DIAGNOSTIC ACCURACY OF TRIPLE ASSESSMENT IN BREAST LUMPS

By

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Dissertation submitted to

BLDE UNIVERSITY BIJAPUR, KARNATAKA

MASTER OF SURGERY

In

GENERAL SURGERY

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ACKNOWLEDGEMENT

With proud privilege and deep sense of respect I express my gratitude and indebtness to my teacher and guide **Dr. M. S. KOTENNAVAR**, Professor, Department of Surgery, BLDEU'S SHRI B.M.PATIL MEDICAL COLLEGE, for his constant inspiration, patience, encouragement and support, which he rendered in preparing this dissertation and in pursuit of my postgraduate studies.

I am forever grateful to my Professor and HOD of Surgery **Dr.Tejaswini Vallabha** and I am forever grateful to my teachers and Professors. **Dr. Aravind V. Patil, Dr. B. B.Metan, Dr. M. B. Patil, Dr.Vijaya Patil;** Associate Professors of Surgery **Dr. Basavaraj Narasanagi, Dr. Hemanth Kumar, Dr. Girish Kulloli, Dr. Ramakanth Baloorkar and Dr. B.P. Kattimani.**

I am grateful to my Assistant Professors **Dr. Prasad Sasnur, Dr. Basavaraj Badadal, Dr. Deepak Chavan, Dr.Vikram Sindagikar Dr.Dayanand Biradar, Dr. Sanjay Namdar, Dr.Ravi Pattar** & **Dr. Y. D. Badiger** and my Senior Residents **Dr. Ravindra Nidoni, Dr.Prasanna Kamble** & **Dr.Santosh Patil** for their advice and help.

I am thankful and grateful to **Dr. M. S. Biradar,** Principal of BLDEU's Shri B.M. Patil Medical College Hospital and Research Centre for permitting me to utilize the hospital resources during my study period.

I am thankful to my seniors **Dr. RajAhmed, Dr. Supreet Ballur and my juniors Dr. Mallikarjun Huggi** and **Dr. Mrinal** for their cooperation.

I thank my fellow post graduates **Dr. Sachin Kadlewad, Dr. Harshavardhan Birader, Dr. Rakshit Aggarwal, Dr.SunilKumar Dr.Bharat S** & **Dr. Ravi A. I** and

my juniors from the department of surgery for their companionship, help and valuable advice throughout these three years.

I express my thanks to **Mr.Yadrami** and **Dr.Madagi** Statisticians, for their services in preparing my dissertation.

I take this opportunity to thank my parents for their constant support, encouragement and care.

Last but not the least, I convey my heartfelt gratitude to all my patients, without whose co-operation, this study would not have been possible.

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LIST OF ABBREVIATIONS USED

UO : Upper outer

UI : Upper inner

LO : Lower outer

LI : Lower inner

C : Central

IDC : Infiltrating ductal carcinoma

FNAC: Fine needle aspiration cytology

CE : Clinical examination

ABSTRACT

Background: Triple assessment is considered as the gold standard method to diagnose breast lumps. More than 95% of breast lumps can be diagnosed accurately (both benign and malignant).The diagnostic accuracy of triple assessment is about 99.99%.

Objective: To study the diagnostic accuracy of triple assessment in breast lumps by comparing with histopathology.

Methods: 50 patients were assessed by triple assessment who underwent surgery for the same and accuracy of triple assessment was compared with histopathology.

Results: Out of 50 patients, 21 patients had infiltrating ductal carcinoma and 1 typical medullary carcinoma on final histopathology report which shows that infiltrating ductal carcinoma is the most common type of carcinoma encountered and among benign lumps, fibroadenoma constituted the most which indicates that it is the most common benign lump in women.

Conclusion: Triple assessment is most accurate in diagnosing breast lumps (both benign and malignant).

Keywords: Clinical examination: Fine needle aspiration cytology: Triple assessment: Infiltrating ductal carcinoma: Mammography: Atypical medullary carcinoma: Histopathology.

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INTRODUCTION

Breast cancer, with its uncertain cause, has captured the attention of surgeons throughout the ages. Despite centuries of theoretical meandering and scientific inquiry, breast cancer remains one of the dreaded human diseases. The story of efforts, to cope with breast cancer is complex, as there is no successful conclusion as in diseases for which cause and cure is known. Currently 50% of American women will consult a surgeon regarding breast disease, 25% will undergo breast biopsy and 12% will develop some variant of breast cancer.[1]

Breast cancer is now the second most common cancer in women worldwide. The incidence is rising now a days because of genetic, environmental and life style changes. It is also more common in urban areas and slowly incidence in rural areas is also increasing.

Every week nearly 900 women are being diagnosed with breast cancer in UK[2]. The incidence has doubled over last 25 years and now it is the second most cancer in India next to carcinoma of cervix.[3].

Diagnosis of breast cancer is mainly by triple assessment, which includes clinical examination first, mammography next followed by fine needle aspiration cytology last. More than 95% of breast cancers can be diagnosed by this method. Triple assessment detects early malignancy and avoids unnecessary multiple procedures, allows to plan the treatment appropriately. Hence this study was taken up in our institute.

AIMS AND OBJECTIVES OF THE STUDY

The aim of the study is to assess the accuracy of triple assessment i.e., clinical examination, mammography and fine needle aspiration cytology in breast lesions by comparing with histopathology.

REVIEW OF LITERATURE

Historical review

Breast cancer has been known since ancient times. The Smith Surgical Papyrus (3000-2500 B.C) mentions about cancerous breast lump. The cancer was in a man, but the description encompassed most of the common clinical features. With reference to this, the author concluded "There is no treatment"[1].

Origin of FNAC

The earliest report of a needle technique being employed to obtain material for microscopy was by Kun in 1847 who described a new instrument for the diagnosis of tumours. They followed sporadic reports of this technique, championed mostly by clinicians including Leydon who in 1883 used needle aspiration to obtain cells to isolate pneumonic microorganisms and Greig and Gray who in1904 diagnosed Trypanosomiasis in cervical lymph node aspirates from patients with sleeping sickness in Uganda. Their findings were reported by Captain Bruce (later of Brucellosis fame) in a British Medical Journal memorandum in 1904. Afterwards, there were other reports of a similar technique to puncture and diagnose lymph nodes infected by Leishmaniasis and secondary syphilis. In the mid-1920s, there were attempts in New York and Chicago to employ large needle (1.2-3.0mm) aspiration for a variety of sites ranging through lymph nodes, prostate and breast but over time the dimension of 1mm or less has come to be accepted as the definition of thin or fine[4,5] .

A detailed and systematic study on FNAC was carried out in the late 1920s by Hayes Martin, a head and neck surgeon and James Ewing, the chief pathologist at the New York Memorial Hospital. Their experience comprising 2500 tumours annually was documented by Fred Stewart (a histopathologist) who then enunciated the fundamental principles regarding the philosophy of aspiration biopsy and emphasized the need for close clinical and pathological co-operation. However, full confidence in the procedure was never achieved and this period coincided with a fierce controversy both in Great Britain and the USA over the reliability and risks of open biopsy in surgical practice, which clinicians feared would increase the risk of tumour spread. However, as their fears were laid to rest, the popularity of needle aspiration waned to such an extent that by the 1960s the technique was all but obsolete in the USA[6,7]. Interest in the procedure was resurrected by Europeans in the mid 1950s.

In contrast to Martin and Stewart who used thicker calibre (18 gauge) needles, the European workers popularized the technique employing thin needles (22 gauge and higher) with an external diameter of 0.6mm. This is the technique known today as the fine needle aspiration (FNA) cytology. Developments in Stockholm Karolinska Radiumhemmet Hospital in Sweden were of utmost and fundamental importance. Here, workers such as Sixten, Franzen, Sordenstrom, and Torsten Lowhagen in collaboration with Joseph Zajicek applied the requisite scientific rigour to define precise diagnostic criteria in a variety of conditions. Their practice invented a novel specialty of ‘clinical cytologist‘ who would examine the patient, aspirate the lesion, prepare and read the slide and arrange subsequent onward referral. They thus provided a model for FNA services for the rest of the world such that it is now part of all sophisticated pathology departments.[8]

In the present era, fine needle aspiration cytology of the palpable breast masses have become increasingly popular as a diagnostic technique and in recent times, it has largely replaced excision breast biopsy more or less because of following advantages.[8]

a) It provides a sensitive, expedient and economical method of obtaining cytological material for examination.

b) It can be done during an office visit without the need of anesthesia thus eliminating the cost of outpatient surgery.

c) It also allows discussion with the patient of various treatment plans for the malignant mass on the same visit.

d) It is most commonly used in combination with physical examination and mammography in the so-called triple test diagnostic triad, which is a highly accurate method of evaluating the breast masses.

e) This procedure is safe, non traumatic and repeatable.

History of mammography

The earliest report of mammography dates back to 20th century. In 1913, Salamon in Germany examined 3000 amputated breasts radiographically and noted microcalcifications in intraductal carcinoma.

In 1927, Kleinschmidt wrote a book in which he described mammography as an aid in diagnosis.

In 1953, Laborgne had published a textbook on mammography and Egan's use of industrial films to improve contrast and detail established mammography as an important technique.

In 1960, Egan reported triple test accuracy of 97% and subsequently he admitted accuracy below 90%.

In 1968, Vacuum packed film screen technique was adopted in Guildford which markedly reduced the radiation dosage previously required for industrial films.

The following year, the first rotating molybdenum anode tube was used in Guildford and this further improved contrast and definition.

Triple test was initially described in 1975. It refers to detection of palpable breast masses by physical examination, mammography and finally FNAC in women.

Anatomy of breast[9]

The breast or mammary gland is a modified sweat gland and it forms an important accessory organ of the female reproductive system.

The breast lies between subdermal layer of adipose tissue and superficial pectoral fascia. The breast is composed of lobes which in turn comprise of multiple lobules. There are fibrous bands that provide support to breast called **suspensory ligaments of Cooper**. Between the breast and pectoralis major, lies retromammary space which contains blood vessels and lymphatics.

Deep to the pectoralis major lies pectoralis minor muscle which is enclosed in clavipectoral fascia which extends laterally to fuse with axillary fascia. The axillary lymphnodes in relation to breast are typically described in relation to pectoralis minor as level 1 which is located lateral to lateral border of pectoralis minor, level 2 which is located posterior to pectoralis minor and level 3 which is located medial to pectoralis minor muscle. The apex of axilla is defined by costoclavicular ligament (**Halsted's ligament**) at which point axillary vein passes into thorax and becomes subclavian vein. Lymphnodes between pectoralis major and minor are called **Rotor's nodes**. Unless these groups are specifically exposed, they are not encompassed in surgical procedures.

Situation

The breast lies in the superficial fascia of the pectoral region. A small extension called the **axillary tail of Spence,** pierces the deep fascia and lies in the axilla.

Extent

Vertically, it extends from the second to the sixth rib and horizontally, it extends from the lateral border of the sternum to the mid-axillary line.

Deep relations:

1. The breast lies on the deep fascia covering the pectoralis major.

2. Still deeper there are the parts of three muscles, namely the pectoralis major, the serratus anterior and the external oblique muscle of the abdomen.

3. The breast is separated from deep fascia by loose areolar tissue.

1. **The skin**

It covers the gland. A conical projection called the 'nipple' is present just below the centre of the breast at the level of forth intercostal space. The nipple is pierced by 15 to 20 lactiferous ducts. It contains circular and longitudinal smooth muscle fibres which can make the nipple stiff or flatten respectively. The skin surrounding the base of the nipple is pigmented and forms a circular area called the 'areola'.

2. The parenchyma

It is made up of glandular tissue, the gland consists of 15 to 20 lobes. Each lobe is a cluster of alveoli and it is drained by lactiferous duct. The lactiferous ducts converge towards the nipple and open on it. Near its termination each duct has a dilatation called 'lactiferous sinus'.

3) The stroma

The fibrous stroma forms septa known as the **suspensory ligaments of Cooper** and the fatty stroma forms the main bulk of the gland.

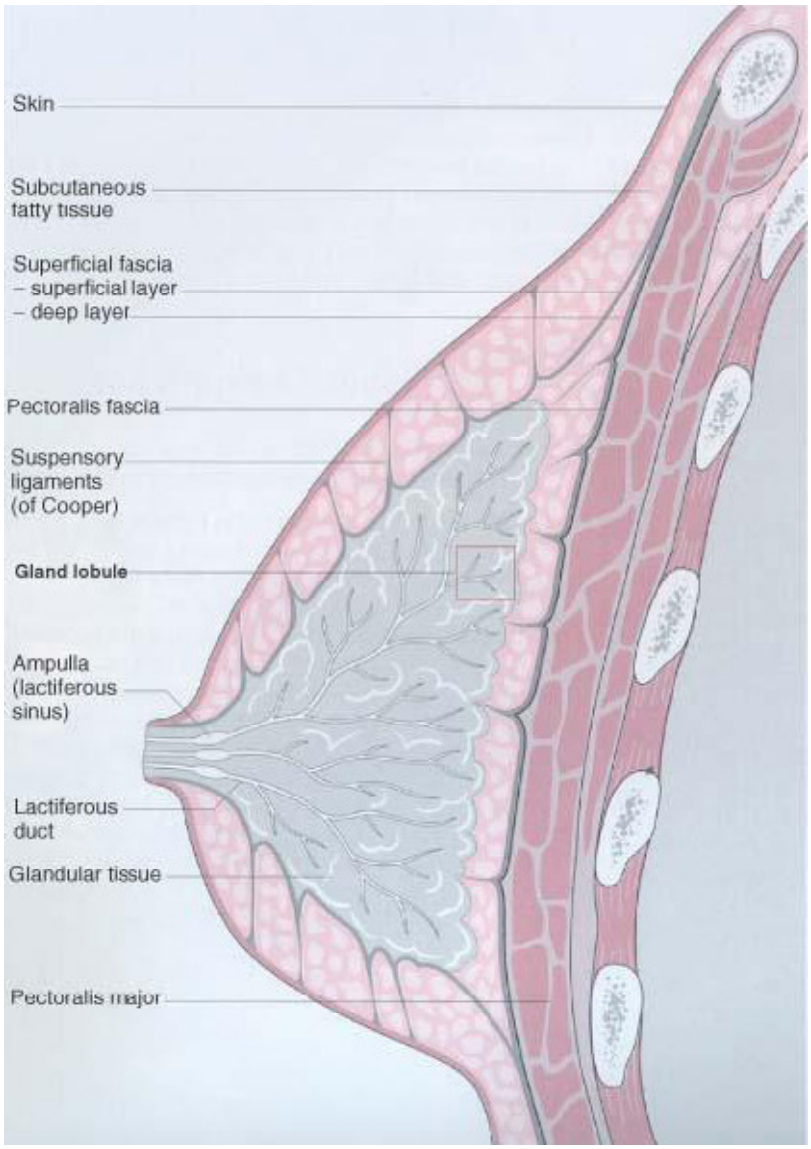


FIG NO: 1 ANATOMY OF THE BREAST

Blood supply

The mammary gland is extremely vascular. It is supplied by branches of the following arteries.

1. Internal thoracic artery, a branch of the subclavian artery.
2. The lateral thoracic, superior thoracic and acromiothoracic branches of the axillary artery.
3. Lateral branches of the posterior intercostals arteries.

The veins follow the arteries. The superficial veins drain into the internal thoracic vein and into the superficial veins of the lower part of the neck. The deep veins drain into the internal thoracic, axillary and posterior intercostal veins.

Nerve supply

The breast is supplied by anterior and lateral cutaneous branches from 4^{th} to 6^{th} intercostals nerves. The nerves convey sensory fibres to skin, autonomic fibres to smooth muscles and blood vessels.

LYMPHATIC DRAINAGE OF THE BREAST[9]

Lymphatic drainage of the breast assumes great importance to the surgeon because, carcinoma of the breast spreads mostly along lymphatics to the regional lymph nodes.

Lymph Nodes

Lymph from the breast drains in to the following lymph nodes.

1. The axillary lymph nodes, chiefly the anterior (or pectoral) group. The posterior, lateral, central and apical groups of nodes also receive lymph from the breast either directly or indirectly.

2. The internal mammary (parasternal) nodes which lie along the internal thoracic vessels.

3. Some lymph from the breast also reaches the supraclavicular nodes, the cephalic (deltopectoral) node, the posterior intercostal nodes (lying in the front of the heads of the ribs), the subdiaphragmatic and subperitoneal lymph plexuses.

