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ROLE OF RADIONUCLIDE SCINTIGRAPHY IN
EVALUATING PATIENTS WITH MAMMARY
CARCINOMA

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INTRODUCTION AND AIM OF THE WORK

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Breast cancer has been one of the most serious diseases affecting women in this century..Its early detection and presurgical diagnosis is still in challenge.

Radioisotope scanning of breast has permitted additional noninvasive, sensitive though non-specific modality to detect primary malignant breast lesions in conjunction with physical examination and mammo-graphy.

The follow-up and management of carcinoma of the breast currently utilizing radioisotope imaging to detect secondaries in bone, liver, brain and lymph nodes, since they are very sensitive indicators of early metastases.

Accordingly, the aim of this work is to evaluate the advantages and limitations of various scintigraphic techniques in the diagnosis and management of breast carcinoma.

*ANATOMICAL AND PHYSIOLOGICAL CONSIDERATIONS
OF MAMMARY GLAND*

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A. Anatomic Considerations of Mammary Gland:

The breast consists embryologically and morphologically of a group of exceedingly highly specialized cutaneous glands, and therefore is a constituent element of the superficial layers of the costal region (McVay, 1984).

The mammary gland with its fibrous and fatty tissue occupies the interval between the second and the sixth rib in the midclavicular line and extends in breadth from the parasternal to the midaxillary line. The glandular tissue rests in great part upon the pectoral fascia and to a less degree upon the serratus anterior muscle. Superolateral part of mammary gland frequently projects toward axilla as an axillary tail of Spence in relation to pectoralis major muscle and pectoral axillary lymph nodes (Pansky, 1984).

The shape and degree of development of the breast vary with the person, the period of function, sex, and age. In male, breasts are flattened undeveloped. In females, virginal breast is almost hemispherical, in multiparae the breasts become large

and lax, at menopause breasts shrunken and are reduced in size (McVay, 1984).

The skin over the centre of the breast is modified to form the areola and nipple. The colour of both in young subjects usually is rose pink. During pregnancy the colour becomes browner, as the pigmentation never disappears and increases slightly with each succeeding gestation.

The circular areola, a cutaneous zone about 5cm in diameter, has many rounded elevations which are areolar gland of Montgomery. These are isolated sebaceous glands secrete an oily substance to lubricate areola and nipple during lactation.

The nipple or papilla mammae, a conical or wartlike elevation is located in the middle of the areola on the approximate summit of each breast. In young breast the nipple usually lies opposite the fourth intercostal space, but after lactation the breast becomes pendant and the nipple no longer is a guide.

(McVay, 1984).

Nipple externally is covered by keratinized stratified squamous epithelium which is continuous

with that of the adjacent skin. This epithelium rests on a layer of connective tissue and smooth muscle fibres. These fibres contract on tactile stimulation inducing firmness and prominence (Junqueira et al., 1983).

* Structure of Mammary Gland: (Fig. 1,2)

- In Females:

Beneath the skin the glandular elements of the breast lie within an areola-fatty subcutaneous tissue. Each mammary gland comprises 15-20 irregular lobes of the compound tubulo-alveolar type whose function is to secrete milk. Each lobe is separated from others by dense connective tissue and much adipose tissue, and has its own excretory duct. The subcutaneous connective tissue further subdivides the lobe into lobules and these into alveoli (McVay, 1984).

The excretory lactiferous ducts about 2-4.5cm long and 15-20 in number, converge toward the nipple when they open independently. Each duct as approaches the base of the nipple represents a fusiform or ampullary enlargement beneath the areola called the lactiferous sinus which acts as a temporary reservoir for the secretion of the gland. Then the duct narrows

beyond the enlargement and passes into the nipple forming opening about 0.5mm in diameter. The lactiferous ducts are lined by stratified squamous epithelium near their external openings. Deeper in the gland the epithelium becomes progressively thinner, with fewer cell layers, until there are only 2 layers of cuboidal cells closer to alveolar ducts and alveolar epithelium becomes simple cuboidal, resting on basal lamina and discontinuous layer of myoepithelial cell processes. At the nipple, smooth muscle fibres are disposed in circles around lactiferous ducts and parallel to them (Junqueira et al., 1983).

