# INTRODUCTION

The most commonly diagnosed cancers worldwide were those of the lung (1.8 million, 13.0%), breast (1.7 million, 11.9%), and colorectal (1.4 million, 9.7%). The most common causes of death were cancers of the lung (1.6 million, 19.4%), liver (0.8 million, 9.1%), and stomach (0.7 million, 8.8%) (***Ferlay et. al., 2013).***

Since the 2008 estimates, breast cancer incidence has increased by more than 20%, while mortality has increased by 14%. Breast cancer is also the most common cause of cancer death among women and the most frequently diagnosed cancer among women in 140 of 184 countries worldwide. It now represents one in four of all cancers in women (***Ferlay et. al., 2013).***

To reduce mortality, screening must detect life-threatening disease at an earlier, more curable stage. Effective cancer-screening programs therefore both increase the incidence of cancer detected at an early stage and decrease the incidence of cancer presenting at a late stage ***(Archie et. al., 2012).***

In any patient who presents with a breast lump or other symptoms suspicious of carcinoma, the diagnosis should be made by a combination of clinical assessment, radiological

imaging and a tissue sample taken for either cytological or histological analysis, the so-called triple assessment. The positive predictive value of this combination should exceed 99.9 per cent ***(Richard Sainsbury 2013).***

The increased use of mammography and introduction of breast screening programmes have resulted in a rise in detection of clinically-occult breast cancer, with one-third of all breast carcinomata diagnosed being non-palpable. These types of cancer have a unique natural history and biology compared to symptomatic breast cancer and this needs to be taken into account when considering surgery and adjuvant treatment (***Muneer et. al., 2014).***

Early stage breast cancer can be cured, whereas metastatic disease is generally incurable. It is therefore intuitive to assume that detection of early stage breast cancer will lead to improved outcomes. Advances in imaging allow clinicians to detect primary breast cancer, loco-regional involvement, and recurrent disease before it becomes symptomatic. Some of these interventions, such as screening mammography and axillary surgery, have become standards of care; however, their optimal use remains unclear (***Eitan et. al., 2012).***

According to the international recommendations, treatment should be carried out in 'breast units' defined as

specialized institutions/departments caring for a high volume of breast cancer patients and provided by multidisciplinary teams, including at least a surgeon, radiation oncologist, medical oncologist, radiologist and pathologist specialised in breast cancer. Depending on the local situation and availability, other members of the breast team may include plastic surgeons, psychologists, physiotherapists, geneticists and specialized breast nurses. Following a diagnosis of breast cancer, a woman finds herself in a new and unfamiliar landscape. This creates different levels of stress that vary from patient to patient, and need to be addressed individually and tailored to every woman's needs (***Senkus et. al., 2013).***

Surgical resection was the first effective treatment for breast cancer and remains the most important treatment modality for curative intent. Refinements in operative techniques along with the use of adjuvant radiotherapy and advanced chemotherapeutic agents have facilitated increasingly focused breast cancer operations. Surgical management of breast cancer has shifted from extensive and highly morbid procedures, to the modern concept obtaining the best possible cosmetic result in tandem with the appropriate oncological resection. An ever-growing comprehension of breast cancer biology has led to substantial advances in molecular diagnosis and targeted therapies (***Jack et. al., 2012).***

# AIM OF THE WORK

**Our work aims to review the different modalities in management of impalpable breast cancer detected by mammography.**

*Chapter One*

# ANATOMY

## Gross anatomy of the breast

- **Extent and location:**

The adult female breast lies between the second and sixth ribs and between the sternal edge and the midaxillary line. Breast tissue frequently extends into the axilla as the axillary tail of Spence. Posteriorly, the upper portion of the breast rests on the fascia of the pectoralis major muscle; inferolaterally, it is bounded by the fascia of the serratus anterior ***(Morrow and Khan, 2006).***