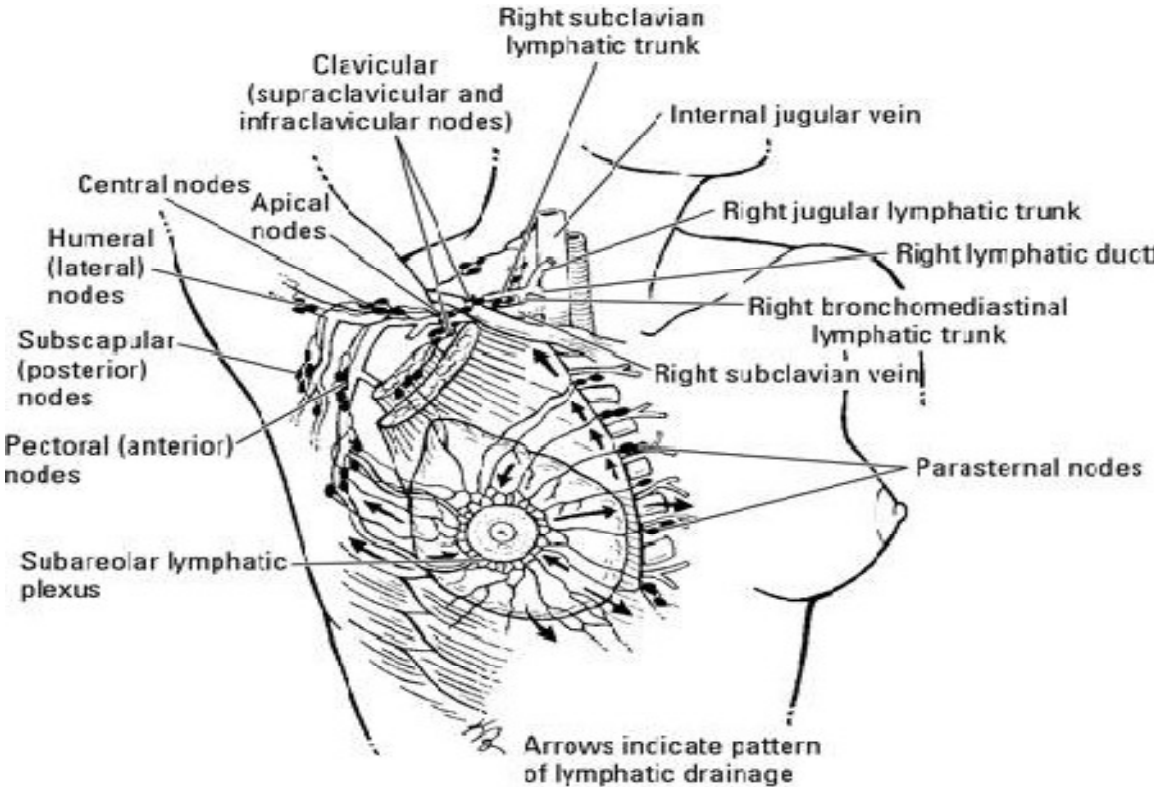


FIG NO: 2 LYMPHATIC DRAINAGE OF THE BREAST

Lymphatic Vessels

The superficial lymphatics drain the skin over the breast except for the nipple and areola. The lymphatics pass radially to the surrounding lymph nodes (axillary, internal mammary, supraclavicular and cephalic).

The deep lymphatics drain the parenchyma of the breast. They also drain the nipple and areola.

Some further points of interest about the lymphatic drainage are-

1. About 75% of the lymph from the breast drains into the axillary nodes, 20% to the internal mammary nodes and 5% to the posterior intercostal nodes. Among the axillary nodes, the lymphatics end mostly in the anterior group and partly in the posterior and apical group.
2. The internal mammary nodes drain the lymph not only from the inner half of the breast, but from the outer half as well.
3. A plexus of lymph vessels (**subareolar plexus of Sappy**) is present deep to the areola. Subareolar plexus and most of lymph from the breast drains into the anterior or pectoral group of lymph nodes.
4. The lymphatics from the deep surface of the breast pass through the pectoralis major muscle and the clavipectoral fascia to reach the apical nodes and also to the internal mammary nodes.
5. Lymphatics from the lower and inner quadrants of the breast may communicate with the subdiaphragmatic and subperitoneal lymph plexuses after crossing the costal margin and then piercing the anterior abdominal wall through the upper part of linea alba.

Embryology[10]

By fourth week, a pair of epidermal thickenings called ‘mammary ridges’ develop on either side of the body from the area of future axilla to future inguinal region. These ridges normally disappear except for the central one-third where the breast develops. This remnant of the mammary ridge produces the primary bud in the

5th week that goes down into underlying dermis. By 10th week, primary bud begins to branch and by 12th week, several secondary buds have formed. These buds lengthen and branch throughout the remainder of gestation. By birth, about 15-20 lactiferous ducts open onto small superficial depression called 'mammary pit'. Proliferation of underlying mesoderm converts pit into an elevated nipple within few weeks of birth.

Histology[11,12]

Each breast consists of 15-25 independent glandular units called 'lobes'. Each lobe drains into exterior by lactiferous duct which forms a dilatation called 'lactiferous sinus'. The keratinizing squamous epithelium of overlying skin continues into lactiferous duct and then abruptly changes into double layered cuboidal epithelium. The breast lobes are embedded in a mass of adipose tissue that is subdivided by collagenous septae. Within each lobe of the breast, the main duct branches repeatedly to form ductules each of which leads to a lobule to form multiple acini. Each terminal duct and its associated lobule is known as Terminal duct lobar unit(TDLU). Two cell types line the ducts and lobules. A low flattened discontinuous layer of contractile cells containing myofilaments lying on basement membrane. A second layer of epithelial cells that lines the lumen has secretory function. The ducts within each lobule are surrounded by intralobular supporting tissue, which is less collagenous and more vascular. Individual lobules with their supportive intralobular stroma are separated by interlobular septum that is moderately dense and collagenous. The nipple contains bands of smooth muscles that are oriented in a parallel fashion to the lactiferous ducts and circularly near the base. The aerola contains sebaceous glands that are not associated with hair follicles. Secretions from these glands help to protect nipple and aerola during breast feeding.

Normal development and Physiology[4]

Prior to puberty, the breast is composed of fibrous stroma and scattered ducts lined with epithelium. Development usually begins by 12^{th} to 13^{th} year although it can vary from 9^{th} to 15^{th} year. These are under the influence of pituitary gonadotropins which raise serum estradiol levels. **Thelarche**, the beginning of adult breast development marks the onset of puberty in majority of white women and occurs at mean age of 10years. In breast, the hormone dependent maturation signifies increased deposition of fat, the formation of new ducts and first appearance of lobular units. This whole process is under the influence of estrogen, progesterone, adrenal hormones, pituitary hormones and trophic effects of insulin and thyroid hormones. This process can vary in both the breasts. Growth factors also play an important role. The term **premature thelarche** refers to development of breast in young girl before 8 years, unaccompanied by other changes of puberty.

The postpubertal mature or resting breast contains fat, stroma, lactiferous ducts and lobular units. During phases of menstrual cycle or in response to exogenous hormones, the breast epithelium undergoes cyclical changes which includes hypertrophy as their dominant part than hyperplasia with subsequent accumulation of fluid producing breast pain and engorgement.

These physiological changes can lead to nodularity and may be mistaken for malignancy. Ill defined masses are observed through the course of menstrual cycle. With pregnancy, there is diminuition of stroma and formation of new acini or lobules called **adenosis of pregnancy**. After birth, there is sudden loss of placental hormones, which combined with high levels of prolactin, is the principal trigger for lactation. The actual expulsion of milk is under hormonal control and is caused by contraction

of myoepithelial cells that surrounds the breast ducts and terminal lobules. Stimulation of nipple appears to be physiologic signal for continued pituitary secretion of prolactin and acute release of oxytocin.

The breast tissue is composed of three tissue types namely glandular epithelium, fibrous stroma with supporting structures and adipose tissue. In adolescents the predominant tissues are epithelium and stroma. In postmenopausal women, the glandular tissues are replaced by adipose tissue. Cooper's ligament provide shape and structure to breast as they course from overlying skin to underlying fascia. Infiltration of these ligaments by tumor cells frequently causes dimpling or tethering of underlying skin.

The glandular epithelium of breast is composed of branching system of ducts which are arranged in radial pattern. It is possible to cannulate the ducts with dye to visualize the branching patterns. Each major duct has a dilated portion called lactiferous sinus below the ampulla of nipple aerola complex. These ducts converge into ampulla of nipple.

Each of the major ducts has multiple dilated portions called terminal ductules or acini. These acini are milk forming glands of breast and together with their small efferent ducts or ductules are known as 'lobules'. Stimulation of nipple appears to be physiologic signal for continued pituitary secretion of prolactin and acute release of prolactin. When breast feeding ceases, there is a fall in prolactin level and no release of prolactin.

A palpable breast mass may be identified when it becomes sufficiently large to be differentiated from surrounding breast tissue physically by an examiner usually the patient or the physician; or is perceived on an imaging examination. Determining by

physical examination whether a mass is present can be difficult, as, all breasts are variable in the combination of glandular tissue, fibrous stroma and fat. True masses are generally asymmetric in relation to the other breast, distinct from the surrounding tissue.

Details of various lumps[13]

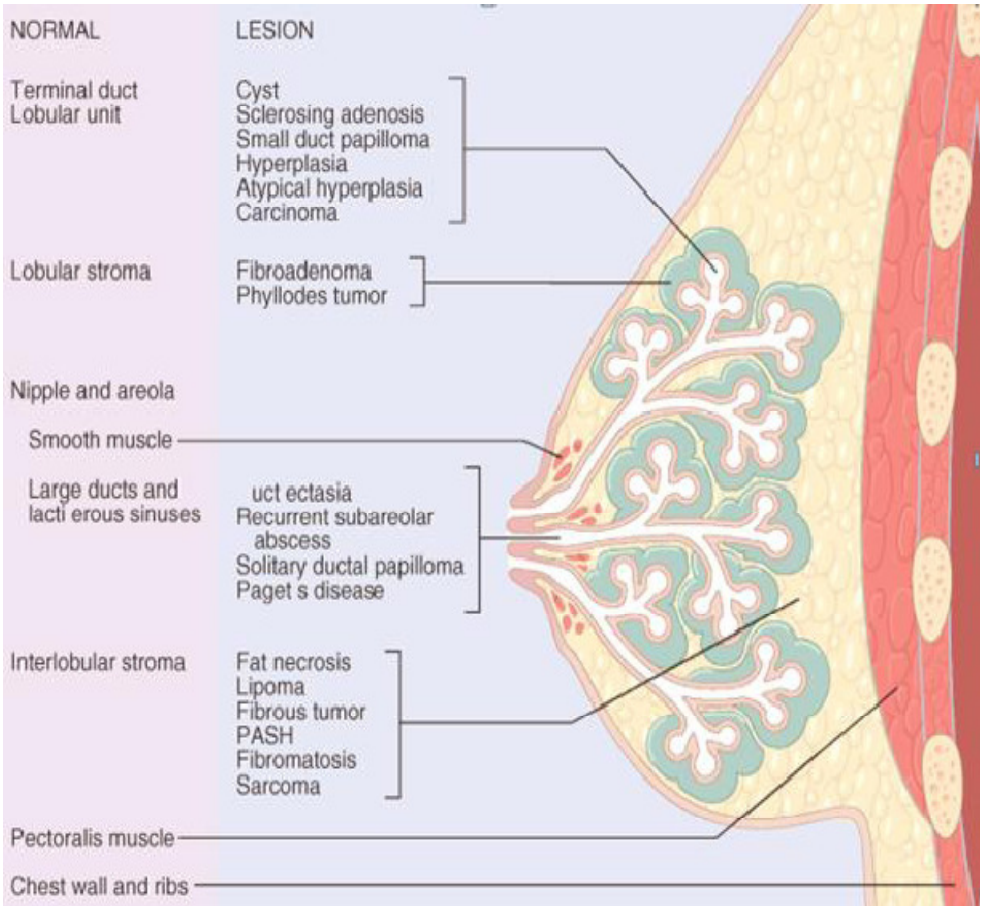


FIG NO: 3 ANATOMICAL LOCATIONS OF DIFFERENT LESIONS OF BREAST.

i) Fibroadenoma

They usually arise in fully developed breast between age 15 to 25 years although occasionally they occur in older women. They arise from hyperplasia of a single lobule, usually grow upto 2-3cms in size. They are surrounded by well-marked capsule and thus enucleated through cosmetically appropriate incision. A fibroadenoma usually does not require excision unless it is symptomatic or patient is experiencing symptoms such as pain due to the lump.

Giant fibroadenomas usually occur during puberty. They are usually over 5cm in diameter and are often rapidly growing and can be enucleated through submammary incision. They are more common in Afro-Carribean population.

ii) Breast cysts

They are more common in last decade of reproductive life as a result of nonintegrated involution of stroma and epithelium. They are often multiple, may be bilateral and can mimic malignancy. Diagnosis can be confirmed by aspiration and/or ultrasound. Their usual presentation is immediate and cause great alarm. Prompt diagnosis and drainage provides immediate relief. Treatment is usually by excision. If the cyst is small, it usually resolves spontaneously. If the cyst reforms repeatedly, exclude cystadenocarcinoma which is more common in elderly.

iii) Galactocele

Galactocele usually presents as a solitary, subareolar cyst and always dates from lactation. It contains milk and in longstanding cases its walls tend to calcify.

iv) Phyllodes tumour

These benign tumours, previously known as **serocystic disease of Brodie** or cystosarcoma phylloides usually occur in women over the age of 40 years but can appear in younger women. They present as large, sometimes massive, tumour with an unevenly bosselated surface. Occasionaly, ulceration of overlying skin occurs because of pressure necrosis. Despite their size, they remain mobile on chest wall. Histologically, there is wide variation in appearance with some resembling fibroadenoma, and others having high mitotic index, which are histologically worrying. The latter may recur locally, but despite the name of cystosarcoma phylloides, they are rarely cystic and only rarely develop features of sarcomatous tumour. They may metastasise via blood stream.

Carcinoma of breast[14]

Various presentations

The presentation of carcinoma of breast may vary from lump to frank ulceration. Any portion of the breast may be involved, including axillary tail. The most frequent site of involvement of the breast is upper outer quadrant. Most breast cancers will present as a hard lump, which may be associated with indrawing of the nipple. As the disease advances locally, there may be skin involvement with peau d' orange or frank ulceration with and fixation to the chest wall. This is described as cancer-en-cuirasse when the disease progresses around the chest wall. There may or may not be involvement of axillary lymphnodes.

i) Inflammatory carcinoma

Inflammatory carcinoma is highly aggressive cancer that presents as painful, swollen breast which is warm with cutaneous oedema. This is the result of blockage of subdermal lymphatics with carcinoma cells. It involves atleast one-third of the breast and may mimic breast abscess.

ii) Insitu carcinoma

Insitu carcinoma is one which has not breached the basement membrane. Presently it accounts for 20 percent of cancers detected by screening in UK. Insitu carcinoma may be ductal (DCIS) or lobular (LCIS), the latter being **multifocal and bilateral**. Both are markers for later development of invasive cancer, which will develop in atleast 20% of patients.

iii) Paget's disease of the nipple

Paget's disease of the nipple is a superficial manifestation of underlying breast carcinoma. It presents as an eczema-like condition of nipple and aerola, which persists despite local treatment. The nipple is eroded slowly and destroyed. If left untreated, the underlying carcinoma will sooner or later become clinically evident. Microscopically, Paget's disease is characterized by large, ovoid cells, with abundant, pale staining cytoplasm in the Malphigian layer of epidermis.

CLINICAL EXAMINATION

The underlying cause of complaints about the breast proves to be benign in the overwhelming majority of cases. Breast symptoms, however, induce such a great anxiety in the patient that malignancy needs to be excluded as speedily as possible.

The first step to rule out malignancy is thorough history and complete physical examination.

Essential points in the history include:

- Age
- Menstrual status
- Family and reproductive history
- Lactational history
- Past history of radiation to the chest
- History of benign breast disease

In physical examination of patients with a breast complaint, seclusion, warmth and privacy are particularly important in the examination of the breast. This avoids discomfort and embarrassment to the patient. Good lighting enables detection of minor abnormalities. The patient is usually examined in sitting posture with parts exposed upto waist.

Attention is paid to general appearance

Inspection:

1. With arms by the side
2. With arms elevated above the head.
3. On bending forwards
4. With both arms tightly held over both the hips
5. On lying down

Look for symmetry of nipples and breasts.

a) Nipple abnormalities
b) Vascularity
c) Indrawing and prominence of skin
d) Tethering
e) Peau d' orange
f) Nodules over the skin
g) Ulceration and fungation of skin
h) Fullness of bilateral supraclavicular fossae

Palpation:

1. Breasts bilaterally :

   a. Lightly by gently rolling over the breast on all the sides.
   b. Deeply systematically from the areola concentrically outwards including the axillary tail.

