Introduction

Stereotactic needle biopsy is an important tool in the diagnosis of breast lesions as part of the triple assessment, which includes clinical, radiologic, and cytohistopathologic studies ***(Salami et al.,1999).***

There are several advantages in definitively diagnosing these lesions with needle biopsy. For benign lesions, establishing a definitive diagnosis obviates unnecessary surgical excision or protracted follow-up, both of which are costly in psychosocial and resource terms ***(Hatmaker et al., 2006).***

Both FNA and core biopsy are used widely in breast examinations of symptomatic patients,however problems with underestimation and the potential for sampling error have led to the introduction of percutaneous biopsy devices involving a larger volume Vacuum-assisted biopsy devices such as the Mammotome (Ethicon Endo-Surgery) which can sample larger tissue volumes than core biopsy devices ***(Liberman et al., 2002).***

Because vacuum biopsy removes more tissue during sampling than does core biopsy, it can sometimes remove the mammographic and ultrasonographic abnormality completely ***(Jackman et al.,1998).***

Evaluation of women with an abnormal mammography result is a common problem, since even high-quality mammography facilities generally interpret 5% to 10% of all

screening examinations as abnormal. The most common mammographic abnormalities found on screening examination requiring further evaluation are masses and calcifications. Approximately 90% of women with abnormal results do not have breast cancer therefore, safe and efficient evaluation is crucial ***(Kerlikowske et al., 2000).***

In early detection of breast cancer, newly introduced techniques, such as vacuum-assisted breast biopsy (VABB) is becoming increasingly common. VABB provides a minimally invasive, faster, less expensive, and less painful method for sampling nonpalpable abnormalities seen on mammography ***(Zagouri et al.,2007).***

The mammotome biopsy ultrasound guided procedure helps physicians locate breast abnormalities and obtain tissue samples for diagnosis. It works under vacuum assistant device. False negative rate is only about 0.6% approaching that of surgical biopsy. The skin incision is tiny (about 0.25 inch for 11G or 8G needles) and it results in a minimal scar and excellent post-procedure cosmetic appearance ***(Elmore et al., JAMA, 2005).***

Up to the recent times, mammotome biopsy was applied exclusively for diagnostic purposes. However, attempts to use this technique to remove benign lesions of the breast have been undertaken for many years. In 2006, U.S. Food and Drug Administration and the National Institute of Health and Clinical Excellence included mammotome biopsy in the group of

therapeutic procedures used for resection of benign tumors ***(Wilson et al.,2005).***

Aim of the Work

The aim of the study is to highlight the role of ultrasound guided directional vaccum assisted breast biopsy system (mammotome) as a diagnostic and therapeutic procedure in management of breast lesions.

1-Anatomy of the Female Breast

What are breasts and what is their function?

The breasts are specialised organs, which are located on the anterior chest wall overlying the musculature that encases it. The muscles involved include the pectoralis major, serratus anterior, external oblique, and rectus abdominus fascia ***(Aston et al.,1997).***

The breast is made up of both fatty tissue and glandular milk-producing tissues. The ratio of fatty versus glandular tissue varies among individuals. In addition, with the onset of menopause (ie, decrease in estrogen levels), the relative amount of fatty tissue increases as the glandular tissue diminishes ***(Bostwick, 2000).***

The female breast is more developed than the male breast, as their primary function is to produce milk for nutrition of the infant and bady. Female hormones such as estrogen and progesterone are important in promoting growth and changes that occur in the breast, especially during pregnancy and the mensutrual cycle ***(Ross et al., 2003).***

Breast Components

The breast consists of:

- Milk glands (lobules) that produce and supply milk.
- Special ducts that transfer milk from the milk glands (lobules) to the nipple.

- Areola (pink/brown pigmented region surrounding the nipple).
- Fat.
- Connective (fibrous) tissue (known as cooper"s ligament).

