

BENIGN BREAST DISEASES PRESENTING AS BREAST LUMP USG AND STRAIN ELASTOGRAPHY EVALUATION WITH PATHOLOGICAL CORRELATION.

Radiodiagnosis

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ABSTRACT

Objective: To study the Sonographic and strain elastographic features of benign breast diseases presenting as lump in patients in our hospital.

Methodology: This is a prospective observational study of all patients visiting our hospital with breast problems. This study was conducted at AVBRH hospital Sawangi wardha over a period of about 19 months (March 2016 to October 2017). All female patients visiting the hospital with breast lumps were included in the study. Patients with obvious clinical features of malignancy were excluded from the study.

Results: A total of 125 patients were included in the study. About 52% patients belonged to 3rd decade of life (age between: 21-30 years) followed by 33.6% from 4th decade (age between: 31 – 40 years). Fibroadenoma was the most common benign breast disease, seen in 44% of patients, followed by fibrocystic disease seen in about 14.4% patients.

Conclusion: Benign breast diseases are common problems in females of reproductive age. Fibroadenoma is the commonest of all benign breast disease in our set up mostly seen in 2nd and 3rd decade of life. Fibrocystic disease of the breast is the next common benign breast disease whose incidence increases with increasing age.

KEYWORDS

Benign breast disease, Fibroadenoma, Fibrocystic diseases, sonography

INTRODUCTION:-

The term "benign breast diseases" includes a heterogeneous group of lesions that may present a wide range of symptoms or may be detected as incidental microscopic finding. [1] Benign breast disease includes all non malignant conditions of the breast, including benign tumours, trauma, mastalgia, mastitis and nipple discharge. Benign tumours include pathologic changes that do not increase a patient's risk for developing cancer, lesions that confer a slightly increase risk and lesions that are associated with up to 50% risk of developing breast cancer. [2] Benign breast disease can present with a palpable mass, pain and nipple discharge or nipple inversion. The issue of benign breast disease is a relatively neglected aspect of breast diseases and has received less importance as compared to the malignant lesions of the breast. This is despite the fact that vast majority of the lesions that occur in the breast are benign and it has been reported that benign lesions of the breasts are much more frequent than the malignant ones. [1, 3] It has also been reported that at least 90% of the patients visiting breast clinics will have non-malignant disease. [4]

With this back ground scenario, it was considered appropriate to determine the imaging spectrum of benign breast disease in our hospital. The objective of this study was to determine the frequencies of various benign breast diseases in female patients presenting with breast lump in AVBRH a rural based tertiary care hospital and study their USG and strain elastographic imaging characteristics with pathological correlation.

The diagnosis of probably benign lesion is based on the exclusion of suspicious signs but also on the confirmation of some important parameters showing benign lesions seen on sonography such as: elliptical shape and horizontal orientation; well-defined curvilinear or only slightly lobated margins; the presence of a complete, thin echogenic capsule; echotexture almost completely hyperechoic. [5]

Compression elastography involves calculating a strain profile in a direction perpendicular to the tissue surface in response to an externally applied force. Specialized software is used to calculate the relative difference in tissue movement from one frame to another and then to estimate the tissue deformation. The deformation measurements are then mapped onto an elastogram, on which stiffer areas are shown as dark and more-elastic areas are in lighter colours, according to convention. This permits depiction of a lesion that is otherwise isoechoic on gray-scale US images [6]

On US images, fibroadenoma appears as a well-circumscribed elliptic mass that is either hypo or isoechoic with uniform echogenicity. The lesion is typically larger in the transverse diameter than in the anteroposterior and has very well-demarcated margins. A

fibroadenoma may have no effect on ultrasound transmission, or acoustic enhancement or shadow may be observed on US images. [7] USG spectrum of focal fibrocystic changes include solid mass, cysts, heterogeneously echogenic tissue, and absent sonographically visible focal change. [8] At US, mastitis appears as an ill-defined area of altered echotexture with increased echogenicity in the infiltrated and inflamed fat lobules, hypoechoic areas in the glandular parenchyma, and associated mild skin thickening with occasional distended lymphatic vessels. [9] Two sonographic signs, interstitial fluid and hypoechoic wall are relatively specific for breast abscess and may aid in the diagnosis of breast disease [10]. Duct ectasia predominantly affects ducts in the retroareolar region and is defined as nonspecific dilatation of one or more ducts. Sonographic evaluation demonstrates anechoic smooth-walled branching structures that taper peripherally [11] Galactocoele is a cystic dilatation of the terminal ducts and ductules containing milk, so the appearance of a galactocoele may vary during the monitoring. To begin with it appears as an anechoic cyst with possible septation, as the milk is fresh with homogeneously emulsified fat globules in a liquid component. Later in the course of disease the content becomes moderately echogenic, when the fat tends to form increasingly large and less emulsified globules, which are distributed unevenly or are suspended above the liquid component. [5]. Intraductal papillary lesions have three basic patterns are recognized on USG. Intraductal mass with or without ductal dilatation, intracystic mass and predominantly solid pattern with intraductal mass totally filling the duct. A distinct vascular pedicle is seen within the central core with branching vessels arborising within the mass. [12]. On ultrasound, three different patterns of breast tuberculosis are described, depending upon the imaging morphology visualized on sonomammography. The most common type is nodular type, followed by diffuse type, and sclerosing type. Nodular group included multiple round to oval focal hypoechoic lesions in breast. When abnormal hypoechoic irregular areas were seen spanning the entire breast parenchyma, the lesion was included under the category of diffuse type. Lesions with heterogenous irregular hyperechoic areas inside the breast lesions are included as the sclerosing variant [13] According to the sonographic criteria set forth by Stavros, simple cysts are anechoic with a thin echogenic capsule, increased through-transmission and thin edge shadows. [14]