- **Size and form:**

The size of the adult female breast varies widely among individuals, and considerable discrepancy in breast size is seen between the breasts of an individual woman. The breast is composed of skin, subcutaneous tissue, and breast tissue. The breast tissue includes both epithelial parenchymal elements and stroma. The epithelial component comprises about 10% to 15% of the breast mass, with the remainder being stroma. Each breast consists of 15 to 20 lobes of glandular tissue that are supported by a framework of fibrous connective tissue. The space between lobes is filled by adipose tissue. Variations in breast size are

accounted for by differences in the amount of adipose tissue in the breast rather than the epithelial elements. Much of the epithelial tissue of the breast is found in the upper outer quadrant, which is why this is the most frequent site of both benign and malignant breast disease. The lobes of the breast are subdivided into lobules, which are made up of branched tubuloalveolar glands. Each lobe ends in a lactiferous duct, 2 to 4 mm in diameter. Beneath the areola, the lactiferous ducts dilate into lactiferous sinuses and then open through a constricted orifice onto the nipple ***(Morrow and Khan, 2006).***

- **Nipple and areola:**

The nipple is located over the fourth intercostal space in the non pendulous breast and is surrounded by a circular, pigmented areola. Beneath the nipple and areola are bundles of radially arranged smooth-muscle fibers that are responsible for the erection of the nipple in response to a variety of stimuli. The nipple and areola contain sebaceous glands and apocrine sweat glands, but no hair follicles. In addition, the tubercles of Morgagni are nodular elevations formed by the openings of the Montgomery glands at the periphery of the areola. These glands are capable of secreting milk and are believed to represent an intermediate stage between sweat and mammary glands. The nipple and areolar region, as well as the

remainder of the breast, is richly supplied with sensory innervation ***(Morrow and Khan, 2006).***

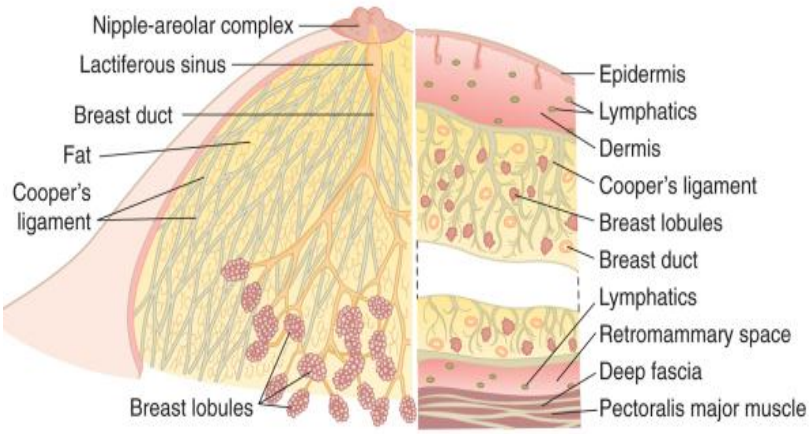


**Fig. (1):** Sagittal section of the breast ***(Bannister et al.., 2005).***

## Fascia of the breast:

The fascial framework of the breast is important in relation to clinical manifestations of disease and surgical technique. Because the breast develops as a skin appendage, it does so within the superficial fascia, such that the superficial part of the superficial fascia forms an anterior boundary and the deep layer of the superficial fascia forms a posterior boundary. In between, condensation of this inter lobar fascia gives rise to ligaments of Cooper, called suspensory ligaments because they provide a supporting framework to the breast lobes. They are best developed in the upper part of the breast and are connected to both pectoral fascia and skin by fibrous extensions. In spite of these fibrous extensions, the superficial layer of superficial

fascia gives a plane of dissection between the skin and breast. The small subcutaneous fat lobules are readily differentiated from the much larger mammary fat lobules. Likewise, the retromammary space provides a ready plane of dissection between the deep layer of superficial fascia and the deep fascia of pectoralis major and serratus anterior. This structural fascial support is so intimately connected to interlobular and intralobular fascia with their enclosed ductal units, no ready plane of dissection exists within the breast substance and all surgery must be carried out by sharp dissection ***(Wilkson et al., 2009).***

## Arterial blood supply:

There are three main sources of arterial blood supply:

1. Internal mammary artery.
2. Lateral thoracic artery.
3. Intercostal arteries.

Many parts of mammary gland are supplied by two and sometimes three of main sources. The medial portion of gland derives its major supply from the penetrating or intercostals branches of the internal mammary artery. The entire gland derives its major supply from intercostal arteries whereas the branches of lateral thoracic artery supply the lateral portion of the gland (***Bannister et al.., 2005).***

## 1-Internal mammary artery:

Branch of first portion of the subclavian artery. It gives off several perforating arteries to the breast which pass through the intercostal spaces.