(Impey et al.,2004)

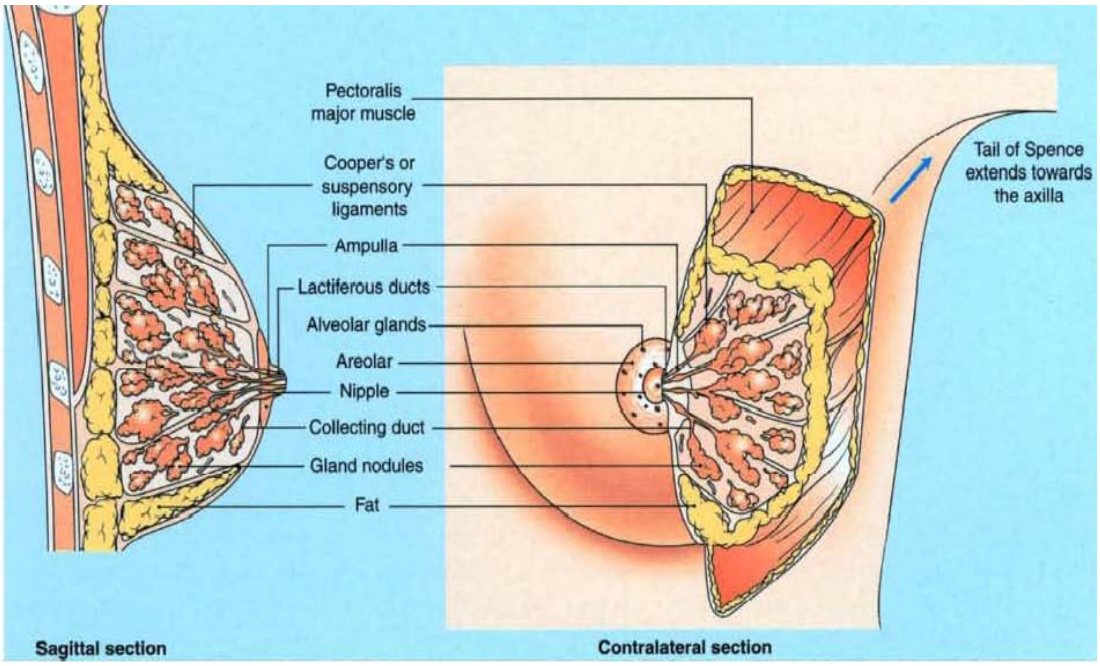

Fig. (1): Cross section of the breast showing anatomy ***(Hall, 2001).***

Breast structure

Female breasts are rarely symmetrical. In most cases, a breast is usually slightly larger or smaller, higher or lower or of different shape to the other side. When fully developed, the female adult breast is composed of 15-20 lobes each with many smaller lobules. The lobules end in dozens of tiny bulbs that

can produce milk.. These lobes are separated by bands of connective tissue which radiate out from the nipple like spokes from the middle of a bicycle wheel. There is lots of fat tissue within the breast. The amount of fat that each person has present, determines the size of the breast. The fatty tissue gives the breast it's soft consistency. The special glands in the breast are called tuboalveolar glands, which are modified sweat glands. Each of these glands end in a lactiferous duct (2-4mm in diameter) and opens up through a small hole onto the nipple. Deep to the areola, each duct has a dilated part called the lactiferous sinus, in which milk can accumulate and remain in the nursing mother. Cells which are important in contraction movements, called myoepithelial cells, are present in the gland and help in secreting fluids ***(Ross et al., 2003).***

Nipple and Areola structure and function

The nipple and areola are the darker areas of the breast. The nipple contain no fat, hair or sweat glands. During puberty, the pigment in the nipple and areola increases and the nipple becomes more prominent. During pregnancy, the areola enlarges and also becomes darker. Within the areola, there are; sebaceous glands, sweat glands and modified mammary glands (glands of Montgomery). These glands produce small elevations on the areola surface. The sebaceous glands enlarge during pregnancy and secretes oily material, which acts as a lubricant for the areola and nipple ***(Ross et al.,2003).***

