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USG AND STRAIN ELASTOGRAPHY EVALUATION OF MASTITIS WITH PATHOLOGICAL CORRELATION.

Radiodiagnosis

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ABSTRACT

Objective: To study the Sonographic and strain elastographic features of mastitis in patients seen in our hospital.

Methodology: This is a prospective observational study of all patients visiting our hospital with mastitis. This study was conducted at AVBRH hospital Sawangi Wardha over a period of about 27months (March 2016 to June 2018). All female patients visiting the hospital with symptoms and clinical diagnosis of mastitis were included in the study.

Results: A total of 18 patients were included in the study. 66% patients belonged to 3rd decade of life (age between: 21-30 years) followed by 34% from 4th decade (age between: 31 – 40 years). Sonographic features seen were heterogenous mass and central hypoechoic area. Elastographic features include high strain value of mass, elastography/B mode ratio >1 and low strain value in central part and high strain value in the periphery.

Conclusion: Elastography can be useful modality as adjunct to sonography in diagnosis of mastitis.

KEYWORDS

Mastitis, Breast Ultrasound, Elastography, Strain Elastography

INTRODUCTION: -

Mastitis can be defined as inflammation of the breast. It is of paramount importance to differentiate benign acute mastitis from carcinomatous mastitis at the earliest, since the latter is a real diagnostic and therapeutic emergency with very poor prognosis. The clinical and radiological appearance of the two types can mimic each other, and a biopsy should always be undertaken where there is the slightest doubt arises as to the diagnosis. [1]Abscesses may have their origin from infection of the subareolar ducts and/or pre-existing galactocele (puerperal mastitis), or from ruptured ectatic ducts or cysts with the chemical inflammation and subsequent bacterial super infection. US features are similar and distinction is based on the history of breastfeeding [2, 3] Puerperal mastitis has an acute onset and although it is of lobar or sub lobar origin, the classic inflammatory signs may involve the whole organ. Nonpuerperal abscesses tend to recur easily and become chronic with cutaneous fistula formation which can be difficult to eradicate. [4] At US, mastitis appears as an ill-defined area of altered texture with increased echogenicity seen in the infiltrated and inflamed fat lobules, hypoechoic areas in the glandular parenchyma, associated with mild skin thickening and sometimes distended lymphatic vessels (5) Two sonographic signs, interstitial fluid and hypoechoic wall are relatively specific for breast abscess and may aid in the diagnosis of breast disease.[6] Mastitis with abscess formation was found to have an elastographic appearance of a soft central area (abscess) and a stiff outer rim (edema and inflammation). Mastitis with or without abscess formation can present with findings suggestive of malignancy on elastography, with the lesion appearing larger on elastography than on B-mode imaging and with stiffness values that are usually greater than the threshold for benignity.[7]

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 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 identification of a lesion that is otherwise isoechoic on gray-scale US images [8]

MATERIALS AND METHODS:-

This was a prospective observational study carried out at AVBRH hospital at Sawangi (meghe), Wardha over a period of about 27 months starting from March 2016 to June 2018. All patients visiting the hospital with symptoms and clinical diagnosis of mastitis 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. Pathological examination was performed in all patients to confirm the diagnosis. 18Cases were analyzed in the age group of 21 to 40 yrs. Real time ultrasound followed by strain elastography was performed with the Hitachi Aloka Arietta S70 with 12-18 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 lesion. Strain ratio was measured in all cases along with elastography/B mode ratio in solid appearing heterogenous masses.

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. [9]

Ratio of elasticity imaging / B-Mode Imaging

The size criterion denotes the difference in the measurement of the longest diameter on the corresponding B-mode image and the elastogram. Structures those are less compressible than surrounding tissues measure larger on the elastogram than they do on the corresponding B-mode image, resulting in size discordance. Therefore, cancers will be larger on the elastogram than on the conventional US image [8]

Pathological Diagnosis

In all 18 cases included in the study diagnosis was established by FNAC, or histopathology after incision and drainage of breast abscess.