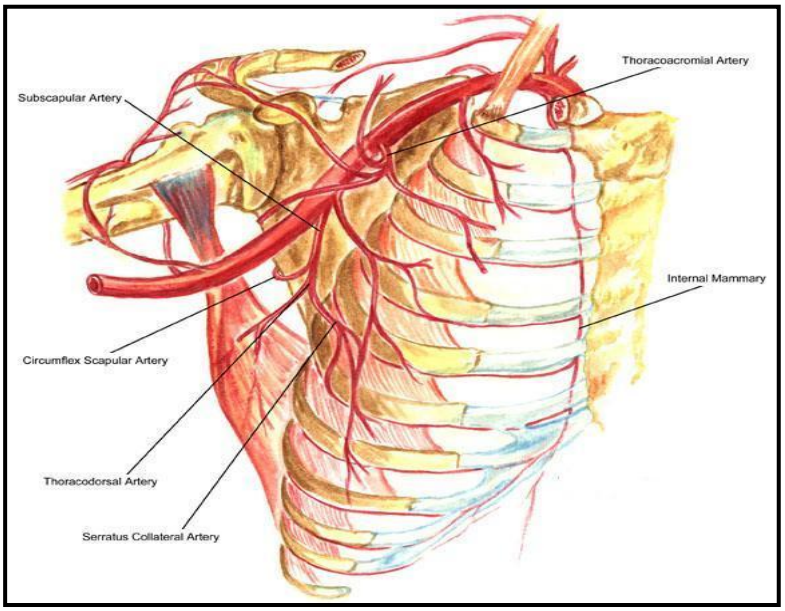


**Fig. (2):** Arterial blood supply of the breast ***(Bannister et al.., 2005).***

***The perforating arteries may be one of the following:***

- **Anterior medial mammary arteries:**

The anterior perforating branches of the internal mammary artery pass forward through the medial end of the intercostal spaces accompanying the anterior cutaneous branches of the intercostal nerves. They pass through spaces from 1 to 4 and divide into cutaneous mammary branches. There are usually

no more than two anterior medial mammary arteries to each side ***(Richard et al., 2005).***

- **Posterior medial mammary arteries:**

They are branches of internal mammary artery. They traverse the intercostal space perforating the pectoralis major muscle and have a tortuous course on the anterior surface of the pectoralis major running in the retromammary space. They traverse the space perforating the breast on the posterior aspect and anastomose with other branches within the breast ***(Richard et al., 2005).***

**2- <u>Lateral thoracic artery (external mammary artery):</u>**

It has also been called the principle external artery of the breast. It may arise from the second part of axillary artery, from the thoracoacromial or subscapular arteries. This artery is absent in 30% of the time but that it may be the only source of blood supply to the nipple 13% of the time.

When it is present, the lateral mammary artery runs over the axillary tail of the breast. It supplies the breast and ends by joining the other mammary arteries in plexus which arborize throughout the parenchyma of the gland and which tends to radiate and concentrate toward the nipple ***(Richard et al., 2005).***

**3- <u>The intercostal arteries:</u>**

They are the least important of the arteries supplying blood to the breast. They take origin from aorta posteriorly and course anteriorly in the intercostal spaces terminating in an anastomotic plexus in the lower quadrant. The fourth or fifth intercostal arteries are usually dominant ***(Richard et al., 2005).***

The arteries of the breast break up into a plexus which communicate freely in the subcutaneous fat of the breast. From the superficial and deep parts of the plexus, there are branches. These branches run toward the base of the nipple and the areola resulting in a rich periareolar blood supply***.(Morrow and Khan, 2006).***

***There are three kinds of periareolar plexus:***

**1-** Circular periareolar plexus with maximum blood supply maintaining the viability of nipple present in 70% to 74% of case.

**2-** Loop plexus, less direct blood supply to the nipple with branches of the lateral thoracic looping above and below the nipple, present in 20% of cases.

**3-** Radial plexus both internal mammary and lateral thoracic branches going directly to the nipple present in 6% of cases ***(Richard et al., 2005).***

## The venous drainage of the breast:

There are two systems the superficial and the deep system. Few veins end directly into the external jugular vein.

**1. <u>The superficial system:</u>**

- Transverse superficial veins which empty directly into the midline internal mammary veins or into perforating branches.
- The longitudinal veins empty in the region of the supra-sternal notch into the jugular system.