MATERIALS AND METHODS:-

This was a prospective observational study carried out at AVBRH hospital at Sawangi (meghe), Wardha over a period of about 19 months starting from March 2016 to October 2017. All patients visiting the hospital with breast lump were included in the study. Ultrasonography was done for each case. All classical USG findings were analyzed in detail. Strain elastography was also performed in each case. Fine needle aspiration cytology (FNAC) was performed in patients with

lumps to confirm the diagnosis. Core biopsy and/or incisional or excision biopsy was done in patients with inconclusive FNAC report. This prospective study was conducted with due approval by the Institutional Legal Ethical Committee. 125 Cases were analyzed from March 2016 to October 2017. Patients included were in the age group of 11 to 50 yrs.

Real time ultrasound followed by strain elastography was performed with the Hitachi Aloka Arietta S70 with 5-18 MHz linear array transducer.

Technique

Each lesion was analyzed as per conventional ultrasound descriptors i.e. shape, orientation, margin, lesion boundary, echostructure, and posterior acoustic features.

Once the optimum B mode image was obtained, elastograms were acquired taking due care that the lesion remained in the imaging plane. The images from conventional sonography and sonographic elastography were displayed on the screen side by side as a single image. A Region of Interest (ROI) box was set to include the area from the subcutaneous fat layer to the superficial portion of the pectoralis muscle and to focus on the target mass.

The elasticity scores of the target lesions were assessed using the following Tsukuba scoring system described by Itoh et al. [15]

TSUKUBA SCORING SYSTEM:-

A score of 1 indicated even strain for the entire hypoechoic lesion (i.e., the entire lesion was evenly shaded in green). A score of 2 means strain in most of the hypoechoic lesion, with some areas of no strain (i.e., the hypoechoic lesion had a mosaic pattern of green and blue). A score of 3 implies that strain at the periphery of the hypoechoic lesion, with sparing of the center of the lesion (i.e., the peripheral part of lesion was green, and the central part was blue). A score of 4 shows no strain in the entire hypoechoic lesion (i.e., the entire lesion was blue, but its surrounding area was not included). A score of 5 indicated no strain in the entire hypoechoic lesion or in the surrounding area (i.e., both the entire hypoechoic lesion and its surrounding area were blue). BGR represents typical artifactual three layered aspect (blue-green-red) encountered with cystic lesions.

Strain Ratio Measurement

A semi quantitative method of lesion assessment, termed as strain ratio (SR) measurement, has also been developed. Calculation of the SR value is based on determining the average strain measured in a lesion and comparing it to the average strain of a similar area of fatty tissue in the adjacent breast tissue. Using proprietary software, the average strain of the lesion is determined by selecting a region of interest (ROI) encompassing the lesion; the value of strain ratio increases as a function of the relative stiffness of the target lesion. As the Strain Ratio increases, the likelihood of invasive breast cancer is also higher. [16]

Pathological Diagnosis

In all 125 cases included in the study diagnosis was established by FNAC, or histopathology.

RESULTS: - A total of 125 patients were included in the study during the one and half year from March 2016 to October 2017. About 55% patients belonged to 3rd decade of life (age between: 21-30 years) followed by 33.6% from 4th decade (age between: 31 – 40 years), 8% from the 5th decade (age between: 41 – 50 years) and 6.4% from 2nd decade (age between: 11 – 20 years) of lives. Fibroadenoma was the most common benign breast disease seen in 44% (n=55) of patients, followed by fibrocystic disease seen in about 14.4% (n=18) patients. Simple breast cysts were seen in 10.4% (n=13). Breast abscess was seen in 9.6% (n=12) patients, and other benign diseases noted were duct papilloma in 1.6% (n=2), galactocele in 9.6% (n=10), and tuberculous mastitis was seen in 4.8% (n=6) of patients. About 58.18% patients with fibroadenoma belonged to 3rd decade of life followed by 21.81% from 4th decade of life. About 55.55% of patients with fibrocystic disease were from 4th decade, 44.44% from 5th decade. Breast abscess was commonly seen in patients (68%) of 3rd decade and in 32% patients of 4th decade. Galactocele which accounted for 9.6% (n=12) of all benign breast disease was seen in 36% of patients in 4th decade of life. Duct papilloma was equally common in both 3rd and 4th decade of life while granulomatous mastitis was more commonly seen (4.8%) in 3rd decade of life. In our study Fibroadenomas were

