

Anterior circumflex humeral artery

Posterior circumflex humeral artery

Subscapular artery

Circumflex scapular artery

Brachial artery

Thoracodorsal artery

Clavicle (cut)

Superior thoracic artery

Thoracoacromial artery

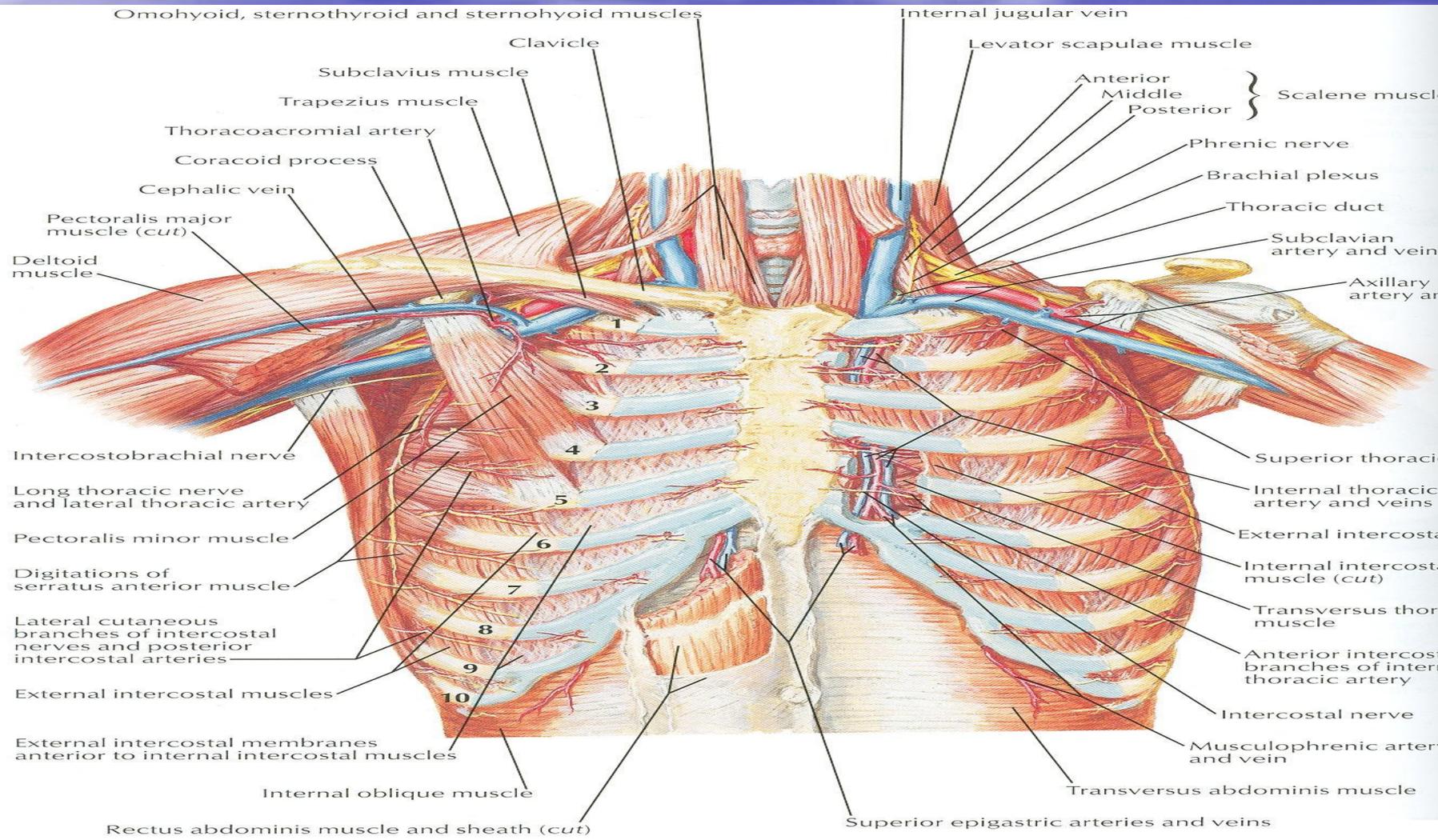
Clavicular branch

Acromial branch

Deltoid branch

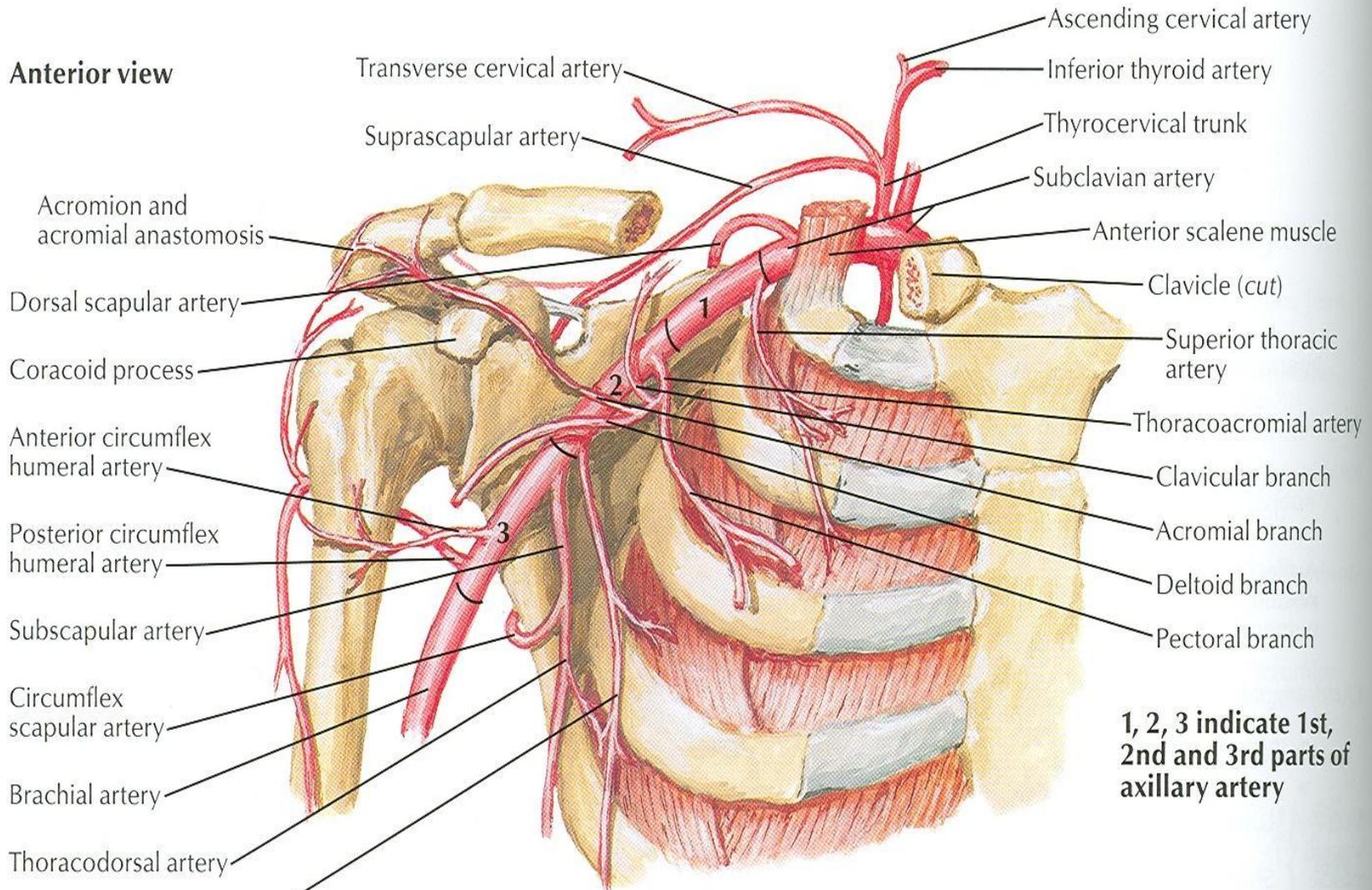
Pectoral branch

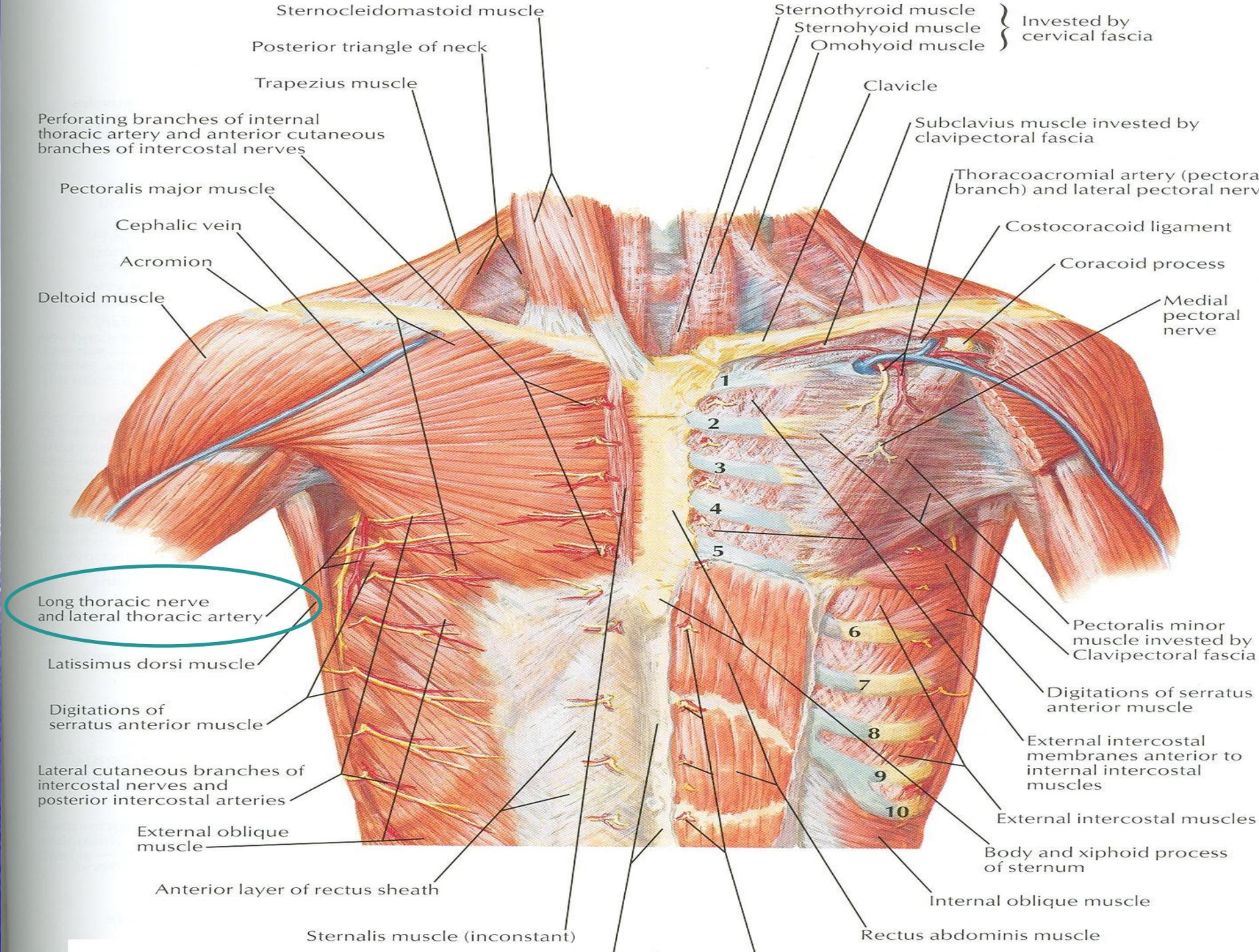
# 2<sup>nd</sup> Part of Axillary Artery

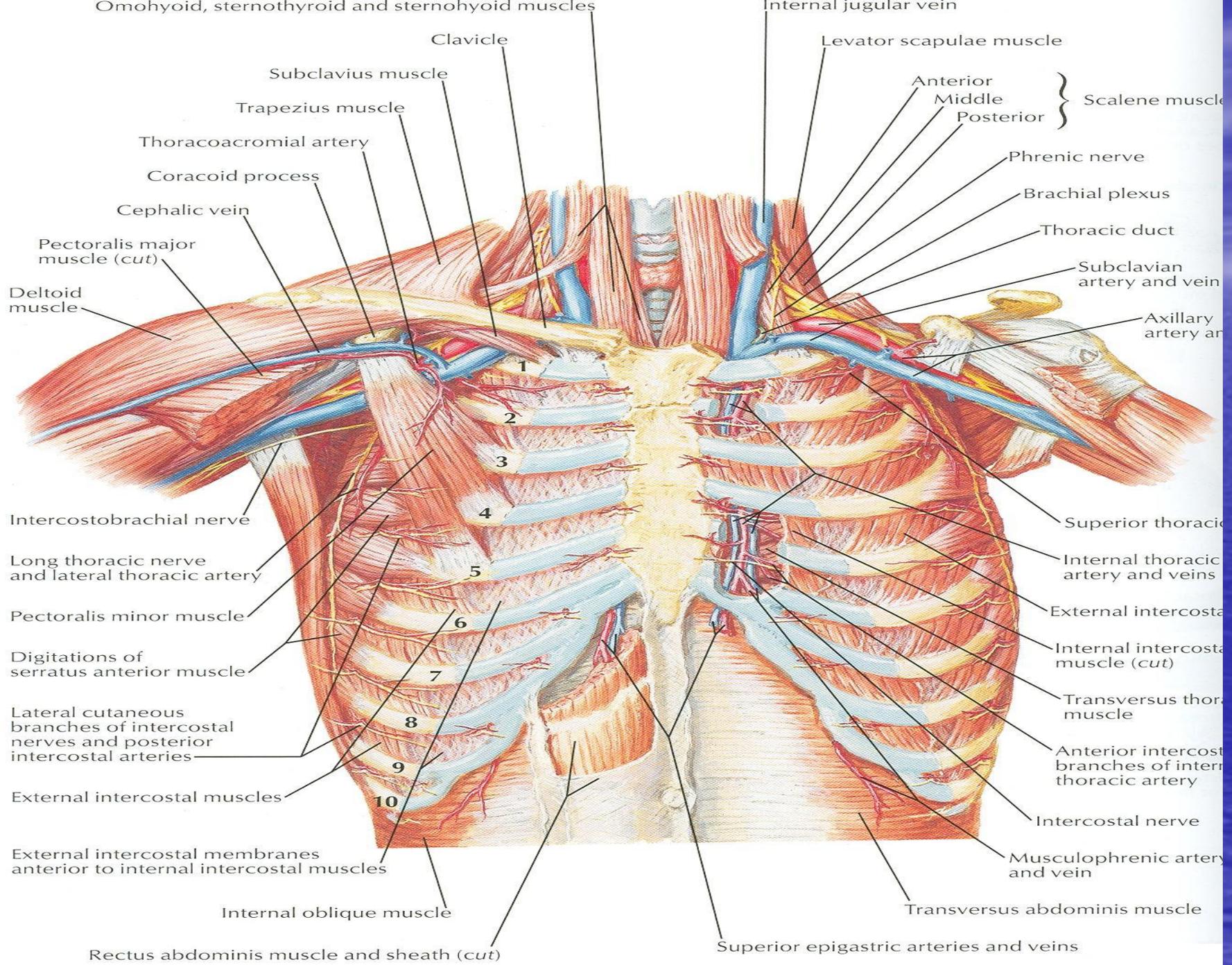


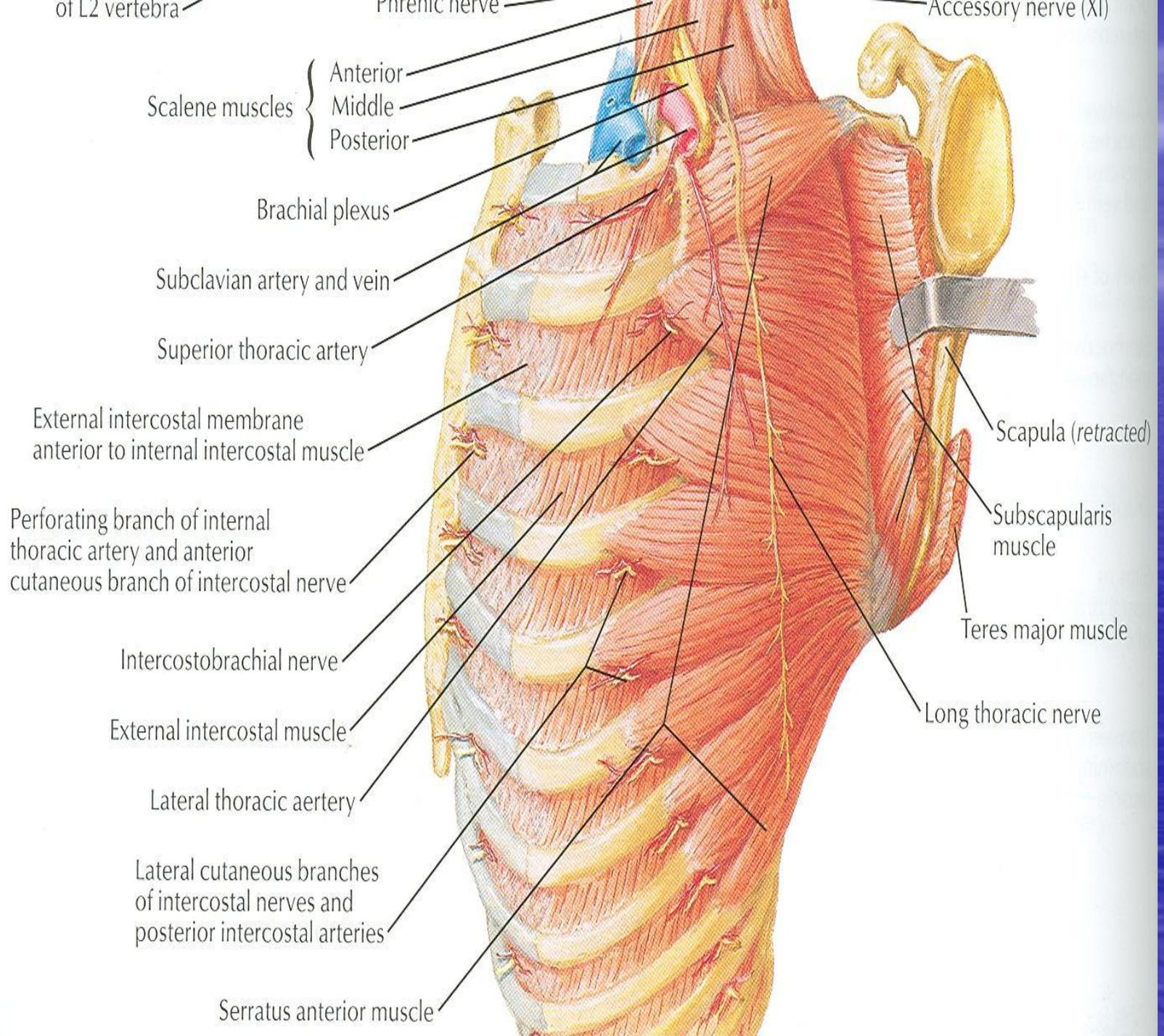
# 3<sup>rd</sup> Part of Axillary Artery