Lateraly, these superficial veins may empty into the lateral thoracic veins. Inferiorly, drainage may be into the intercostal system (communicate with vertebral and azygous system).

**2. <u>The deep system:</u>**

- The perforating branches of internal mammary vein which empty into the corresponding innominate veins.
- The axillary vein receives many tributaries from chest wall, the pectoral muscles and the deep surface of the breast.
- The intercostal vein communicates with vertebral veins and azygous vein which finally drain into superior vena cave.

- A subareolar plexus of radiating veins drain into a periareolar vein which is polygonal in shape and appears to be the principal link between the superficial and deep venous systems ***(Richard et al., 2005).***

## Lymphatic drainage of the breast:

The lymphatics of the breast are thin-walled, valveless vessels that drain unidirectionally except when obstructed by inflammatory or neoplastic cells. The superficial subareolar lymphatic plexus drains primarily the skin of the breast and the nipple and areola, in addition to some of the central portion of the gland. This plexus is interconnected with the deep lymphatic plexus, which drains most of the breast parenchyma ***(Morrow and Khan, 2006).***

The lymphatic drainage of the breast can be very variable. From the subareolar plexus (of Sappey) there are efferent vessels draining to the following:

A- The contralateral breast.

B- The internal mammary lymph nodes chain, and via:

1. The mediastinal lymph nodes to the para-aortic lymph nodes, bronchomediastinal trunks, thoracic duct and right thoracic duct.

2. Inferiorly, the superior and inferior epigastric lymphatic routes to the groin.

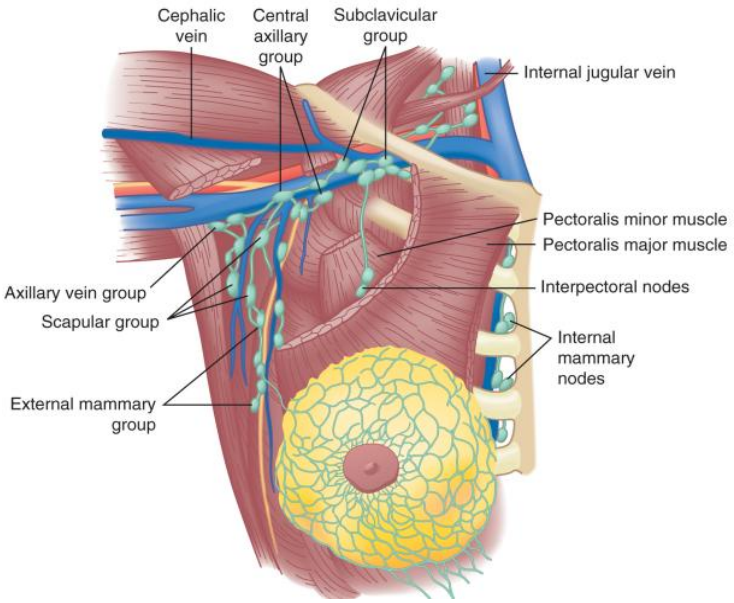


**Fig. (3):** Lymphatic drainage of the breast ***(Morrow and Khan, 2006).***

C- The axillary lymph nodes, the predominant site of drainage from the breast.These numbers from 20-40; in the past there were named and grouped artificially as lower, central, subscapular, lateral and apical. Nowadays, a simpler nomenclature is generally adopted, based on the relation of the nodes to pectoralis minor:

- **Level I nodes,** Those lying below the pectoralis minor.
- **Level II nodes,** Those behind the pectoralis minor and inferior to the axillary vein.

- **Level III nodes,** The upper or apical nodes, lying between the pectoralis minor and the lower border of the clavicle ***(Sainsbury, 2006).***

## Nerve supply of the breast:

The nerve supply of the breast is derived from the anterior and lateral branches of the $4^{th}$ to $6^{th}$ intercostal nerves, which carry sensory and sympathetic efferent fibers. The nipple supply is from the anterior branch of the lateral cutaneous ramus of T4; this forms an extensive nerve plexus within the nipple. These are essential in signaling suckling to the central nervous system; however, secretory activities of the gland are largely controlled by ovarian and hypophyseal hormones rather than by efferent motor fibres ***(Bannister, 2005).***