2. Axilla bilaterally :

   a. Taking the weight of the patient's forearm on the examiner's hand for palpation of central, apical, anterior and posterior lymph nodes for enlargement.
   b. Both axillae from behind the patient.

3. Bilateral supraclavicular fossae for metastases.

4. Chest for evidence of pleural effusion, lung metastasis and chest wall involvement.

5. Abdomen for ascites, hepatomegaly or lymphnodes.

6. Lastly per rectal examination to look for **Blummer shelf** lesion which indicates secondaries in pouch of Douglas.

Atypical cancer may be firm and have indistinct borders and attachments to the skin or fascia with dimpling or nipple retraction. Benign lesions typically have discrete borders, well defined margins and are mobile. Cysts can be differentiated from solid lesions by palpation to look for consistency.

Nevertheless, the physical findings of benign and malignant disease in its earliest stages may overlap, and without the use of FNA and/or breast imaging, some palpable malignant lesions may be followed up inappropriately leading to serious consequences for both the patient and the surgeon.

Although some masses exhibit distinct physical findings, an imaging evaluation is required in almost all cases to characterize the palpable lesion, search for ipsilateral multifocal or multicentric carcinoma, and screen the contralateral breast. A negative imaging evaluation, however, should never over rule a strongly suspicious finding on physical examination or vice versa.

MAMMOGRAM[15]

Technical aspects of mammography[15]

Soft tissue radiographs are taken by placing the breast in direct contact with ultrasensitive film and exposing to low-voltage, high amperage x-rays. The dose of radiation is approximately 0.1cGY. The sensitivity of this investigation increases as age advances, as breast becomes less dense. About 5 percent of breast cancers are missed by population-based mammographic screening programmes. Thus a normal mammogram does not exclude carcinoma.

Mammographic projection and appearance[16]

The standard technique for undergoing mammogram in symptomatic women consists of two views:

1) Craniocaudal view(CC)
2) Mediolateral oblique view(MLO)

The mediolateral oblique is the most effective single view, because it includes greatest amount of breast tissue and is the only while-breast view to include all of the upper-outer quadrant and axillary tail.

The craniocaudal view provides better visualization of medial aspect of the breast image detail, because great compression of the breast is usually possible.

The importance of proper compression of the breast cannot be overemphasized. The compression device

i) Holds the breast still and thereby prevents motion unsharpness.
ii) Brings object closer to the film and reduces blur.
iii) Seperates overlapping tissues that might obscure underlying lesions

iv) Decreases the radiation dose of mammography by making the breast less thick.

The young women's breast contains core of glandular tissue which appears as soft tissue density whereas in older women, the involution of breast has occurred appears as fat tissue density.

On mammogram films, all lesions including malignant and nonmalignant appear as white. Fat appears as black ones. All other components including connective tissue, glands, tumor deposits, appear as shades of white on mammogram. In general, younger the women, denser the breasts. As women grow older, breasts become less dense and are replaced by fatty tissues which appear as areas of dark shadows on mammogram.

BIRADS

The American College of Radiology (ACR) first developed the Breast Imaging-Reporting and Data System (BIRADS) in 1993 in an effort to provide a quality assurance tool that would standardize mammographic reporting. The ACR BIRADS provided the first standardized lexicon and reporting format. It allowed the radiologist to relate to the degree of concern for malignancy through a concise description using approved terminology and to give clear management recommendations.[32]

MASSES	
Shape	Round ,oval, lobular, irregular
Margin	Circumscribed, obscured, microlobulated, irregular and speculated
Density	High, isodense, low, radiolucent
CALCIFICATIONS	
Benign	Large, round, coarse(popcorn), rod like, lucent centered, eggshell/rim,diffuse,scattered,bilateral,regional,dermal,vascular,milk of calcium, suture, dystrophic
Intermediate	Usually smaller, amorphous, indistinct, coarse heterogeneous, clustered, regional, linear, segmental
Suspicious	Usually smaller, amorphous, indistinct, coarse heterogeneous, clustered, regional, linear, segmental
ASYMMETRY	Global, focal
SPECIAL CASES	Asymmetric tubular structure/solitary dilated duct, intramammary Node
ASSOCIATED FINDINGS	Skin or nipple retraction, skin thickening, trabecular thickening, skin lesion,axillary adenopathy,architectural distortion

American College of Radiology BIRADS final assessment categories

BIRADS	ASSESSMENT	CLINICAL MANAGEMENT
I	**Negative**	Routine screening
II	**Benign finding**	Routine screening. Definitely benign finding.
III	**Probably benign finding**	Very high probability of benignity. Short term follow-up is recommended to establish stability.
IV	**Suspicious- looking abnormality**	Not characteristic but has reasonable probability of malignancy; biopsy should be considered 4A- Low suspicion for malignancy 4B-Moderate suspicion for malignancy 4C- Highly suspicious for malignancy
V	**Highly suggestive of malignancy**	Very high probability of malignancy; appropriate action should be taken.
VI	**Known cancer**	Appropriate action should be taken.

Applications of mammogram[16]

Screening mammography is performed in asymptomatic women with the goal of detecting breast cancer. Mammography has been used in North America since 1960s.The benefit of screening mammography for women older than 50 years of age has been universally accepted.

Mammography is used to evaluate women with abnormal findings such as breast mass or nipple discharge. The MLO views images the greatest volume of breast tissue including upper outer quadrant and axillary tail of Spence. Compared with MLO view, the craniocaudal view provides better visualization of medial aspect of the breast and permits greater breast compression. In addition to MLO and CC views, a diagnostic examination may use views that better define nature of any abnormalities such as 90- degree lateral and spot compression views. The 90-degree lateral is used along with CC views to triangulate the exact location of an abnormality.

Spot compression may be done in any projection by using a small compression device, which is placed directly over mammographic abnormality that is obscured by overlying tissues.

The compression device minimizes motion artifact, improves definition, seperates overlying tissues and decreases radiation dose needed to penetrate the breast. Magnification techniques are often combined with spot compression to resolve calcifications and margin of masses.

Diagnostic mammogram

Here the women presenting with complaints like nipple discharge, palpable lump and mastalgia are evaluated. Here mammographies are routinely reported as being benign, probably malignant, highly probable of malignancy and malignant.

Findings that suggest malignancy

A. A dense mass with speculated irregular margins with strands of fibromalignant tissue radiating from the mass is considered highly suggestive of malignant The spicules may extend more than several centimeters from the mass or appear as fine brush border. The spiculations suggest fibrosis that may be related to generalized desmoplastic response that some cancers elicit in the surrounding tissue. However, postsurgical scarring, fat necrosis and radial scars show spiculations that mimic malignancy.

B. Calcifications

   A wide variety of calcifications are shown by mammograms which as almost always due to benign processes. However, there are some patterns that always suggest malignancy. Fine irregular branching patterns are always due to malignancy

There are other findings in mammogram that suggests malignancy:

i) Lesions with illdefined margins : This is common though nonspecific characteristic that suggest malignancy. Many cancers do not elicit desmoplasia that produce spiculations. But the tumor infiltration into surrounding tissues is reflected by lack of well defined mammographic border.

ii) Lesion with microlobulated margin : Many well circumscribed masses have some amount of fibroadenomas, for example are not perfectly round, but have some degree of lobulation. The more lobulated the lesion, the more malignant it is. When the lobulations are multiple and measure

several millimeters, they are called as 'microlobulations'. Presence of lobulation is a strong indication of malignancy, but not pathognomonic.

iii) Lesion with architectural distortion : This is characteristic of malignancy. However, postsurgical fat necrosis is common nonmalignant cause of architectural distortion.

iv) Distorted parenchymal edge: Architectural distortion is most evident at the edge of parenchymal cone and subcutaneous fat interface. In the normal breast, the interface is scalloped by Cooper's ligament attached to the retinacula cutis to the skin. Cancers developing at the edge of this can distort this relationship and can cause retraction, bulging or flattening of parenchymal skin.

v) Clustered microcalcifications : When found in isolation, they frequently herald the onset of malignancy. i.e, early stage breast cancer. Clustered microcalcifications are defined as calcifications, which are ≥ 5 in number each measuring $\leq$ 0.5mm, isolated within small volume of breast and project within 1cc volume on mammogram.

FINDINGS THAT SUGGEST BENIGN

Included in this category are-

a) Round or oval circumscribed masses

b) Smooth round clustered calcifications

c) Focal asymmetries

Circumscribed masses favour a benign etiology, with the likelihood of malignancy being very low, probably less than 2%. Ultrasonography is used to establish whether the mass is solid or cystic. If the mass is cystic, no further workup is

required. If it is solid, magnification mammography may be required to conform that all the margins of solid mass are truly circumscribed.

A solitary circumscribed mass is usually followed-up with 6^{th} monthly interval to establish that it is stable (not growing). If stable, continued mammographic screening is recommended for atleast 2 years. The presence of multiple circumscribed masses strongly suggests benignity and follow-up of 1 year is usually sufficient.

Microlobulated margins increase the likelihood of malignancy. The finding of indintinct margins suggests possibility of malignancy. A mass with speculated margins from its border is highly suggestive of malignancy. An area of speculation without any associated mass is called an architectural distortion.

At present, American Cancer Society continues to recommend annual screening mammography for women older than 40years and suggest that this practice should continue as long as women is in good health.

Current guidelines of National Comprehensive Cancer Network suggest that normal risk women more than or equal to 20 years of age should have a breast examination atleast every 3 years. Starting at the age of 40years, breast examination should be performed yearly and a yearly mammogram should be taken. Prospective randomized studies of mammographic screening conform a 40% reduction in stage 2, stage 3 and stage 4 cancer in screened population with 30% increase in overall survival.

Xeromammography techniques are identical to those of mammography except that image is recorded on xerography plate, which provides a positive rather than negative image. Details of the breast and its entire soft tissues can be recorded

with one exposure**. Screen film mammography** has replaced xeromammography because it requires lower dose of radiation, provides similar image quality.

Recent advances in mammography[17,18,19,20]

Digital mammography is more and more replacing conventional mammography. Initial concerns about an inferior image quality of digital mammography have been largely overcome and recent studies even show digital mammography to be superior in women with dense breasts, while at the same time reducing radiation exposure. Nevertheless, an important limitation of digital mammography remains: namely, the fact that summation may obscure lesions in dense breast tissue. However, digital mammography offers the option of so-called advanced applications, and two of these, contrast-enhanced mammography and tomosynthesis, are promising candidates for improving the detection of breast lesions otherwise obscured by the summation of dense tissue. Two techniques of contrast-enhanced mammography are available: temporal subtraction of images acquired before and after contrast administration and the so-called dual-energy technique, which means that pairs of low/high-energy images acquired after contrast administration are subtracted. Tomosynthesis on the other hand provides three-dimensional information on the breast. The images are acquired with different angulations of the X-ray tube while the object or detector is static. Various reconstruction algorithms can then be applied to the set of typically nine to 28 source images to reconstruct 1-mm slices with a reduced risk of obscuring pathology. Combinations of both advanced applications have only been investigated in individual experimental studies. More advanced software algorithms and CAD systems are still in their infancy and have only undergone preliminary clinical evaluation.

Modern x-ray mammography uses dedicated systems (that is, a machine used only for breast x-rays) to produce x-rays that are high in quality but low in radiation dose. In the past, there were concerns about radiation risks. Modern mammography systems are tightly monitored by the **Mammography Quality Standard Act** (MQSA) and any risk is far outweighed by the benefits of early breast cancer detection. In order to x-ray the breast, a "softer" type of x-ray is used than for other parts of the body. Mammography is designed for imaging the soft tissue of the breasts as opposed to "harder" x-rays designed to penetrate and image the bones of the body.

X-ray mammography is the only approved examination to screen for breast cancer. However, **ultrasound imaging, magnetic resonance imaging** (MRI), **t-scan** (EIS impedance imaging), and **nuclear medicine imaging** have been further developed in recent years for use in imaging the breast, as adjunct tools to diagnostic **x-ray mammography**. MRI imaging, ultrasound and nuclear medicine do not provide the spatial resolution (fine detail) available with conventional x-ray mammography. However, MRI provides images with excellent contrast resolution that can help radiologists diagnose and differentiate breast cancers. Ultrasound is useful for imaging cysts and guiding breast biopsy. Nuclear medicine is good for evaluating the spread metastasis of cancer into the lymphatic system, other organs and skeletal system.

Researchers and medical imaging system manufacturers continue to invest tremendous resources into the field of breast imaging. The collective goal of this research and development is:

- To increase the number of cancers found with imaging before they are felt by the patient or her physician.

- To find cancers even smaller than those detected currently by mammography.
- To improve the accuracy of breast imaging in distinguishing benign breast conditions from cancers.
- To increase patient comfort and safety during breast imaging and biopsy.
- To continue to lower the dose of radiation require to produce quality mammograms.

This modern mammography system has excellent high adjustable flexibility allowing it to image patient breasts of all sizes in various positions.

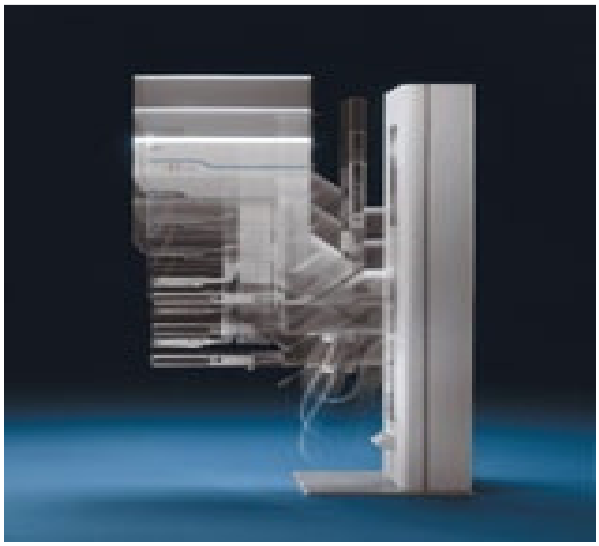


FIG NO: 4 SHOWING MODERN MAMMOGRAPHY MACHINE

Researchers and medical imaging system manufactures continuously strive to improve the design of mammography systems to increase patient comfort and safety during mammography and biopsy. Recent improvements to mammographic systems include:

a) Special devices to minimize patient discomfort while applying appropriate compression to maximize image quality.
b) Newer x-ray technologies that deliver excellent image quality and minimal x-ray dose.
c) Improved ergonomic designs to allow maximum flexibility in obtaining different anatomic views on a wide range of patients while providing improved patient comfort. Patients can now be imaged while standing, sitting or lying down, depending upon the need.
d) New technologies to allow the mammographic exam to be completed more quickly for increased patient comfort and convenience.

Ultrasonography

Ultrasonography is useful in differentiating solid and cystic lesions. However it has not been a useful tool because it is highly operator dependent. The American College Of Radiology Imaging Network (ACRIN) has performed a trial in high risk women in whom mammography and ultrasonography were performed in order to compare sensitivity, specificity and diagnostic yield of ultrasonography plus mammography alone. The investigators yield that combination of ultrasonography plus mammography allows for an increased diagnostic yield of 4.2cancers/1000 women. However, the use of ultrasonography resulted in more false positive events and required more callbacks and biopsies.

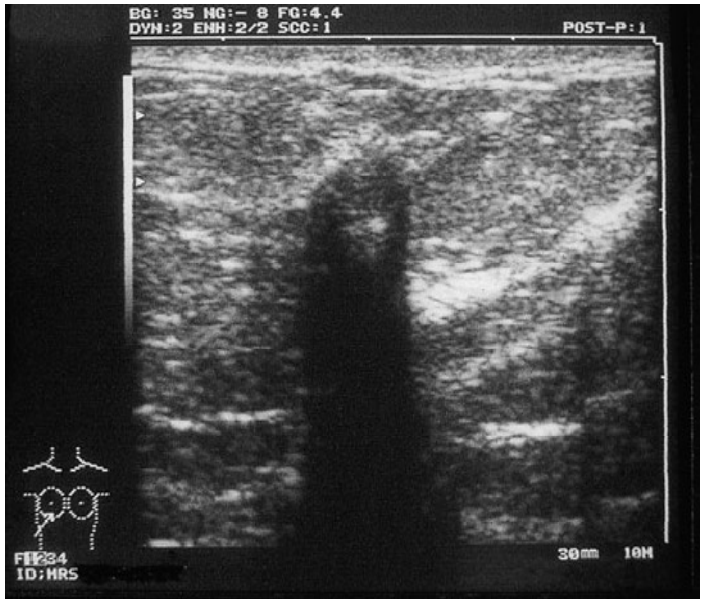


FIG NO: 5 ULTRASOUND OF BREAST SHOWING BREAST CYST

Magnetic resonance imaging[21,22]

MRI is increasingly being used for evaluation of breast abnormalities. It is used for identifying primary tumor in the breast who present with axillary lymphnode metastasis. It is also used for assessing extent of primary tumor with mammographic evidence of primary breast tumor. It is also used for assessing extent of primary tumor in young women who have dense breasts and for evaluating extent of invasive lobular carcinoma. MRI has also been shown as a useful screening tool in patients with known *BRCA* 1 mutations and in detecting contralateral breast cancers in women diagnosed to have unilateral breast cancer on mammography. The sensitivity for detecting invasive cancer by MRI is 90%.