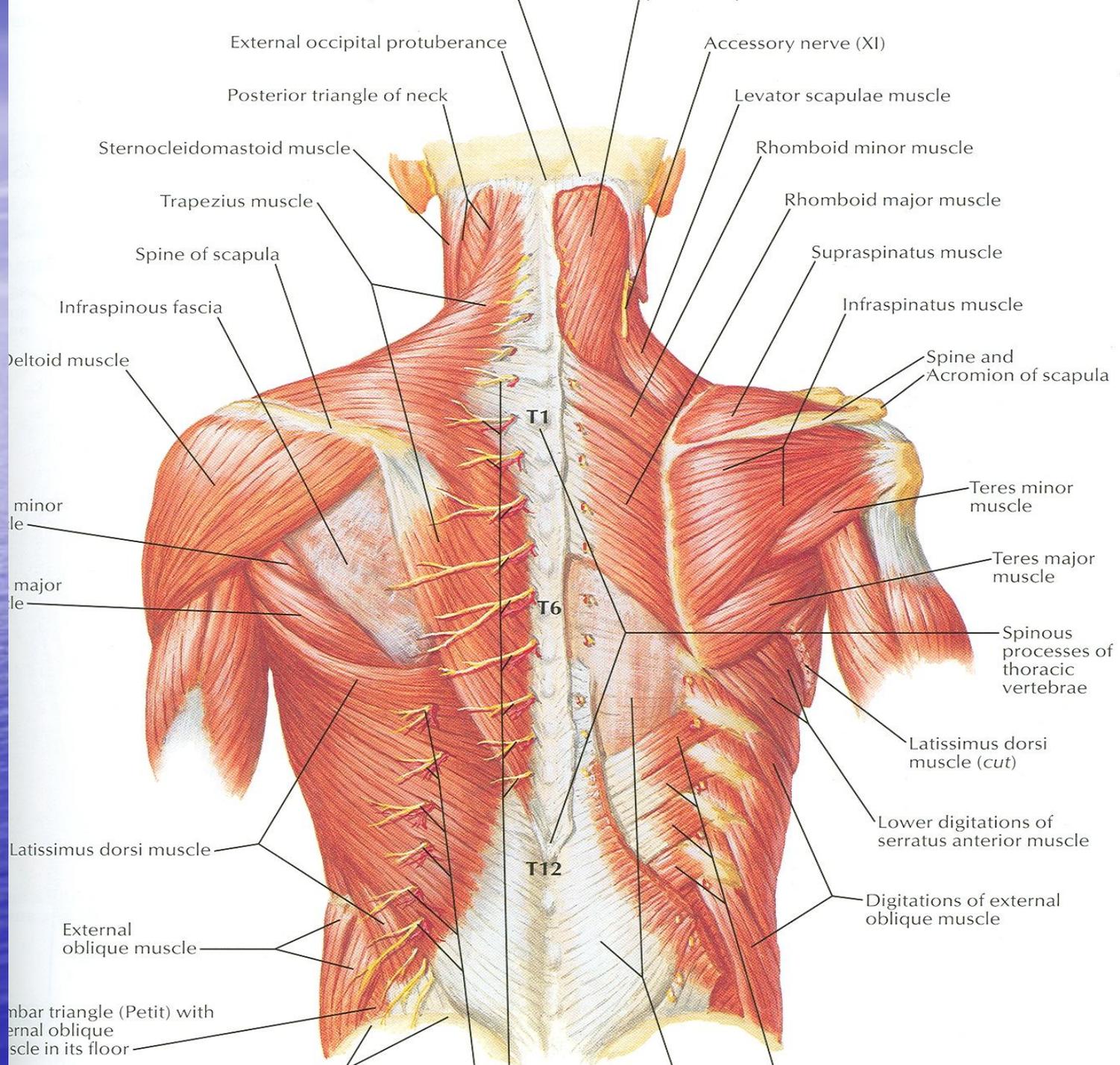
## Anterior view



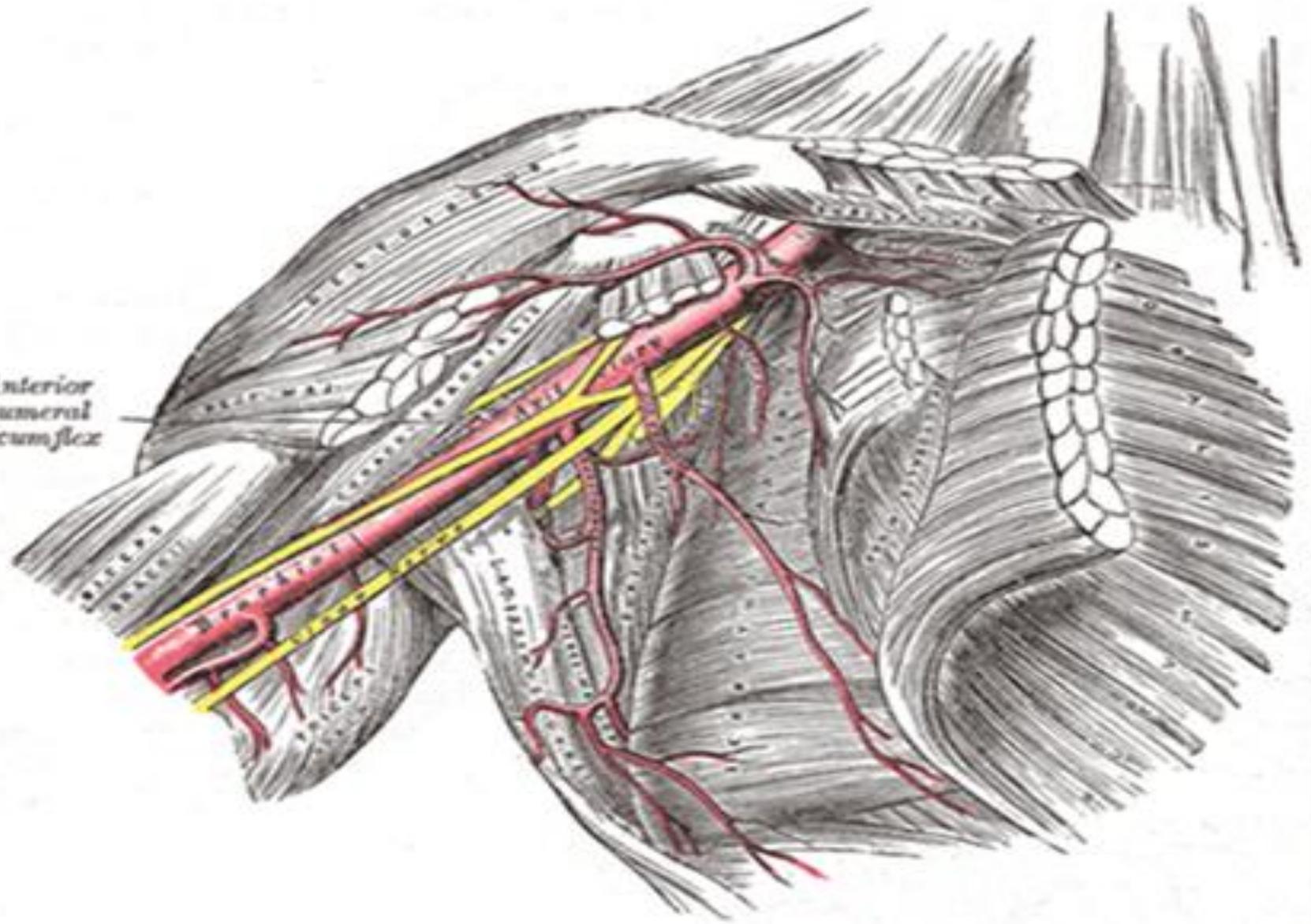


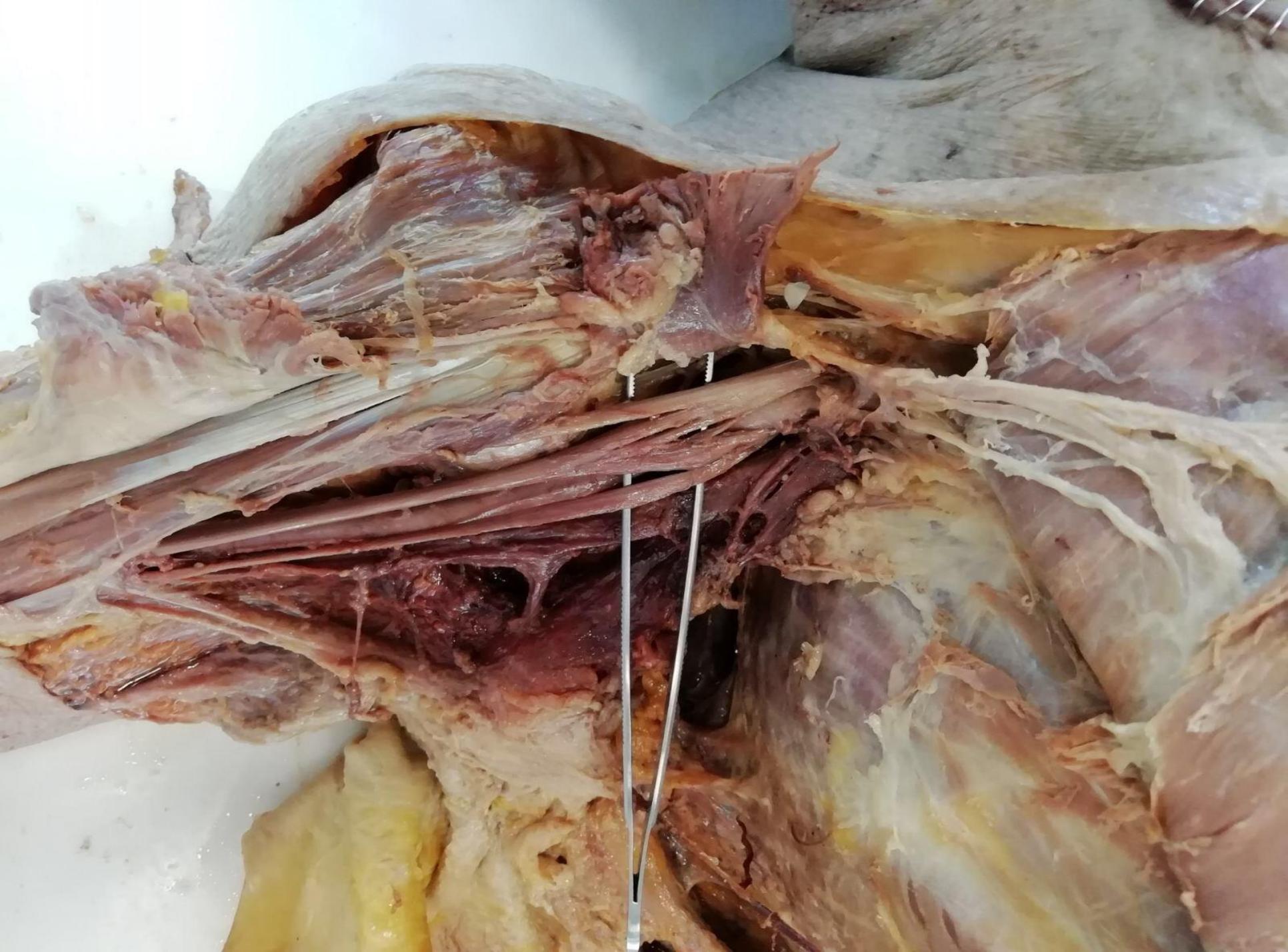






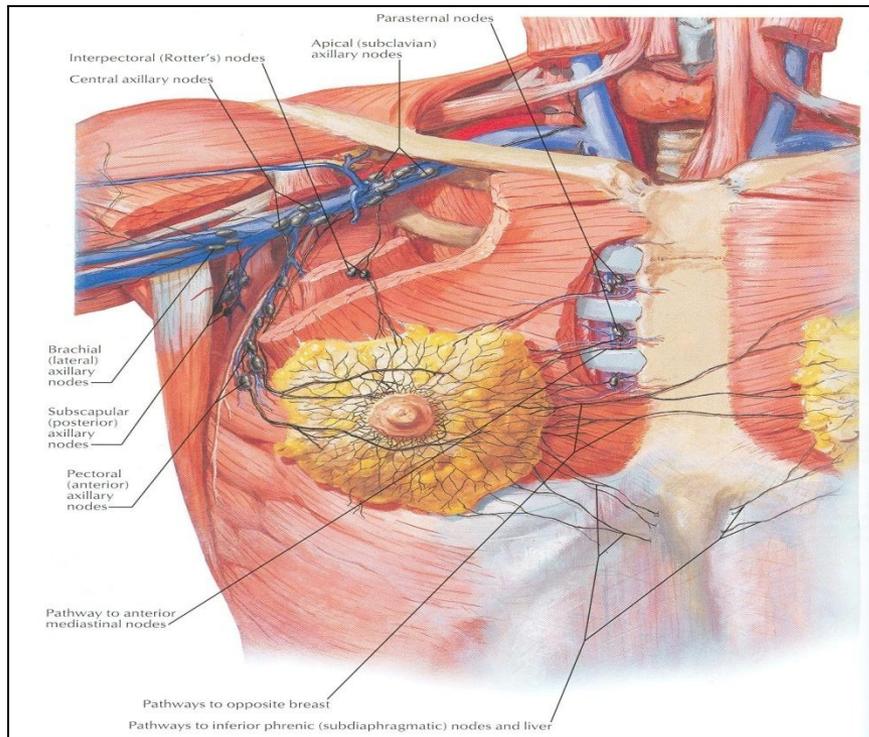
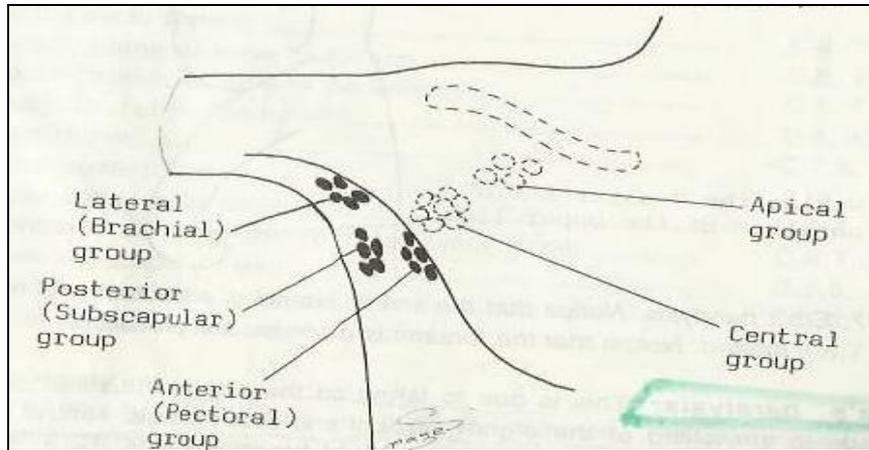
*Anterior  
humeral  
circumflex*





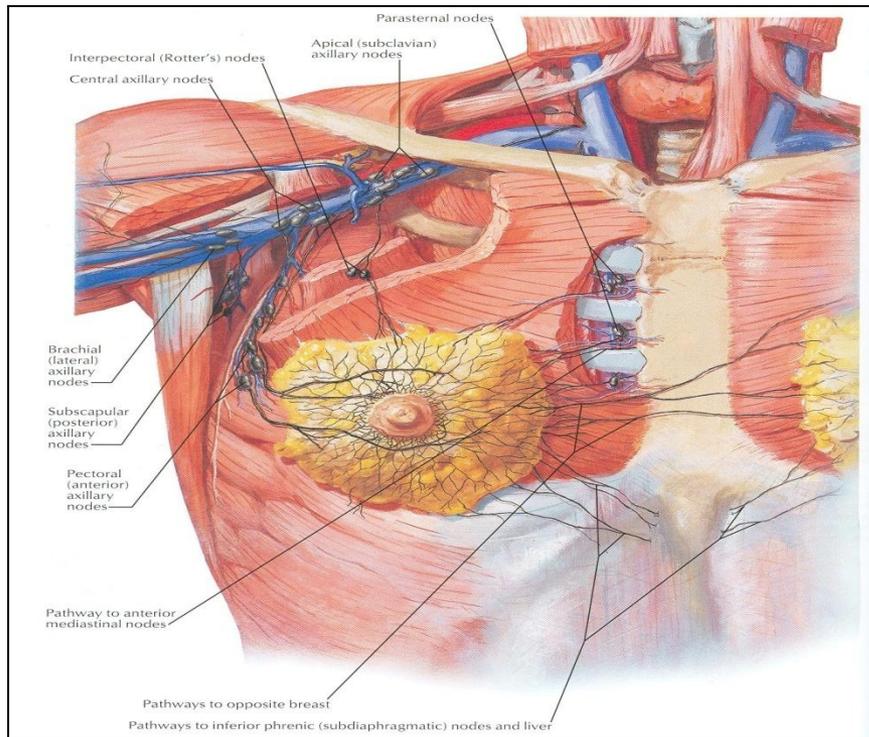
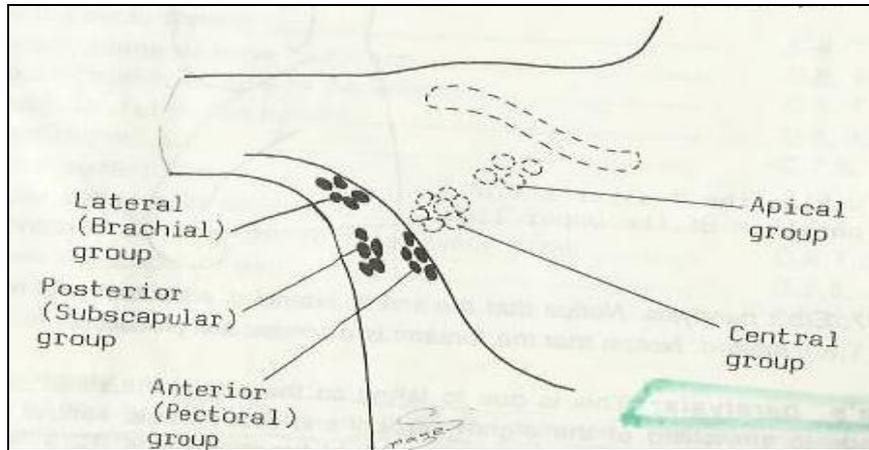


# AXILLARY LYMPH NODES



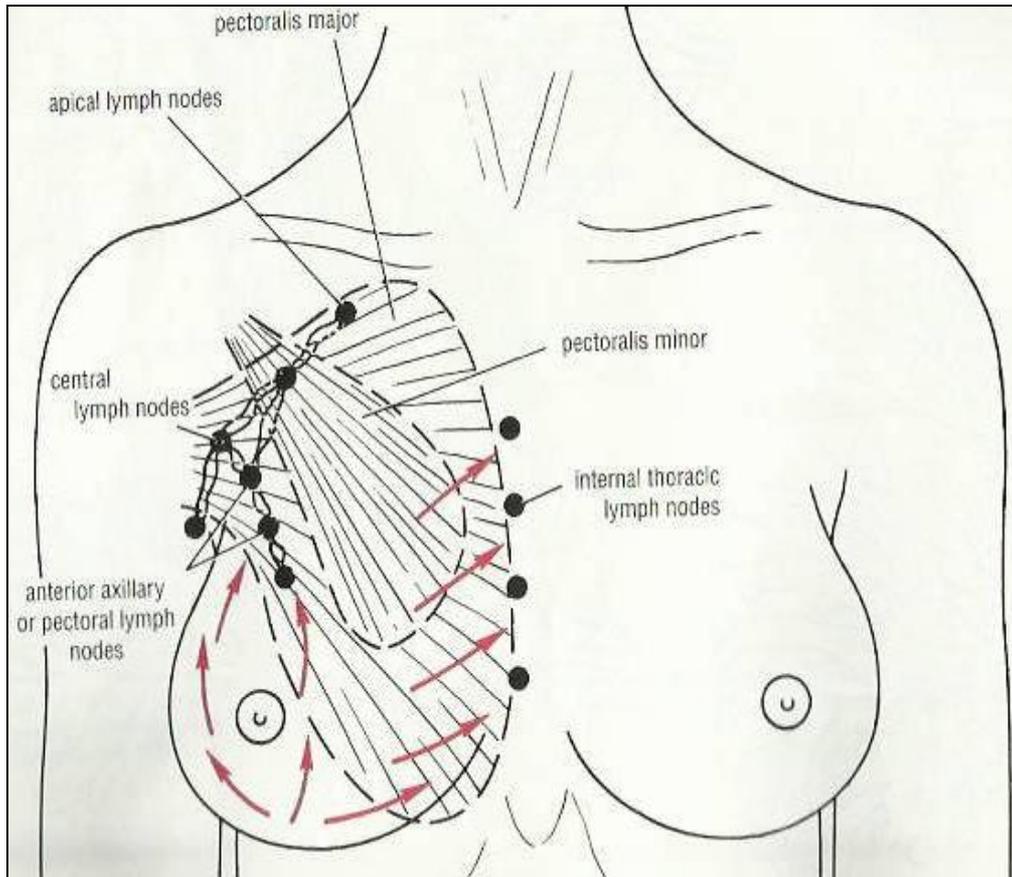
- They are arranged into 5 groups which lie in axillary fat :
- **Pectoral (Anterior) group** : which lies on the pectoralis minor along lateral thoracic vessels.
- **Subscapular (Posterior) group** : which lies on posterior wall of axilla on lower border of subscapularis along subscapular vessels.

# AXILLARY LYMPH NODES



- **Brachial (Lateral) group** : lies on lateral wall of axilla along **3<sup>rd</sup>** 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.

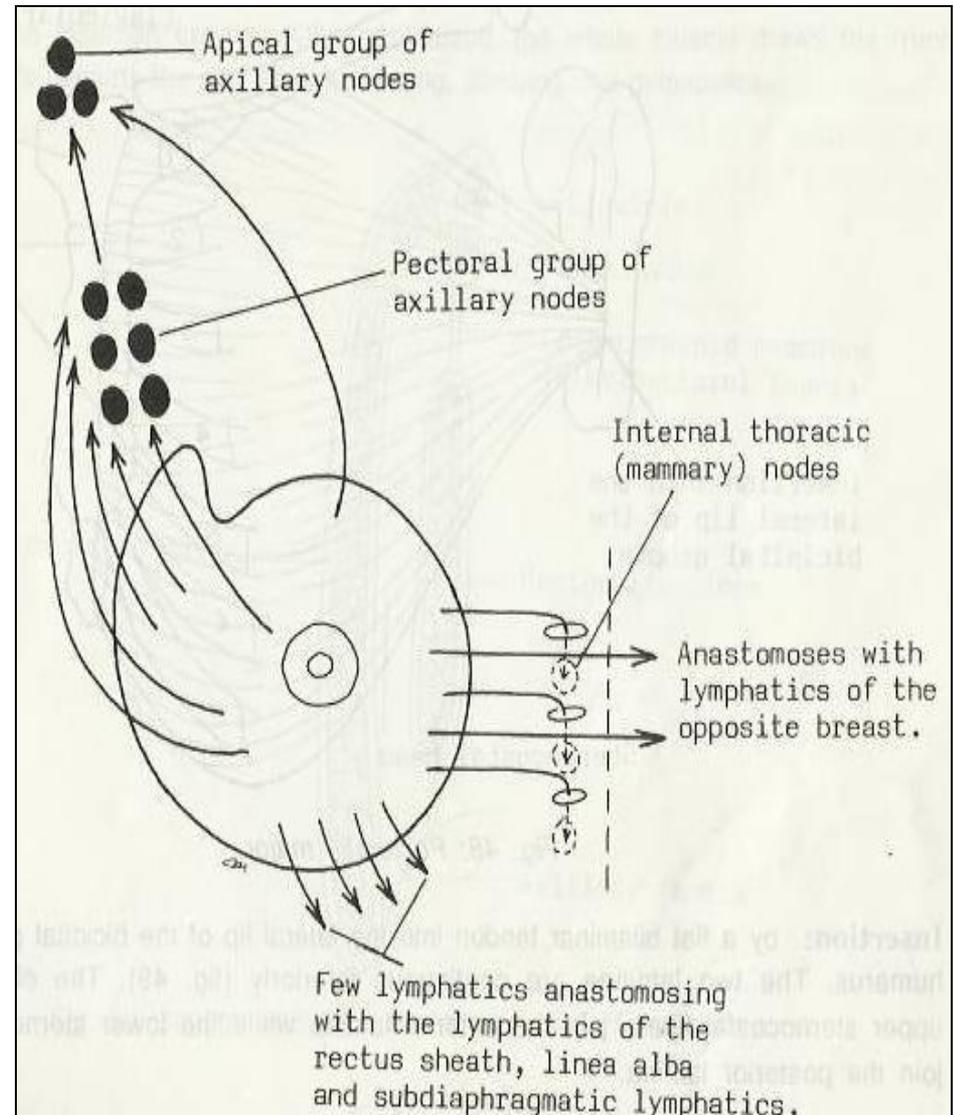
# LYMPHATIC DRAINAGE



- **Subareolar lymphatic 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 nodes.**

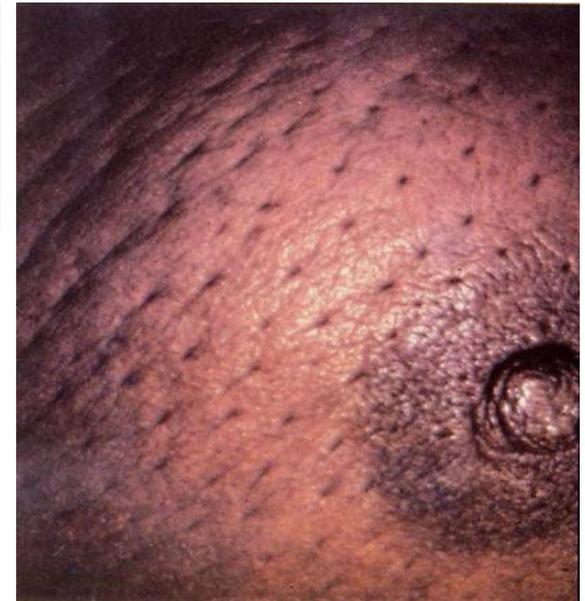
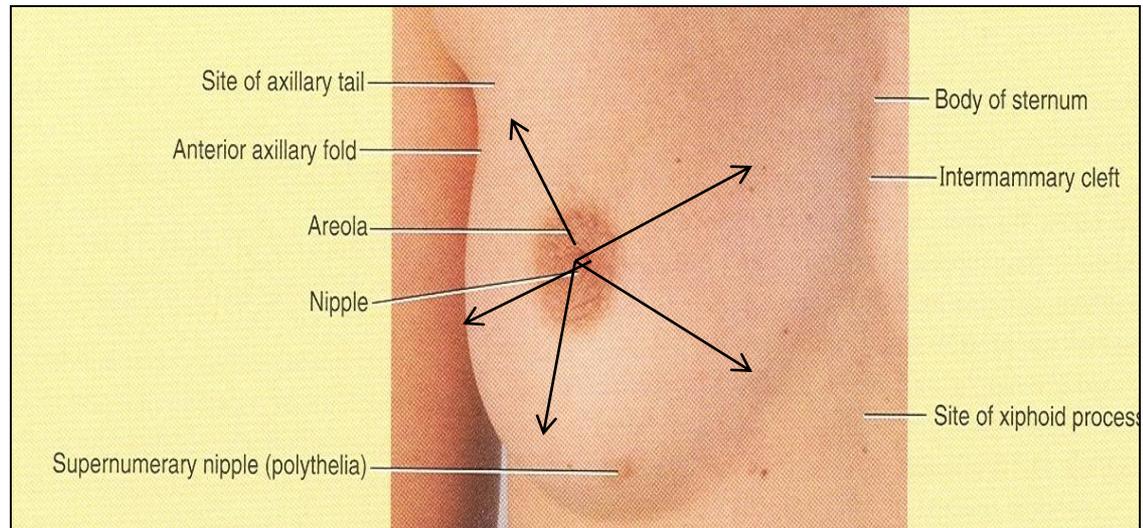
# APPLIED ANATOMY- CANCER BREAST

- It is a common surgical condition.
- 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.



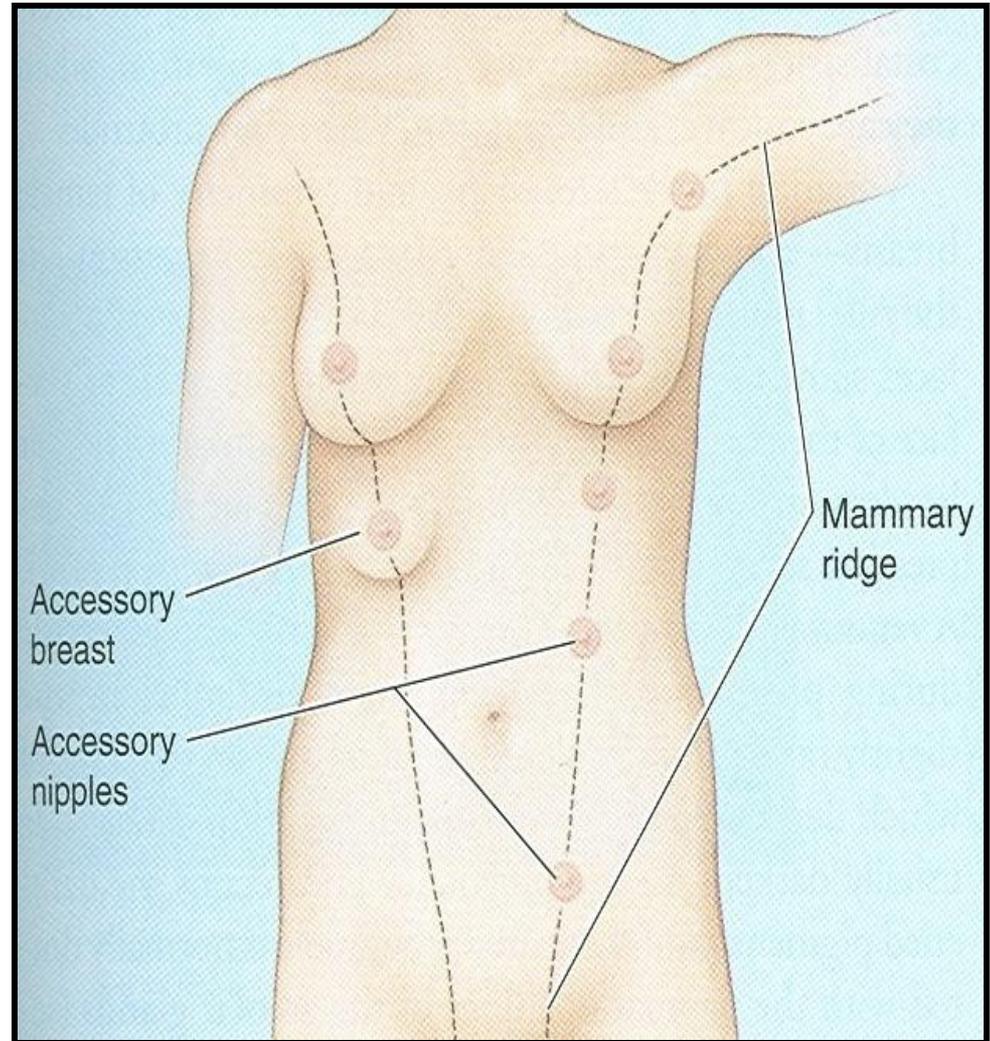
# Applied Anatomy

- The lactiferous ducts are radially arranged from the nipple, so **incision of the gland should be made in a radial direction to avoid cutting through the ducts.**
- Infiltration of the ligaments of Cooper by **breast cancer** leads to its shortening giving **peau de'orange appearance** of the breast.