Supports of Mammary Gland:

The superficial fascia not only forms a general covering for the secreting apparatus but also sends into it partitions which aid materially in supporting the glandular as well as the fatty elements. Each duct is surrounded by an area of periductal connective tissue with attachment to the skin, these fibrous extensions were described by Sir Astley Cooper and became known as "Cooper's ligaments". When carcinoma invades any glandular area, since the periductal strands of connective tissue fails to lengthen with enlargement of the gland, the skin over the area becomes retracted (McVay, 1984).

- In Males:

In males, mammary gland is undeveloped throughout life and is only formed of small ducts with little surrounding adipose tissue and fibrous tissue. The nipple is relatively small. It has no suspensory Cooper's ligaments (McVay, 1984).

Blood Supply:

A. Arteries:- (Fig. 3)

1. From axillary artery: supreme thoracic, pectoral branch of the thoracoacromial and lateral thoracic arteries which give to external mammary artery.
2. From intercostal arteries: cutaneous branches in 3rd, 4th, 5th spaces.
3. From internal thoracic artery: perforating branches in 2nd to 4th interspaces.

B. Veins:-

From anastomotic circle around the nipple. Branches pass peripherally from this to axillary, internal thoracic, lateral thoracic and upper intercostal veins.

(Pansky, 1984).

Lymphatic Drainage: (Fig. 4)

A knowledge of the lymph drainage of the breast is extremely important because breast cancer commonly spreads along such channels. In subareolar area there is particularly numerous meshwork of lymphatics that widens peripherally to form a dense circumareolar plexus. From this enormous external and internal trunks are the main routes of lymphatic drainage from the breast to the axilla.

1. The external trunk passes from subareolar plexus to the outer border of the pectoralis major and receives collaterals from the upper half of the breast.
2. The internal trunk from the medial edge of the subareolar plexus, runs downward and laterally to reach the outer border of pectoralis major. It receives tributaries from the lower half of the breast (Last, 1985).

Both trunks terminate in the axillary lymph nodes. There are two accessory routes of lymphatic drainage from the breast to the nodes at the apex of axilla.

1. Transpectoral route begins as retromammary plexus in the loose areolar tissue between the pectoral

fascia and the breast. It empties into subclavicular group of axillary lymph nodes.

2. The retropectoral route is a lymphatic pathway found in about one-third of subjects and drains the superior and internal portion of the breast. It empties also into subclavicular axillary lymph nodes (McVay, 1984).

From these plexuses lymph from the most of the central and lateral parts of the breast drains into pectoral group of axillary nodes. The upper part of breast drains into subclavicular group. The axillary tail when present, drains into the scapular group. The medial part of the breast drains into internal mammary (parasternal) lymph nodes. Also some lymphatics pass from the medial part crossing the median plane to communicate with submammary plexus of the opposite breast. From inferomedial part lymphatics communicate with lymphatics of the linea alba and anterior wall of rectus sheath to the peritoneal lymphatic plexus, and finally along falciform ligament of the liver. Also few lymphatics pass from inferomedial portion of the breast to communicate with the subdiaphragmatic plexus to the abdominal lymph nodes (Mahran et al., 1977). This explains how breast carcinoma gives

malignant nodules at the umbilicus and metastases in the liver (Abou-Zeid, 1984).

- Nerve Supply:-

From anterior and lateral cutaneous branches of 2nd to 6th intercostal nerves (McVay, 1984).

B) Physiologic Considerations of Mammary Gland:-

At birth, the breast is rudimentary and consists essentially of the tiny nipple from which radiates a few ducts. In new-born secretion of a fluid resembling colostrum may occur, probably stimulated by maternal hormones. Little further development occurs until the time of puberty, so the mammary glands are composed of lactiferous sinuses and ramified lactiferous ducts that have small cellular aggregates in their extremities.

During puberty, with increasing amount of ovarian hormones, the mammary gland increases in size and develops a prominent nipple. This enlargement is due to increase in the volume of lactiferous ducts and accumulation of adipose tissue in both interlobar and interlobular connective tissue, with formation of small alveoli in the extremities of the ducts. With the recurrence of menstrual cycle the gland