Although MRI is highly sensitive (85% to 100%), it lacks specificity (47% to 60%). MRI is inferior to mammography in detecting insitu cancers and cancers smaller than 3mm and it costs no benefit over excisional biopsy for verifying malignancy.

Research suggests two potential roles for MRI in breast mass diagnosis:

a) Evaluating patients with silicon breast implants.
b) Assessing patients in whom evaluation by ultrasound and mammography is problematic.

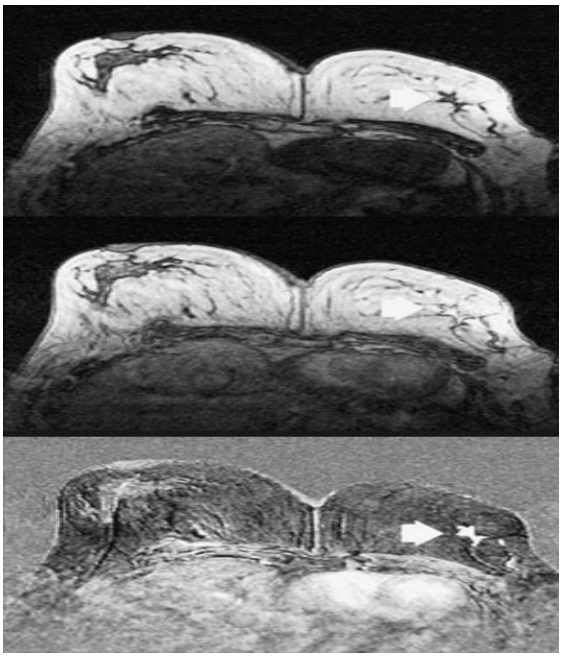


FIG NO: 6 MRI SHOWING CARCINOMA OF LEFT BREAST

- It can be useful to distinguish scar from recurrence in women who have had previous breast conservation therapy for cancer (although it is not accurate within 9 months of radiotherapy because of abnormal enhancement).
- It is the best imaging modality for the breasts of women with implants.
- It has proven to be useful as a screening tool in high-risk women (because of family history).
- It is less useful than ultrasound in the management of the axilla in both primary breast cancer and recurrent disease.

FINE NEEDLE ASPIRATION CYTOLOGY[23]

Technique

It is done with 22-guage needle, with an alcohol preparation. The aspirate must be properly prepared on a slide for cytological examination to be clinically useful. The main usefulness of this is to differentiate between solid and cystic masses.

FNAC is the least invasive and most accurate method of diagnosing cell diagnosis if both operator and cytologist are experienced. However, false negatives do occur mainly through sampling error and invasive disease cannot be distinguished from in situ disease. A histopathology biopsy taken before commencing treatment allows for preoperative diagnosis and also for commencing neoadjuvant therapy. It also allows tumor to be stained for receptor status.

If FNAC of suspected cyst does not reveal cyst fluid, the next step is to consider core needle biopsy usually under mammographic or ultrasonographic guidance. If cyst aspiration reveals blood tinged fluid, consideration should be given to image guided core needle biopsy. If cyst demonstrate to be a simple cyst on imaging, no further imaging is required. If the cyst demonstrate to be a complex one, further imaging is required.

If the mass is solid and clinical examination is consistent with carcinoma, cytological examination of aspirated material should be performed. The needle is inserted into the mass while applying consistent negative pressure to the syringe. Suction is released and needle is withdrawn. The cellular material and scanty fluid are submitted in normal saline or fixed immediately on slides in 95% ethyl alcohol.

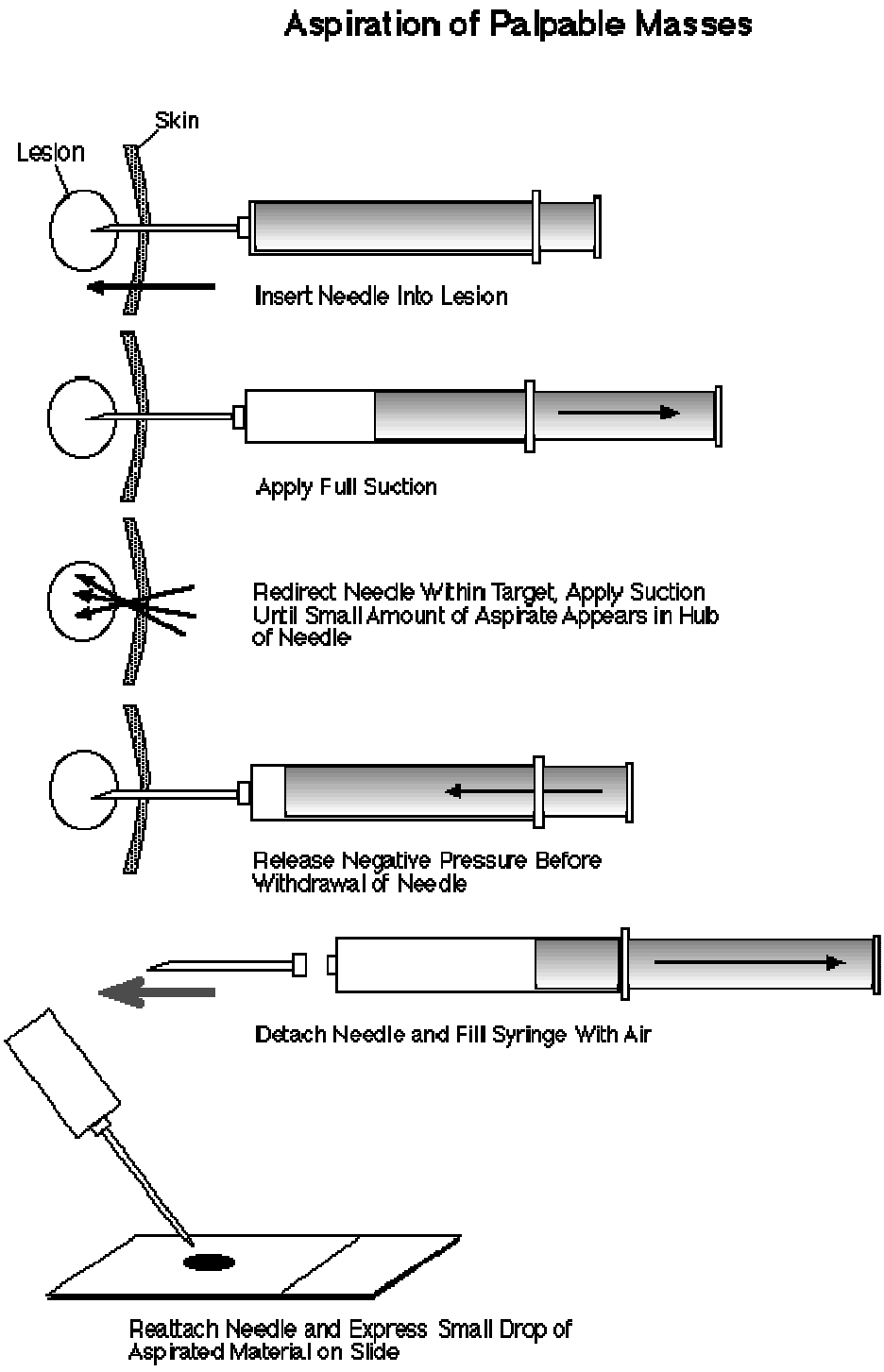


FIG NO: 7 SHOWS TECHNIQUE OF FNAC

1. Insertion of needle 2. Applying negative suction to aspirate
3. Redirect needle with target until small amount of aspirate appear
4. Release negative pressure 5. Detach needle and fill syringe with air
6. Express aspirated material onto slide

Reporting of the fine needle aspiration cytology of the breast falls in to 4 main categories.

1. Unsatisfactory (inadequate) cytology

Insufficient numbers or absence of epithelial cells

The standard criteria for a diagnostic aspirate are not yet well defined. Providing that the cells are well preserved and they are not obscured by blood and/or inflammatory cells, breast aspirate is said to be satisfactory when there are more than 3 to 6 epithelial cell groups per slide.

The unsatisfactory or inadequate sampling is due to,

1. Scant cellularity
2. Air drying or distortion artifact
3. Obscuring blood/inflammation.
4. Others.

2. No malignant cells seen

This may be expanded to include the type of cells and therefore suggest type of lesion. For example, the presence of apocrine metaplasia together with foam cells suggests cystic mastopathy. Benign cells aspirated from the breast are duct cells, apocrine cells, foam cell, stripped nuclei, fat cells, lymphocytes and red cells.

3. Malignant cells present

This report must be used only when there is no doubt that the lesion is malignant; as such a report should result in the patient receiving definitive treatment for the breast cancer. It is possible not only to diagnose malignancy but also to report whether the tumour is well, moderately or poorly differentiated and whether or not there is lymphocytic response. It is not possible to determine the presence or absence of invasion cytologically.

4. Cells present that are suspicious but not diagnostic of malignancy

The cytologist must advice excisional / incisional biopsy for the same.

Comparison of benign and malignant by fine needle aspiration cytology

BENIGN	MALIGNANT
Normal cell size	Increased cell size
Good cell adhesion	Loss of cell adhesion
Uniformity of cells	Pleomorphism
Low cellularity	High cellularity
Smooth nucleolar membrane	Jagged nucleolar membrane
Frequent strippled nuclei	Lack of strippled nuclei
Presence of sentinel cells	Lack of sentinel cells

Cytology in different conditions [24,25,26]

1. **Benign mammary dysplasia**

   When this lesion is aspirated one expects to see a few tight groups of duct cells, some adipose tissue and few stripped nuclei. Apocrine cells and foam cells are often seen, particularly when cysts are present.

2. **Fibroadenoma**

   This lesion produces very cellular specimen. Duct cells are seen in large groups and sheets in honey coomb appearance surrounded by many stripped nuclei. Some nuclear pleomorphism of the duct cells usually present. The high cellularity and mild to moderate pleomorphism of fibroadenoma may lead to false diagnosis of malignancy. This is the tumour most likely lead to false positive diagnosis.

3. **Phyllodes tumour**

   Variable cellularity, biphasic pattern similar to that of fibroadenoma. Cellular stromal component with spindle cells of various sizes and shapes. Variable cytological atypia and mitotic activity of stromal elements may be present.

4. **Pregnancy and lactation**

   Under hormonal stimulation the duct cells enlarge, round up, loose their adhesion and show prominent nucleoli. It helps in distinguishing these specimens from malignancy to note that the cells usually have little or no cytoplasm and that there is a protinaceous blue staining back ground in that numerous vacuoles appear, probably due to lipid droplets.

5. **Fat necrosis**

Aspirates show a messy mixture of degenerate fat cells, polymorphs, histiocytes and often a few giant cells. These are embedded in a blue staining background containing frequent holes, which are presumably dissolved lipid.

6. **Acute inflammation**

Like mastitis and breast abscess it produces sheets of degenerate pus cells and other leucocytes usually with histiocytes scattered throughout. Duct cells, when present shows inflammatory changes like nuclear enlargement and cells degeneration.

7. **Granulomatous mastitis-**

It is characterized by a cellular aspirate demonstrating conspicuous numbers of lymphocytes, plasma cells and granulomas with epitheloid and multinucleated giant cells. Isolated clusters of fibroblast and reactive ductal epithelial cells are also present. Occasionally necrosis may be seen. The cellular material from such aspirates should be carefully examined for the presence of acid-fast bacilli, fungi and parasites. Occasionally distinction between atypical mononuclear epitheloid histiocytes in granulomatous mastitis and neoplastic mammary epithelial cells may be difficult.

8. **Carcinoma of the breast**

A false diagnosis of breast carcinoma is unacceptable and it is to be avoided at all costs. It is much better to issue a false negative report and proceed to frozen section. There are structured criteria for the diagnosis of malignancy by cytology, which are stratified into:

a) Structural alterations in the cells.

b) Changes in inter relationship of cells in cell clusters

Structural modifications:

a) Alterations of nuclear cytoplasmic ratio with disproportionate enlargement of nuclei.

b) Hyperchromasia due to increased chromosomal content, aberrant chromatin pattern.

c) Increased number of nucleoli beyond the normal.

d) Multinucleation with nuclear atypia, abnormal mitotic figures.

e) Marked thickening of nuclear membrane.

f) Cytoplasmic changes enhanced by staining, such as pronounced basophilia/ acidophilia.

g) Presence of cytoplasmic inclusions like pigment granules, leukocytes and cellular debris.

Cell –Cell changes

a) Enlargement of cells beyond normal shape.

b) Aberrant forms with associated nuclear atypia.

c) Degenerative or necrotic changes.

d) Lack of uniform orientation of cells and nuclei anisocytosis/anisokaryosis – with marked variation in size of cells/nuclei within the same cell cluster.

e) Loss of distinct cell boundaries.

f) Dense grouping and crowding of cells and nuclei.

g) Engulfment of one cell by another.

Indirect Changes

a. Presence of blood from aspirate.
b. Increased Lymphocytes.
c. Prominent histiocytes and polymorphonuclear cells.

Well differentiated carcinoma of the breast

Diagnosis depends mainly upon the nuclear chromatin, which is finer and smoother than in benign duct cells, together with loss of adhesion of the cells. Other helpful factors are the greater cellularity of the specimens and the lack of stripped nuclei. These tumour cells are difficult to identify without experience.

Moderately and poorly differentiated carcinoma of the breast

These cases rarely present diagnostic difficulty. They show varying degrees of nuclear enlargement, loss of adhesions, pleomorphism abnormal nuclear chromatin and often prominent nucleoli.

Needle aspiration and/or scrapings from the Pagets disease of the nipple show large single malignant cells with clear cytoplasm (Paget cells). Usually there is a dirty back ground with inflammatory cells.

Other malignant tumors of the breast

a) **Colloid carcinoma -** It is suggested by the presence of sheets or columns and clusters of large tumour cells having compressed, crescent shaped nuclei with prominent nucleoli molded by one or two large cytoplasmic vacuoles (signet ring cells).
b) **Epidermoid carcinoma *(squamous)*-** It is rare tumour that may originate from the metaplastic epithelium of the duct lining or from the skin covering the nipple. The cytology will show orange keratinised malignant cells with

abnormal nuclei similar to ones described for squamous carcinoma of other sites.

c) **Medullary carcinoma-** In medullary carcinoma (brain like) aspirations may produce an abundance of large, ovoid or polygonal cells with adequate, vesicular, slightly basophilic cytoplasm and round or oval large nuclei with prominent, single nucleoli. Large number of lymphocytes may also be present.

d) **Breast sarcoma-** Breast angiosarcoma (lymphangiosarcoma and haemangiosarcoma) is very rare. It accounts for 0.5% of malignant tumors of the breast. It usually develops following radiotherapy to the breast e.g. for Hodgkin's lymphoma usually after 10 to 20 years. It may be very difficult to distinguish clinically a sarcoma of the breast from medullary carcinoma, but areas of cystic degeneration suggest sarcoma and on incising the neoplasm it is pale and friable. Sarcomas tend to occur in younger women between age 30 and 40 years. It is very difficult to differentiate by fine needle aspiration cytology. The lesion is composed of numerous slit like, irregular dilated vascular channels dissecting between collagen bundles lined by atypical endothelial cells.

e) **Lipoma-** A true lipoma of the breast is very rare.

f) **Metastasis-** On rare occasions, cancer may present with a metastasis in the breast. The breast is also occasionally infiltrated by Hodgkin's disease.

ADVANTAGES OF FNAC

1) Does not require anaesthesia.
2) Tolerated by patients as an outpatient procedure.
3) No specialized equipment is required.
4) No damage to breast tissue that may occur with open biopsy.

5) Though small hematomas may be encountered, neither hemorrhage nor sepsis is noted.
6) Can easily diagnose cysts / abscesses and treat them.
7) Eliminated need for open biopsy when a diagnosis of carcinoma is made.
8) Can be easily repeated.

