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Original Research Paper

Radiology

RADIOLOGICAL EVALUATION OF BREAST MASSES

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ABSTRACT A lump in the breast is a cause of great concern. High frequency, high-resolution USG helps in its evaluation. This is exemplified in women with dense breast tissue where Mammography is useful in detecting small breast cancers that are not seen on Sonography. Several studies in the past have addressed the issue of differentiating benign from malignant lesions in the breast with the help of various imaging modalities. The American College of Radiology has also brought out a BIRADS-US classification system for categorizing focal breast lesions.

KEYWORDS : Breast ultrasound, Breast mass, ACR BIRADS,Mammography reporting.

INTRODUCTION

Breast cancer is the most common female cancer worldwide representing nearly a quarter (25%) of all cancers with an estimated 1.67 million new cancer cases diagnosed in 2012. Women from less developed regions (883 000 cases) have slightly more number of cases compared to more developed (794000) regions.[1] In India, although age adjusted incidence rate of breast cancer is lower (25.8 per 100000) than United Kingdom (95 per 100 000) but mortality is at par (12.7 vs 17.1 per 100 000) with United Kingdom.[2] There is a significant increase in the incidence and cancer-associated morbidity and mortality in Indian subcontinent as described in global and Indian studies.[3-7] Earlier cervical cancer was most common cancer in Indian woman but now the incidence of breast cancer has surpassed cervical cancer and is leading cause of cancer death, although cervical cancer still remains most common in rural India.[8]

AIMS AND OBJECTIVES

1. To evaluate the palpable breast lumps with various imaging modalities
2. To analyse its image characteristics and to classify its benign and malignant nature by to go for follow up or biopsy.
3. To compare the use of various imaging modalities in the diagnostic yield of breast masses.

MATERIALS AND METHODS

Source of Data:

A hospital based prospective cross sectional study was conducted over a period of 18months (Feb 2018 to Aug 2019) in Department of Radiodiagnosis, MLB MEDICAL COLLEGE, Jhansi. Data of this study was collected from 75 patients with breast lumps referred from Dept. of surgery and Department of Obstetrics and Gynaecology

Inclusion Criteria:

- Patients with breast lumps aged 15 and above.

Exclusion criteria:

- Patients less than 15 years
- Pregnant patients
- Patients with advanced fungating breast masses.
- Patients who refused to give consent.

Method of collection of data:

- After taking informed consent, a detailed history was taken from the patient focussingon the risk factors for breast masses like age of menarche, menopause, Parity, breast feeding practices, hormonal therapy/ OCP usage. Examination by USG and Mammography was well explained and any questions were answered. All the required parameters to evaluate the breast pathology on USG and Mammography were studied.
- Sonographic evaluation was done with SONOACE X8 ultrasound machine. Mammographic evaluation was done with XRAY mammography (Allenger medical Mammography MAM-4035 (400Ma)
- The suspicious lesions were then evaluated with AIRIS ELITE HITACHI 0.3 T machine.

Equipments:

The studies will be conducted with the following equipments

1. Mammography-(Allenger medical Mammography MAM-4035(400Ma)
2. SONOACE X8 ultrasound machine: Medison SA 9900 prime with colour Doppler & Sony sonographic printer.
3. Real time USG machine: medison SA 8000 SE with colour Doppler and Sony sonographic printer.
4. Hitachi-AIRIS ELITE 0.3 TESLA MRI machine with Kodak dry view 6800 laser image printer.

MAMMOGRAPHY:

The mammograms are performed with Craniocaudal and mediolateral oblique images are obtained from both breasts.In cases with equivocal findings, both lateral views and magnified spot compression views were taken to further analyse the mammographic findings.

ULTRASONOGRAPHY:

High resolution ultrasonography with linear array transducers (5-12Hz) with the patient being examined in the supine position and lateral position.The scanning protocol includes

A. **Grid scanning**: in the transverse or longitudinal plane.

B. **Radial scanning**: scanned as a clock face beginning at 12 o'clock in a sagittal plane with the toe of the probe at the nipple, scanned by rotating the probe around the nipple. If pathology is identified, the probe is rotated to 90 degrees in the anti-radial plane.

