ANATOMY OF THE MAMMARY GLAND AND IT’S CLINICAL CONSIDERATION

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STUDY OUTLINE
During the course of this discussion, participants will understand the following:

- The overview of mammary gland (breast)
- The development of the mammary gland
- The Gross Anatomy of the mammary gland: location, blood supply, venous drainage, lymphatic drainage, innervation.
- Clinical consideration: breast quadrant, cancer of the mammary gland, developmental anomaly etc.
INTRODUCTION (L. mammae)

- A soft rounded elevation present over the pectoral region.
- A modified sweat gland; exocrine in nature and present in both sexes;
- Is rudimentary in males but well developed in females after puberty and functions as an accessory reproductive organ in females.
- Lies in the subcutaneous tissue (superficial fascia) overlying the pectoralis major and minor muscles overlapping serratus anterior and small rectus sheath and external oblique muscles.
DEVELOPMENT OF THE BREAST

- By an invagination of the **ectoderm** of the ventral wall of the body.

- At 7\(^{th}\) week of intrauterine life, **two longitudinal ectodermal ridge/thickenings** develop one on each side called **MILK OR MAMMARY RIDGE**.

- This extends from the **axilla** to the **groin**; the milk ridge persist in pectoral region in **humans** and give rise to **16-24 sprouts**.
DEVELOPMENT OF THE BREAST CONT.
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• In growth from the ridge give rise to the glandular element: the ducts and alveolar of the breast;

• while connective tissue supporting the glandular tissue is derived from the supporting mesenchyme.

• Lactiferous ducts first opens into epithelial pit, shortly after birth, the pit is transformed into nipple by proliferation of underlying mesenchyme.
GROSS ANATOMY OF THE MAMMARY GLAND (MG) : EXTENT

- **Vertically:** from 2\textsuperscript{nd} to the 6\textsuperscript{th} rib
- **Horizontally:** medially from the lateral sternal line to the mid-axillary line (laterally). The part of the gland extends into the axilla to form the axillary process or tail of Spence
EXTENT OF MG CONT

• **upper part** of the figure shows the **fat lobules** and suspensory ligaments.
• **middle part** shows the appearance of **glandular tissue in the non-lactating** (resting) breast.
• **lower part** shows the appearance of **glandular tissue in the lactating breast**.
The axillary tail (AT) from the suprolateral part of the gland pieces the deep fascia of the anterior fold of axilla.

AT lies at the level of 3rd rib and comes in relation to pectoral groups of lymph nodes on the lateral chest wall.

It’s opening in the deep fascia is known as “foramen of langer”.

Some women discover the axillary process of Spence during a menstrual cycle because it can enlarge and can mistake it to be a lump (tumor) or enlarged lymph nodes.
SHAPE AND SITUATION

- **Shape:** Hemispherical in post-pubertal nulliparous female but pendulous in old life.

- **Size:** is determined by genetic, ethnic and dietary factors.

- 2/3rd lies on fascia covering pectoralis major, 1/3rd on serratus anterior.

- is separated from the underlying structures by areola tissue (AR).

- **AR** lies in a space between the deep aspect of the breast and the fascia covering the pectoralis major
SHAPE AND SITUATION CONT.

- MG is separated from the underlying structures by areola tissue.

- AR lies in a space between the deep aspect of the breast and the fascia covering the pectoralis major.

- This space (retromammary space) allows the breast some degree of movement on pectoral fascia. **Fixity of the breast to pectoral fascia and the muscles** may occur by invasion in advanced carcinoma of breast

- This is of importance in clinical staging of breast cancer
COMPONENTS OF BREAST

- **Skin**: deep to it is the superficial fascia
- **Nipple**: a cylindrical or conical projection directed suprolaterally; lies at the level of 4th intercostals space in nulliparous females; Perforated by 15-20 lactiferous ducts; Pink in colour but dark in nursing mothers and consists of non-striated muscle.
COMPONENTS OF BREAST CONT.