LIMITATIONS

1) Cannot qualify the type of malignancy
2) There may be false negative reports when
    a. Small tumors <1 cm.
    b. Sclerotic lesions.
    c. Deep seated tumors.
    d. Large/pendulous breasts.

CORE NEEDLE BIOPSY[27]

Core needle biopsy is investigation of choice for nonpalpable image detected breast abnormalities. This technique is also preferred for palpable lesions. It can be done under mammographic, ultrasonographic or MRI guided. Mass lesions that are visualized on ultrasonography can be sampled under ultrasonographic guidance. Calcifications and densities that are best seen on mammography are sampled under stereotactic guidance.

During stereotactic core needle biopsy, the breast is compressed, most often with the patient lying prone on stereotactic core biopsy needle. A robotic arm and biopsy device are positioned by computed analysis of triangulated mammographic images. After local anaesthesia is injected, a small skin incision is made and **11 gauge core biopsy needle** is inserted to obtain tissue sample under vacuum assistance.

There are standards for obtaining number of core biopsies for tissue diagnosis based on the type of abnormality. Clips should be placed for marking purpose and for identifying lesions that are difficult to be detected by mammography. The specimen should be placed on petridish and imaged to conform that target lesion has been obtained. A similar approach is used for ultrasonographic and MRI-guided biopsy of lesions. A post biopsy mammogram is obtained to identify the defect that has been created which indicates that biopsy has been taken for sampling.

Various studies conducted

In a study conducted by Ghimire et al. in department of surgery, Institute of Medicine Tribhuvan University Teaching Hospital in 2008 involving 117 patients with an age group of 35 to 70 years, all patients underwent triple test which was correlated with histopathology. The sensitivity, specificity of triple test was 100% and 95.2% with an overall accuracy of 98%.[28]

Chalya PL et al. conducted a study in Department of Surgery, Bugando Medical Centre, Tanzania involving 212 patients from March 2009 to Feb 2012 for evaluation of symptomatic lesions with age range between 35 years to 78 years with median age of 43 years from, it was observed that the sensitivity and specificity of triple assessment was 100% and 100% with overall accuracy of 100%.[31]

Masooda Jan and others conducted a study in Department of Surgery, Government Medical College, Srinagar, Kashmir over a period of 3 years from June 2005 to May 2008 involving 200 patients with breast lump irrespective of age, it was found that the sensitivity and specificity of triple assessment was 100% and 99.3%

with (P 0.000). It also showed that the most common quadrant involved was upper outer and most common side of involvement of breast was right.[29]

Rajan V and others conducted a study in 2013 at Mahatma Gandhi Medical College and Research Institute, Nagpur involving 80 patients with palpable breast lumps were assessed by triple assessment. The results of triple test were compared with final histopathological examination. It was found that, the sensitivity and specificity of triple assessment was 100%, 82% and an overall diagnostic accuracy of 88.7%.It also showed that the number of malignant cases were more in the age group of 41 to 50 years.[30]

MATERIALS AND METHODS

Source of data

All patients attending the surgery OPD &/or admitted patients in BLDEU's Shri B. M. Patil Medical College Hospital & Research Centre, Bijapur with symptoms/ clinical features of breast lesions, undergoing surgery for the same, during the period of October 2012 to May 2014 were included in the study.

Calculated sample size: 50

Following formula was used to estimate the sample size

$$n = \frac{z^2_{\alpha/2}\, p\, q}{e^2}$$

$$= \frac{1.96^2 * 0.0229 * 0.9771}{0.041463^2}$$

$$= 50$$

e- permissible error

Zα/2- be the critical value of z distribution at 5% level of significance

p- incidences

q- 1-p

Statistical analysis was done by-

a) Mean± 2SD

b) Diagrammatic representation

c) Chi square test

Inclusion criteria

All patients attending surgery OPD and / or admitted with breast lesions, who underwent surgery for the same were included in the study irrespective of age.

Exclusion criteria

1) Patients with proven diagnosis of carcinoma of breast .
2) Patients with acute bacterial mastitis.

Method of collection of data:

- Patients coming with history of breast lesions were included after informed consent. Detailed history was taken.
- They underwent evaluation of breast lesions by clinical examination, sonomammography or mammography and FNAC.
- After appropriate surgery, the results were compared with final histopathology report to assess the accuracy of triple assessment.

Statistical analysis

The data was analysed by Z test. P value of <0.005 was considered statistically significant.

RESULTS

The study was conducted on a total of 50 patients irrespective of age who presented with history of breast lumps for which clinical examination was done first followed by mammogram and finally FNAC to come to a provisional diagnosis in BLDEU's Shri B.M.Patil Medical College Hospital and Research Centre, Bijapur from October 2012 to May 2014.

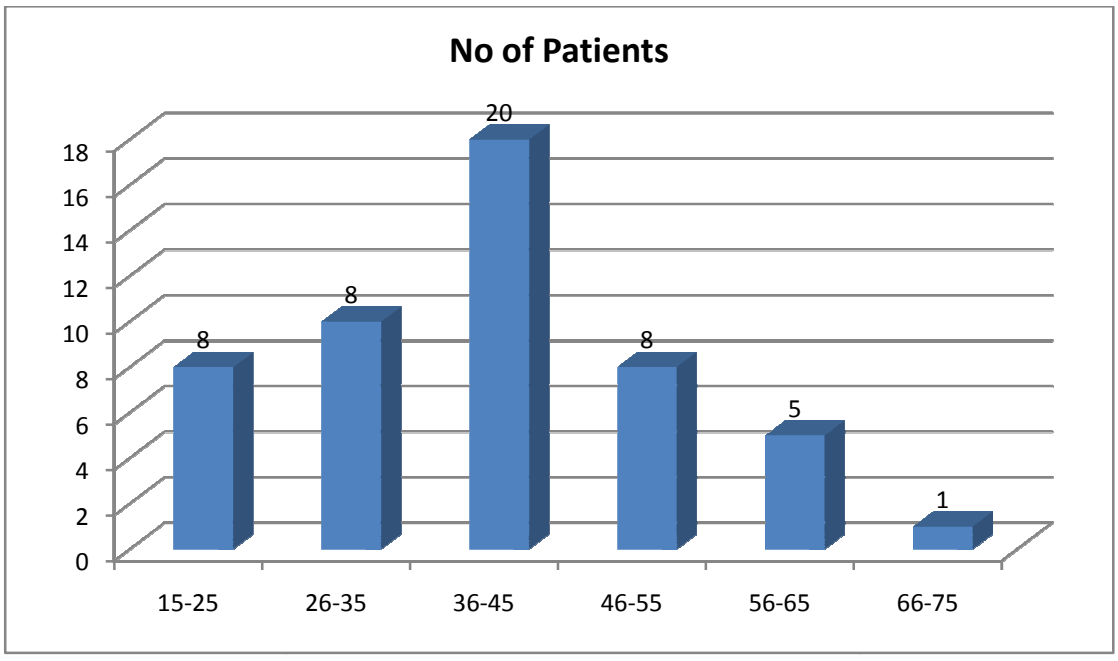
Among 50 patients, 22 turned out to be malignancies on histopathology, 21 had infiltrating ductal carcinoma and 1 had atypical medullary carcinoma.

28 were benign lesions on histopathology, 22 had fibroadenoma, 3 had fibroadenosis with fibrocystic disease and 3 had duct ectasia.

Table no-1 Distribution of lumps by age group

Age(yrs)	No.of patients
15-25	8
26-35	8
36-45	20
46-55	8
56-65	5
66-75	1
Total	50

Graph No.1 Distribution of lumps by age group

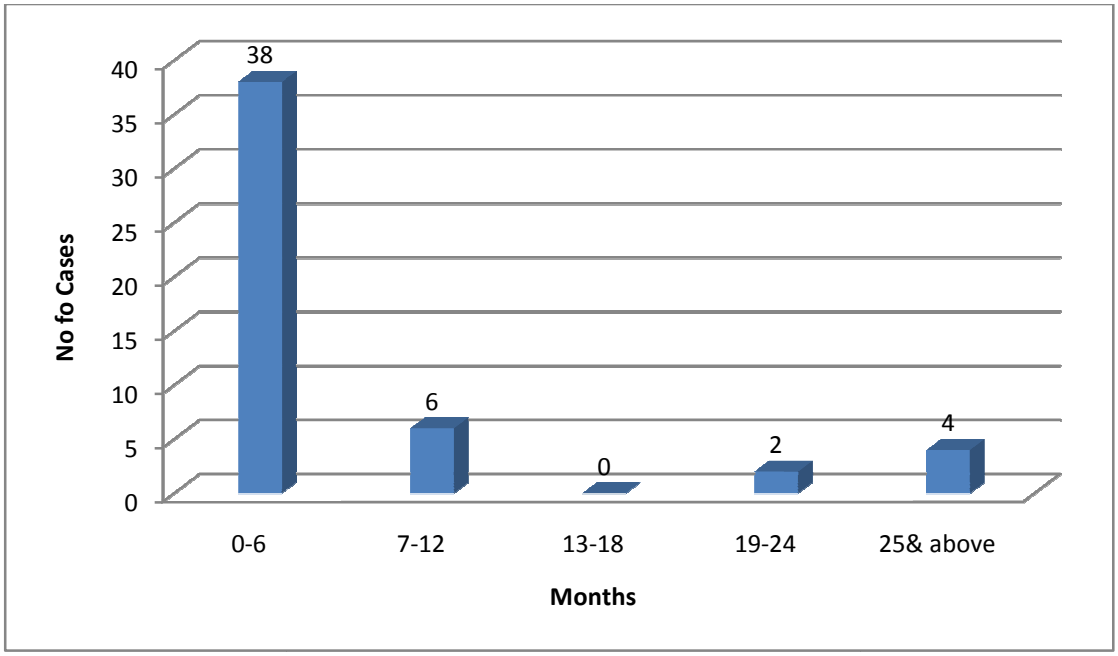


From the above graph, it seen that lumps were more common in age group of 36-45yrs.

Table no.2 Based on duration of symptoms

Duration of symptoms(months)	Number	Percentage
0-6	38	76%
7-12	06	12%
13-18	0	0
19-24	02	4%
25 & above	04	8%
Total	50	100%

Graph No.2 Bar diagram on duration of symptoms (Months)



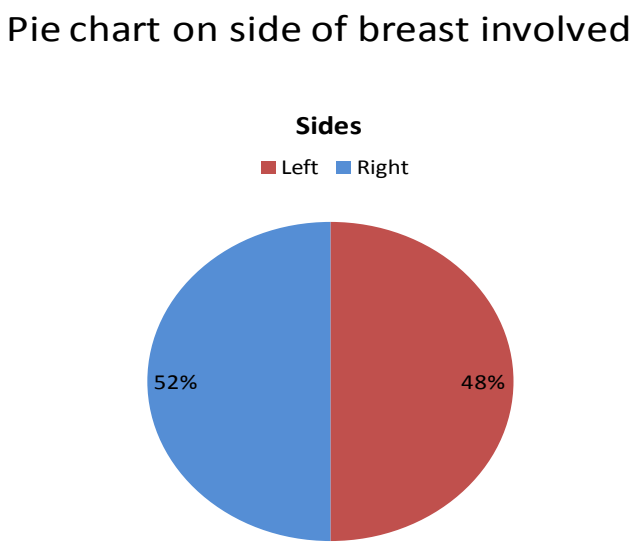
Most of the patients had symptoms in the range of 0-6 months

Table no.3 Based on side of the breast involved

Right breast(no.)	Left breast(no.)
26(52%)	24(48%)

Pie chart No.1

Pie chart on side of breast involved

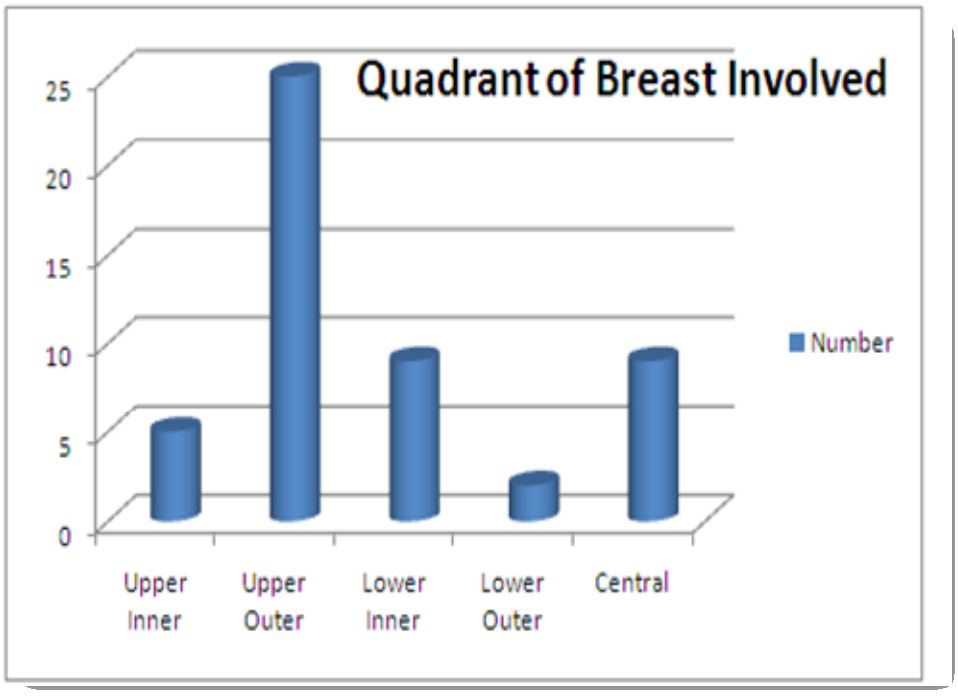


Right breast was involved more commonly than left breast

Table No.4 Table on quadrant of breast involved

Quadrant	Number	Percentage
Upper inner	5	10%
Upper outer	25	50%
Lower inner	9	18%
Lower outer	2	4%
Central	9	18%
Total	50	100%

Graph No.3 Bar graph on quadrant of breast involved

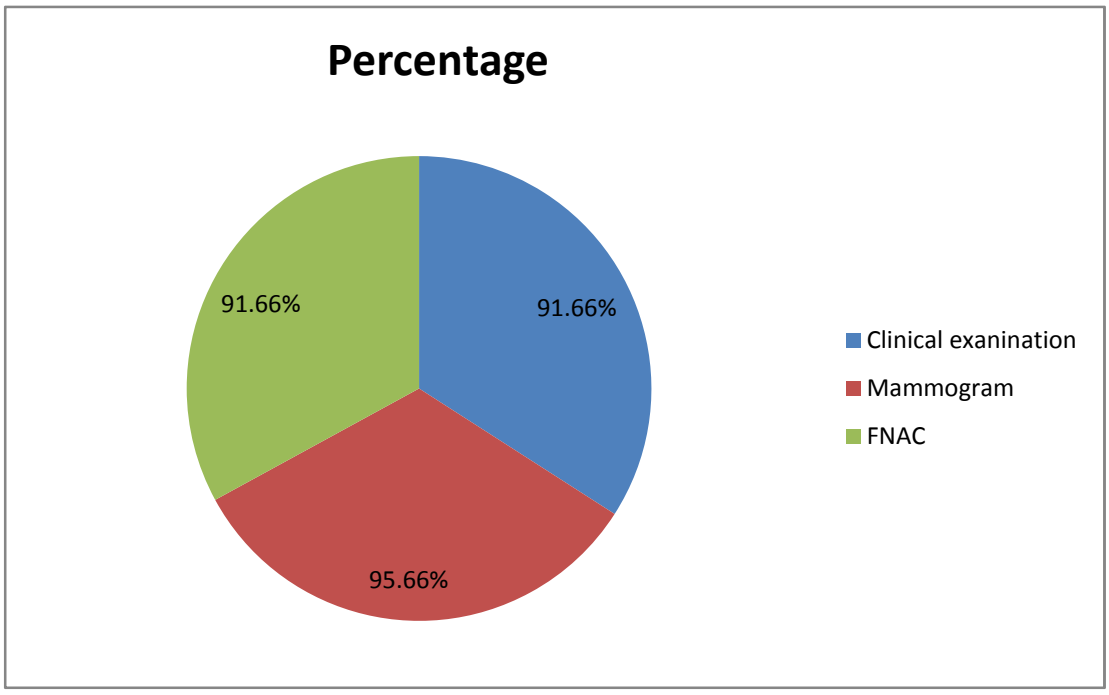


Among all the quadrants, the percentage involvement of upper outer quadrant alone constituted 50% whereas central and lower inner quadrant constituted 18% each with upper inner 10% and lower outer constituting 4% respectively.