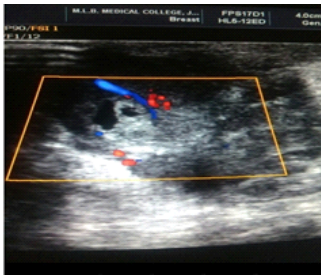
MAGNETIC RESONANCE IMAGING:

Breast MRI is performed with 0.3 TESLA magnet with body coil. Prior to the examination, an i.v. cannula is secured. The patient is placed in prone position. After the initial localizer,

one T1 sagittal series was obtained of the affected breast.Then, axial images of both breasts are obtained, one series before and six series after contrast agent(Gd-DTPA,Magnevist) administration. The amount of contrast agent is 30ml, manually injected, followed by a 20 ml saline flush. The imaging time for one series is 60 seconds. After that contrast enhanced T1- weighted sagittal images are repeated on the basis of visually monitored kinetic study.

OBSERVATION:

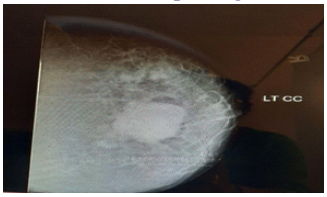
Case 1: An well defined macrolobulated wider than taller solid hypoechoic lesion with minimal to no vascularity is noted with edge shadowing...likely Fibroadenoma (BIRADS2)



Case 2: An ill defined heterogenous hypoechoic solid mass lesion with internal cystic spaces and internal vascularity... likely suspicious lesion (BIRADS 4)

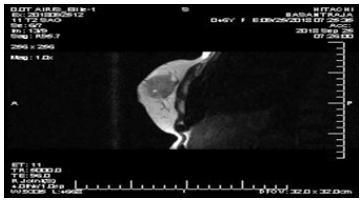
Case 3: An illdefined wider than taller lesion with central vascularity with associated ducts dilation...likely Suspicious (BIRADS 4 lesion)..Turned out to be Diabetic or lymphocytic mastitis on histopathology.

Case 4: A well defined low soft tissue density lesion with no associated calcifications Likely benign lesion BIRADS 2



Case 5:CC view of left breast shows An irregular low soft tissue density lesion is noted with indistinct/obscured margins is noted in the mid third of breast with no associated calcification...likely BIRADS4 suspicious lesion

Case 6: Magnified view of MLO view of left breast shows fine thin pleomorphic calcifications...likely highly suggestive of malignancy (BIRADS 5)



Case 7: A well defined T2 isointense lesion is noted with internal T2 hyperintense cystic spaces that showed Persistant and progressive contrast uptake on T1C+ ... likely Fibroadenoma with cystic degeneration.

DISCUSSION

Our study was conducted on patients referred to Department of Radiodiagnosis, Maharani Laxmi Bai Medical College, Jhansi, Uttar Pradesh. The patients were above the age of 15 years.

All these patients presented with various signs and symptoms of breast lumps. All patients were subjected to thorough clinical examination prior to being subjected to sonographic evaluation.

Detection and evaluation of breast lesions can be one of the most challenging and rewarding areas of medicine. The goal is to differentiate between benign and malignant lesion at an earliest possible stage and yet keep unnecessary biopsies to a base minimum.

On Ultrasonography, the characteristics of the masses were assessed.

1. Nature of the mass lesion:

In our study,The nature of the lesion was studied,

- 55 (73.34%) of the 75 cases were solid in nature.
- 16 (21.33%) of the 75 masses were cystic in nature.
- 4 (5.33%) of the 75 masses were having focal prominent fibroglandular tissue (focal adenosis).
- This is similar to a study conducted by,

Starvos AT et al[9] has reported 21% incidence in his study of 750 breast lesions were cystic lesions and 79% were solid lesions.

2.Margins of the mass lesion:

The margins of the masses were then studied on sonography in our study.

- 27 (36%) out of 75 masses were well defined,
- 15(20%) of 75 breast masses were ill defined
- 19 (25.33%) of 75 breast masses had lobulated margins,
- 10 (13.33%) out of 75 breast masses had spiculated margins,
- 4 (5.33%) out of 75 breast masses had no specific shape.
- In a study conducted by ***Fornageet al***[10] ***(1989)***, 57% of the lesions had regular margins, 16% had lobulated margins, whereas 25% had irregular margins.