- **AREOLA**: A circular pigmented area of the skin around the nipple
- Rose-pink in virgins, and **dark brown** or **black** during pregnancy and lactation.
  - **change in colour** is of **medicolegal importance** in caucassians.
- Skin covering the areola contains sebaceous glands called **AREOLA GLANDS (AR)**.
- **AR** enlarge during pregnancy and lactation and form **raised tubercules called “montgomery’s tubercles.”**
Montgomery’s tuberules perform the following functions:

• **Prevents** the skin from cracking during lactation.

• **Adds adhesion** to the lips of the new born baby during sucking.

• **Secreted lubricating material**

• **Create great sensitivity** so that sympathetic stimulation leads to more and more secretion
COMPONENTS OF BREAST CONT

Glandular tissue

- Consist of 15-20 lobes. Each is made of several lobules and each lobules consists of clusters of alveoli (acini) which open into the smallest branches of lactiferous duct.
- These smallest branches of lactiferous duct unit to form larger branches of the duct.

- Each lactiferous ducts drains a lobe of the gland and opens at the nipple.

- Before opening at the nipple, each lactiferous duct is dilated to form a sinus called LACTIFEROUS SINUS in which a small droplet of milk accumulates or remains in the nursing mother.

- The lobules (15-20) of the glandular tissue constitute the parenchyma of the mammary gland.

- *The glandular tissues is the functional portion of the breast that secretes milk.*

- Partial atrophy of gland tissue occurs at the end of lactation; breast also atrophies in old age.
COMPONENTS OF BREAST  CONT

Fibrous tissue stroma:

- Are numerous septa that separate the lobule and also supports lobule.
- It connects or links the breast to the skin and to the underlying pectoral fascia.
- These fibrous tissue are called skin ligaments (L. retinacula cutis), the suspensory ligaments of copper.
- In cancer of the breast, the suspensory ligaments contract, causing pitting on of the over skin.
- In spite of these fibrous bands, the normal breast show reasonable mobility over the deep fascia and its skin can be pinched up.
COMPONENTS OF BREAST CONT

**Adipose tissue**

- Fills the interalveolar and interductular intervals and account for the smooth contour of the breast.
Arterial (blood) supply

- **Internal thoracic (internal mammary artery)**. Through perforating branches of the 2\textsuperscript{nd}–6\textsuperscript{th} anterior intercostals arteries.
- **Branches of axillary artery**: namely lateral thoracic (external mammary artery) and thoraco-acromial arteries.
- Lateral branches of posterior intercostals arteries.
Venous drainage.

- Corresponding vein drain the breast
Lymphatics

- The skin except nipple and areola drain into axillary, internal mammary, supraclavicular and pectoral groups of lymph nodes.

- Lymphatic from the skin of one side may communicated to those of opposite side, hence unilateral malignancy (carcinoma) may become bilateral.

- Lymphatics from the parenchyma, nipple and areole drain.
  - 75% into axillary lymph nodes
  - 20% into internal mammary groups of lymph nodes i.e. to the medial quadrant and lateral quadrant.
Lymphatics cont.

- 5% into posterior intercostals lymph nodes

- Subareolar plexus of SAPPY located beneath the areola drain the nipple and areola and communicates with the parenchyma lymphatics.

- Lymphatics from the deep surface of the breast pass through pectoralis major and clavipectoral fascia to reach the apical group
CLINICAL CORRELATIONS OF MG

- **Understanding the lymphatic drainage of the breasts** - is of practical importance in predicting the metastasis (dispersal) of cancer cells from a carcinoma of the breast (breast cancer).

- **Carcinomas of the breast**: are malignant tumors, usually adenocarcinomas arising from the epithelial cells of the lactiferous ducts in the mammary gland lobules.