more numerous in right breast (56%), upper lateral quadrant was the most common location of fibroadenoma. Only one giant fibroadenoma was found in young girl whereas multiple fibroadenomas were seen in 28% cases. 90% were solid, most of them (78%) were oval in shape, 88% had well defined margins and 12% were irregular in shape. As compared to breast parenchyma 84% were hypoechoic in echogenicity. Homogenous internal echoes were seen in 92% cases. Acoustic shadows were seen on both sides of nodule in 8% cases. Calcification was noticed in 8% cases, while cystic changes in 10%. Elasticity score for 90% fibroadenomas was 2. The strain ratio was helpful for diagnosis in majority of cases and was found to be less than 3 and the maximum strain ratio value in one case was 3.8.

A detailed account of this benign breast diseases according to the various age groups is shown in Table-1

Table 1: Incidence of various benign breast diseases presenting as lump.

Disease	Number of Patients (n)	Percentage
Fibroadenoma	55	44
Fibrocystic disease	18	14.4
Simple breast cyst	13	10.4
Breast abscess	12	9.6
Galactocele	12	9.6
Granulomatous mastitis	6	4.8
Fibroadenolipoma	2	1.6
Intraductal Papilloma	2	1.6
Benign Phyllodes tumor	2	1.6
Fat necrosis	2	1.6
Duct ectasia	1	.8

Table 2: Age group wise incidence of Benign breast disease.

Age group	No. of patients (n)	Percentage
21-30	65	52%
31-40	42	33.6%
41-50	10	8%
11-20	8	6.4%

Table 3: Age wise incidence of Fibroadenoma.

Age group	Number Of cases (n)
21-30 yrs	32 (58.18%)
31-40yrs	12 (21.81%)
41-50 yrs	7 (12.72%)
11-20 yrs	4 (7.27%)

Table 4: Age wise incidence of fibrocystic disease.

Age group	Number of cases (n)
31-40 yrs	10 (55.55%)
41-50 yrs	8 (44.44%)

Table 5: Elastographic features:-

Cystic Benign lesion	Classical BGR(BLUE-GREEN-RED) appearance
Benign complex cystic mass	Solid component taking soft colours on elastography scale and low strain ratio.

DISCUSSION: - In our study about 87.26% of the patients with benign breast diseases were in the age group between 11-40 years with peak incidence (52%) in age group between 21-30 years. These results are consistent with the study of Otu AA in which majority of the patients were below the age of 30 years. [17] Ihekweba in his study from Western Africa showed that about 80.5% of the benign breast diseases occur in females between 16-35 years of age. [18] In our study fibroadenoma was the most common benign breast disease seen in 55 patients. Fibroadenoma was most commonly seen (58.18%) in patients with 3rd decade (21 - 30 years) of life. This observation is also noted in a study where they found fibroadenoma as common benign breast disease with incidence of 45%. [19] Fibrocystic disease was the second most common (14.4%) benign breast disease seen in our study. The vast majority of the patients (55.55%) with fibrocystic disease were from 4th decade followed by 44.44% from 5th decade of life. Ali et al also noted fibrocystic disease as second common benign breast disease after fibroadenoma accounting for 36%. [19] Recently it has been observed that fibrocystic changes constitute the most common and frequent benign breast disease. Such changes generally affect the premenopausal women between 20-50 years of age. [1] Although many other names have been used to describe this entity over the years including (fibrocystic disease, Cystic mastopathy, chronic cystic

disease, mazoplasia, Reclus disease), the term “fibrocystic disease” is now preferred because this process is observed clinically in up to 50% and histologically in 90% of the women. [20] Breast abscess was seen in 9.6 % of the patients in our study with peak incidence in patients from 3rd decade of life. This was most commonly observed in lactating females during the first three months after delivery. Breast tuberculosis though rare in Western world but the fact that travelling from one place to another in the global world has been increasing and that the prognosis for complete cure with appropriate antituberculous therapy is excellent. The overall incidence is less than 0.1% of all breast lesions in developed countries and 3–4% in developing countries. [21] In our study, 6 patients (4.8%) had granulomatous mastitis. Other benign lesions seen in our study were Galactocele (9.6%), Fibroadenolipoma (1.6%), Intraductal papilloma (1.6%), benign phylloid tumor (1.6%), fat necrosis (1.6%) and duct ectasia (0.8%)

CONCLUSION: - Benign breast diseases are common problems in females of reproductive age. The common problems for which women consult or are referred to breast clinic are palpable lump, breast pain and nipple discharge. Fibroadenoma is the commonest of all benign breast disease in our set up mostly seen in 2nd and 3rd decade of life. Fibrocystic disease of the breast is the next common BBD whose incidence increases with increasing age.