3.Orientation of the mass:

The orientation of the mass is studiedin our study and

- 55(75.33%) out of 75 breast masses had wider than taller

orientation
- 16(21.33%) out of 75 masses had taller than wider orientation and
- 4 (5.33%) of the breast masses had no specific orientation.
- In a study conducted by ***Hangensen et al***[11] ***(1973),*** 60% had wider than taller orientation and 40 % had taller than wider orientation.

4.Posterior acoustic pattern of the mass:

Then was studied about the posterior features of the mass in our study. Out of 75 masses,
- 30(40%) showed posterior acoustic enhancement,
- 41 (54.66%) shows posterior shadowing, 4 (5.33%) shows no posterior features.
- This commensurate with the study conducted by a study conducted by ***Cole Benglet et al***[12] ***(2009)*** who studied 2000sonomammograms, 73% of the lesions showed acoustic enhancement while 27% of the lesions showed posterior shadowing.

5.Echogenecity of the mass:

Then, The echogenicity of the lesion was studied in our study, Out of 75 breast masses,
- 16(21.33%)showedhomogenous echotexture,
- 55(73.33%)showed heterogenousechotexture,
- 4(5.33%) showed no specific echotexture.
- Similarly, in a study conducted by, ***Fornage et al***[10] (1989) studied sonographic patterns of 100 breast masses, 71% of the lesions were homogenous, whereas 295 showed a variable degree of texture inhomogeneity.

6. Echopattern of the mass:

Then the echopattern was studied, Out of 75 breast masses,
- 6(8%) were anechoic,
- 4 (5.33%) were hyperechoic,
- 42(56%) were hypoechoic,
- 19 (25.33%) were showing mixed echogenicity,
- 4(5.33%) showed isoechoicto no specific echopattern.
- This commensurate with a study conducted by, ***Fornage et al***[10]***(1989)*** studied sonographic patterns of 100 masses 90% were hypoechoic, 4% hyperechoic, 2% had mixed pattern, 1% anechoic and 1% isoechoic.

7. Internal characteristics of the mass:

The internal characteristics were studied,
- 59(78.60%) showed colour flow signals,
- 4(5.33%) showed internal cystic spaces,
- 8(10.6m7%) showed calcification,
- 4 (5.33%) showed no internal characteristics.
- This commensurate with a study conducted by ***Liberman et al (1996)***[13]reported the ultrasonographic findings in 30 cases of breast masses where both malignant and benign subtypes typically appeared as hypoechoic masses with cystic areas, few cases showed internal calcifications and colour flow signals.

8. Associated features of the mass:

Then the associated features were studied, Out of 75 breast masses,
- 24 (32%) showed dilated ducts,
- 7(9.33%)showedassociatedaxillary lymph nodes,
- 2(2.66%)hadassociatednipple retraction,
- 2(2.66%) showed associated thickened premammary zone,
- 40(53.33%)showednoassociated features.
- Thiscommensuratewithastudy conducted by ***Sweeney DJ et Al***[12]***(2000)***has studied associated features of 14 breast masses,and found that duct ectasia is the predominant associated features.

9. Distributionofcaseson sonographic assessment:

Distribution of cases on sonography were as follows,
- Out of 75 masses, 46 were benign and probably benign masses (BIRADS2/3), 19 were suspicious (BIRADS4) and 10 were highly suggestive for malignancy (BIRADS5).
- Benign and probably benign BIRADS 2/3 masses includes 20 fibroadenomas, 4 breast cysts, 6 chronic breast abscess, 4 cases of focal adenosis, 2 cases of phyllodes tumor, 6 cases of galactocele, 2 cases of intraductal papilloma, 2 cases of fat necrosis.
- Suspicious BIRADS 4 masses included 16 low level suspicious masses and 3 masses which were highly suspicious for malignancy.
- Malignant BIRADS 5 masses included 10 masses highly suggestive of malignancy.
- This commensurate with the study conducted by ***Eun Kyung Hee et al***[13]***(2008)*** has studied the clinical application of the BIRADS Final assessment of Breast sonography where he studied 4668 masses on sonography 0.1% were in BIRADS 1, 20% in BIRADS 2, 3 % in BIRADS 3, 31 % in BIRADS 4 and 20.9 % in BIRADS 5

MAMMOGRAPHY:

On mammography,

1. Density of masses:

The density of the masses were studied.
Out of 75 masses,
- 13(17.33%) were high density masses,
- 39 (52%) were low density masses
- 8 (10.66%) were fat containing masses,
- 15 (20%) lesions showed asymmetry/focal increase in density.