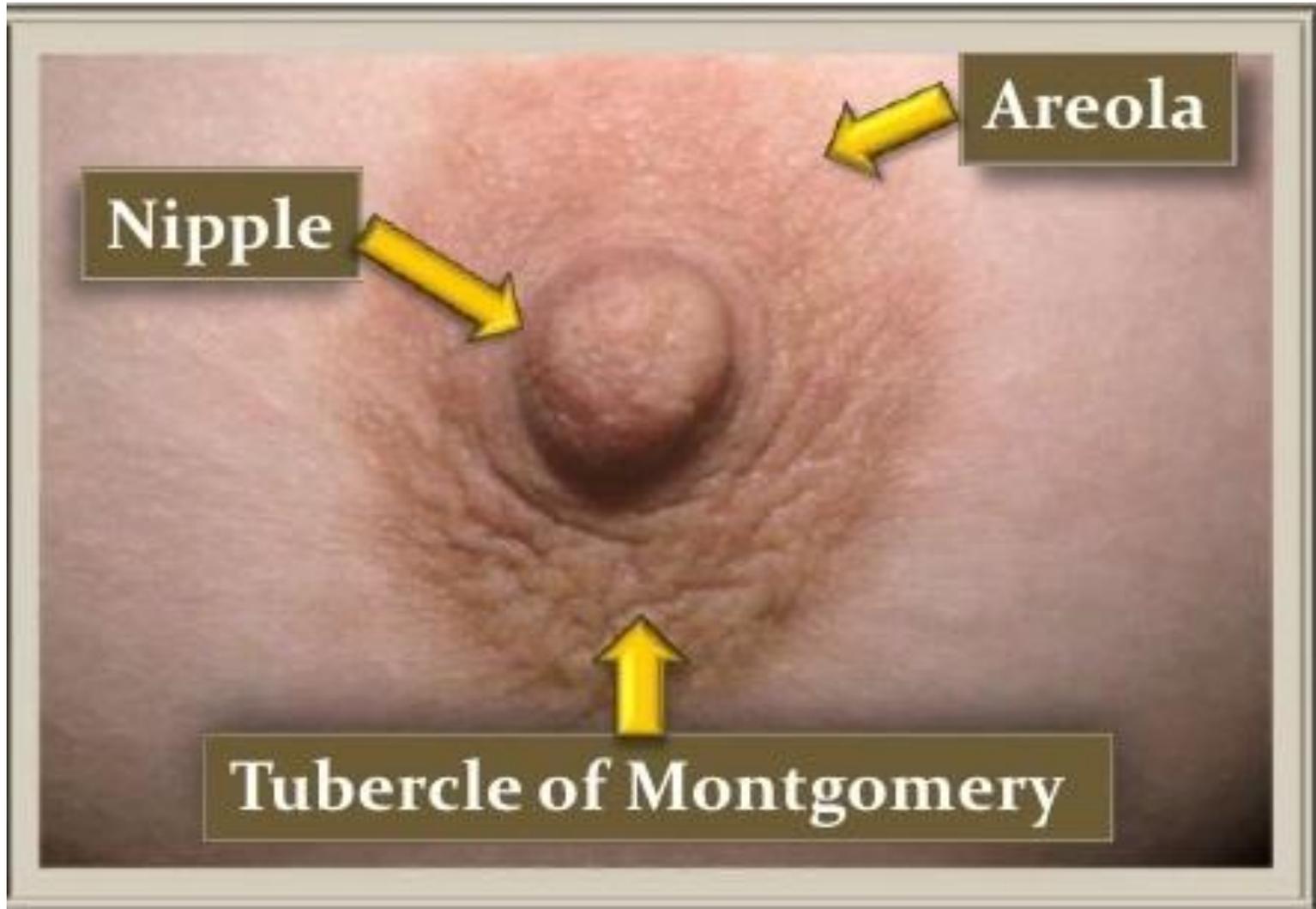


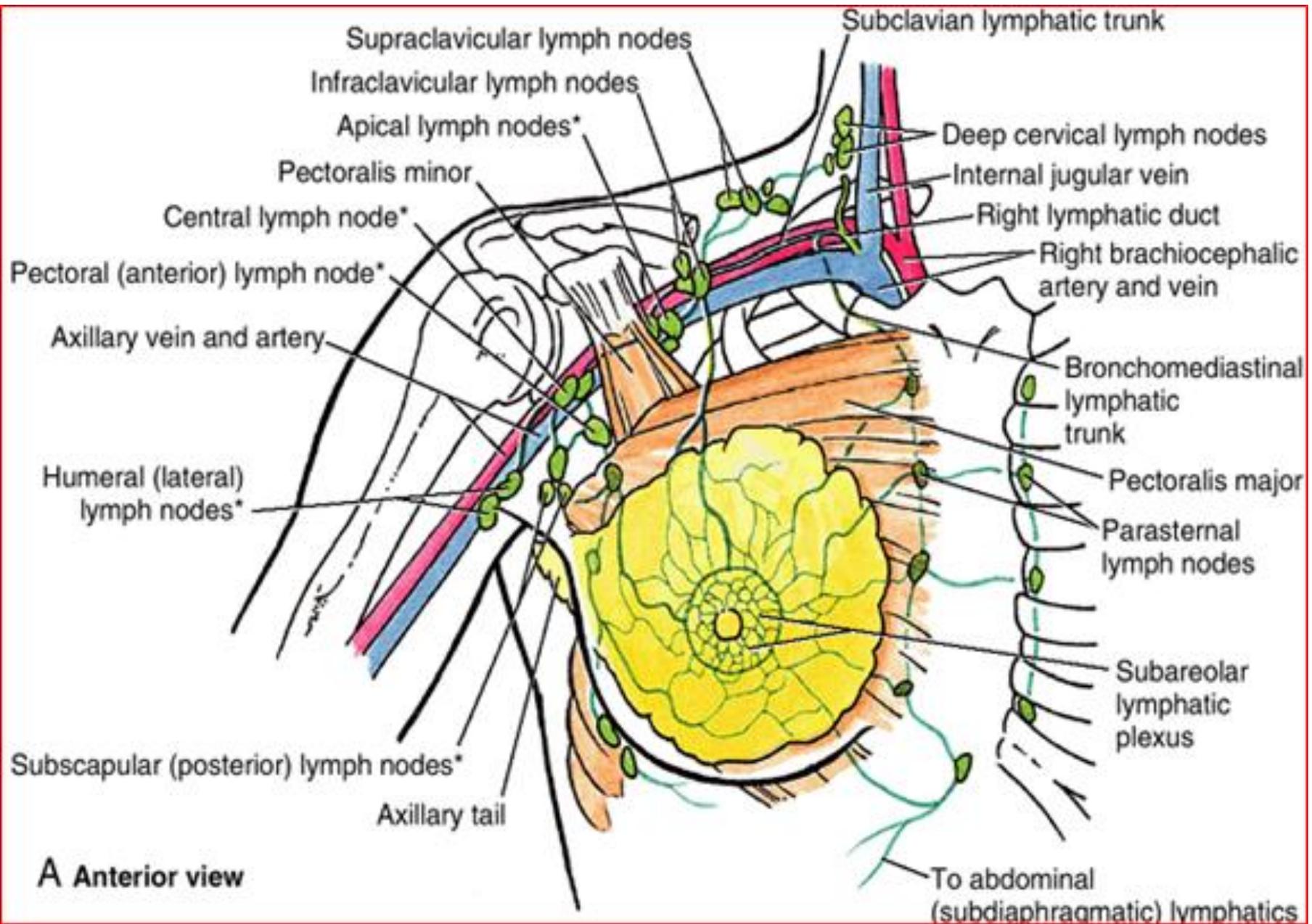
# Mammary ridge

- **Mammary ridge** extends from the axilla to the inguinal region.
- In human, the ridge disappears **EXCEPT** for a small part in the pectoral region.
- **In animals, several mammary glands are formed along this ridge.**



# Skin /sebaceous gland





# What is the difference



## Axillary Lymph node

Axillary (ipsilateral): interpectoral (Rotter's) nodes and lymph nodes along the axillary vein and its tributaries that is divided into the following levels:

- a. Level I (low-axilla): lymph nodes lateral to the lateral border of pectoralis minor muscle.
- b. Level II (mid-axilla): lymph nodes between the medial and lateral borders of the pectoralis minor muscle and the interpectoral (Rotter's) lymph nodes.
- c. Level III (apical axilla): lymph nodes medial to the medial margin of the pectoralis minor muscle and inferior to the clavicle. These are also known as apical or infraclavicular nodes.

# Regional Lymph Nodes for Breast

**A:** Pectoralis major muscle

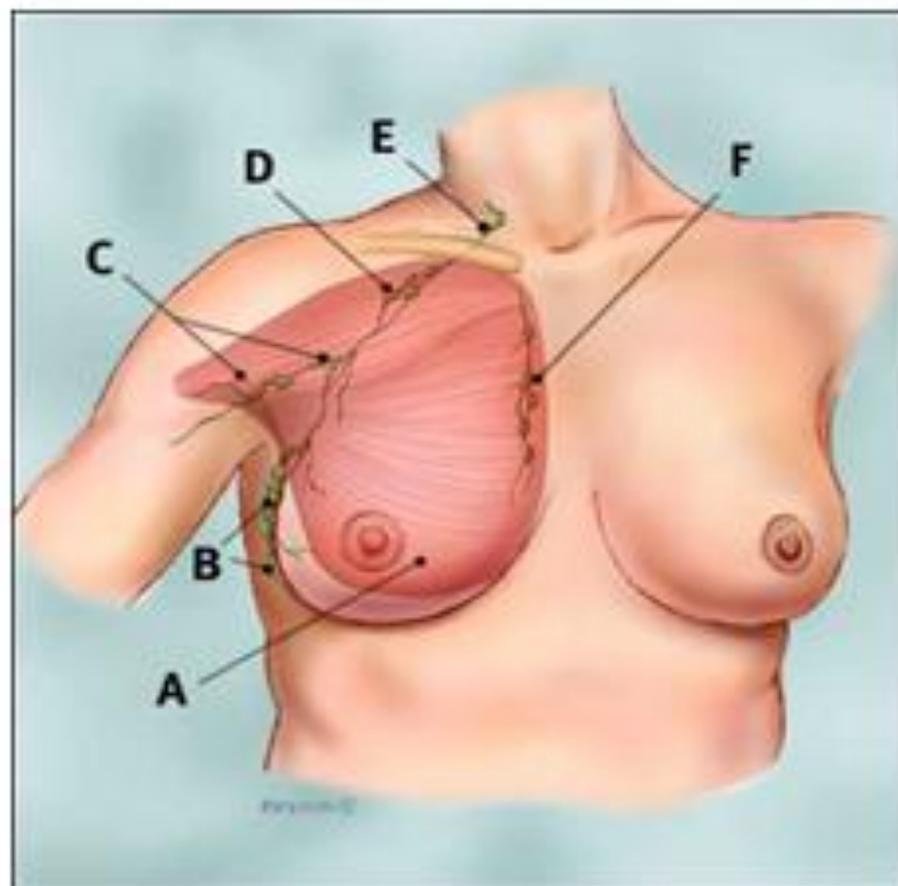
**B:** Axillary lymph nodes level I

**C:** Axillary lymph nodes level II

**D:** Axillary lymph nodes level III

**E:** Supraclavicular lymph nodes

**F:** Internal mammary lymph nodes



# Sentinel node biopsy and axillary dissection

- Sentinel node biopsy is the most common way to check the axillary lymph nodes for cancer.
- Before or during the procedure, a radioactive substance (called a tracer) and/or a blue dye is injected into the breast. These substances help the surgeon find the nodes to remove.
- The first lymph node(s) to absorb the tracer or dye is called the sentinel node(s). This is also the first lymph node(s) where breast cancer is likely to spread.

# Sentinel node biopsy and axillary dissection

- The surgeon removes the sentinel node(s) to get it checked if the node(s) contain cancer cells.
- If cancer is not found, it's likely the other nodes do not contain cancer. So, no more surgery is needed.
- If the node(s) do contain cancer, more lymph nodes may be removed, which is called axillary dissection.

# Lymphedema

- When lymph nodes are removed, some of the lymph vessels can become blocked and cause lymphedema. Lymphedema is a build-up of lymphatic fluid. It causes swelling in the arm or other areas such as the hand, fingers, breast, chest or back.

# Lymphedema

- Lymphedema isn't common when only a few lymph nodes are removed. The cases that do occur are less severe than when more nodes are removed.
- Today, sentinel node biopsy is the preferred way to remove lymph nodes (only a few nodes are removed). So, most people don't get lymphedema.

# Clinical anatomy

- Skin incisions over breast
- Retraction of skin and nipple
- Congenital anomalies- “thelia” and “mastia”
- Lymphadenopathy
- Krukenberg’s tumour
- Breast examination

# Clinical Features



*Peau d' orange  
Appearance*

## Right Breast Skin Dimpling & Nipple Retraction



Clinical  
features  
of Breast  
Cancer



*Breast edema*



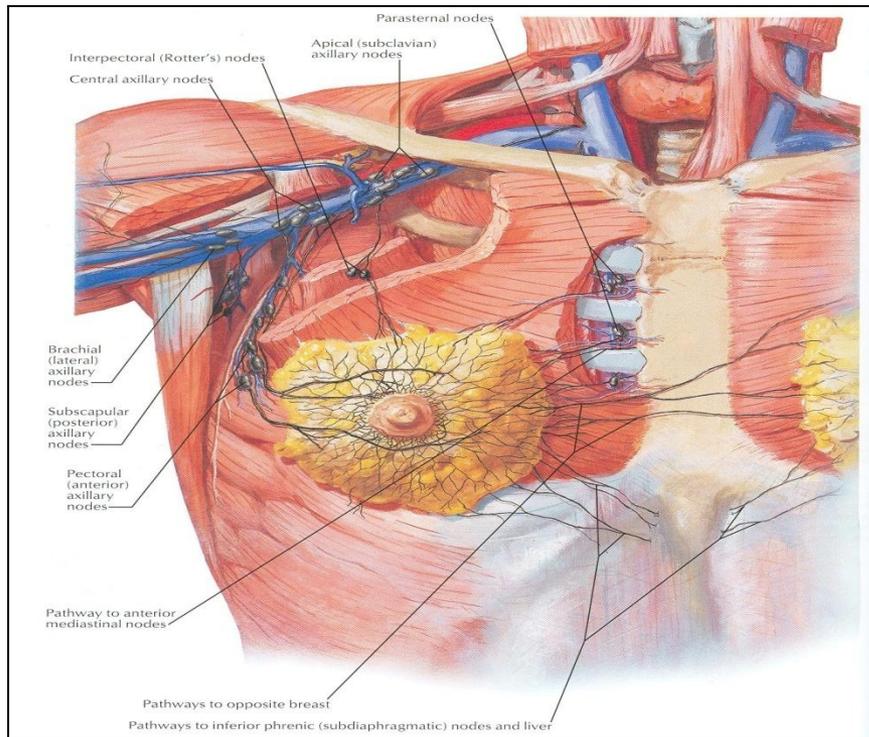
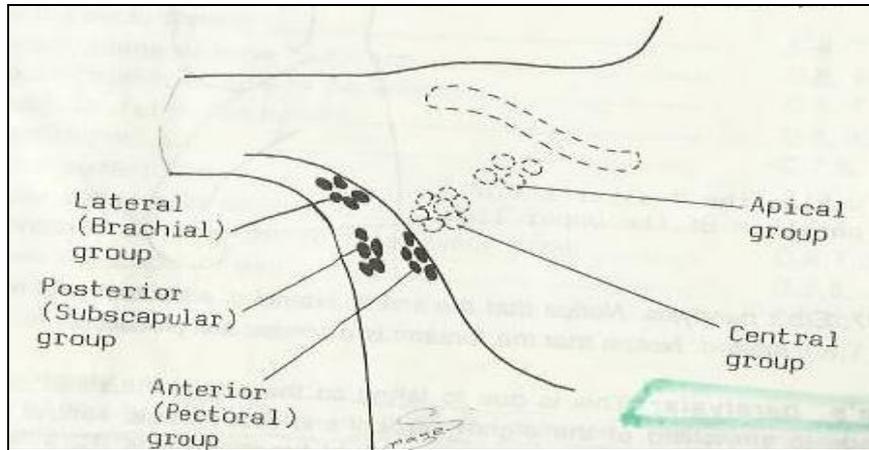
# 1-

- A 40 years female presents with pain along the medial side of arm. On examination- she has palpable lump in upper outer quadrant of breast and enlarged axillary lymph nodes. This referred pain is due to enlarged lymph nodes compressing-
  - A- long thoracic nerve
  - B- **Intercostobrachial nerve**
  - C- lateral pectoral nerve
  - D- medial cutaneous nerve of arm

## 2

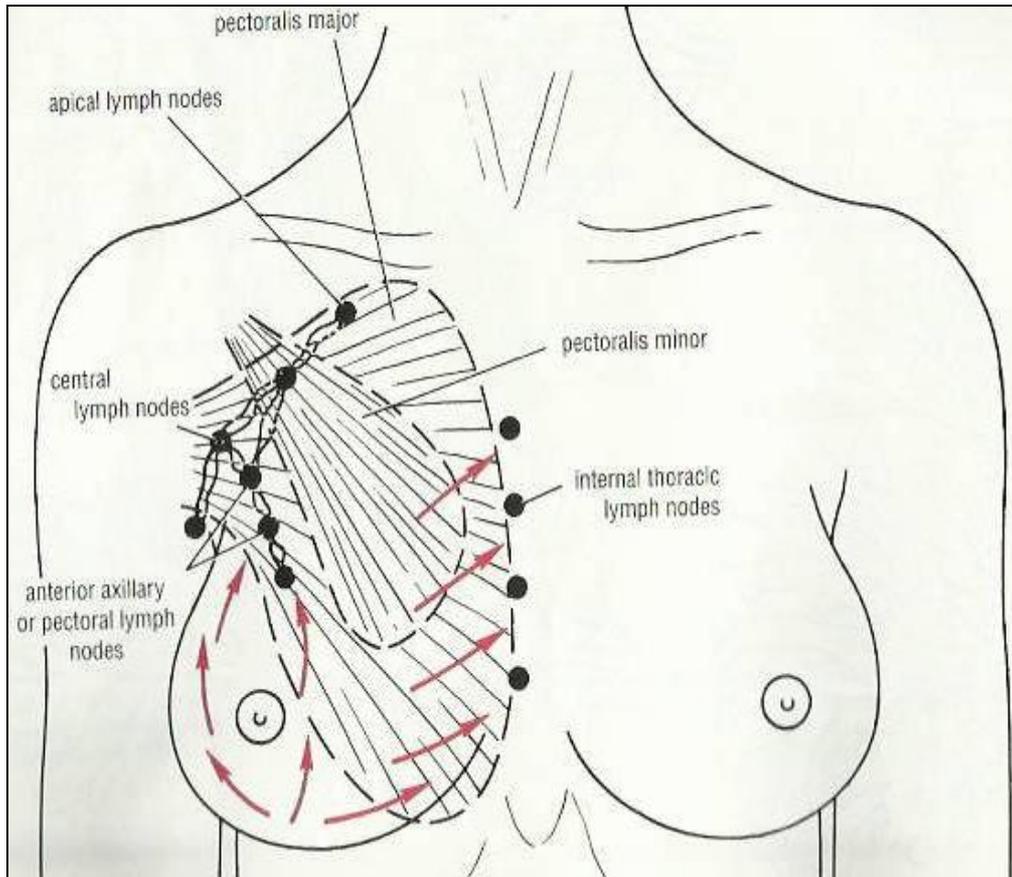
- Which of the following is correct about lymphatic drainage of mammary gland?
- A- pectoral group of lymph nodes lie along lower border of pectoralis major
- B-medial group of axillary lymph nodes drain inner quadrants
- C- 75% of lymphatics from mammary glands drained by Internal mammary nodes
- D- **lymphatics from breast can transmit to ovarian surface**

# AXILLARY LYMPH NODES



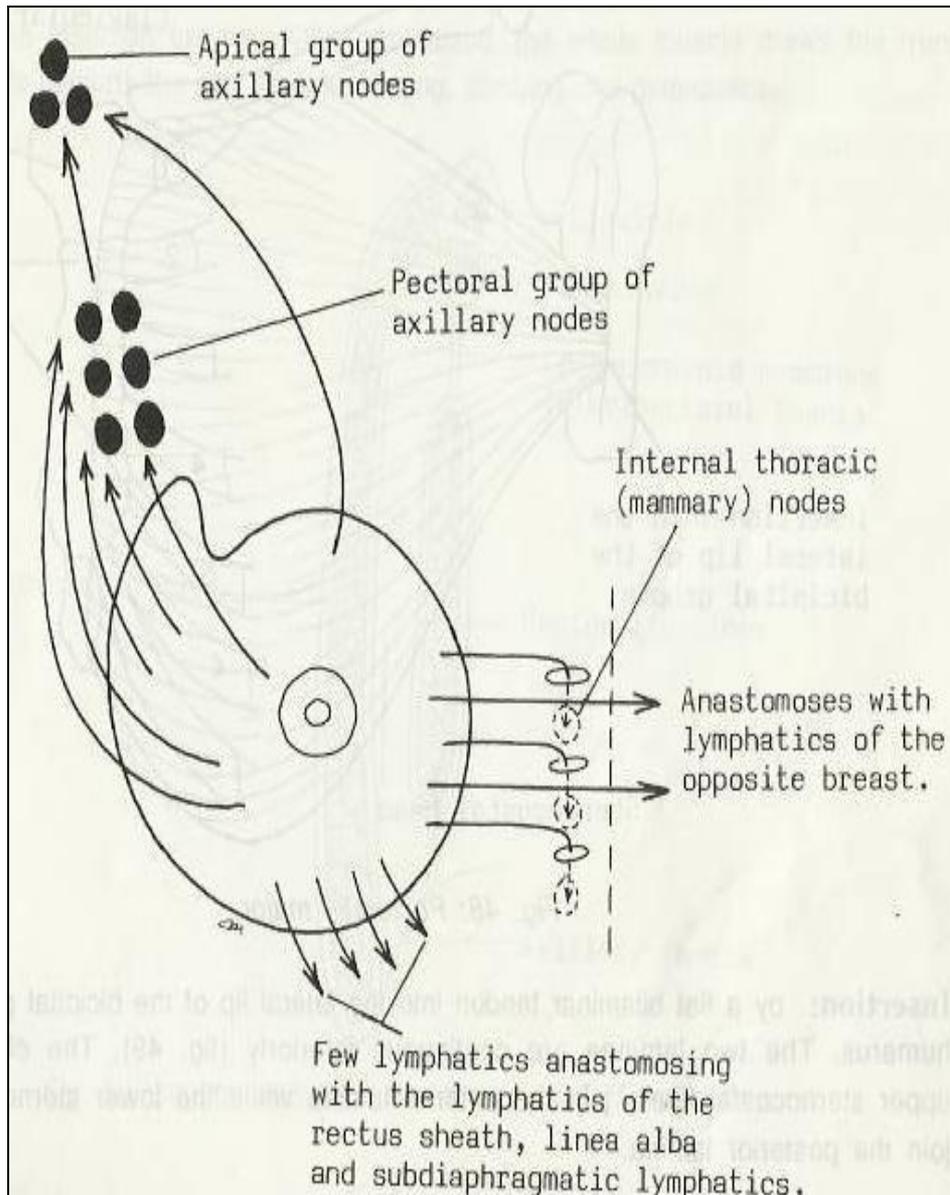
- They are arranged into 5 groups which lie in axillary fat :
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- **Subscapular (Posterior) group** : which lies on posterior wall of axilla on lower border of subscapularis **along subscapular vessels**.
- **Brachial (Lateral) group** : lies on lateral wall of axilla **along 3<sup>rd</sup> 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.