Table No.5-Malignant cases diagnosed by triple assessment

Method	Number	Sensitivity
Clinical examination	20	91.66%
Mammogram	21	95.66%
FNAC	20	91.66%

Pie chart No.2: Malignancies diagnosed by triple assessment

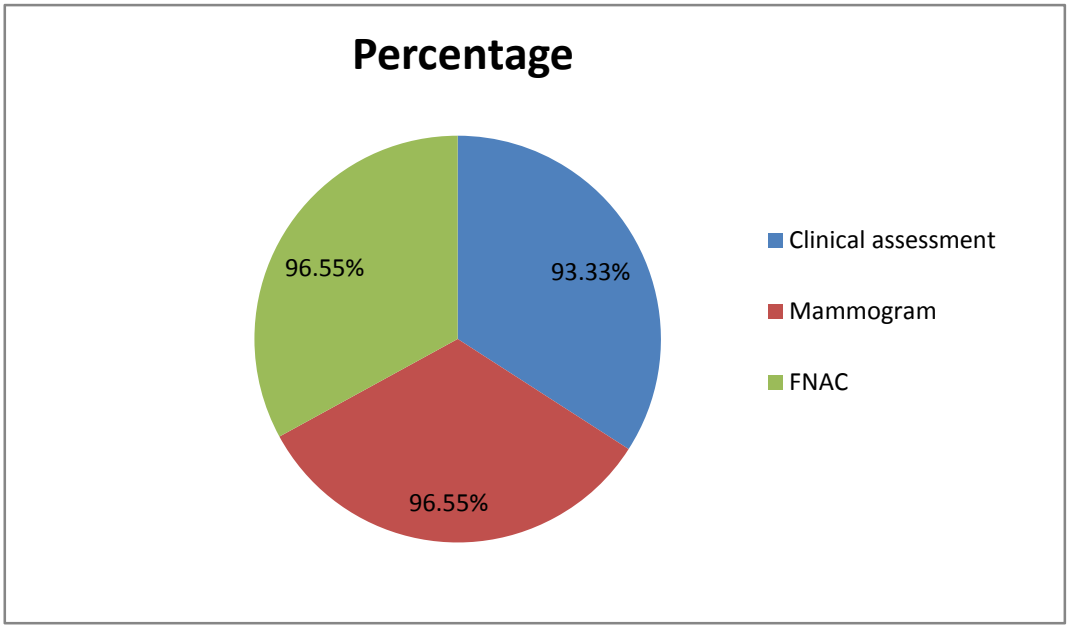


Thus it was seen that the sensitivity of detecting malignant cases alone by clinical examination was 91.66% i.e. 20 cases, by mammogram 95.66% i.e.21 cases and by FNAC was 91.66%.i.e.20 cases.

Table no.6: Benign cases diagnosed by triple assessment

Method	Number	Sensitivity
CE	30	93.33%
Mammogram	29	96.55%
FNAC	30	93.33%

Pie chart No.3: Benign cases diagnosed by triple assessment

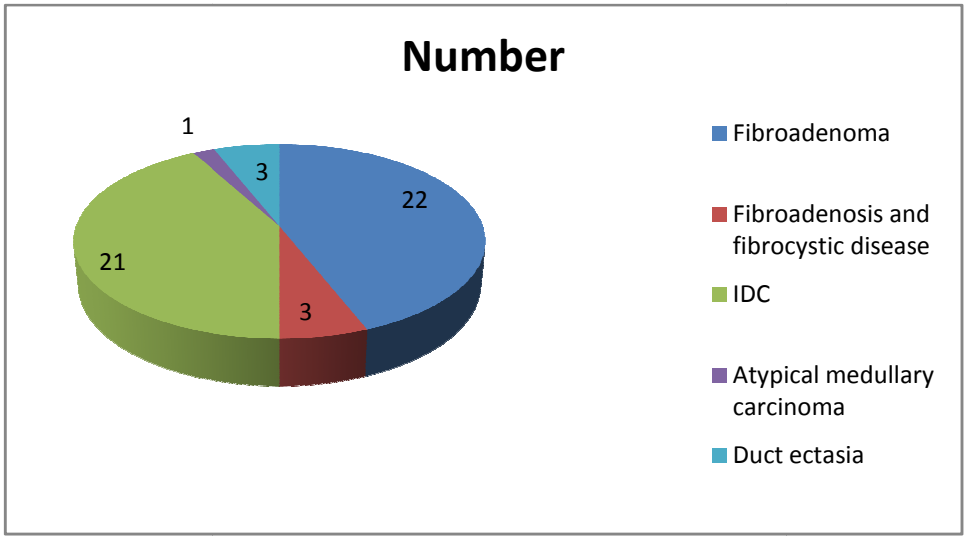


Thus it is seen that the no. of benign cases being diagnosed by clinical assessment was 30(93.33%), mammogram 29(96.55%) and by FNAC 30(96.55%).

Table no.7: Table on final histopathology report

Histopathology	Number	Percentage
Fibroadenoma	22	44%
Fibroadenosis and fibrocystic disease	03	6%
Infiltratingductal carcinoma	21	42%
Atypical medullary carcinoma	01	2%
Duct ectasia	03	6%

Pie chart No 4: Histopathology Report



The lumps diagnosed by HPR were fibroadenoma 22, infiltrating ductal carcinoma 21, fibroadenosis and duct ectasia 3 each and 1 atypical medullary carcinoma.

Table No.8 : Table on Sensitivity and Specificity of individual tests(both benign and malignant)

	Clinical examination	**Mammogram**	**FNAC**	**Clinical +mammogram +FNAC**
Sensitivity(benign) (malignant)	93.33% 91.66%	96.55% 95.66%	96.55% 91.66%	100%
Specificity(benign) (malignant)	91.66% 93.33%	95.65% 96.55%	95.65% 96.55%	100%
PPV(benign) (malignant)	93.33% 91.66%	96.55% 95.66%	96.55% 95.65%	
NPV (benign) (malignant)	91.66% 93.33%	95.65% 96.55%	95.65% 93.33%	

Considering the malignancy as positive when it is positive even in a single test among clinical examination, mammography and fine needle aspiration cytology or considering the malignancy as positive when any of the three tests are positive sensitivity is 100% and specificity is 100%.

DISCUSSION

The first step in management of patient coming with history of breast lump is, detailed clinical examination, mammogram in females above 35 years of age / sonomammogram in women of less than 35 years of age is performed and finally FNAC is done to come to a provisional diagnosis. This allows precise diagnosis of palpable breast lumps and reduces misdiagnosis. In this study, all the 50 patients underwent triple assessment. i.e, clinical examination, mammogram/ sonomammogram and finally FNAC and it was followed by definitive surgical procedure and compared with histopathology report.

On histopathology, 22 were malignant and 28 were benign. Among all three components, the sensitivity was more in mammography than other two. The number of malignancies which were diagnosed by clinical examination was 20, by mammogram 21 and by FNAC 20 and it was compared with histopathology.

Diagnostic method	**Benign**	**Malignant**	**Total**	**Chi-square value**	***P* value**
Clinical examination	30	20	50	3.89	<0.05
FNAC	30	20	50		
Mammogram	29	21	50		

Conclusion-Thus it is clear that there is an association between triple assessment and malignancy.

1. Comparison of age incidence of both benign and malignant cases with Rajan V et al study

Age group	Present study		Rajan V et al	
	B	M	B	M
15-25	8	0	34	0
26-35	7	1	09	05
36-45	10	10	7	19
46-55	3	5	0	4
56-65	0	5	0	2
66-75	0	1	00	00

Considering the age incidence, our study involved more cases in the in the age group of 36-45years(Benign-10, Malignant-10) compared to Rajan V et al study which involved more benign cases in 15-25 age group and more malignant cases in age group 36-45 years.

2. Comparison of involvement of side of breast with Masooda Jan and others with our study

Side of breast	Present study	Masooda Jan and others
Left	48%	40%
Right	52%	58.5%
Bilateral	0%	1.5%

Considering the side of the breast involved, our study involved maximum cases in right side of the breast compared to Masooda Jan and others which also showed maximum cases involving right side of the breast.

3. Comparison of quadrant wise distribution of palpable breast lumps with Masooda Jan and others

	Present study	**Masooda Jan and others**
Upper inner	10%	17%
Upper outer	50%	48%
Lower inner	18%	12.5%
Lower outer	04%	11.5%
Central	18%	11%

Considering the quadrant of the breast involved, our study shows that upper outer quadrant was involved more than other quadrants compared to Masooda Jan and others which also involved lumps in upper outer quadrant.

4. Comparison of sensitivity and specificity of clinical examination with Philip J.Drew et al. Ghimire et al and Masooda Jan with our study.

Clinical examination	**Present study**	**Chalya PL et. al**	**Ghimire et.al**	**Masooda Jan and others**
Sensitivity	91.66%	100%	87%	92%
Specificity	93.33%	100%	80%	66.7%

Clinical examination of breast in good hands remains a sensitive test and reliable method to differentiate benign and malignant lumps. In our study it was 91% compared to Chalya PL et.al which showed 100% sensitive in detecting malignant lump.

5. Comparison of sensitivity and specificity of mammogram with Masooda Jan Philip J Drew and Ghimire et al with our study.

	Present study	**Chalya PL et.al**	**Ghimire et al**	**Masooda Jan and others**
Sensitivity	95.66%	100%	91%	96%
Specificity	96.55%	100%	78%	66.7%

Thus in the present study showed almost equal specificity and sensitivity in detecting both benign and malignant lumps by mammogram compared to Chalya PL et.al study which showed 100% sensitivity and 100% specificity. Ghimire et.al and Masooda Jan both showed high sensitivity and low specificity in detecting both benign and malignant lumps by mammogram.

6. Comparison of sensitivity and specificity of FNAC with Philip J Drew et al Ghimire et al and Masooda Jan and others.

	Present study	**Chalya PL et. al**	**Ghimire et al**	**Masooda Jan and others**
Sensitivity	91.66%	100%	97.7%	100%
Specificity	96.55%	100%	99.4%	97.1%

The present study showed low sensitivity and high specificity in comparison with Philip J Drew et al which showed low sensitivity and high specificity in detecting malignant lumps.

Ghimire et.al observed that the sensitivity, specificity of triple test was 100% and 95.2% with an overall accuracy of 98%.

Chalya PL et.al observed that the sensitivity and specificity of triple assessment was 100% and 100% with overall accuracy of 100%.

Masooda Jan and others observed that sensitivity and specificity of triple assessment was 100% and 99.3% with (P 0.000).

Rajan V and others observed that the sensitivity and specificity of triple assessment was 100%, 82% and an overall diagnostic accuracy of 88.7%.

7. Comparison of sensitivity and specificity of triple test with Ghimire et. al, Chalya PL et. al, Rajan V and others, Masooda Jan and others with our study.

	Sensitivity of triple test	**Specificity of triple test**
Ghimire et.al[28]	100%	95%
Masooda Jan and others[29]	100%	99.3%
Rajan V and others [30]	100%	82%
Chalya PL et.al[31]	100%	100%
Our study	100%	100%

CONCLUSION

Our study shows that triple assessment is 100% sensitive and 100% specific in diagnosing both benign and malignant lumps.

SUMMARY

- This prospective study was performed in 50 patients irrespective of age attending BLDEU's Shri B.M.Patil Medical College, Hospital and Research Centre, Bijapur from October 2012 to August 2014.
- All patients were subjected to detailed clinical examination followed by mammogram /sonomammogram and finally FNAC is done to come to provisional diagnosis.
- Then they underwent appropriate surgery for the same.
- The excised specimen was subjected to histopathology for final diagnosis.
- Out of 50 patients, 22 had malignancy and 28 had benign lesion.
- Out of 22 malignant lumps, 21 were infiltrating ductal carcinoma and 1 atypical medullary carcinoma.
- Out of 28 benign lumps, fibroadenoma constituted 22, fibroadenosis 3 and duct ectasia 3.
- Sensitivity of clinical examination was 91.66% and specificity 93.33%
- Sensitivity of mammogram was 95.66% and specificity 96.55%
- Sensitivity of FNAC was 91.66% and specificity 96.55%
- In our study, the diagnostic accuracy of triple assessment was 100%.

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BLDEU'S SHRI B.M.PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRES BIJAPUR-586103

SAMPLE INFORMED CONSENT FORM

TITLE OF THE PROJECT : **DIAGNOSTIC ACCURACY OF TRIPLE ASSESSMENT IN BREAST LUMPS**

PG GUIDE : **DR. M.S. KOTENNAVAR**

PROFESSOR OF SURGERY

BLDEU'S Shri B.M. Patil

Medical College, Hospital &

Research Centre,

Bijapur, Karnataka.

PG STUDENT: **DR. ANIKETAN K.V.**

Department of Surgery

PURPOSE OF RESEARCH

I have been informed that the purpose of this study is to compare the efficacy of triple assessment in breast lesions with histopathology.

I have also given free choice of participation in this study.

This study helps in proper understanding of triple assessment in breast lesions.

PROCEDURE:

I am aware that in addition to routine care received I will be asked series of questions by the investigator. I have been asked to undergo the necessary investigations, which will help the investigator in this study.

RISK AND DISCOMFORTS:

I understand there is no risk involved and I will experience some pain and discomfort during my procedures performed. This is mainly the procedure of this study and is not expected to exaggerate these feelings that are associated with usual course of the treatment.

BENEFITS:

I understand that my participation in this study will help in assessing the accuracy of triple assessment in breast lumps.

CONFIDENTIALITY:

I understand that the medical information produced by this study will become a part of Hospital records and will be subject to the confidentiality and privacy regulation. Information of a sensitive personal nature will not be a part of the medical records, but will be stored in the investigator's research file and identified only by a code number. The code-key connecting name to numbers will be kept in a separate location.

If the data are used for publication in the medical literature or for teaching purpose, no name will be used and other identifiers such as photographs and audio or videotapes will be used only with my special written permission. I understand that I may see the photographs and videotapes and hear the audiotapes before giving this permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at anytime. Dr Aniketan K.V. is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation.

If during the study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. A copy of this consent form will be given to me to keep for careful reading.

REFUSAL FOR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital. I also understand that Dr.Aniketan K.V. may terminate my participation in the study after he has explained the reasons for doing so and has helped arrange for my continued care by my own physician or physical therapist, if this is appropriate.

INJURY STATEMENT:

I understand that in the unlikely event of injury to me resulting directly from my participation in this study, if such injury were reported promptly, the appropriate treatment would be available to me, but no further compensation would be provided.

I understand that by my agreement to participate in this study I am not waiving any of my legal rights.

I have explained to _____the purpose of the research, the procedures required and the possible risks and benefits to the best of my ability in patient's own language.

Date

Dr. Aniketan K.V. Dr. Manjunath.S. Kotennavar

(Investigator) (Guide)

STUDY SUBJECT CONSENT STATEMENT:

I confirm that Dr. Aniketan K.V. has explained to me the purpose of research, the study procedures that I will undergo, and the possible risks and discomforts as well as benefits that I may experience in my own language. I have read and understood this consent form. Therefore, I agree to give consent to participate as a subject in this research project.