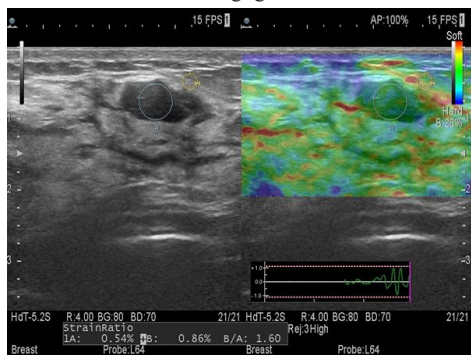


Figure1] well defined hypoechoic wider than taller breast lesion showing grade 2 elasticity score on elastography scale with strain ratio of 1.60 indicating fibroadenoma.

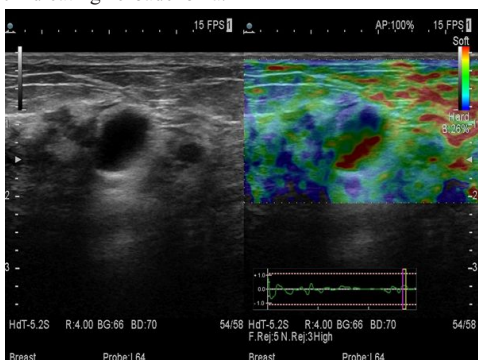


Figure2] Simple cyst breast showing typical BGR (Blue-Green-Red) appearance on elastography scale.

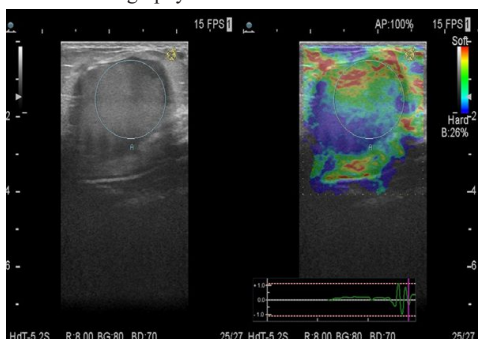


Figure3] A well defined breast mass in a lactating mother showing internal debris and fluid levels within. On elastography scale typical BGR (Blue-Green-Red) pattern seen suggestive of Galactocele.

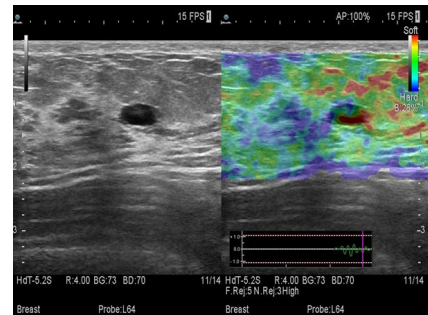


Figure4] Fibrocystic disease seen as thickened heterogeneous breast parenchyma, areas of solid tissue and cystic lesions on sonography. On elastography cyst taking BGR pattern on elastography scale and solid tissue taking soft colours (red and green).

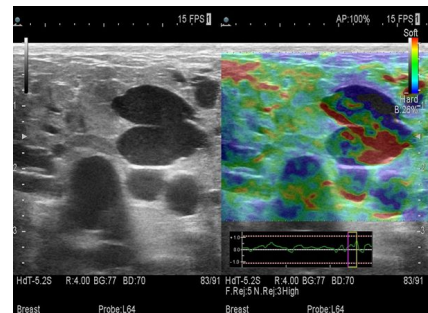


Figure5] Ductal ectasia seen on USG as dilated mammary ducts containing fluid and debris within. On elastography BGR pattern seen.

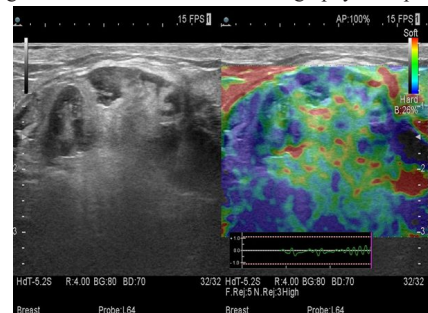


Figure6] Fibroadenolipoma breast seen as well defined compressible wider than taller mass showing hyperechoic fat within and taking soft colours on elastography.(Green and red)

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