# LYMPHATIC DRAINAGE

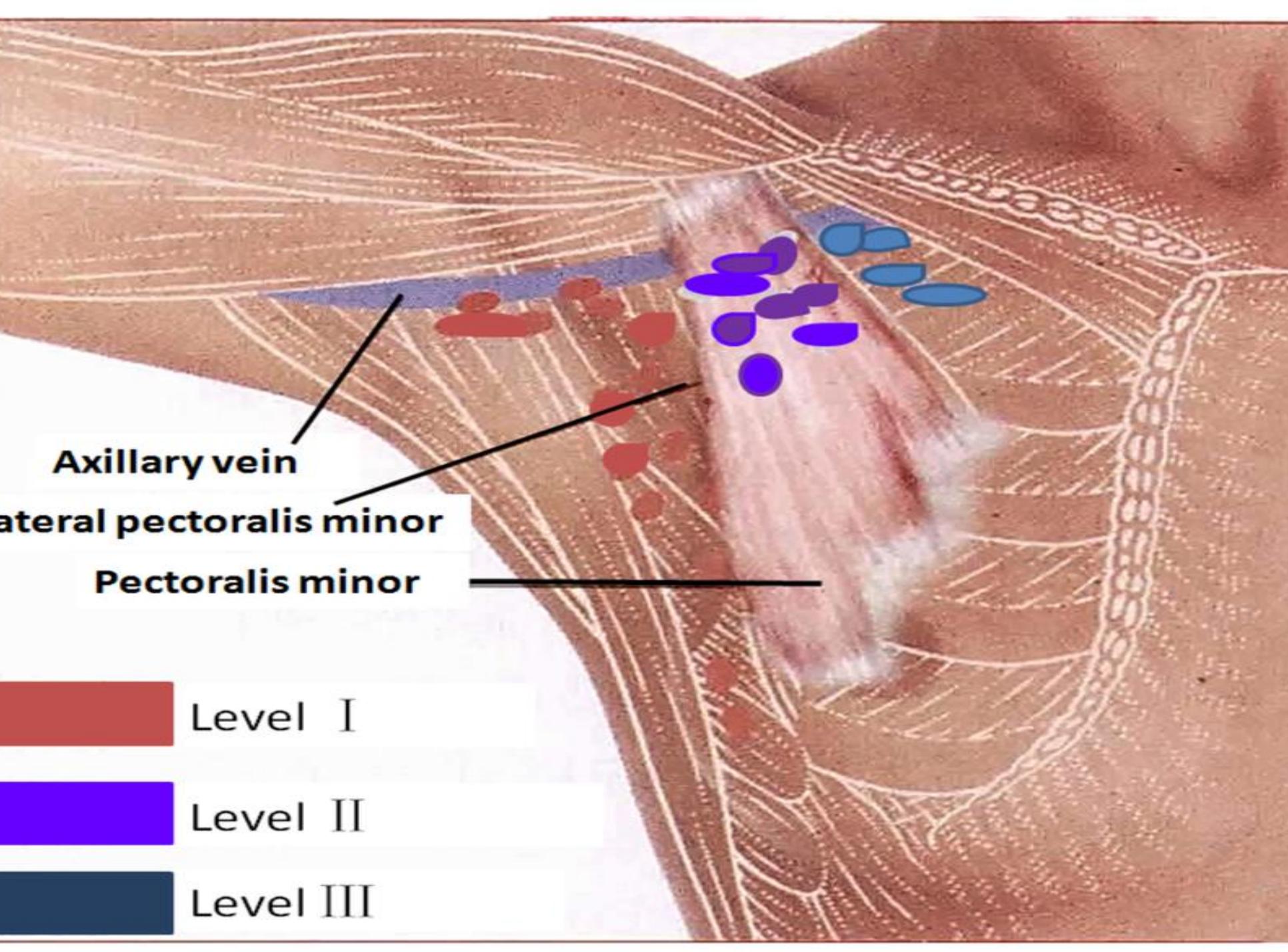


- **Subareolar lymphatic plexus :**
- **Lies beneath the areola.**
- **Deep lymphatic plexus:**
- **Lies on the deep fascia covering pectoralis major.**
- **Both plexuses radiate in many directions and drain into different lymph nodes.**

# LYMPHATIC DRAINAGE



- **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**.



**Axillary vein**

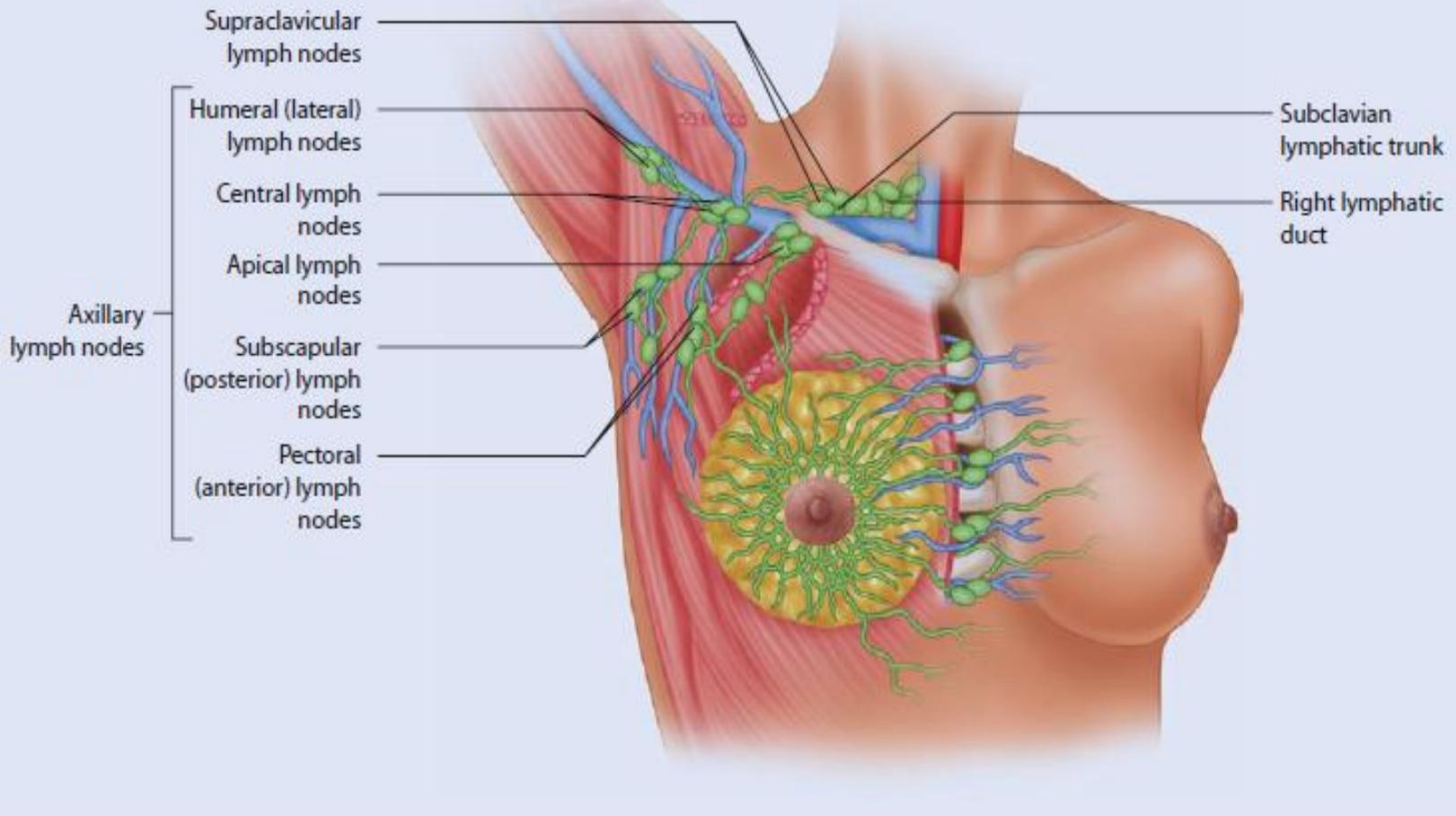
**lateral pectoralis minor**

**Pectoralis minor**

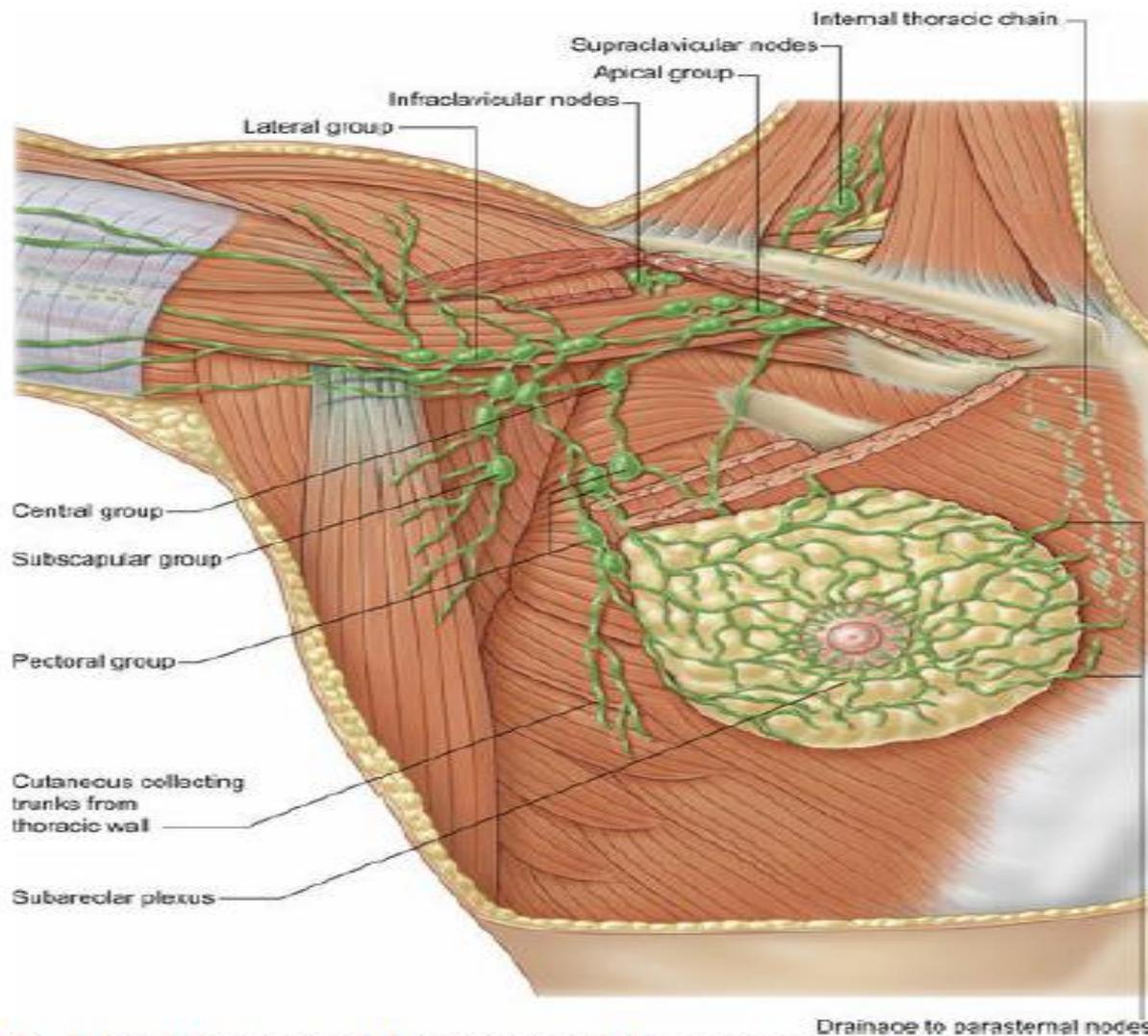
Level I

Level II

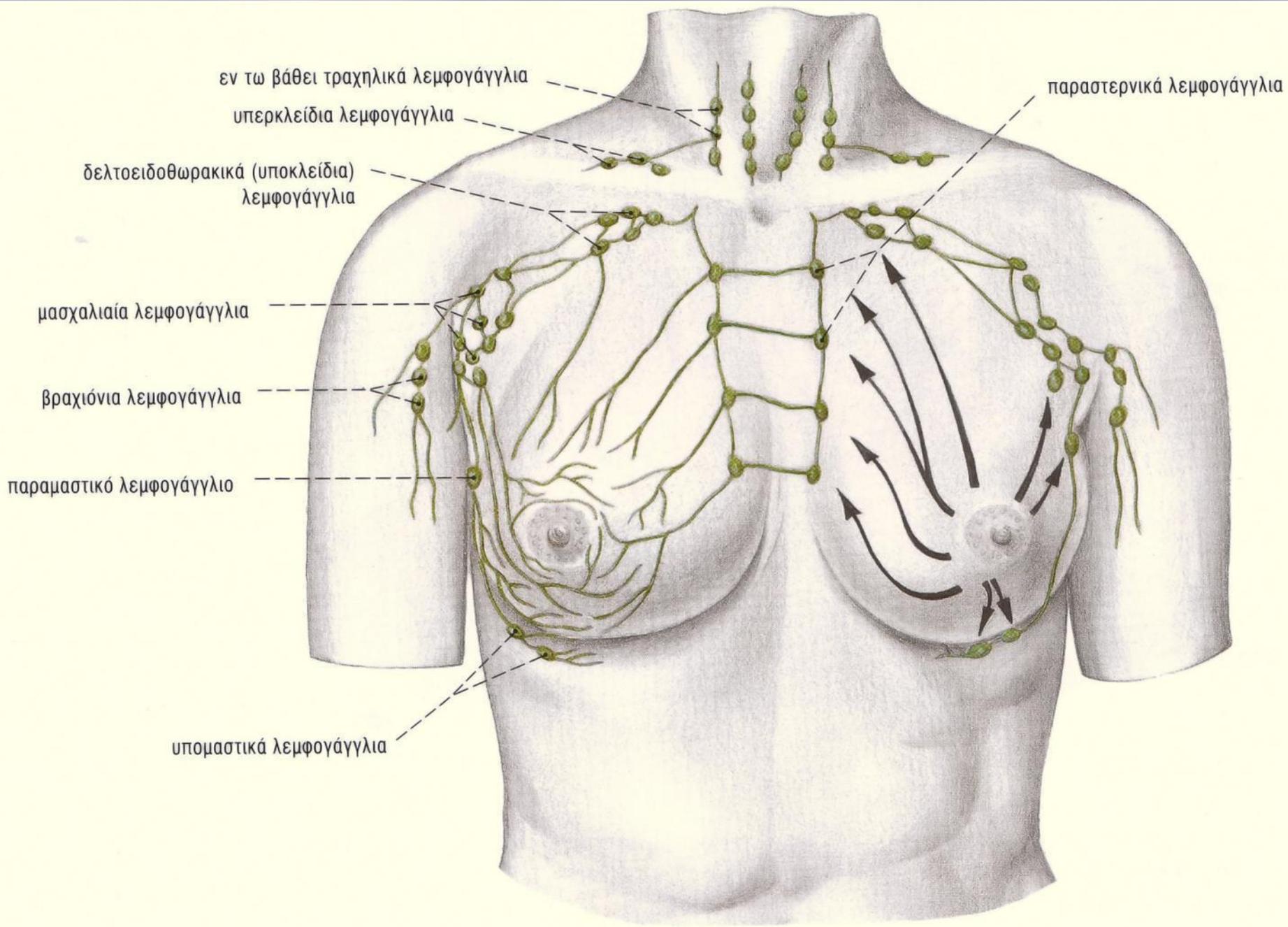
Level III

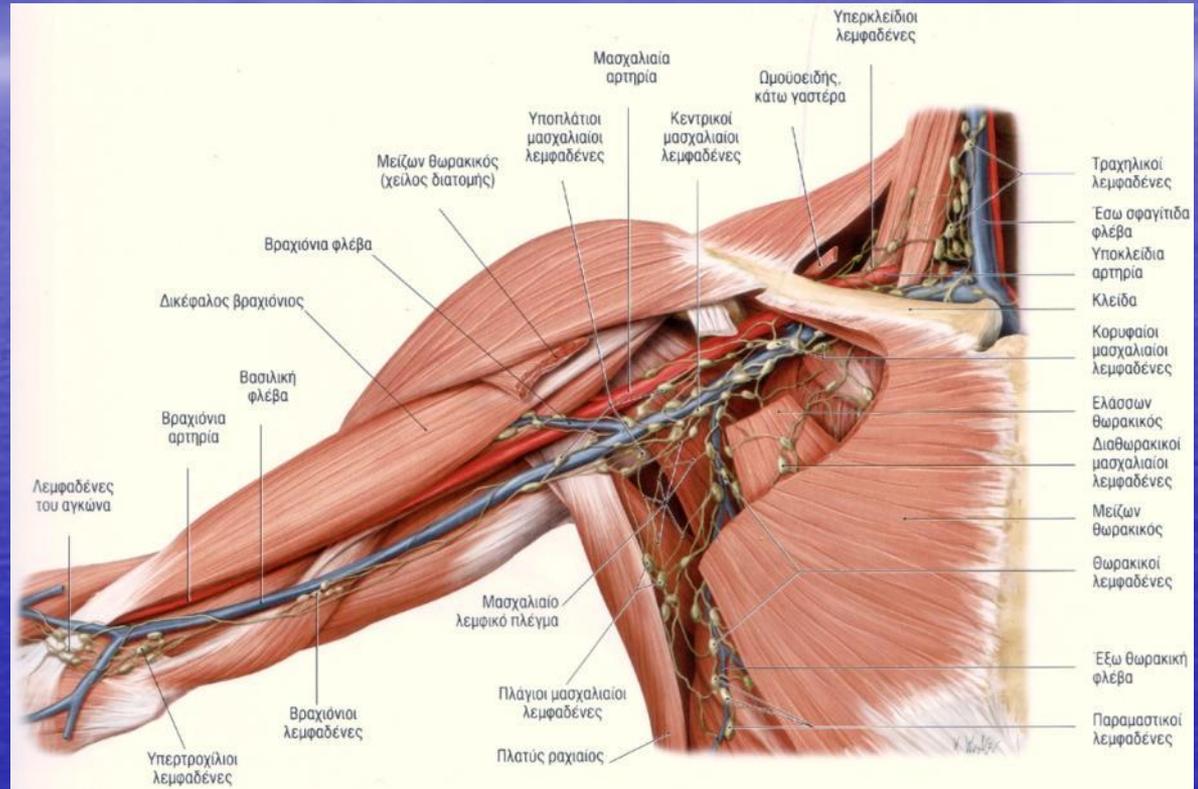
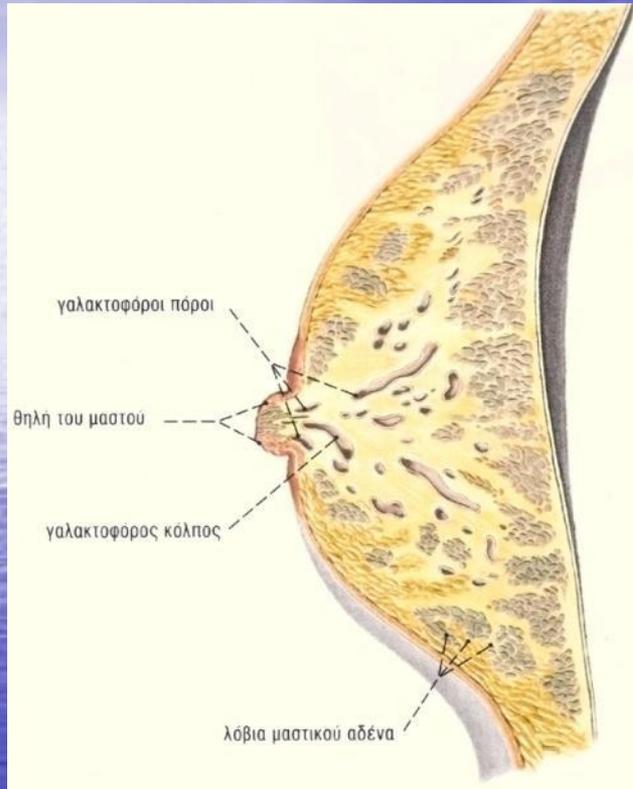


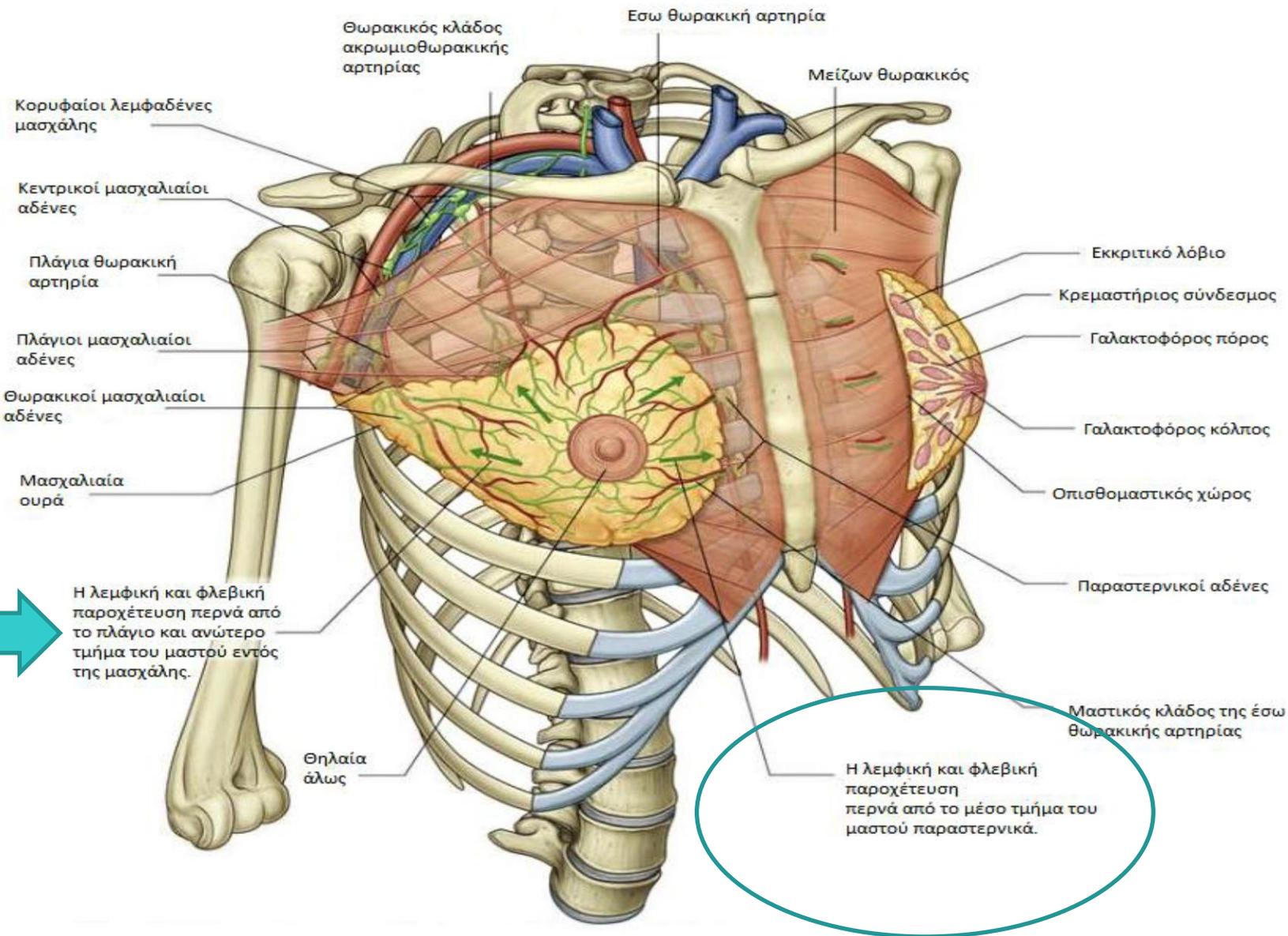
■ Fig. 1.8 Figure showing the lymph node groupings in the axilla

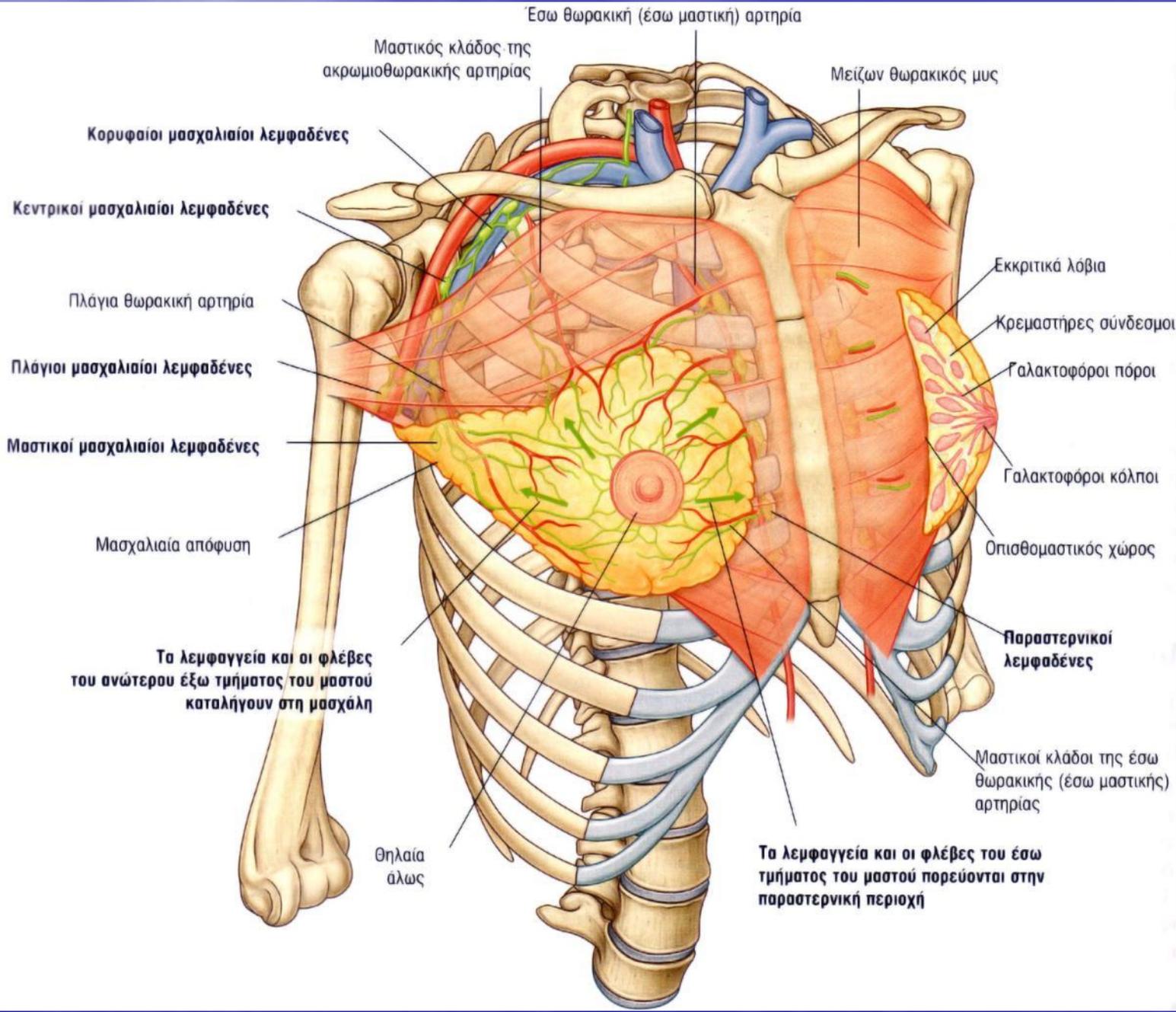


**FIG. 43.9** Lymph vessels of the breast and the draining axillary and supraclavicular nodal groups. (From S. Standring (ed.), *Gray's Anatomy*, forty-first ed. © Elsevier, 2016, Fig. 53.24.)