_____

Participant / Guardian Date

_____

Witness to signature Date

SCHEME OF CASE TAKING:

1) Case No: 8) IP NO/OP NO:

2) Name 9) D.O.A:

3) Age: 10) D.O.S:

4) Sex 11) D.O.D:

5) Religion:

6) Occupation:

7) Address:

12) Chief complaints

Lump: Yes ____ No ____

Duration ---------- Size ----------

13) History of Presenting Illness:

Duration of lump

Number

Mode of onset

Site

Pain

Relation with menstrual cycle Yes _____ No _____

H\o discharge from lump or nipple

Associated symptoms

14) Past History:

H/o similar complaints in the past

15) Family History:

Similar complaints:

h/o breast malignancy

16) Personal History:

Diet: Veg/Mixed

Appetite:

Sleep:

Bowel and bladder:

Menstrual history

Age at menarche

Age at marriage

Age at first child birth

Breast feeding

Menstrual cycles

Menopause

Obstetric history

17) General Physical Examination

Pallor	present/absent
Icterus	present/absent
Clubbing	present/absent
Generalized Lymphadenopathy	present/absent
Built	Poor/Moderately nourished/Well nourished

18) Vitals

PR:	RR:
BP:	Temp:

19) Local Examination

Inspection

R L

Number

Size

Shape

Position

Discharge

Palpation

Local rise of temperature

Tenderness

Size

Shape

Surrounding skin

Mobility/fixity

Nipple

Examination of lymph nodes

20) Other systemic examination

Respiratory system

Cardiovascular system

Central nervous system

21) Provisional diagnosis

22) Investigations

- Blood for
    - Hb:
    - TC:
    - DC:
    - ESR:
    - HIV: (done for universal precautions)
    - HbsAg (done for universal precautions)
    - Random blood sugar:

- Urine for
    - Albumin :
    - Sugar :
    - Microscopy :

B) MAMMOGRAPHY/ SONOGRAPHY FINDING:

FINE NEEDLE ASPIRATION CYTOLOGY:

No/date

SURGICAL PROCEDURE:

HISTOPATHOLOGY REPORT:

No/date

FINAL DIAGNOSIS:

INFERENCE:

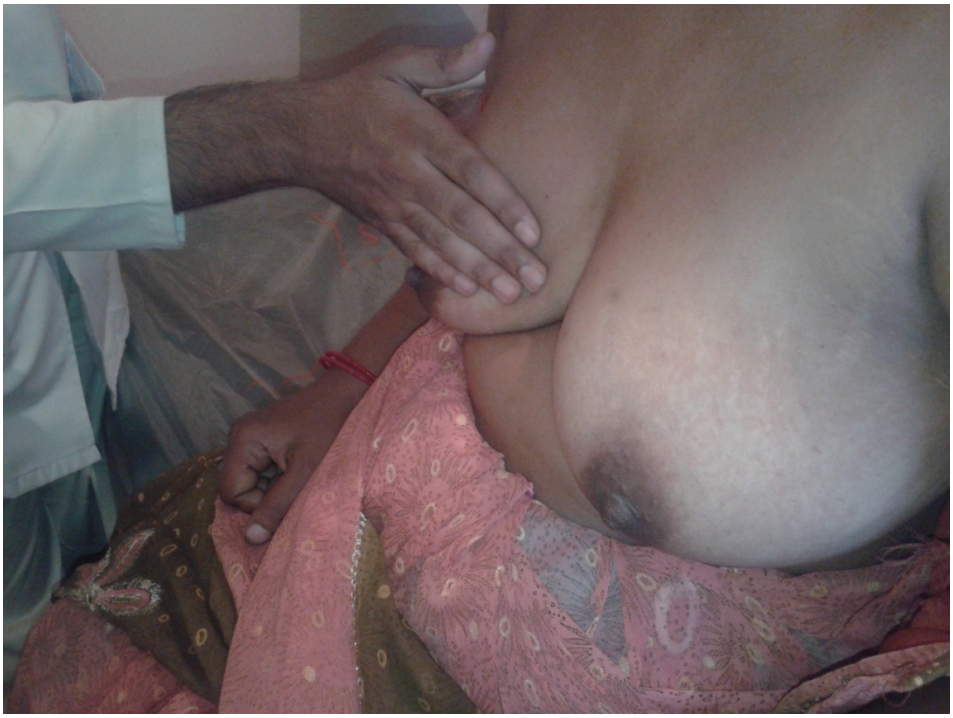


FIG NO.8 CLINICAL EXAMINATION OF BREAST WITH ARMS BY THE SIDE

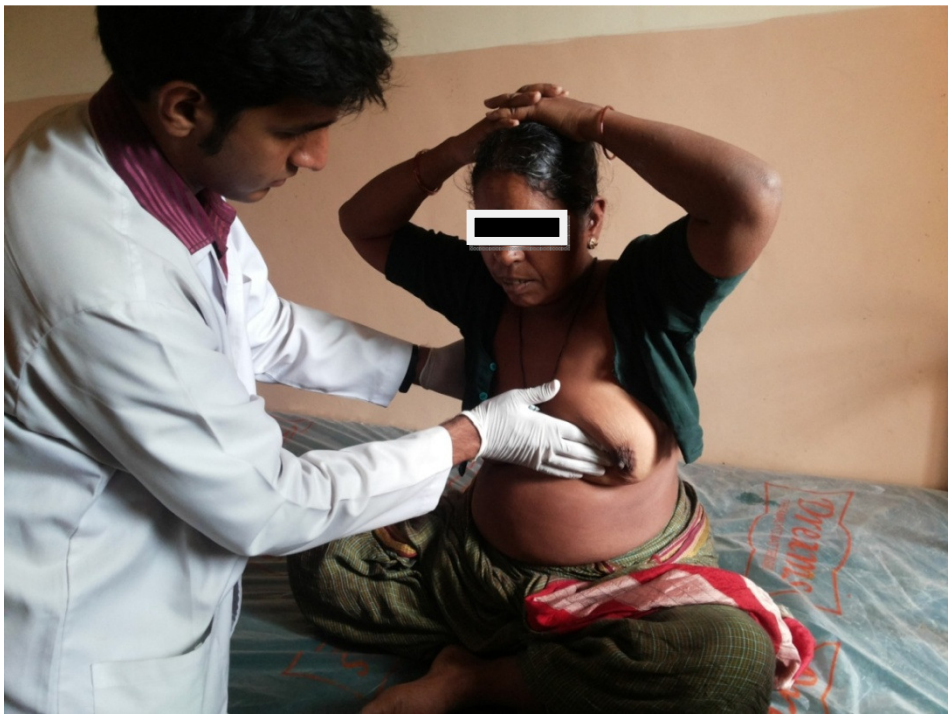


FIG NO.9 CLINICAL EXAMINATION OF BREAST WITH ARMS RAISED ABOVE THE HEAD

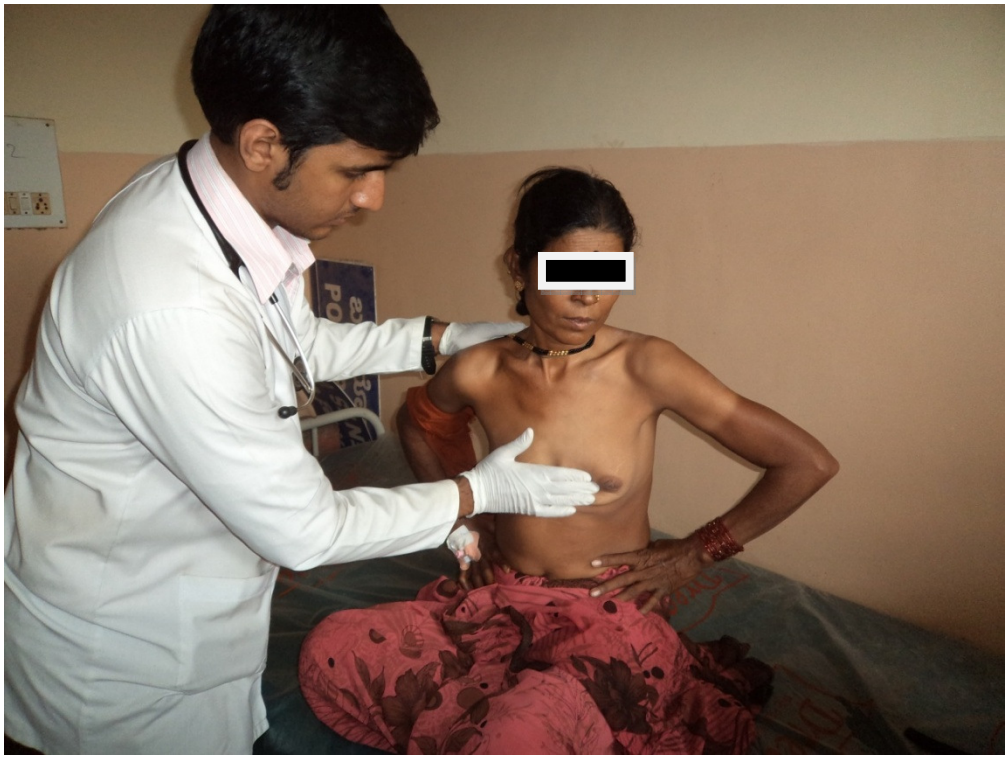


FIG NO.10 CLINICAL EXAMINATION OF BREAST WITH ARMS ON BOTH THE HIP JOINTS

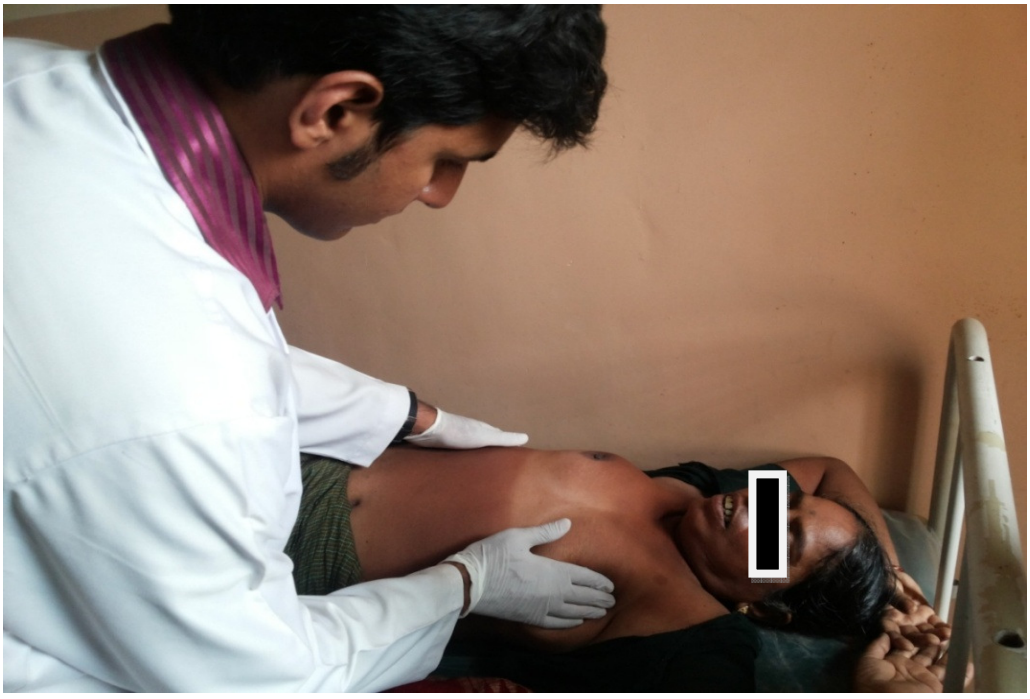


FIG NO 11. CLINICAL EXAMINATION OF BREAST IN SUPINE POSITION

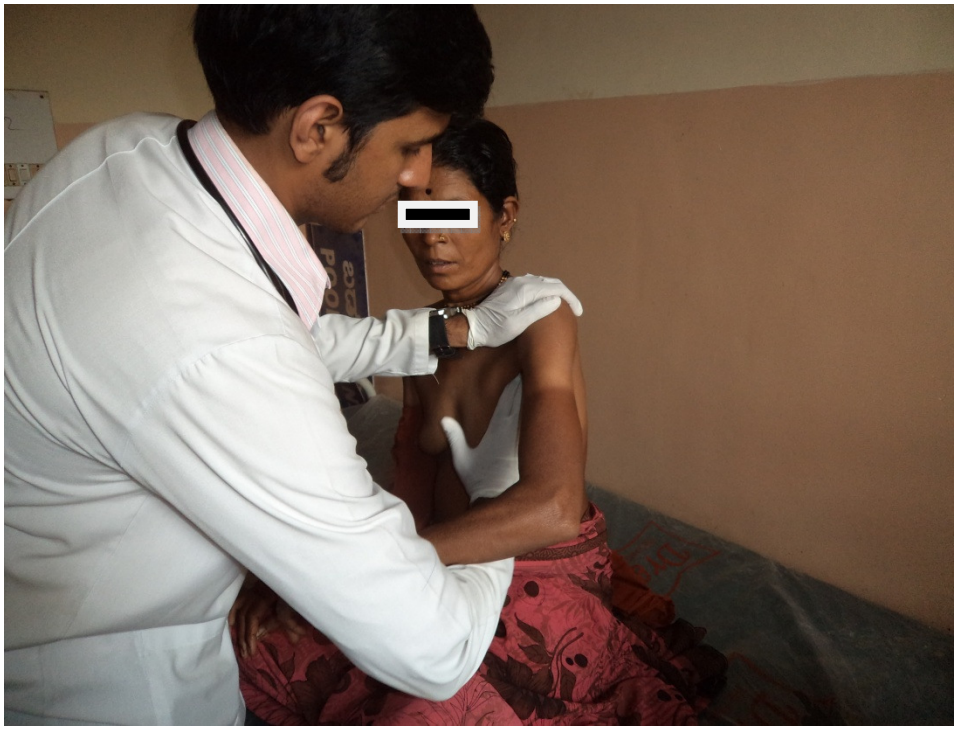


FIG NO.12.CLINICAL EXAMINATION OF AXILLARY LYMPHNODE

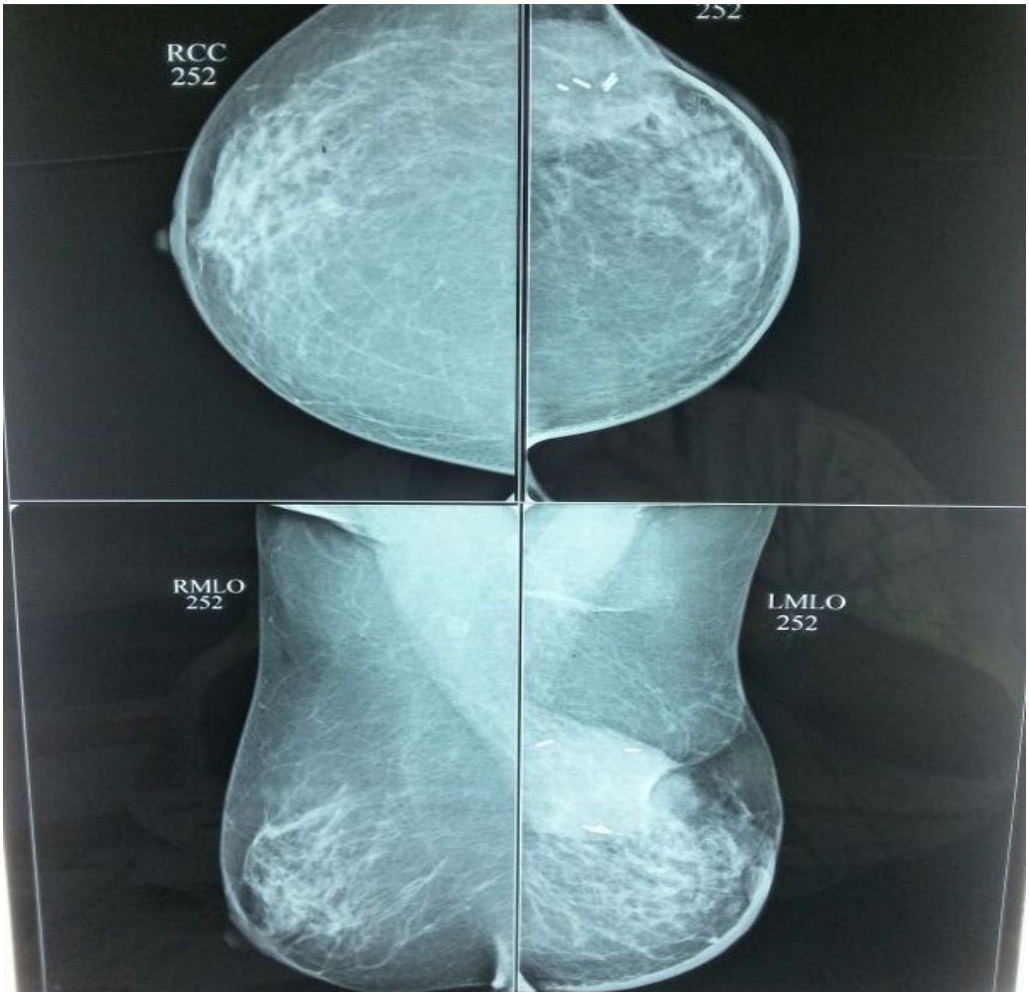


FIG NO. 13 MAMMOGRAPH OF BREAST(FIBROADENOMA) ON CRANIOCAUDAL AND MEDIOLATERAL OBLIQUE VIEW SHOWING WELL DEFINED SOFT TISSUE DENSITY MASS IN RIGHT OUTER QUADRANT OF BREAST WITH FEW AREAS OF SPECS OF CALCIFICATION SUGGESTING FIBROADENOMA