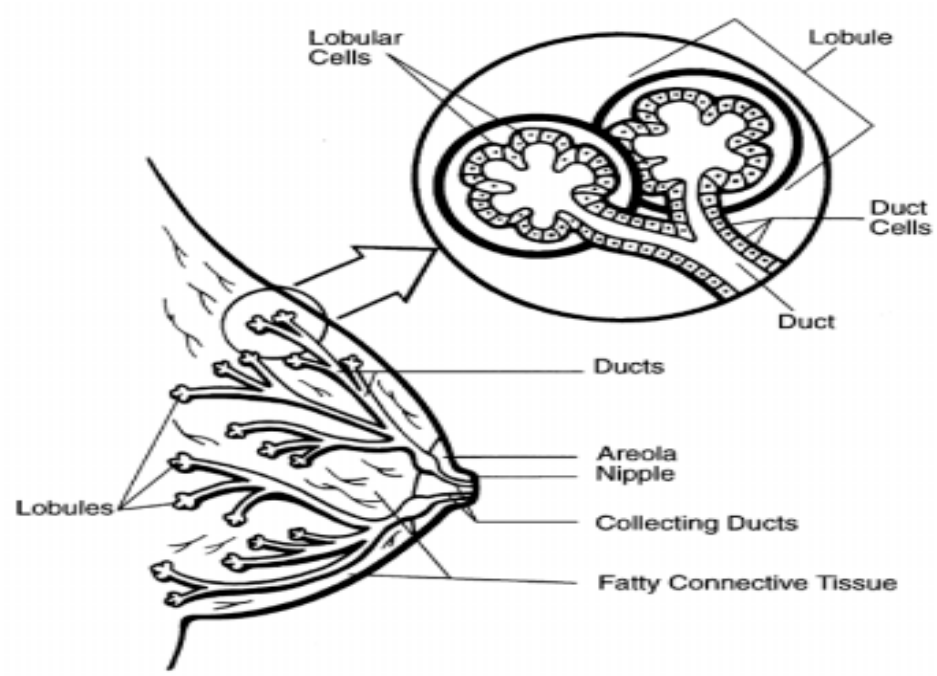

Fig. (2): Anatomy of breast lobe ***(Abeloff et al.,2004).***

Vasculature of Breast

Arteries carry oxygen rich blood from the heart to the chest wall and the breasts, whilst veins take de-oxygenated blood back to the heart.

The arterial blood of the breast skin depends on the subdermal plexus, which is in communication with underlying deeper vessels supplying the breast parenchyma. The blood supply is derived from (1) perforating branches of the internal mammary artery, (2) the lateral thoracic artery, (3) the thoracodorsal artery, (4) intercostal artery perforators, and (5) the thoracoacromial artery ***(Aston et al.,1997).***