Έσω θωρακική (έσω μαστική) αρτηρία

Μαστικός κλάδος της ακρωμοθωρακικής αρτηρίας

Μείζων θωρακικός μυς

Κορυφιαίοι μασχάλιοι λεμφαδένες

Κεντρικοί μασχάλιοι λεμφαδένες

Πλάγια θωρακική αρτηρία

Πλάγιοι μασχάλιοι λεμφαδένες

Μαστικοί μασχάλιοι λεμφαδένες

Μασχάλια απόφυση

Τα λεμφαγγεία και οι φλέβες του ανώτερου έξω τμήματος του μαστού καταλήγουν στη μασχάλη

Θηλαία άλω

Εκκριτικά λόβια

Κρεμαστήρες σύνδεσμοι

Γαλακτοφόροι πόροι

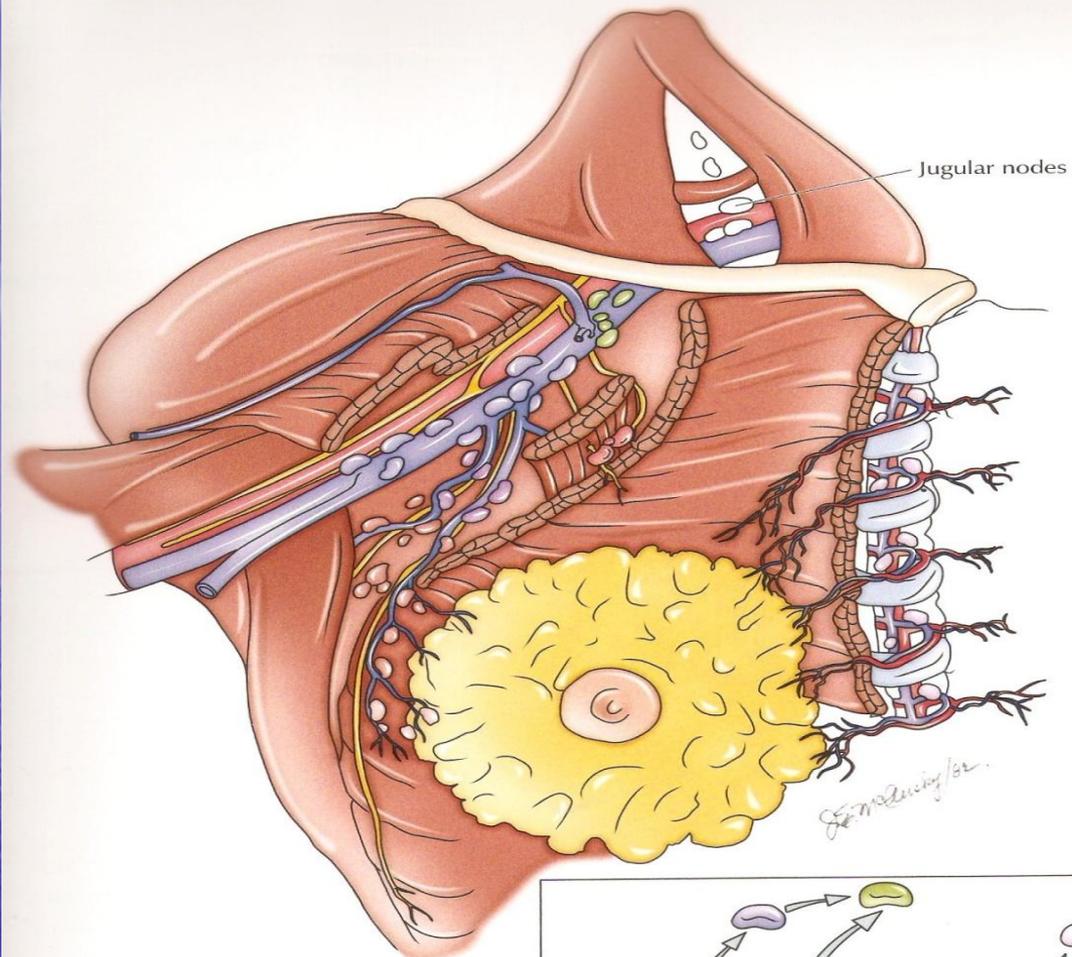
Γαλακτοφόροι κόλποι

Οπισθομαστικός χώρος

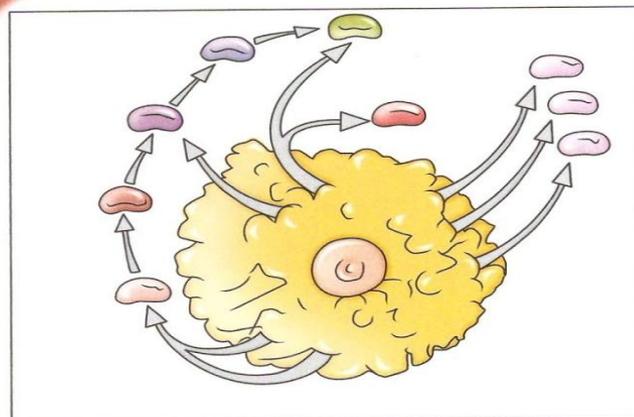
Παραστερνικοί λεμφαδένες

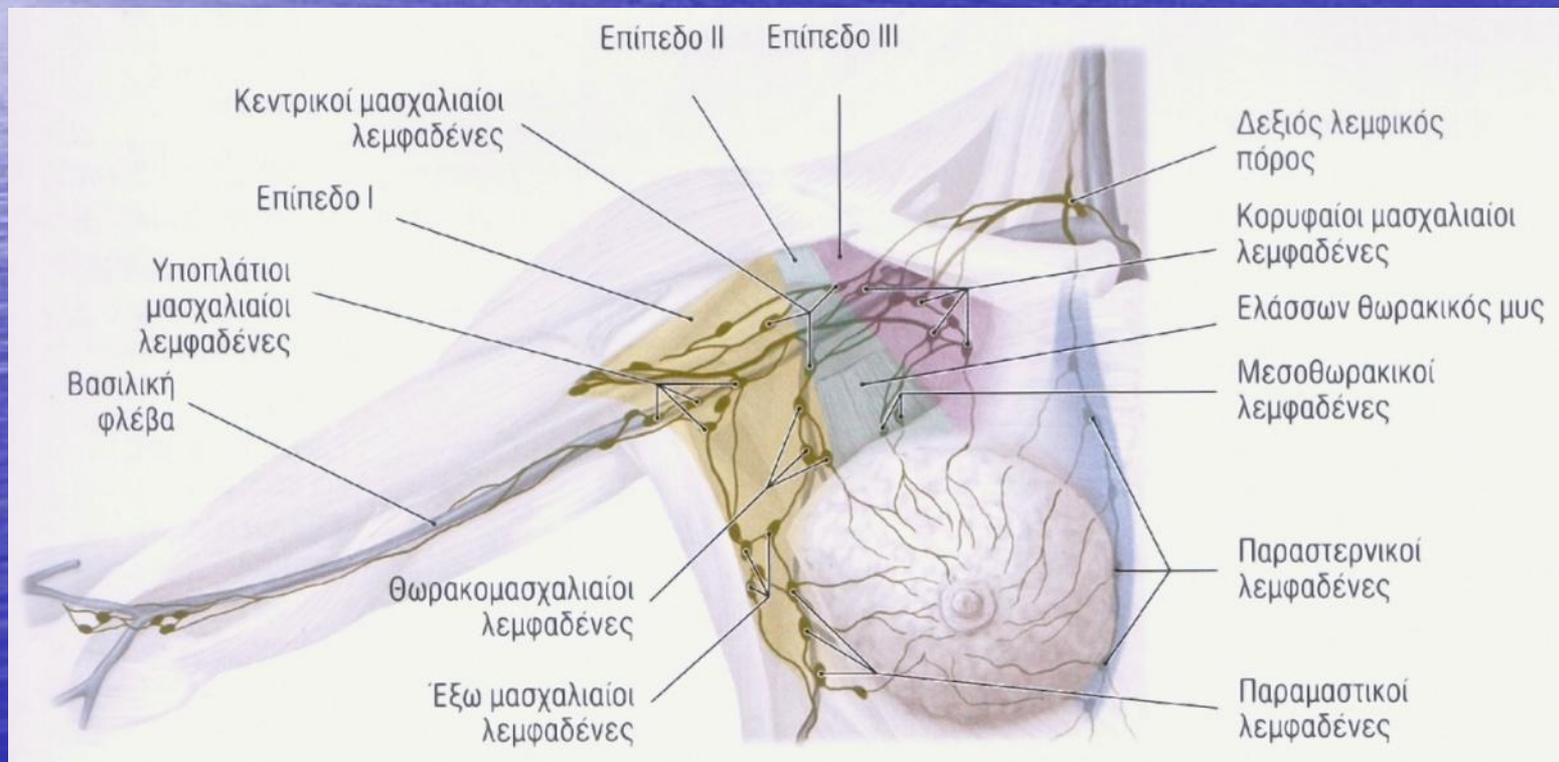
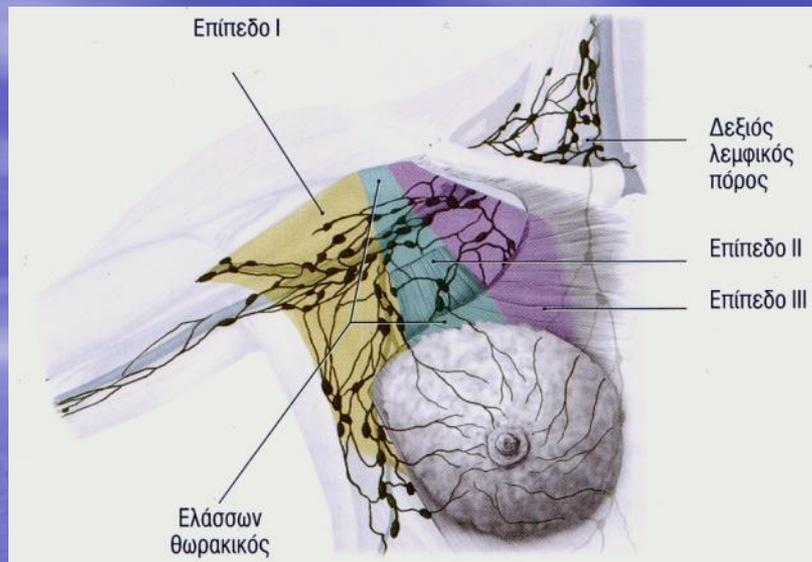
Μαστικοί κλάδοι της έσω θωρακικής (έσω μαστικής) αρτηρίας

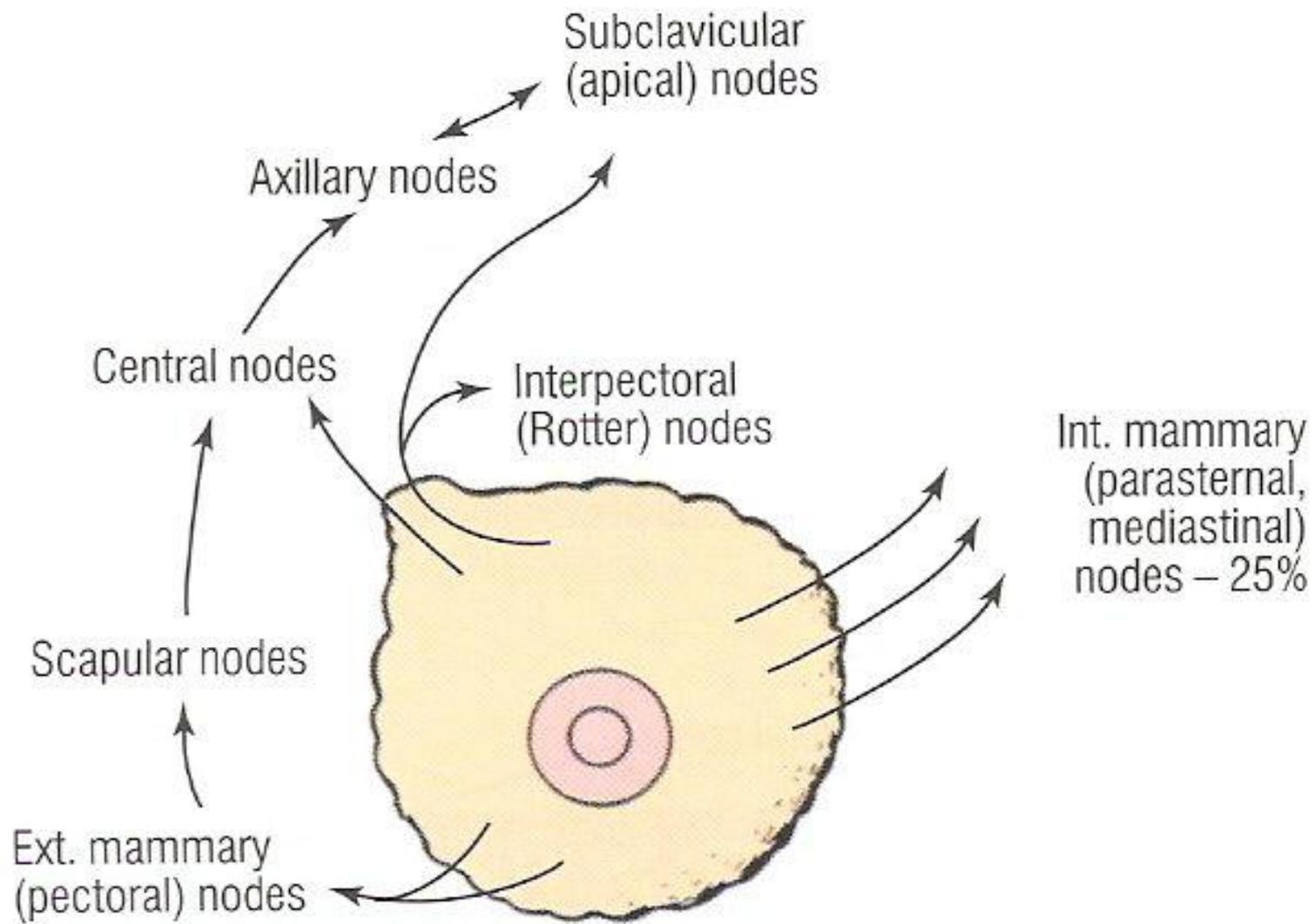
Τα λεμφαγγεία και οι φλέβες του έσω τμήματος του μαστού πορεύονται στην παραστερνική περιοχή



- External mammary (pectoral) nodes
- Scapular nodes
- Central nodes
- Axillary vein nodes
- Subclavicular nodes
- Interpectoral (Rotter) nodes
- Internal mammary nodes (parasternal) (mediastinal)



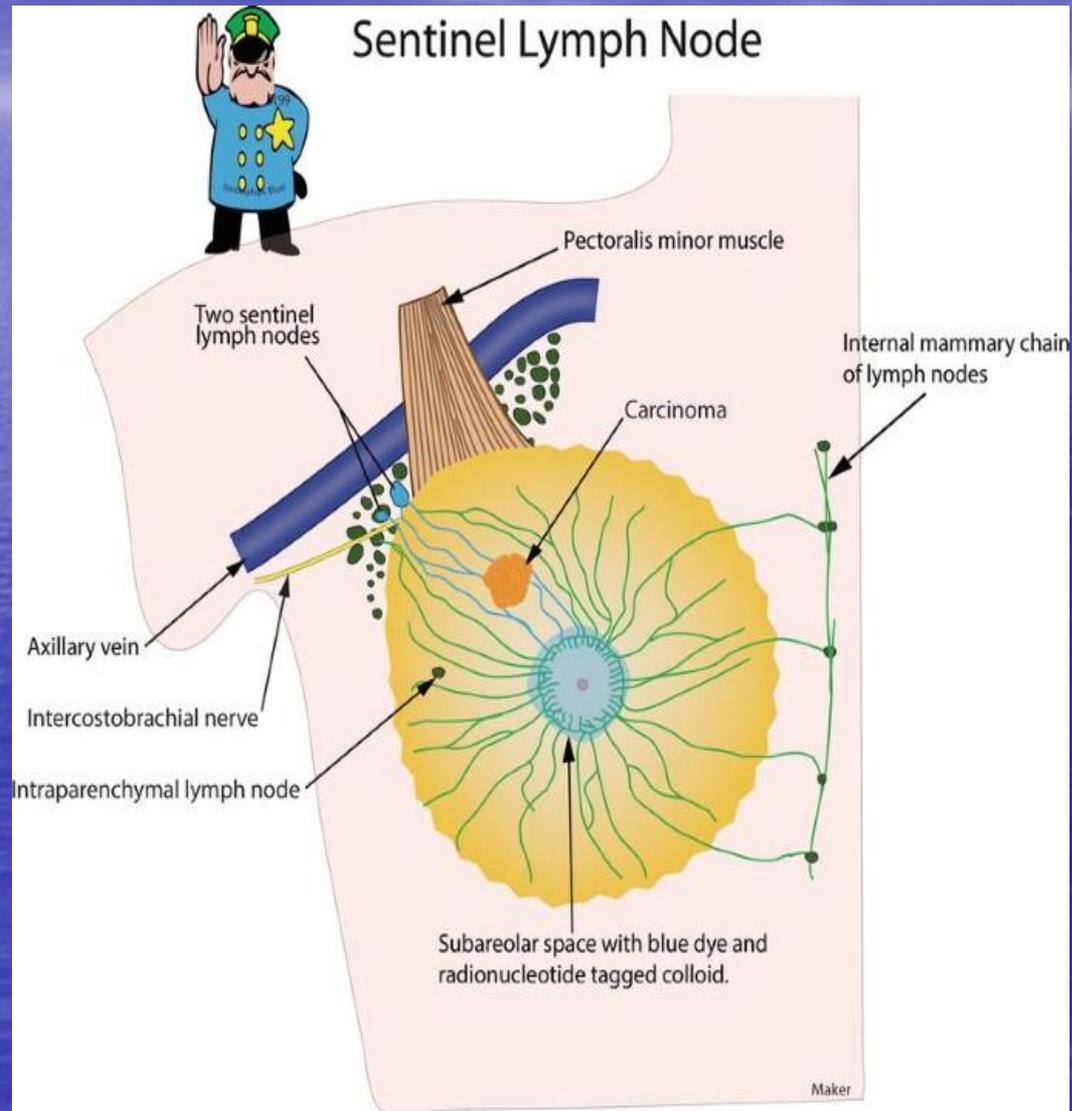


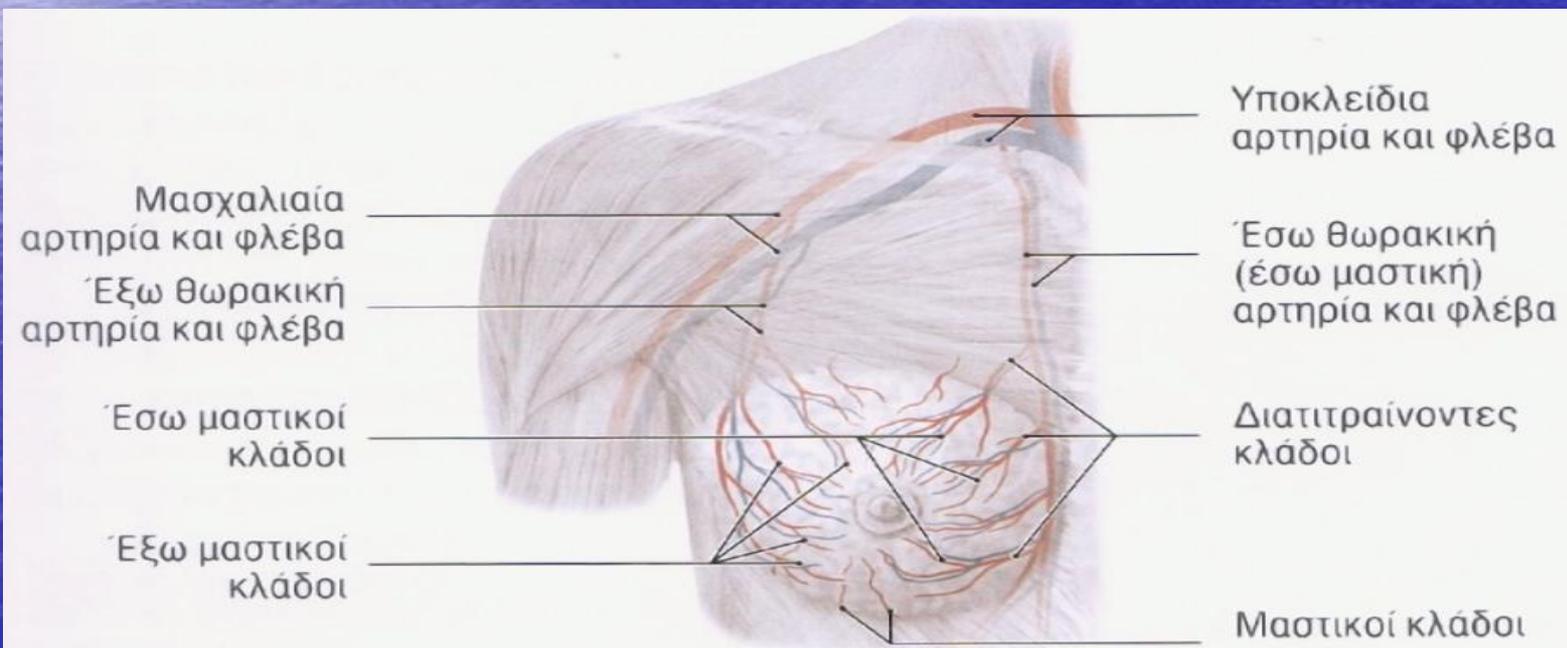
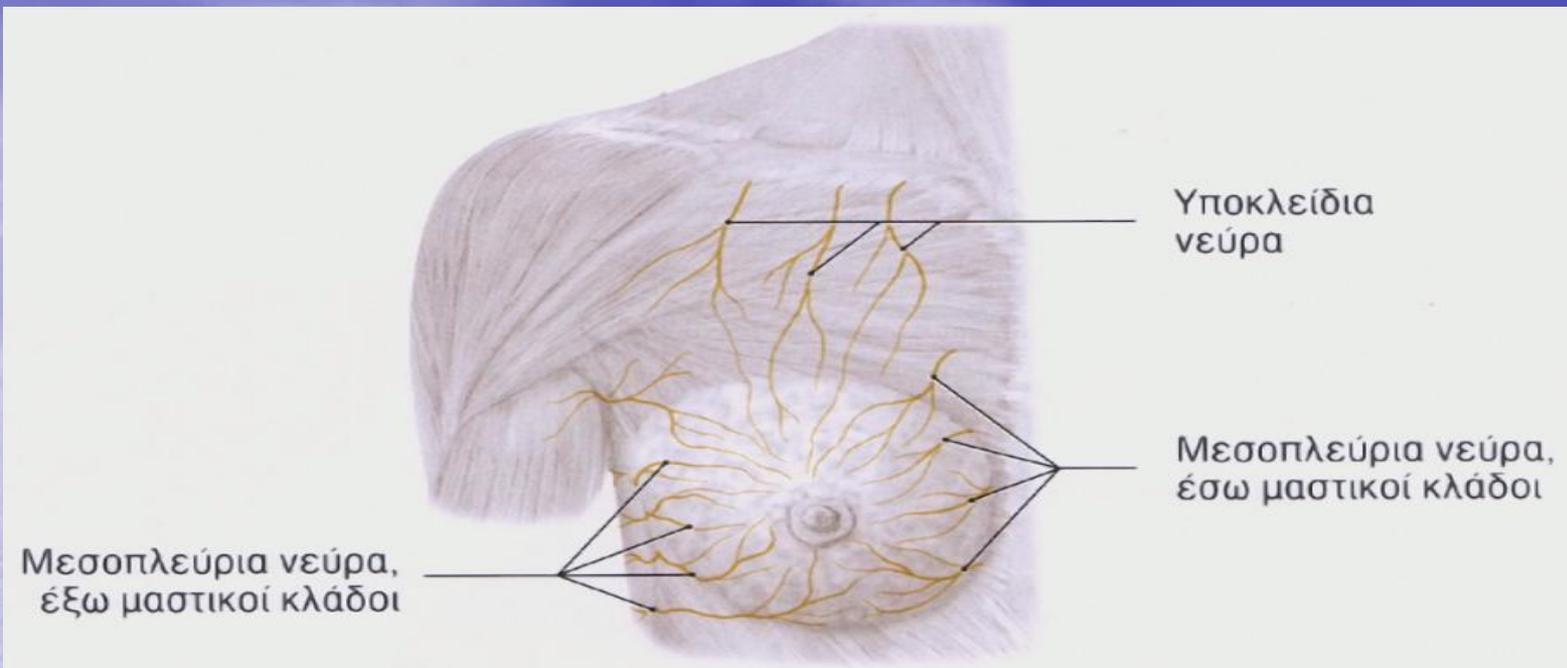