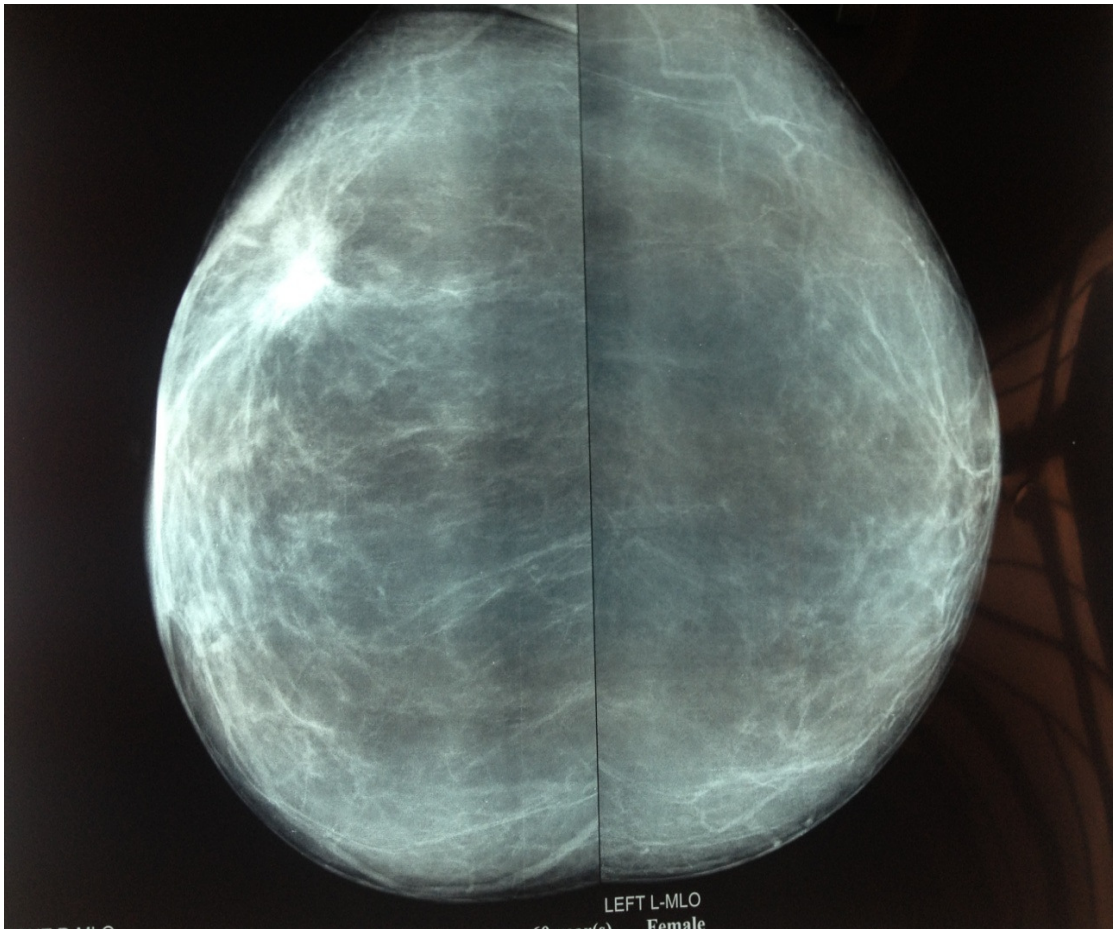
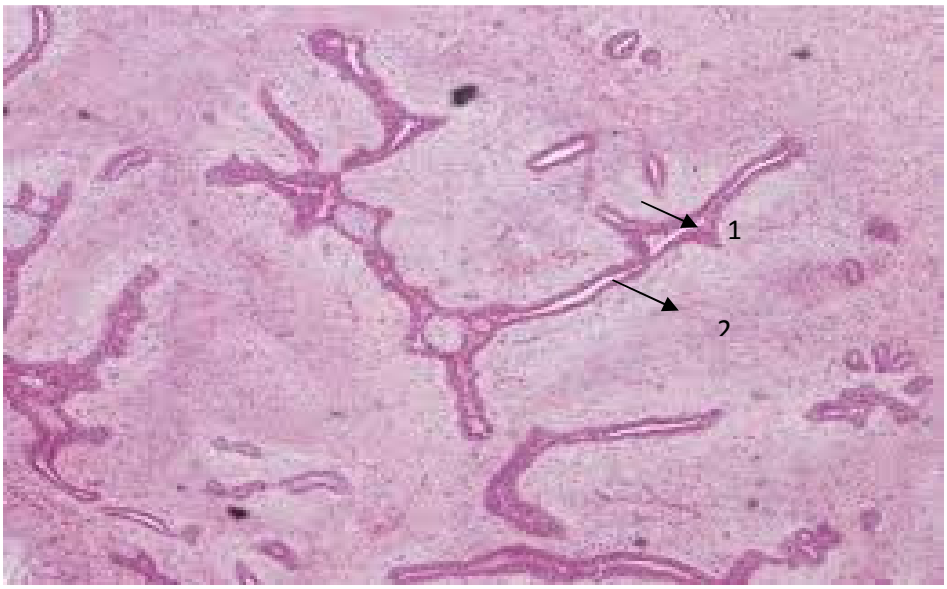


FIG NO.14 SHOWING MAMMOGRAPH OF BREAST(MALIGNANCY) OF BOTH SIDES IN MEDIOLATERAL AND OBLIQUE VIEW SHOWING AREAS OF SPICULATED CALCIFICATIONS SUGGESTIVE OF MALIGNANCY (BIRADS 5)



1. Ducts 2. Stroma

FIG NO.15 SHOWING HISTOPATHOLOGY OF FIBROADENOMA WITH STROMAL PROLIFERATION CAUSING COMPRESSION OF DUCTS SUGGESTIVE OF PERICANALICULAR TYPE

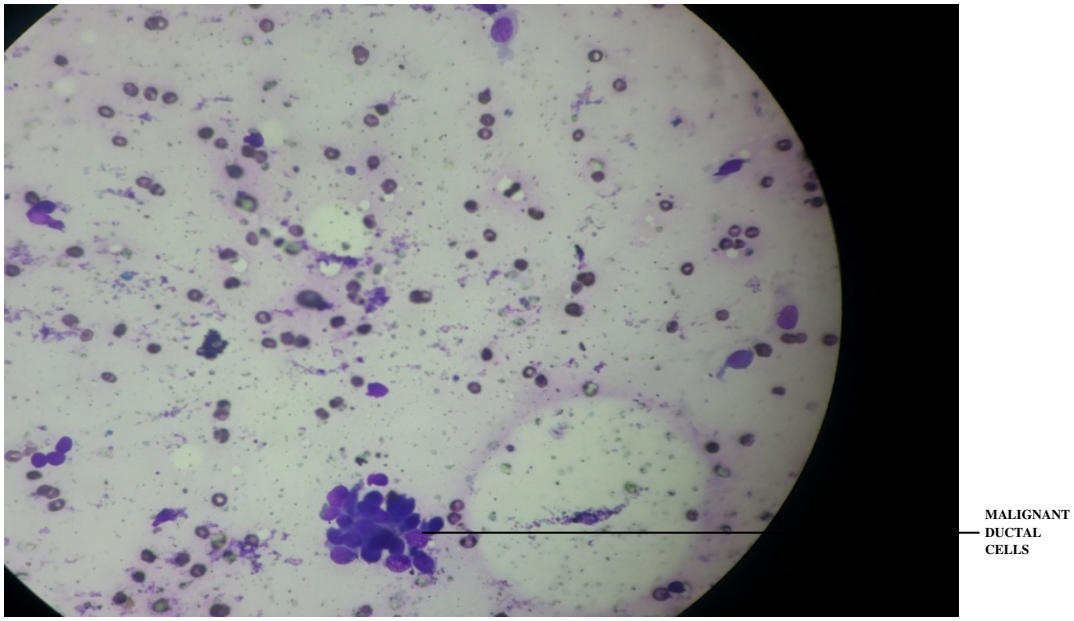
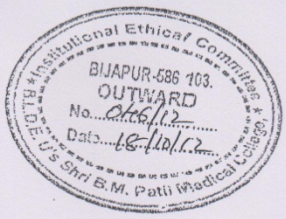


FIG NO.16 SHOWING FNAC SLIDE OF INFILTRATING DUCTAL CARCINOMA SHOWING MALIGNANT DUCTAL CELLS WITH HEMORRHAGIC AND NECROTIC BACKGROUND

ETHICAL CLEARANCE CERTIFICATE



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SHRI.B.M.PATIL MEDICAL COLLEGE, BIJAPUR-586 103
INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on 18-10-2012 *at* 3-30pm *to scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected & revised version synopsis of the Thesis has been accorded Ethical Clearance.*

Title "Diagnostic accuracy of triple assessment in breast lesions"

—x—x—

Name of P.G. student Dr. Aniketan, K.V.
Surgery

Name of Guide/Co-investigator Dr Manjunath. S. Kotennavar
Assoc prof of surgery

DR.TEJASWINI. VALLABHA
CHAIRMAN
INSTITUTIONAL ETHICAL COMMITTEE
BLDEU'S, SHRI.B.M.PATIL
MEDICAL COLLEGE, BIJAPUR.

Following documents were placed before E.C. for Scrutinization
1) Copy of Synopsis/Research project.
2) Copy of informed consent form
3) Any other relevant documents.

MASTER CHART

SL NO	NAME	AGE (YRS)	SIDE	QUADRANT	DURATION	CLINICAL DAIGNOSIS	MAMMO	FNAC	SURGERY	HPR	FINAL DIAGNOSIS
1	Kavita	38	R Breast	Upper inner	1Y	FIBROADENOMA	BIRADS 4	FIBROADENOMA	MRM	IDC	IDC of R BREAST
2	Fatima	45	R Breast	Upper outer	8M	CARCINOMA	BIRADS 4	IDC	MRM	IDC	IDC of R BREAST
3	Prema	56	L Breast	Upper inner	3D	CARCINOMA	BIRADS 5	IDC	MRM	IDC	IDC OF L BREAST
4	Gangamma	70	R Breast	Upper outer	6M	CARCINOMA	BIRADS 5	IDC	MRM	IDC	IDC of R BREAST
5	Bismilla	40	L Breast	Upper outer	4M	FIBROCYSTIC DISEASE	BIRADS 5	IDC	MRM	IDC	IDC OF L BREAST
6	Prema	58	L Breast	Upper inner	2M	CARCINOMA	BIRADS 5	IDC	MRM	IDC	IDC OF L BREAST
7	Nirmala	17	L Breast	Upper outer	1M	FIBROADENOMA	BIRADS 1	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
8	Vijaylakshmi	22	L Breast	Central	5D	GALACTOCELE	BIRADS 1	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
9	Lalitabai	47	R Breast	Upper inner	6Y	FIBROADENOMA	BIRADS 2	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
10	Jayashree	38	R Breast	Central	6M	FIBROADENOMA	BIRADS 3	DUCT ECTASIA	EXCISION	BENIGN BREAST DISEASE	DUCT ECTASIA
11	Boramma	52	R Breast	Upper outer	3M	CARCINOMA	BIRADS 5	IDC	SIMPLE MASTECTOMY	IDC	IDC
12	Kamala	50	L Breast	Upper outer	10D	CARCINOMA	BIRADS 5	IDC	MRM	IDC	IDC
13	Sarojini	48	L Breast	Lower inner	2M	FIBROADENOMA	BIRADS 4	IDC	MRM	IDC	IDC
14	Ramadevi	45	R Breast	UpperOuter	1M	FIBROADENOMA	BIRADS 2	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
15	Sangeeta	40	R Breast	Upper outer	2Y	FIBROADENOMA	BIRADS 2	FIBROADENOMA	EXCISION	FIBROADENOSIS	FIBROADENOSIS
16	Manjula	35	R Breast	Upper outer	10Y	FIBROADENOSIS	BIRADS 2	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
17	Suma	52	L Breast	Lower inner	2M	CARCINOMA	BIRADS 5	IDC	MRM	AMC	ATYPICAL MEDULLARY CARCINOMA
18	Mallamma	42	L Breast	Upper outer	9M	FIBROADENOSIS	BIRADS 3	IDC	MRM	IDC	IDC
19	Hanamawwa	40	L Breast	Upper outer	8M	CARCINOMA	BIRADS 4	IDC	MRM	IDC	IDC
20	Krishnabai	48	R Breast	central	1M	FIBROADENOMA	BIRADS 2	FIBROCYSTIC DISEASE	EXCISION	FIBROCYSTIC DISEASE	FIBROCYSTIC DISEASE
21	Kamalawwa	40	R Breast	Upper outer	1M	CARCINOMA	BIRADS 5	IDC	MRM	IDC	IDC
22	Siddawwa	60	L Breast	Lower inner	1M	CARCINOMA	BIRADS 5	PAPILLARY CARCINOMA	MRM	IDC	IDC
23	Gangamma	35	L Breast	Lower inner	2M	CARCINOMA	BIRADS 5	IDC	MRM	IDC	IDC
24	Boramma	45	R Breast	Upper outer	2M	FIBROADENOMA	BIRADS 2	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
25	Sharada	29	L Breast	Central	7M	FIBROADENOMA	BIRADS 3	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
26	Hanamawwa	38	L Breast	Lower inner	2M	CARCINOMA	BIRADS 2	CHRONIC MASTITIS	EXCISION	BENIGN BREAST DISEASE	CHRONIC MASTITIS
27	Akkamahadevi	61	R Breast	Upper outer	3D	CARCINOMA	BIRADS 4	IDC	MRM	IDC	IDC
28	Vachana	25	R Breast	Upper outer	4Y	FIBROADENOMA	BIRADS 1	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA

SL NO	NAME	AGE (YRS)	SIDE	QUADRANT	DURATION	CLINICAL DAIGNOSIS	MAMMO	FNAC	SURGERY	HPR	FINAL DIAGNOSIS
29	Shaziya	20	R Breast	Upper outer	3M	FIBROADENOMA	BIRADS 2	BENIGN BREAST DISEASE	EXCISION	FIBROADENOMA	FIBROADENOMA
30	Siddamma	34	L Breast	Lower inner	1M	FIBROADENOMA	BIRADS 1	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
31	Sahadevi	35	R Breast	Central	1M	FIBROADENOMA	BIRADS 1	FIBROCYSTIC DISEASE	LUMPECTOMY	FIBROCYSTIC DISEASE	FIBROCYSTIC DISEASE
32	Nagamma	42	R Breast	Upper outer	3M	FIBROADENOMA	BIRADS 2	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
33	Savita	32	R Breast	Central	6M	FIBROADENOMA	BIRADS 1	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
34	Akshata	17	R Breast	Central	2M	FIBROADENOMA	BIRADS 1	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
35	Suvarna	35	L Breast	Upper outer	2M	DUCT ECTASIA	BIRADS 1	DUCT ECTASIA	EXCISION	BENIGN BREAST DISEASE	DUCT ECTASIA
36	Shailaja	42	L Breast	Upper outer	5Y	CARCINOMA	BIRADS 2	FIBROADENOSIS	EXCISION	FIBROADENOMA	FIBROADENOMA
37	Sujata	38	R Breast	Upper outer	2M	CARCINOMA	BIRADS 4	IDC	MRM	IDC	IDC
38	Sunita	38	R Breast	Upper outer	2M	FIBROADENOMA	BIRADS 2	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
39	Priyanka	25	L Breast	Upper inner	15D	FIBROADENOMA	BIRADS 1	ENOSIS WITH LACTATIONAL	EXCISION	FIBROADENOMA	FIBROADENOMA
40	Shantabai	50	L Breast	Upper inner	1M	FIBROADENOMA	BIRADS 1	DUCT ECTASIA	EXCISION	DUCT ECTASIA	DUCT ECTASIA
41	Indumati	36	L Breast	Central	2Y	CARCINOMA	BIRADS 4	IDC	MRM	IDC	IDC
42	Shivakantawwa	42	L Breast	Lower inner	2M	CARCINOMA	BIRADS 5	IDC	MRM	IDC	IDC
43	Vijaylakshmi	38	R Breast	Upper outer	2M	FIBROADENOMA	BIRADS 2	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
44	Vidyavati	44	R Breast	Lower outer	6M	FIBROADENOMA	BIRADS 2	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
45	Saraswati	45	L Breast	Lower outer	1Y	CARCINOMA	BIRADS 5	IDC	MRM	IDC	IDC
46	Lakshmi	15	L Breast	Central	2M	FIBROADENOMA	BIRADS 1	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
47	Kamala	24	R Breast	Upper outer	2M	FIBROADENOMA	BIRADS 1	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
48	Vimala	35	R Breast	Lower inner	3M	FIBROADENOMA	BIRADS 1	FIBROADENOMA	EXCISION	FIBROADENOMA	FIBROADENOMA
49	Sridevi	50	R Breast	Upper outer	1M	CARCINOMA	BIRADS 5	IDC	MRM	IDC	IDC
50	Kamallawwa	65	L Breast	Upper outer	6M	CARCINOMA	BIRADS 4	IDC	MRM	IDC	IDC