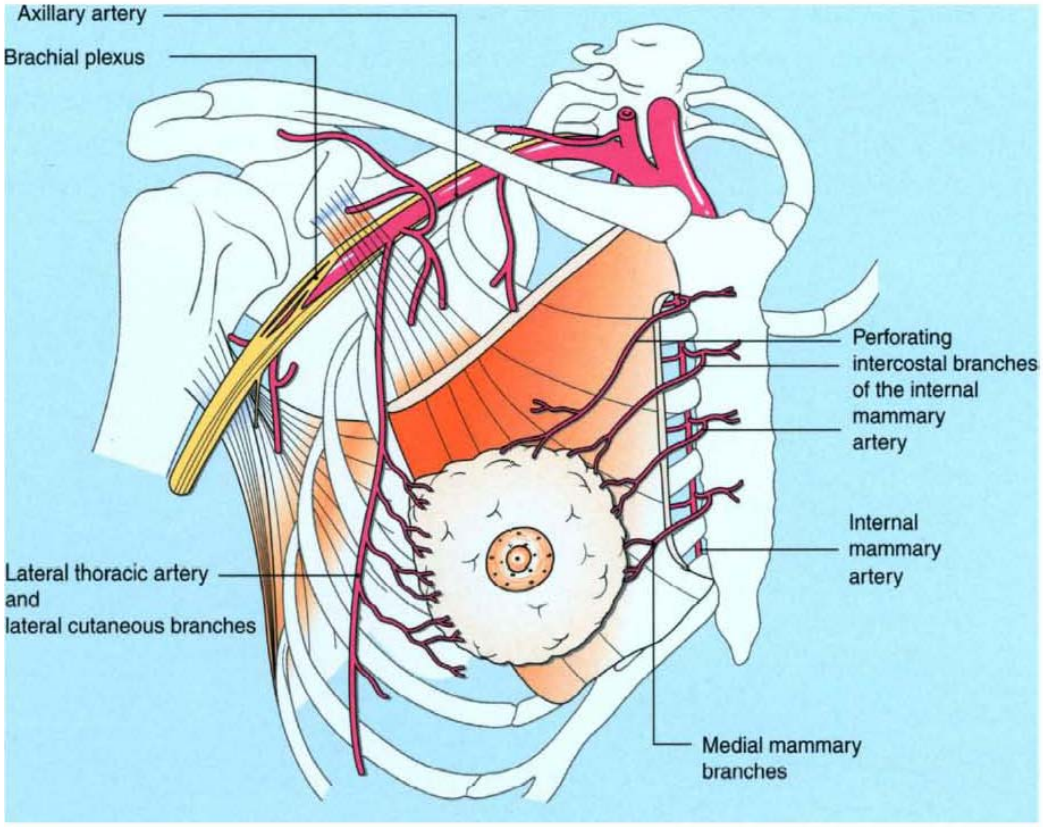

Fig. (3): Arterial blood supply of the breast ***(Hall, 2001).***

Venous drainage of the breast is mainly through the axillary vein, and some drainage occurs through the internal thoracic veins ***(Moore et al.,1999).***

Nerve supply of the breast

Sensory innervation of the breast is dermatomal in nature. It is mainly derived from the anterolateral and anteromedial branches of thoracic intercostal nerves T3-T5. Supraclavicular nerves from the lower fibers of the cervical

plexus also provide innervation to the upper and lateral portions of the breast. Researchers believe sensation to the nipple derives from the lateral cutaneous branch of T4 ***(Aston et al.,1997).***

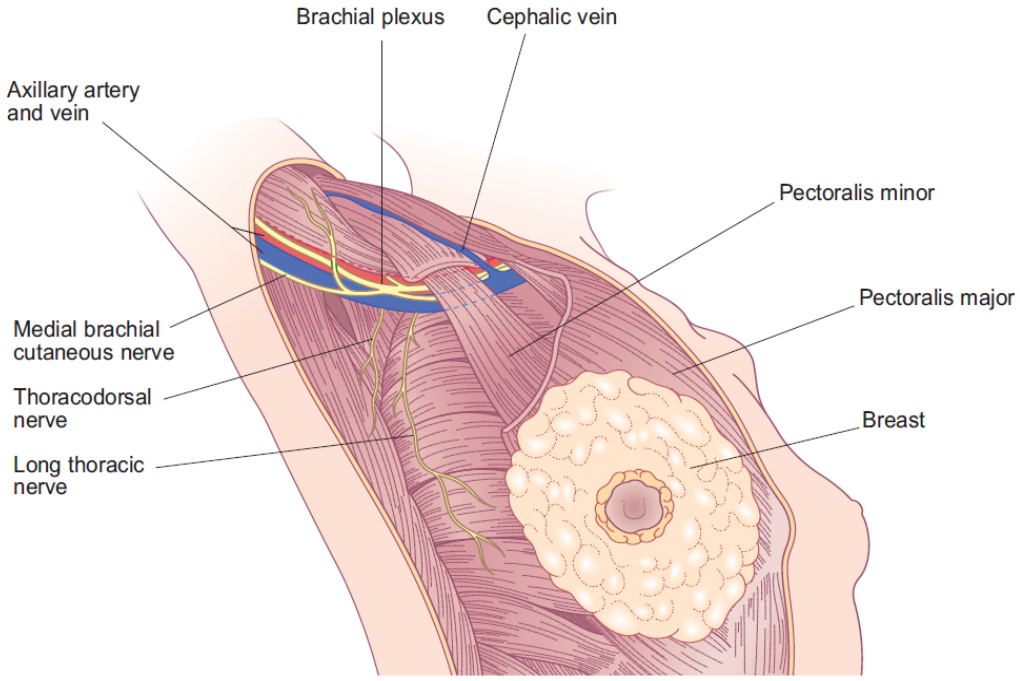

Fig. (4): Nerve supply of the breast ***(Dixon,2006).***

The lymph (lymphatic) system

The lymph system is important to understand because it is one of the ways in which breast cancers can spread. This system has several parts:

1. Lymph nodes are small, bean-shaped collections of immune system cells (cells that are important in fighting infections) that are connected by lymphatic vessels.