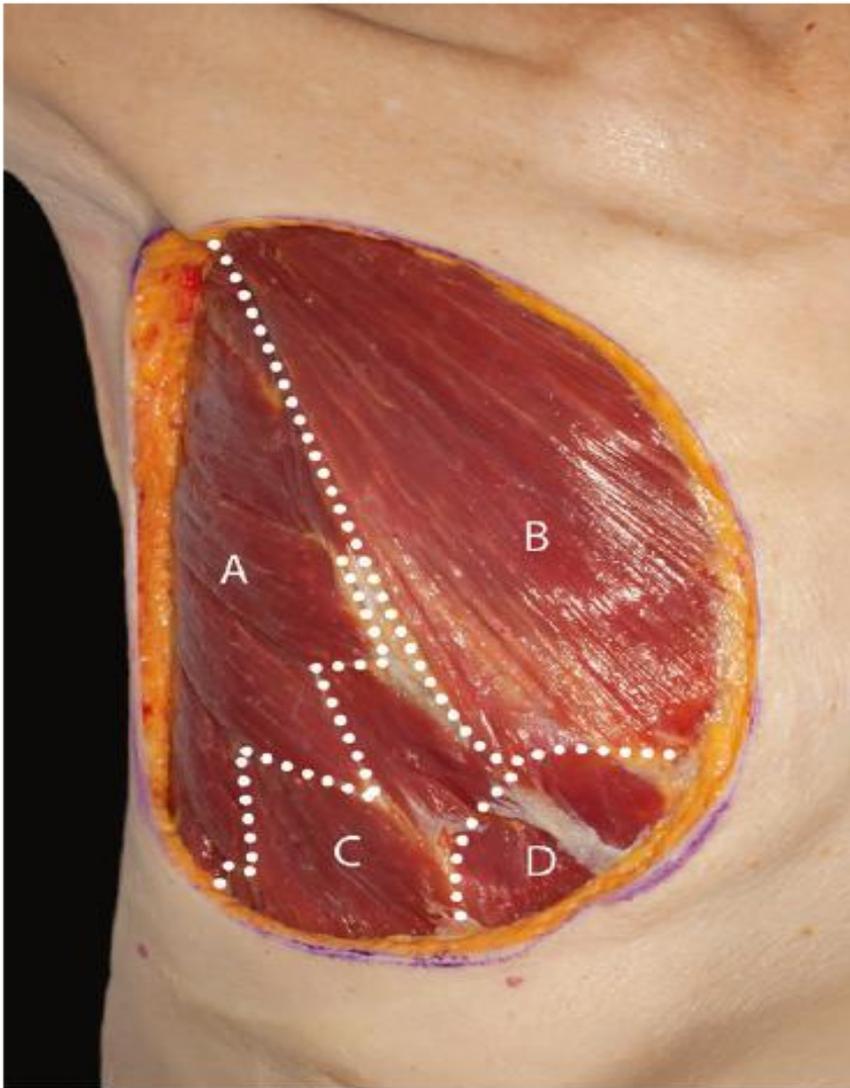
Breast cancer section analysis correlates with sentinel lymph node biopsies:

Precision and topographic anatomy. Chrysikos D et al. Breast Dis.

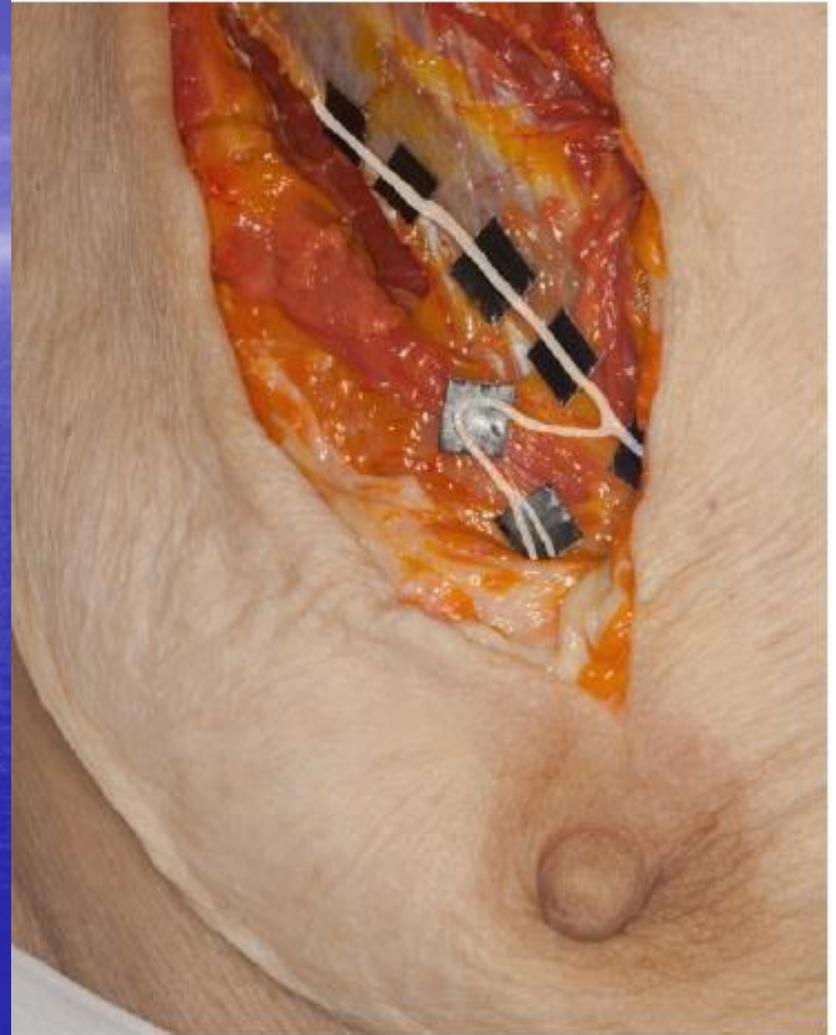
2019;38(1):1-5. doi: 10.3233/BD-180355.





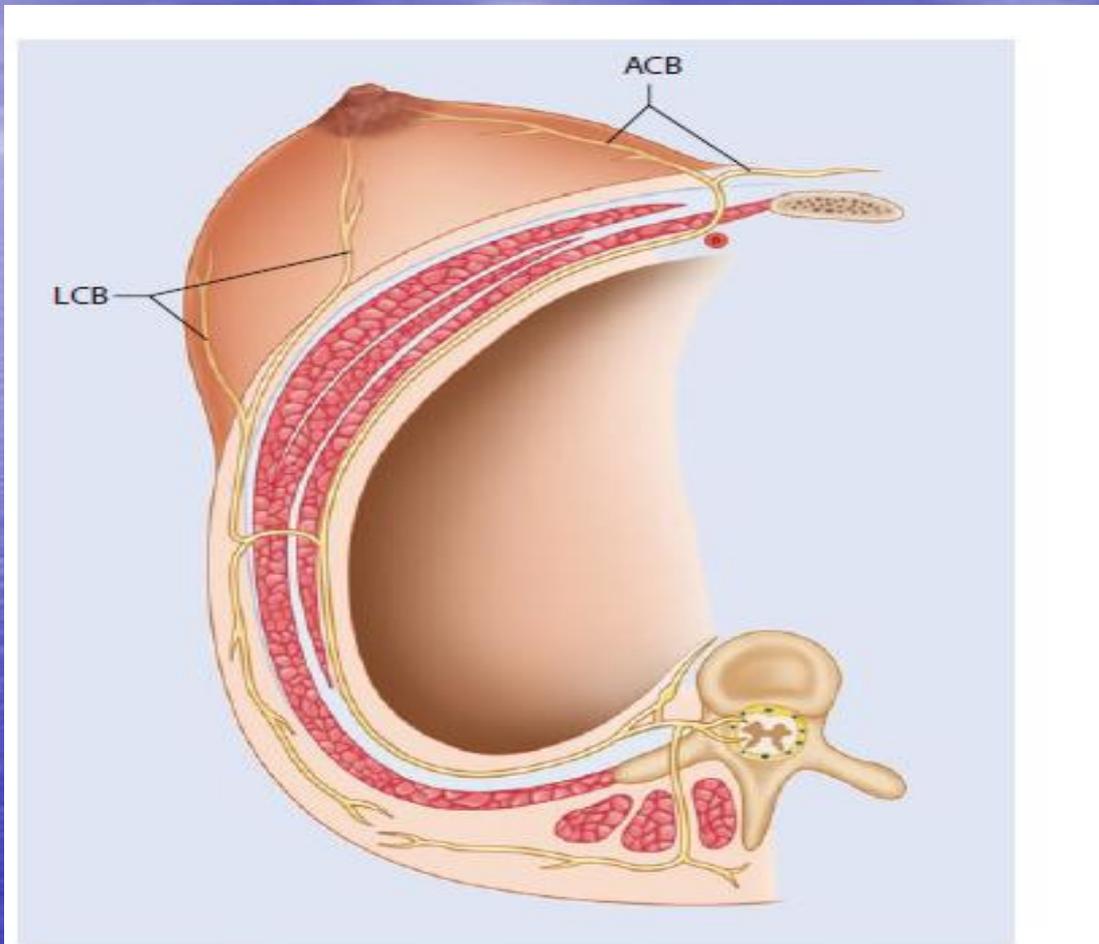


■ Fig. 1.6 Muscles of the chest wall in the area of the breast footprint. Serratus anterior (A), pectoralis major (B), abdominal external oblique (C) and rectus abdominis muscles (D)

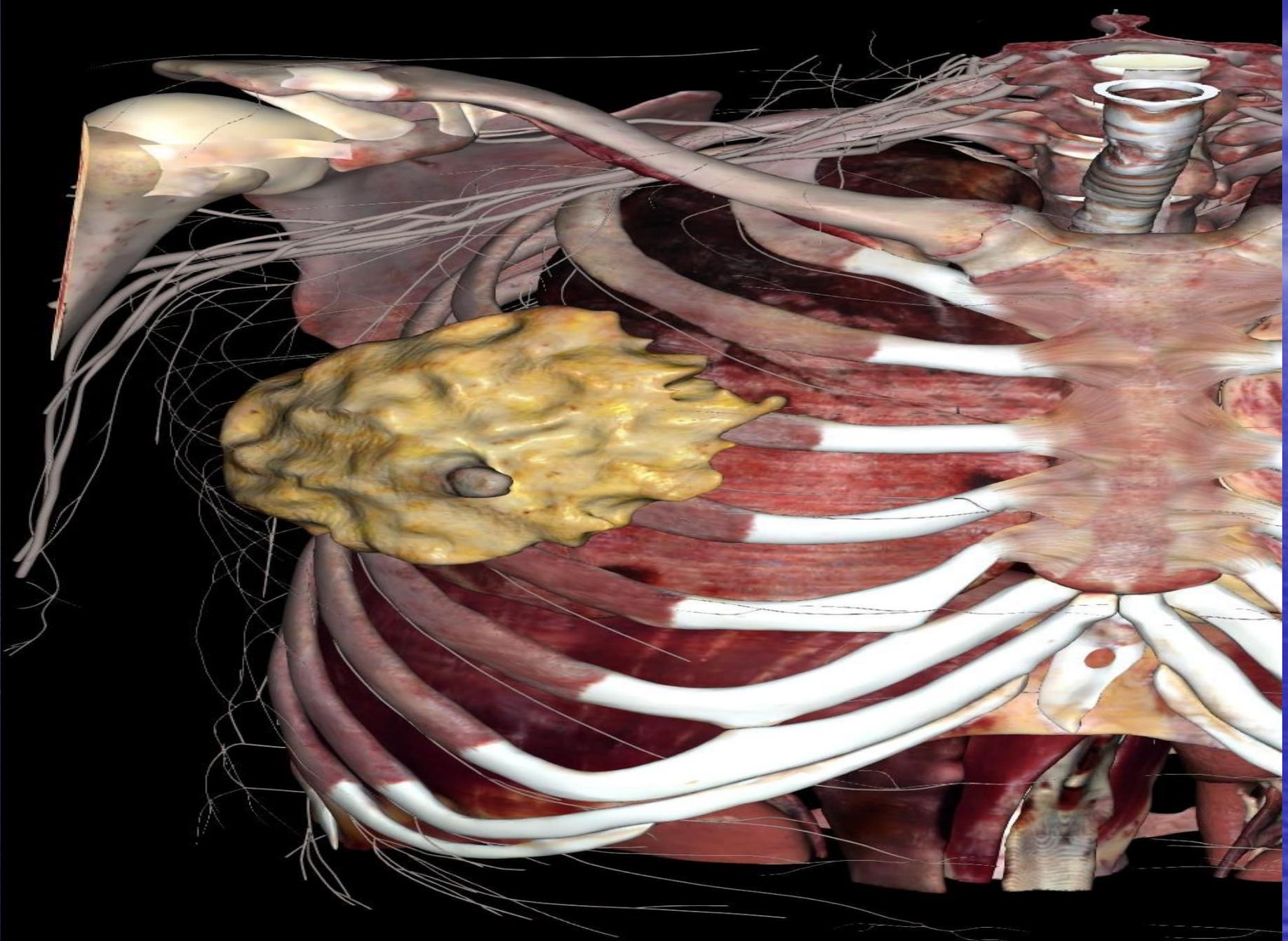


■ Fig. 1.7 The lateral cutaneous branch of the fourth intercostal nerve in a right-sided breast

## lateral (LCB) and anterior cutaneous branch (ACB)



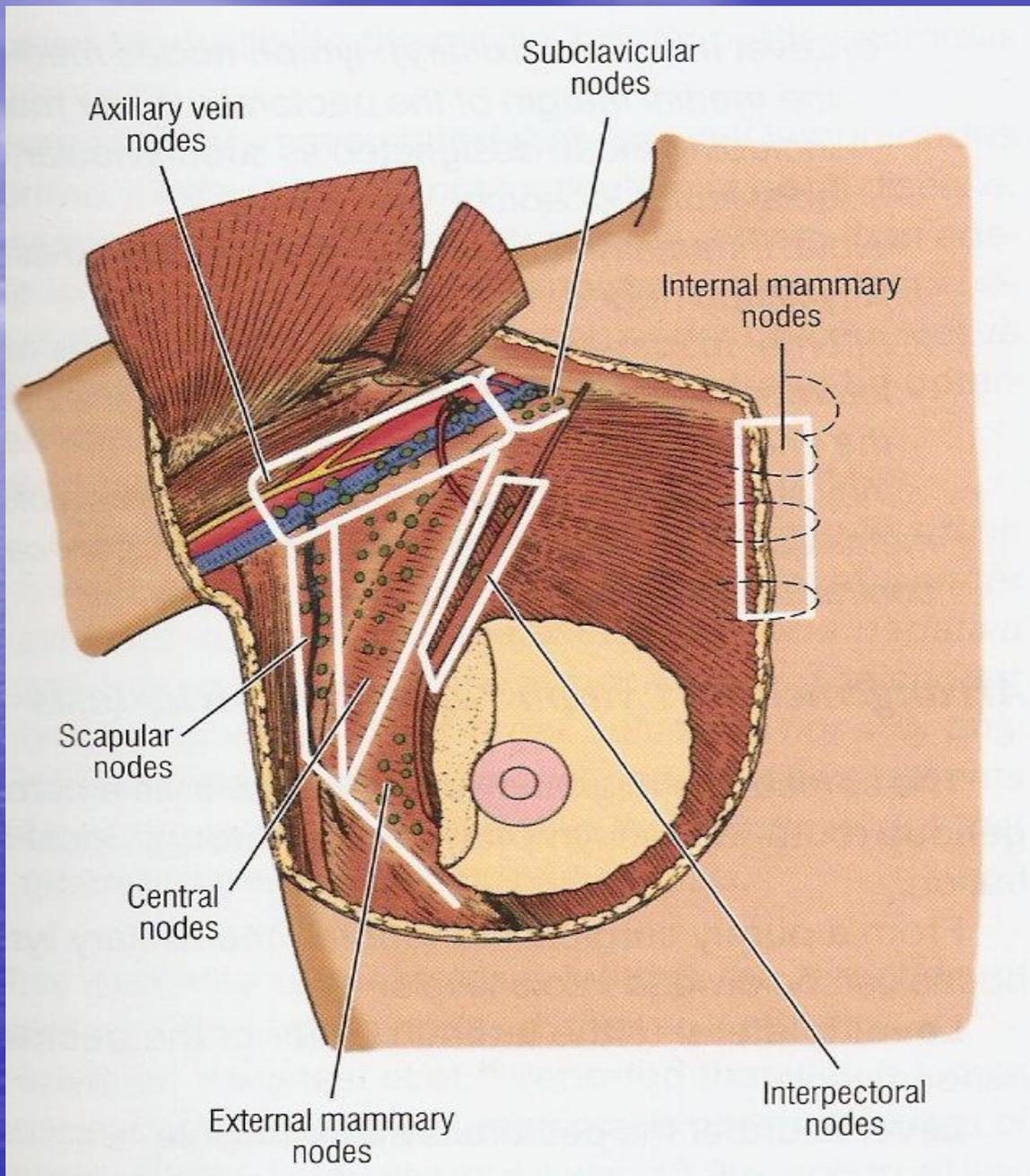
■ Fig. 1.5 Figure demonstrating a schematic of the nerve supply to the breast



# Anatomy of mastectomy

- The triangular bed of radical mastectomy is formed:
- by the cut pectoralis major
- and minor muscles medially, the medial border of the latissimus dorsi muscle laterally, and the axillary vein superiorly.
- The serratus anterior and the subscapularis muscles form the floor of the triangle.
- The long thoracic nerve (Bell's) lies on the external surface of the serratus anterior muscle slightly anterior to the midaxillary line;
- The thoracodorsal and subscapular nerves lie on the subscapularis muscle.





- Skin flaps must be kept thin, and all fat and glandular tissue must be removed to avoid recurrence of malignant disease. The choice of cautery or knife is up to the surgeon. Remember that the most frequent complication of mastectomy is skin necrosis.
- **Flap Complications**
- Stevenson<sup>90</sup> studied complications of flap surgery and individual flap complications. He **stressed the importance of a thorough anatomic knowledge of vascularization** of the flap for successful surgery

# Postmastectomy Flap Necrosis



**Physical Examination  
Signs for Pattern Recognition**

**Blackish to black discoloration on  
the flap**



- **Nerve Injury**
- **Thoracodorsal Nerve**
- If the thoracodorsal nerve (middle subscapular) is cut, internal rotation and abduction are weakened, although there is no deformity.
- **Long Thoracic Nerve**
- Section of the nerve results in the "winged scapula" deformity.
- **Anterior Thoracic Nerves (Pectoral)**
- Inadvertent division of the lateral pectoral nerve results in atrophy of the clavicular head, with resulting unsightly cosmetic deformity just inferior to the clavicle.
- If branches of one or both pectoral nerves are injured, the result will be atrophy of the pectoralis major and minor muscles.
- **Brachial Plexus**
- Direct injury to the brachial plexus is possible, but most injury is the result of stretching the nerves during operation. One patient in the series of 249 mastectomies of Zintel and Nay<sup>86</sup> suffered transient injury to the plexus.

- **Vascular Injury**

- The sources of bleeding during mastectomy are:
  - the perforating arteries and veins, especially those of the first and second intercostal vessels
  - the axillary vein and its tributaries
  - the axillary artery and its branches

- **Organ Injury**

- Pneumothorax is a possible danger during ligation of perforating vessels. The surgeon should use curved hemostats and not apply them at right angles. The pneumothorax is easily repaired, but the possible contamination of the pleural cavity with malignant cells is a delayed catastrophe. Zintel and Nay<sup>86</sup> had one pneumothorax among 249 consecutive radical mastectomies.

- The average blood loss during radical mastectomy has been estimated to be 732 ml.<sup>85</sup>
- The perforating vessels should be ligated; the first three are too large for cautery. The axillary vein, if torn, must be ligated. The axillary artery is rarely injured;<sup>86</sup> but when repair is necessary, it must be done between bulldog clamps.
- Postoperative edema of the arm is a common sequel to radical mastectomy and extensive lymphadenectomy. According to Horsley,<sup>87</sup> about 10% of radical mastectomy patients experience disabling lymphedema. At one time, obstruction to the axillary vein was considered an important factor in edema formation. Subsequent studies<sup>88,89</sup> have shown this is not so. Lymphatic obstruction or destruction appears to be the sole cause of edema, which appears transiently in about half of the patients undergoing radical mastectomy.

## ⓐ Tips and Anatomical Hazards

Never compromise oncology for aesthetics, but consider your placement of an incision to excise a breast cancer and if possible place it off the breast in the lateral crease or inframammary fold, or around the areola.