2. Shape of masses:

Then the shape of the masses were studied on mammography. Out of 75 masses,
- 47 (62.66%) were round to oval in shape,
- 13 (17.33%) were irregular,
- 15 (20%) showed no particular shape.

3. Margins of masses:

Then the margins of the masseswere studied, Out of 75 masses,
- 16(21.33%)hadcircumscribed margins,
- 15(20%) had macrolobulatedmargins,
- 4(5.33%) had microlobulatedmargins,
- 15 (20%) showed obscured or indistinct margins,
- 10(13.33%)showedspiculated margins,
- 15 (20%) had no specific margins.

4. Calcifications of masses:

Then the calcifications were studied on mammography, Out of 75 masses,
- 48 (64%) had benign calcifications,
- 12(16%) had suspicious calcifications,
- 15(20%) had no calcifications.

5. Associated features:

Then, the architectural distortion and asymmetries were looked for in mammography, Out of 75 breast masses,
- 10 (8.67%) had architectural distortion
- 31 (66.66%) had asymmetries
- 16 (21.33%) had axillary lymph nodes
- 3 (4%) had premammary zone thickening
- 15(20%) had no associated features.
- This commensurate with a study conducted by**Kopans et**

Al[14] (1982) where he studied 158 patients with breast masses on conventional mammography where high density spiculated masses with thin pleomorphic calcificationsh a d malignant characteristics, low density masses with circumscribed margins with popcorn and coarse calcifications had benign characteristics.

6.Distribution of cases after assessmentwith x-ray mammography:

- 15 cases had BIRADS 2 benign imaging assessment,
- 31 cases had benign/ probably benign BIRADS2/3 assessment,
- 19 cases had assessment
- 10 cases had assesment.

Suspicious masses furthur worked up with MRI:

Then, the 19 suspicious lesions were further evaluated with Magnetic resonance imaging,

Out of 19 suspicious masses,

- 3 (15.78%) showed heterogenous enhancement,
- 14 (73.68%) had heterogenous enhancement with non enhancing internal septations,
- 2 (10.52%) had no enhancement.

Then, **the pattern of contast enhancement** is visually assessed and out of 19 suspicious masses,

- 3 (15.78%) had rapid washout of contrast,
- 7 (38.84%) had plateau phase of enhancement,
- 3 (15.78%) had persistant progressive type of enhance ment,
- 6 (31.57%) had no enhancement.
- This commensurates with the study conducted by ***Ansgar Malichet al[15] (2005)*** who studied 192 patients and found that heterogenous enhancement with non enhancing internal septations had high chances of benign characteristics whereas rim enhancement and intense enhancement with early washout had malignant possibilities.

Final assesment after combined sonographic, mammogr aphic and MRI evaluation of breast masses:

Out of 75 masses, 28 were benign, 34 were probably benign and and 13 were malignant masses and the distribution is as follows:

- **BIRADS 2 Benign masses:** 16 Fibroadenoma (21.33%), 4 Breast cyst (5.33%), 4 Fibroadenosis (5.33%), 2 Chronic breastabcesss (2.67%), 2 Galactocele (2.67%).
- **BIRADS 3 Probably Benign masses:** 20 Fibroadenoma (26.66%), 4 chronin breast abscess (5.33%), 2 phyloodes (2.67%), 4 Galactocele (5.33%), 2 Intraductal papilloma (2.67%), 2 fat necrosis (2.67%).
- **BIRADS 5 Malignant masses**: 13 Masses highly suggestive of malignancy (17.33%)

CONCLUSIONS

- The sensitivity of detection of palpable breast lumps with combined X-ray mammography and sonography increases the diagnostic yield to almost 100% as compared to the diagnostic yield of single imaging assessment with X-ray mammography alone or with Ultrasound alone.
- And in suspicious lesions, Work-up with MRI helps to further distinguish the lesion into benign and malignant characteristics.

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