2. Lymphatic vessels are like small veins, except that they carry a clear fluid called lymph (instead of blood) away from the breast. Lymph contains tissue fluid and waste products, as well as immune system cells. Breast cancer cells can enter lymphatic vessels and begin to grow in lymph nodes and spread to other parts of the body through the lymph system by a process known as metastasis.

About 75% of lymph from the breast travels to the ipsilateral (same side) axillary lymph nodes. Some lymphatic vessels connect to lymph nodes inside the chest (internal mammary nodes) acorss the midline to the opposite breast and those either above or below the collarbone (supraclavicular or infraclavicular nodes). as well as abdominal lymph nodes ***(Abeloff et al.,2004).***

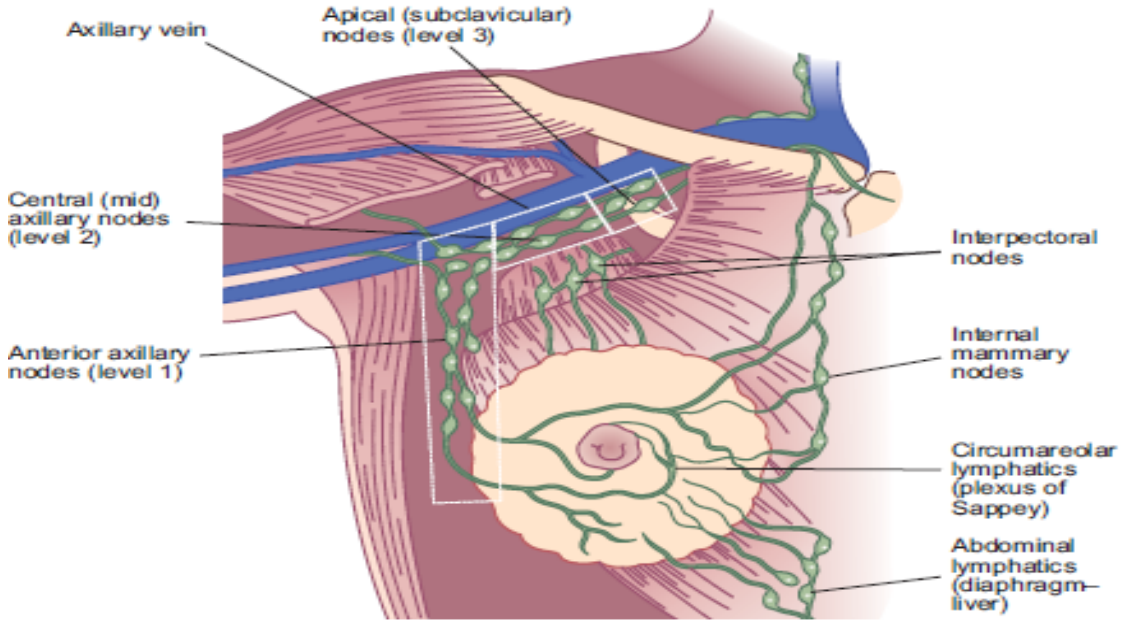

Fig. (5): Lymphatic anatomy.The vast majority of lymph from the breast drains to the axilla. The axilla is divided into three levels: 1 lateral to pectoralis minor, 2 deep to pectoralis minor, and 3: medial to pectoralis minor ***(Dixon,2006).***

Knowing if the cancer cells have spread to lymph nodes is important because if it has, there is a higher chance that the cells could have also gotten into the blood stream and spread (metastasized) to other sites in the body ***(Avis et al.,2005).***

11-Normal Sonographic Appearance of the Breast

Definition

Breast ultrasound (or sonography) is an imaging technique for diagnosing breast disease, such as cancer. It uses harmless, high frequency sound waves to form an image (sonogram). The sound waves pass through the breast and bounce back or echo from various tissues to form a picture of the internal structures. It is not invasive and involves no radiation ***(Trevino and Merlino, 2003).***