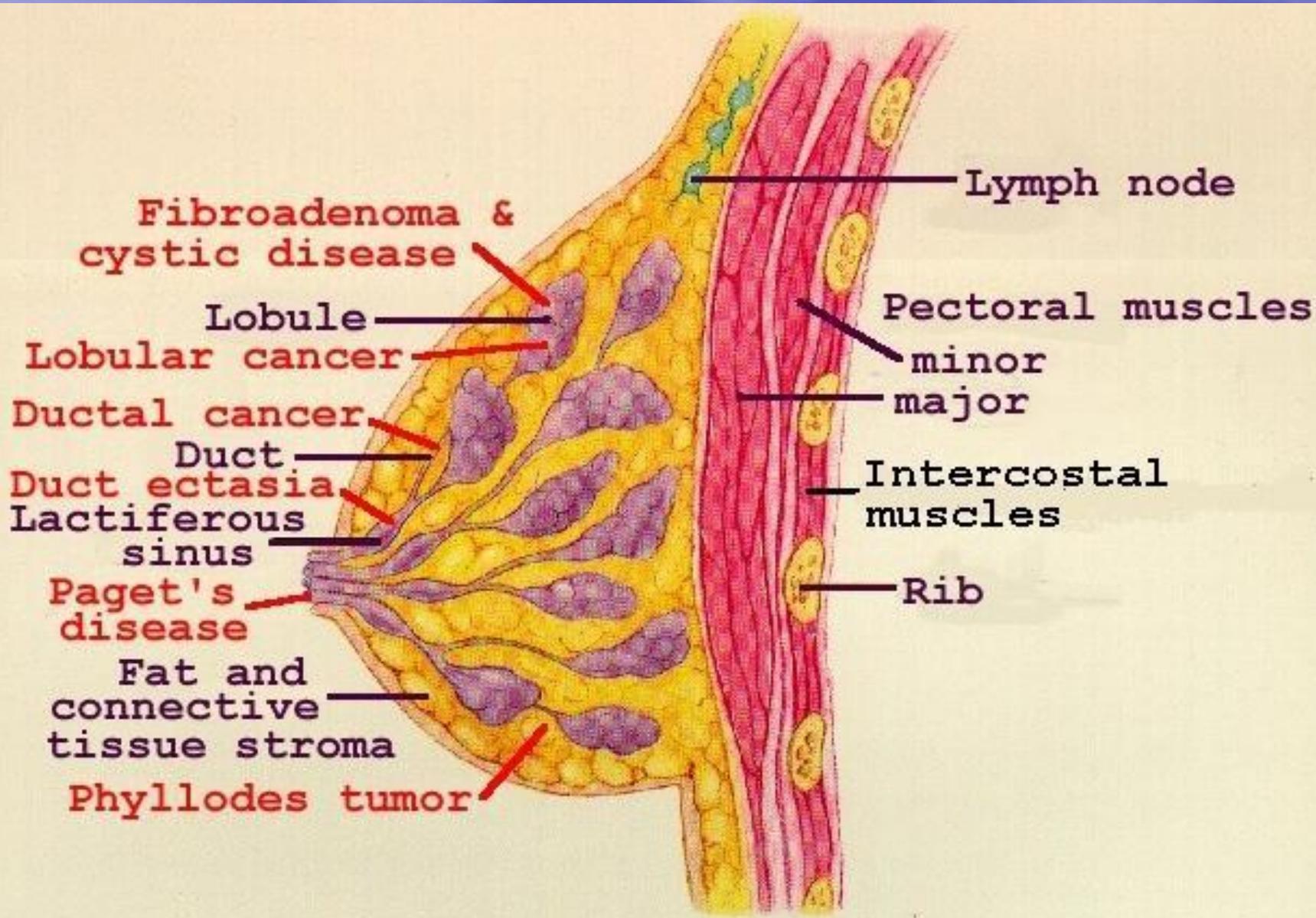
Beware of the large medial perforator vessels in a mastectomy – watch out for them to avoid injury to minimise risks of skin flap necrosis.

Be sure to maintain the orientation of a wide local excision and mark it clearly and consistently as agreed with your pathologist.

In sentinel node biopsy do not excise more than 4 nodes to minimise the risks of lymphoedema.

If no radio-isotope or blue dye is detected in the axilla a 4 node sample is a suitable alternative.

In axillary clearance be sure to identify your key anatomical landmarks early and preserve them throughout – the long thoracic nerve, thoracodorsal pedicle and axillary vein.



Fibroadenoma & cystic disease

Lobule

Lobular cancer

Ductal cancer

Duct

Duct ectasia

Lactiferous sinus

Paget's disease

Fat and connective tissue stroma

Phyllodes tumor

Lymph node

Pectoral muscles

minor

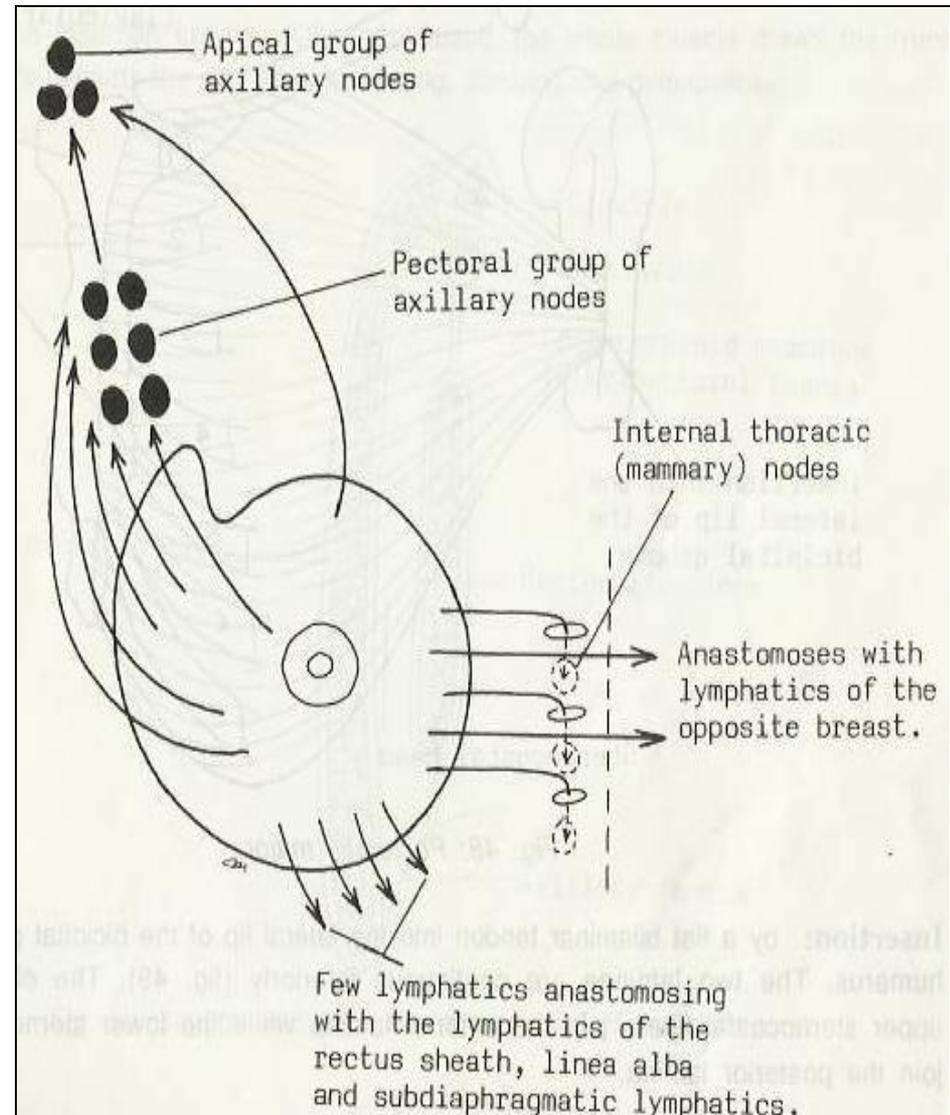
major

Intercostal muscles

Rib

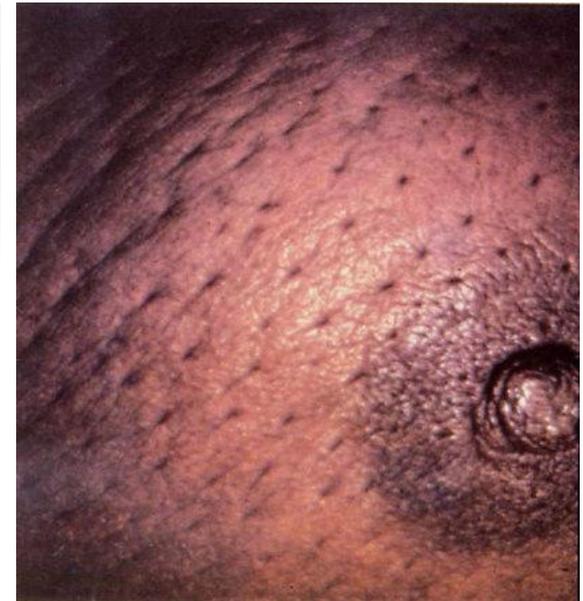
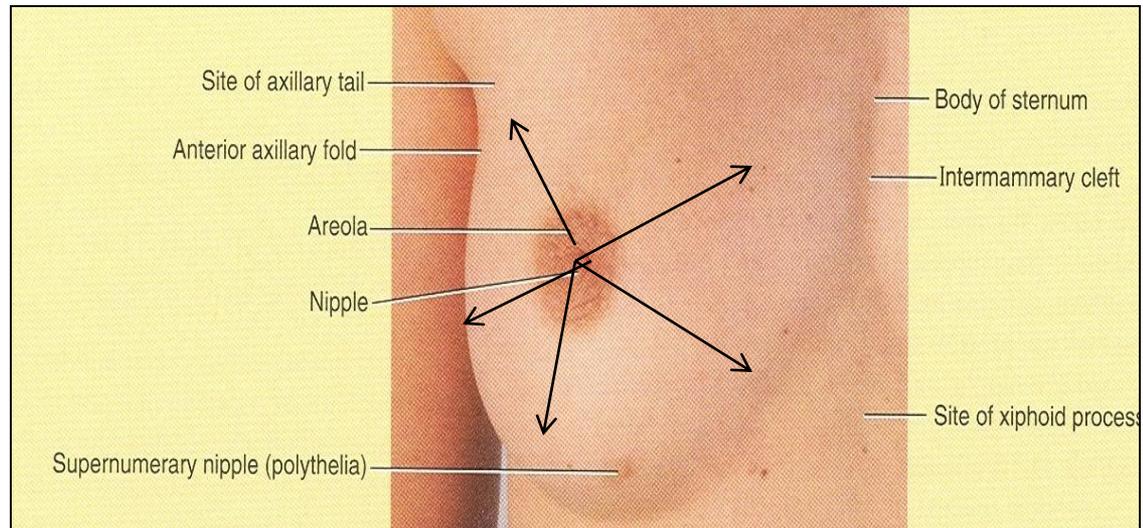
# APPLIED ANATOMY- CANCER BREAST

- It is a common surgical condition.
- 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.
- In patients with **localized cancer breast**, a simple mastectomy, followed by radiotherapy to the axillary lymph nodes is the **treatment of choice**.



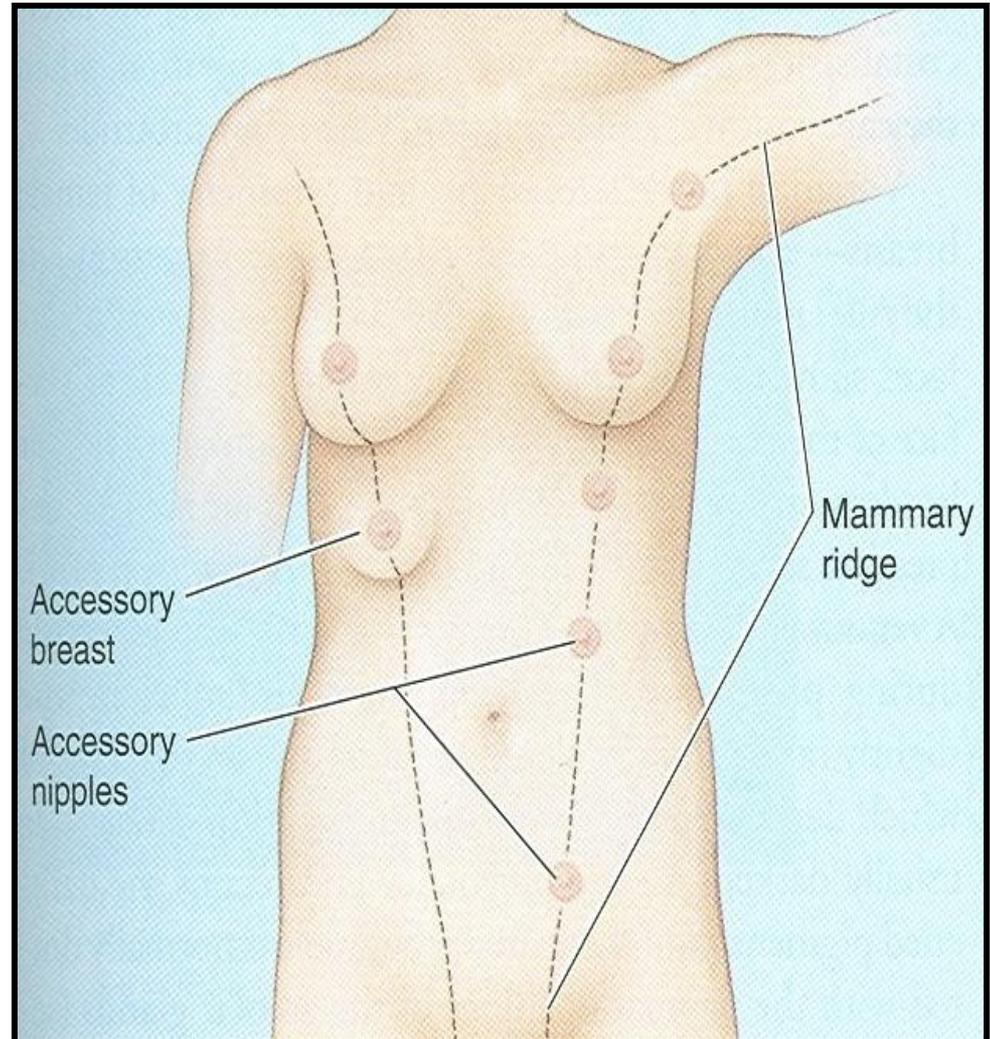
# Applied Anatomy

- The lactiferous ducts are radially arranged from the nipple, so incision of the gland should be made in a radial direction to avoid cutting through the ducts.
- Infiltration of the ligaments of Cooper by breast cancer leads to its shortening giving peau de'orange appearance of the breast.



# Mammary ridge

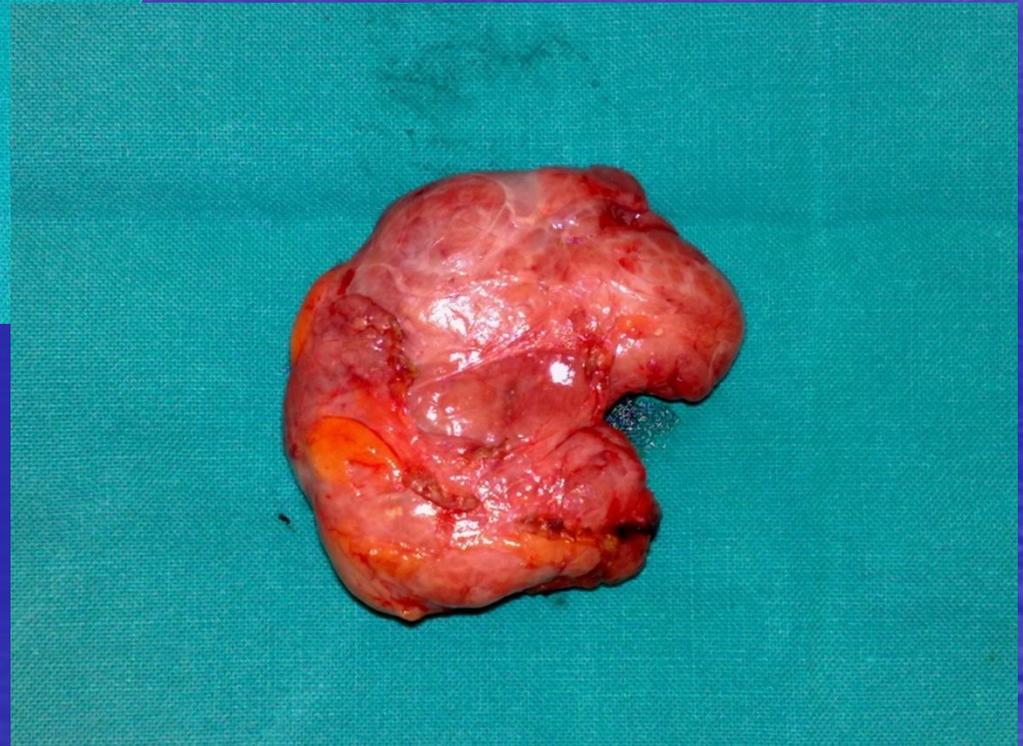
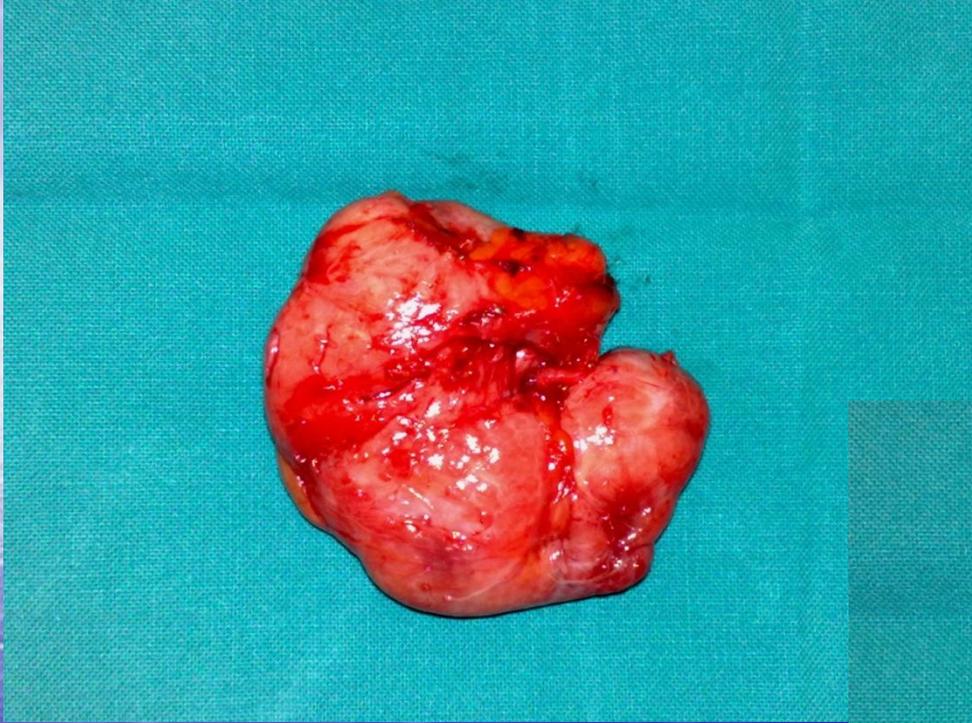
- **Mammary ridge** extends from the axilla to the inguinal region.
- In **human**, the ridge disappears **EXCEPT** for a small part in the **pectoral region**.
- In **animals**, several mammary glands are **formed along this ridge**.