- **Metastatic cancer cells**: enter a lymphatic vessel and usually pass through two or three groups of lymph nodes before entering the venous system.
Interference with the lymphatic drainage by cancer may cause *lymphedema* (edema, excess fluid in the subcutaneous tissue), which in turn may result in deviation of the nipple and a thickened, leather-like appearance of the skin. Prominent or “puffy” skin between dimpled pores give it an orange-peel appearance (*peau d'orange* sign).
• Larger dimples (fingertip size or bigger) result from cancerous invasion of the glandular tissue and fibrosis (fibrous degeneration), which causes shortening or places traction on the suspensory ligaments. **Subareolar** breast cancer may cause retraction of the nipple by a similar mechanism involving the lactiferous ducts.
CLINICAL CORRELATIONS CONT
Breast cancer typically spreads by means of lymphatic vessels (lymphogenic metastasis), which carry cancer cells from the breast to the lymph nodes, chiefly those in the axilla.

The cells lodge in the nodes, producing nests of tumor cells (metastases).

Abundant communications among lymphatic pathways and among axillary, cervical, and parasternal nodes may also cause metastases from the breast to develop in the supraclavicular lymph nodes, the opposite breast, or the abdomen.

Because most of lymphatic drainage of the breast is to the axillary lymph nodes they are the most common site of metastasis from a breast cancer.
CLINICAL CORRELATIONS CONT

- **Enlargement of these palpable nodes suggests the possibility of breast cancer and may be key to early detection.**

- However, the absence of enlarged axillary lymph nodes is no guarantee that metastasis from a breast cancer has not occurred because the malignant cells may have passed to other nodes, such as the **infraclavicular and supraclavicular lymph nodes.**
The posterior intercostal veins drain into the azygos/hemiazygos system of veins alongside the bodies of the vertebrae and communicate with the internal vertebral venous plexus surrounding the spinal cord.

Cancer cells can also spread from the breast by these venous routes to the vertebrae and from there to the cranium and brain.

Cancer also spreads by contiguity (invasion of adjacent tissue)
When breast cancer cells invade the retromammary space attach to or invade the pectoral fascia overlying the pectoralis major, or metastasize to the interpectoral nodes, the breast elevates when the muscle contracts.

This movement is a clinical sign of advanced cancer of the breast.

To observe this upward movement, the physician has the patient place her
CLINICAL CORRELATIONS OF MG

• Breast quadrants: for anatomical location and description of tumors and cysts, the surface of the breast is divided into four quadrants as seen in right breast on the screen.
Changes in breast

- **Branching of lactiferous ducts** occurs during menstrual periods and pregnancy.

- First milk that produce during the 1st trimester and after delivery are called *colostrum*, a creamy white or yellowish pre milk fluid reach in protein, immune agents and growth factors.

- **Multiperous breast** is large and pendulous.

- At old age it in small due to decrease in fat and atrophy of glandular tissue.

- **Carcinoma of the breast:** possible and can follow the lymphatic and various drainage and spread to adjacent structure.
Carcinoma of the breast:
Changes in breast

- Are malignant tumors usually arising from the epithelial cells of the lactiferous ducts.

- Mammography: is a radiological examination of the breast aimed at detecting breast mass.
• Temporary enlargement of breast in males (70%), is a normal occurrence at puberty (10-12 years).

• Only about 1.5% breast cancers occur in males.
Mastectomy (breast incision)

- **Simple mastectomy**: breast is removed down to the retommary space.
- **Radical mastectomy**: involves removal of the breast, pectoral muscles, fat, fascia and lymph nodes. In current practice the tumor and surrounding tissues are removed i.e. a lumpectomy or quadrantectomy.
• **Polymastia:** Congenital anomaly in which there are more breast on one/or both side due to persistence of milk ridge

• **Polythelia:** Presence of supernumerary nipples

• **Athelia:** Absent of nipple

• **Armastia:** gland may be absent on both sides.
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THANKS FOR LISTENING