Why It Is Done

Breast ultrasound is done to:

- Find the cause of breast symptoms, such as pain, swelling, and redness.
- It is used to see whether a breast lump is fluid-filled (a cyst) or if it is a solid lump. A lump that has no fluid or that has fluid with floating particles may need more tests.
- Check abnormal results from a mammogram.
- Look at the breasts in younger women under age 35 because their breast tissue is often more dense, and a mammogram may not show as much detail.
- Watch for changes in the size of a cyst.
- Check your breasts if you have silicone breast implants for leakage or rupture and dense breasts. In these situations, a mammogram may not be able to see breast lumps.

- The lack of radiation used with ultrasound makes it ideal for studying breast abnormalities in women who are pregnant.
- Breast inflammation, where pockets of infection or abscesses may form, can be diagnosed and monitored by ultrasound.
- Thickened and swollen breast skin may be a sign of inflammatory breast cancer.
- Breast ultrasound is employed to observe and guide a needle for several interventional procedures. These include cyst aspiration, fine needle aspiration, large core needle biopsy (as a first step in determining treatment for a lesion that is likely to be cancerous), and needle localization in surgical breast biopsy.

(Pagana and Pagana, 2006)

Normal results

The breast tissue looks normal,If the test is done on both breasts, the tissue looks similar (Pagana KD, Pagana TJ ,2006)

All macroscopic breast structures can be easily imaged with adequate sonographic equipment.

The breast can be divided into four regions:

- Skin, nipple, subareolar tissues.
- Subcutaneous region.
- Parenchyma (between the subcutaneous and retromammary regions).
- Retromammary region. ***(Bassett et al.,1989)***

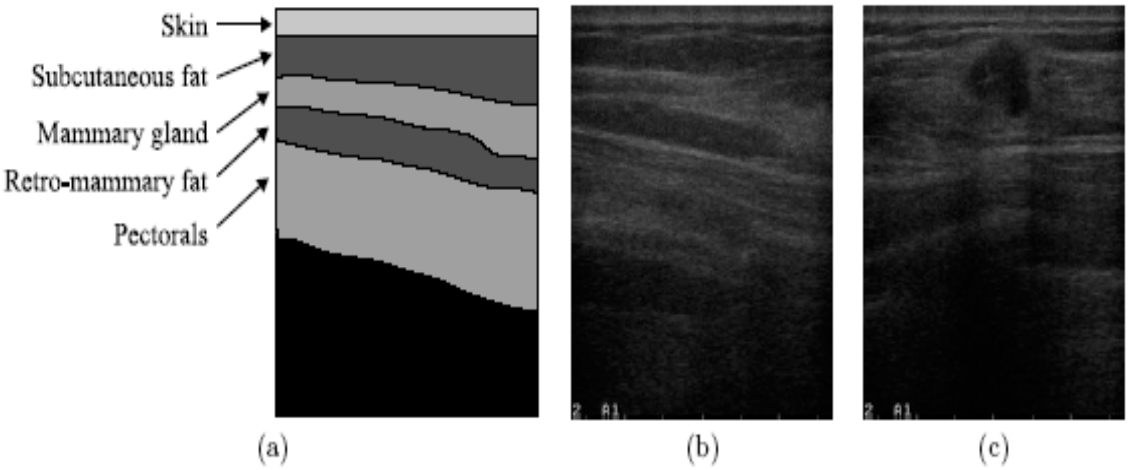

Fig. (6): (a) A schematic drawing of tissue layers in breast US images (b)A normal breast ultrasound image consisting of mainly near-horizontal edges (c) An abnormal image with a mass showing near-horizontal and near-vertical edges ***(Drukker et al., 2004).***

The skin is the superficial component of the breast is more or less homogeneous band that is more echogenic than the underlying fat tissue. Normal skin thickness varies between 0.5 mm and 2 mm, and is usually maximum in the lower quadrants, towards the inframammary fold ***(Chersevani et al.,1995).***

The nipple may be visualized as a rounded, well-defined nodule, having a medium level echogenicity. Distal attenuation is due to some degree to its fibrous structure ***(Chersevani et al.,1995).***