# Nipple skin lesions



# Fibroadenoma



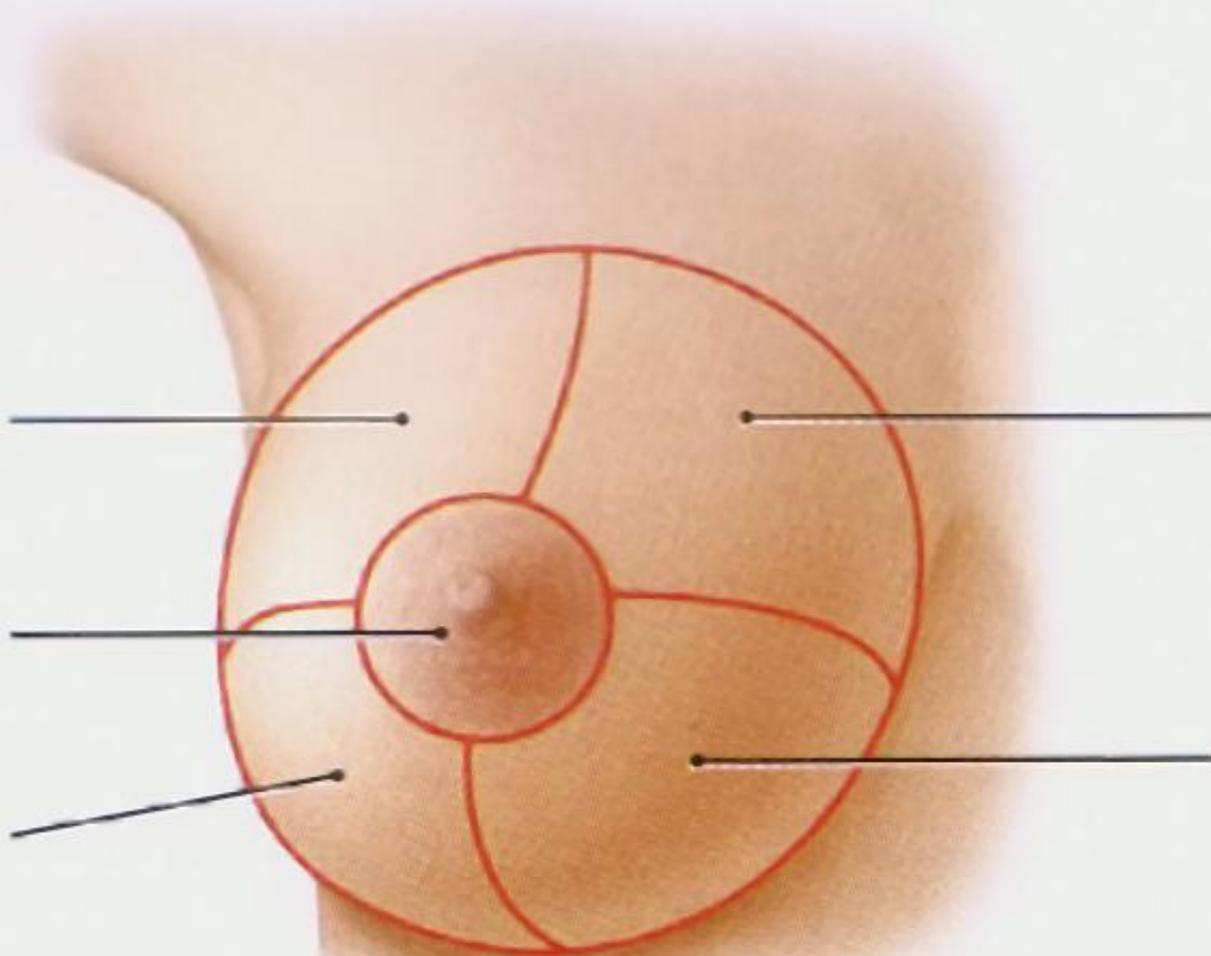
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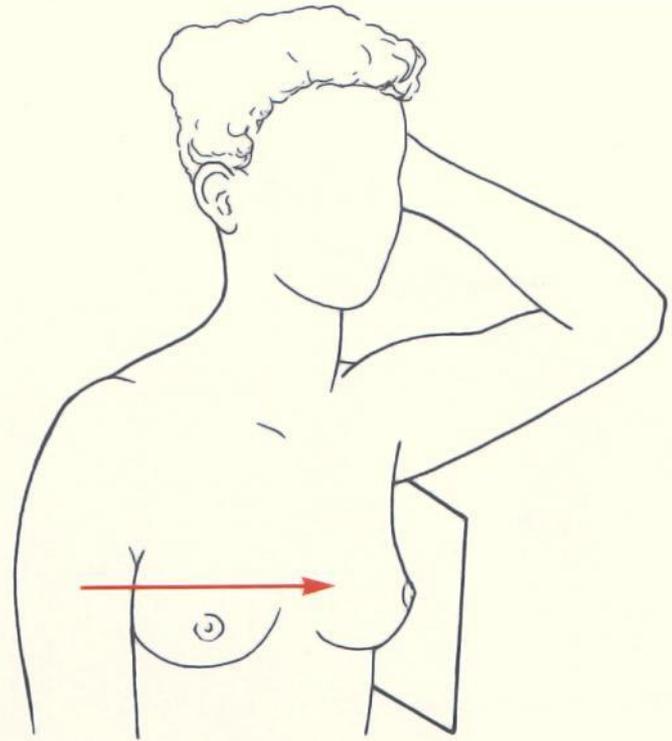
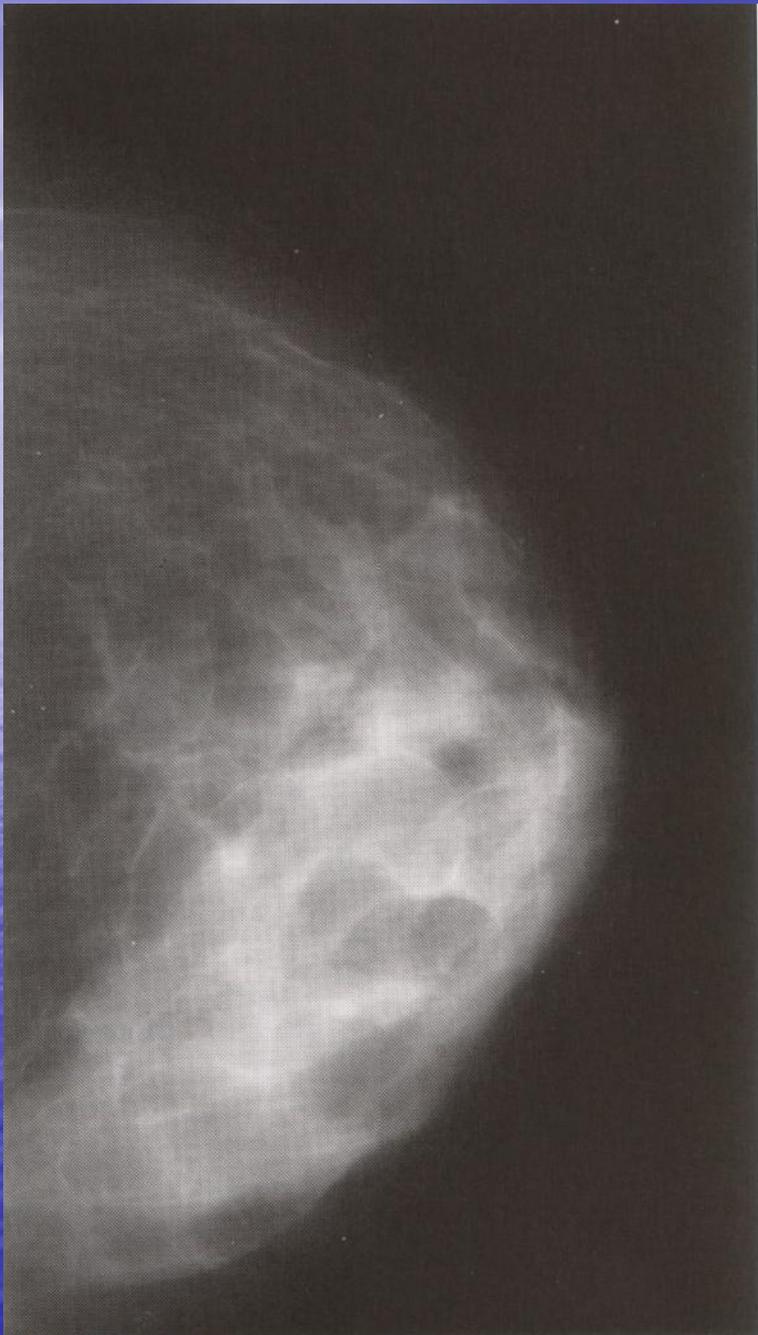
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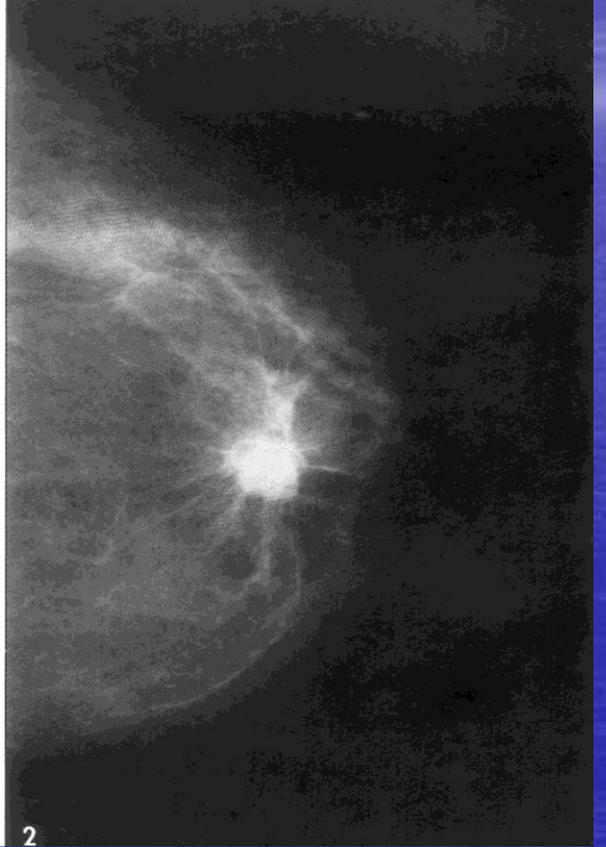
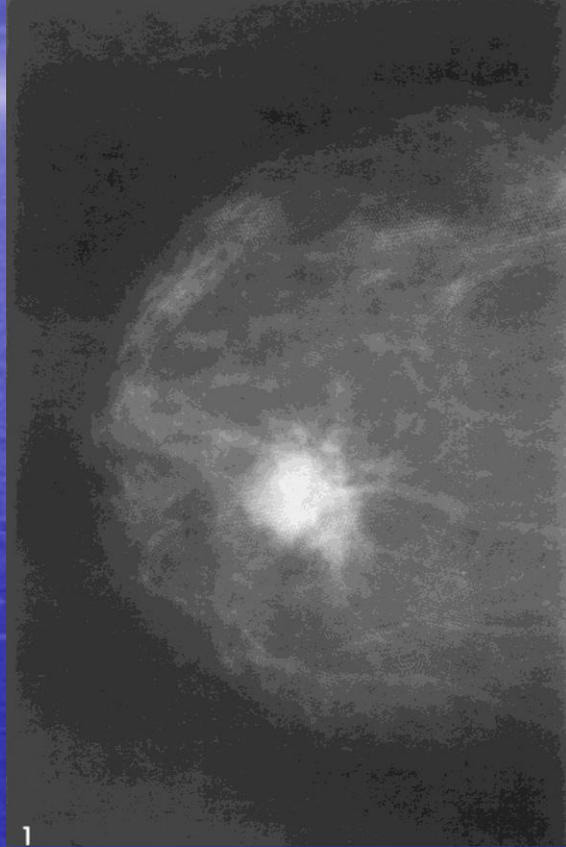
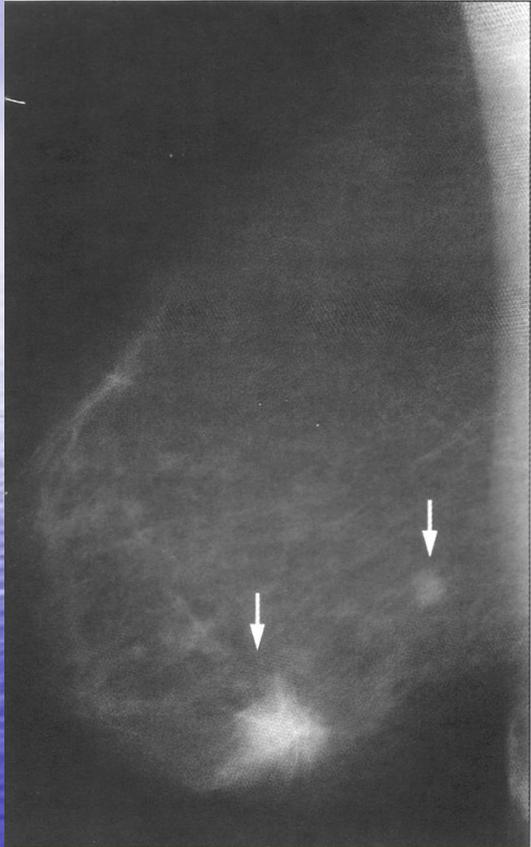
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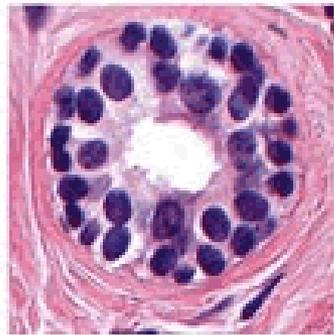
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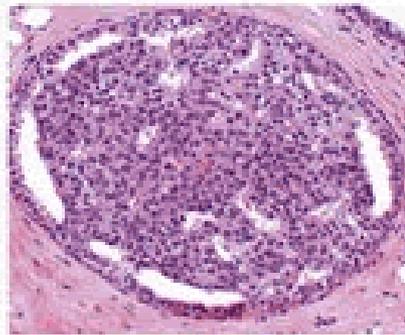




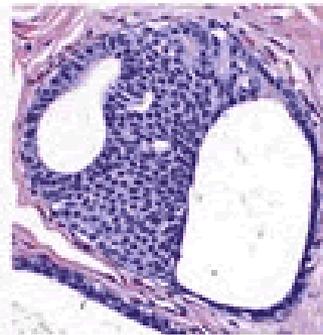




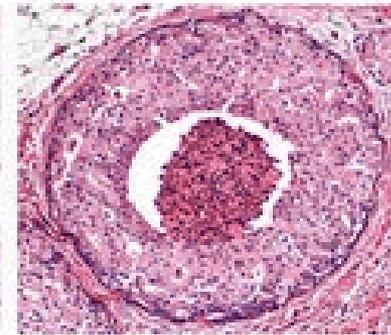
Normal  
Ductal Lumen



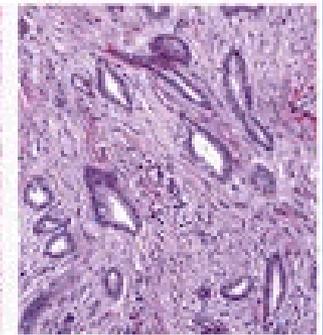
Benign Proliferative  
Changes



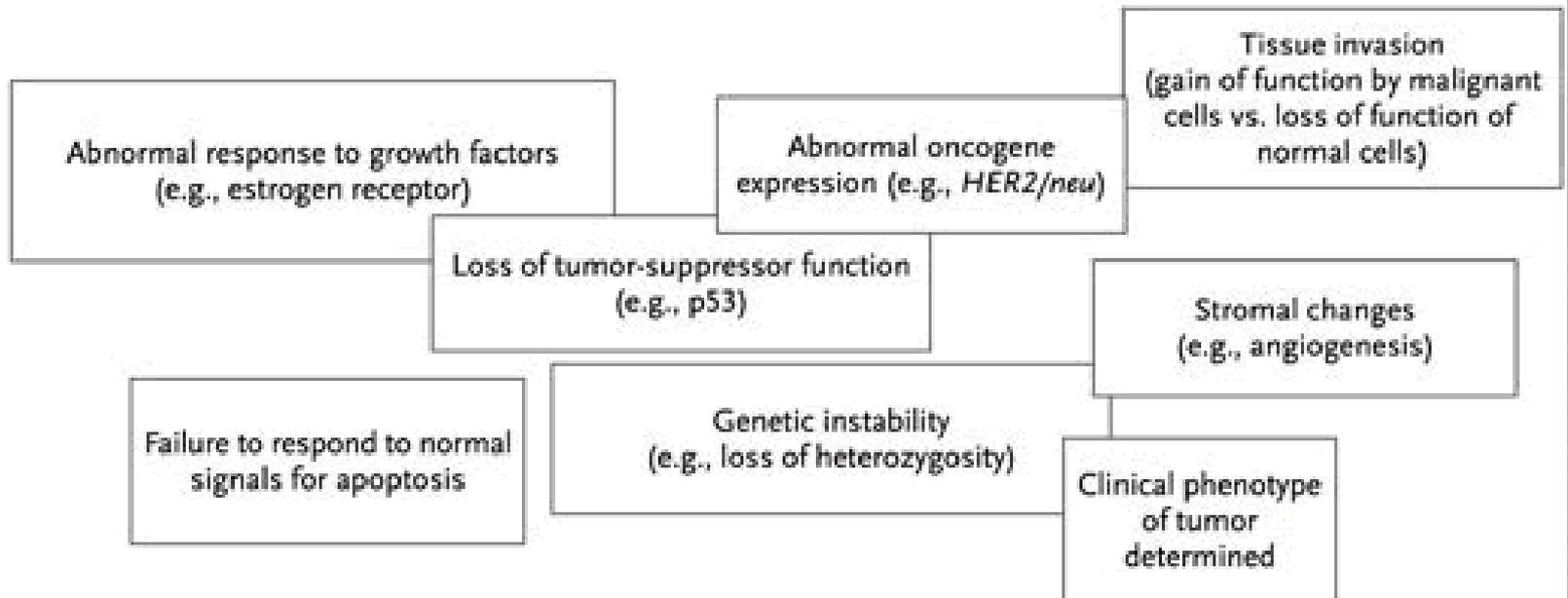
Atypical Hyperplasia

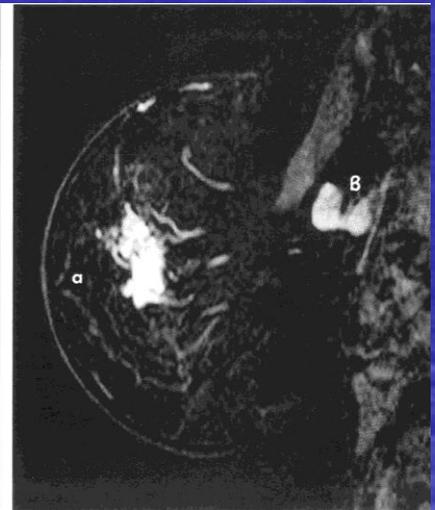
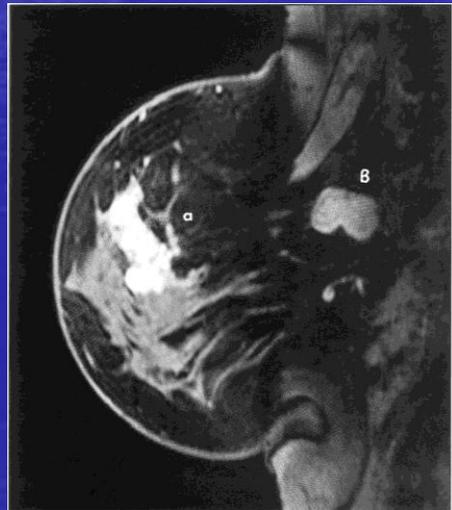
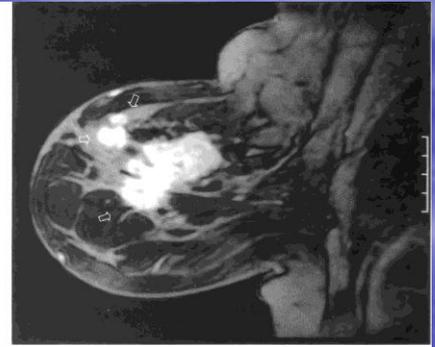
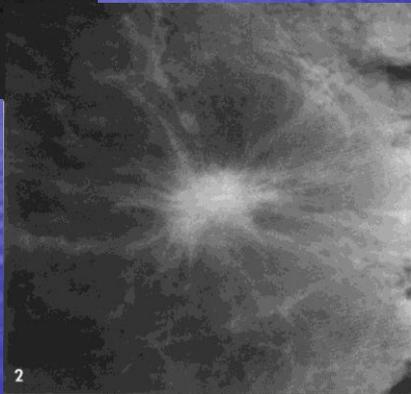
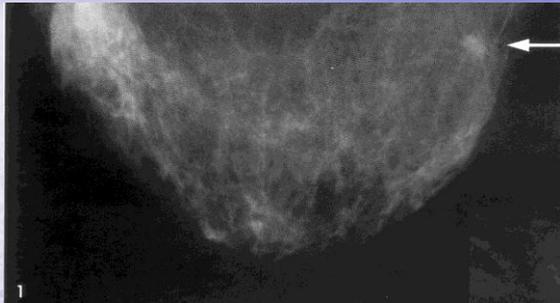


Ductal Carcinoma  
in Situ



Invasive Carcinoma











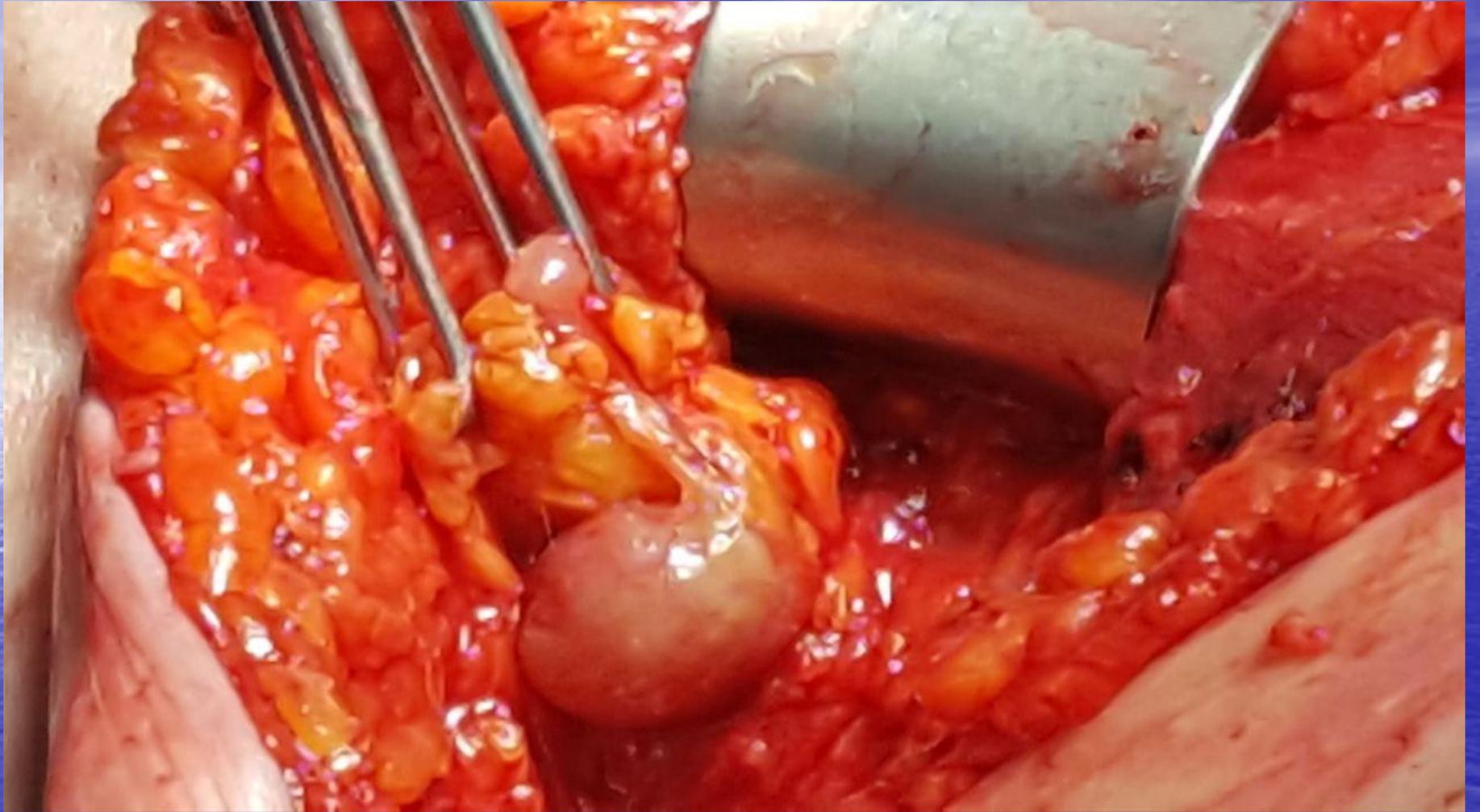
**Ca breast**





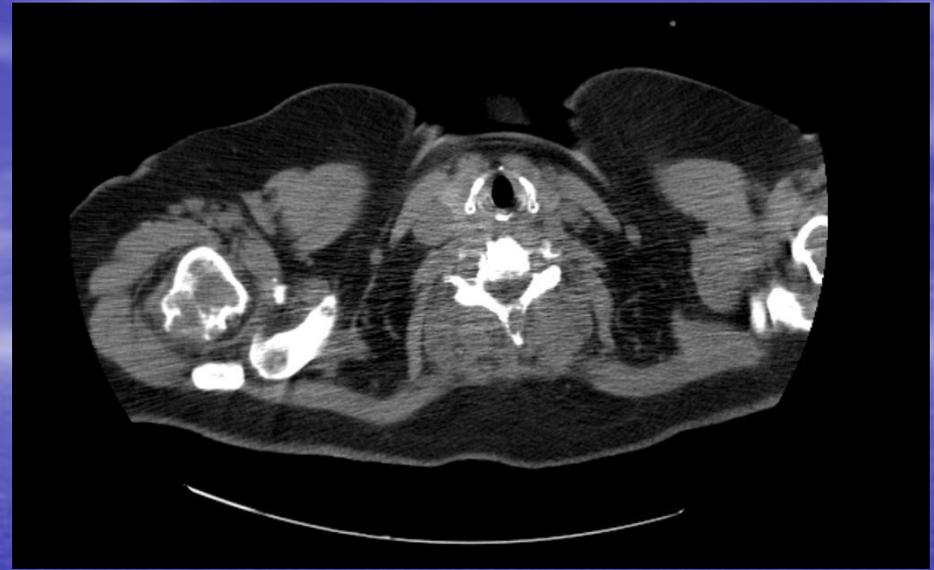
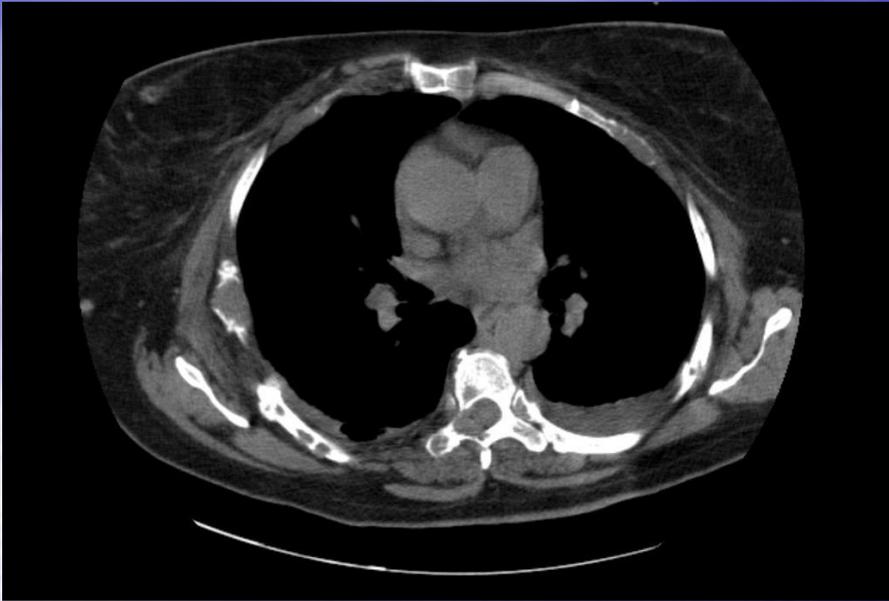




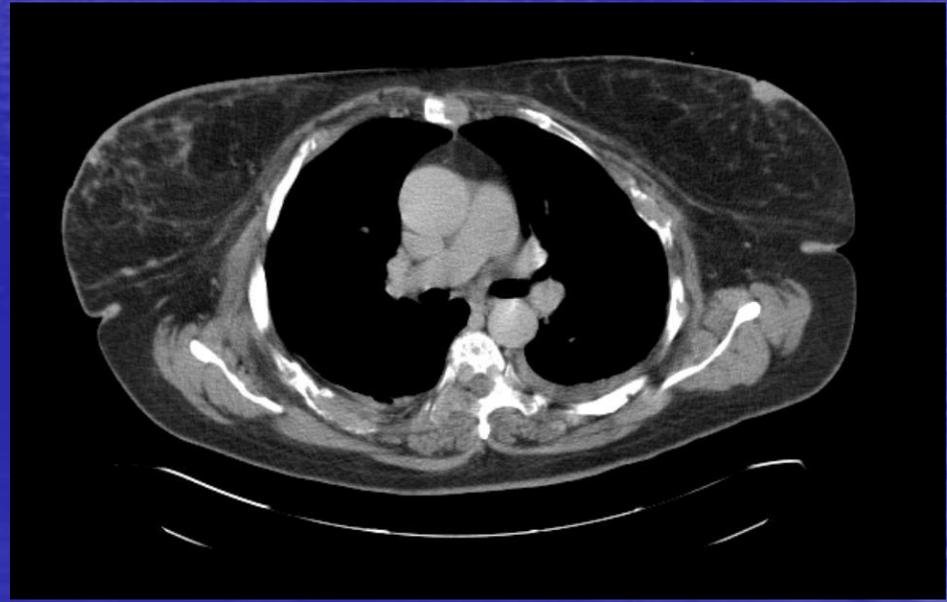


# Reccurent breast cancer





## Bone metastasis



● Thank u