RESULTS: - A total of 18 patients were included in the study from March 2016 to June 2018. 66% patients belonged to 3rd decade of life (age between: 21-30 years) followed by 34% from 4th decade (age

between: 31 – 40 years. In USG features central hypoechoic area was seen in most breast abscesses. While hypervascularity and reactive axillary lymphadenopathy was observed in all cases. (100%).In elastography features abscesses revealed low central strain ratio and high strain ratio in the periphery part showing stiff tissue. Cases seen as heterogenous mass showed high strain ratio and elastography/B mode ratio more than 1 simulating neoplasm.

Table 1: Age group wise incidence of Benign breast disease.

Age group	No. of patients (n)	Percentage
21-30	12	66%
31-40	06	34%

Table 2: Clinical presentation of patients

Palpable mass	10	55%
Pain	18	100%
History of fever	6	33%
Inflammatory skin changes	6	33%
History of Breast feeding	6	33%

Table 3: USG features of mastitis

USG Features	Number of cases	Percentage
Heterogenous mass	4	22%
Central hypoechoic area with surrounding wall	14	78%
Hypervascularity on doppler	18	100%
Reactive axillary lymphadenopathy	18	100%

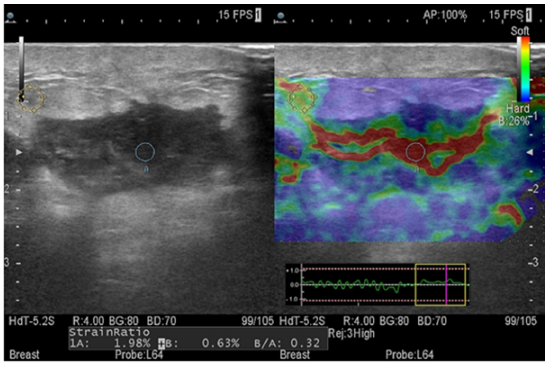
Table 4: Elastographic features of Mastitis

Elastographic/B mode ratio	Number of cases	Percentage
>1.2	2	11%
>1.4	2	11%
Strian ratio(Abscess)		
Central area		
<1	4	22%
1-2	6	33%
2-3	4	22%
Outer rim		
4-8	6	33%
8-16	4	22%
>16	4	22%
Strain ratio of heterogenous mass		
>7	2	11%
10-20	1	5.5%
>20	1	5.5%

DISCUSSION: - In our study , 4 cases of mastitis which were seen as heterogenous mass without abscess were found to have malignant features by elastographic criteria. All of the lesions that could be measured on B-mode imaging presented with elastographic/B-mode ratios of greater than 1.Strain ratio in these cases were found to be quite high more than 7 in two cases, between 10-20 in another two cases and >20 in one case. These findings are similar to Nicholas Sousaris et al [7]

There were several limitations to this study lesser duration of study and small sample size and limited research in the use of elastography in mastitis. Further large series is required for establishing guidelines of use of elastography in cases of mastitis.

CONCLUSION: Elastography can be useful modality as adjunct to sonography in diagnosis of mastitis.



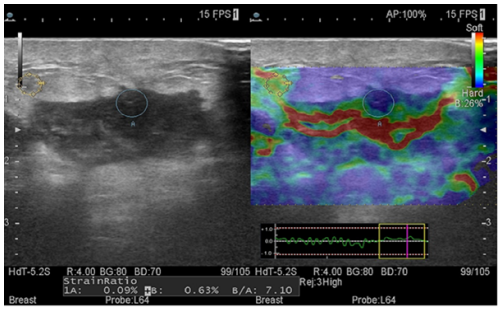


Figure 1 A and B: Breast abscess seen as central hypoechoic area and well defined walls. On elastography showing strain ratio of .32 in central part and strain ratio of 7.10 in the periphery.

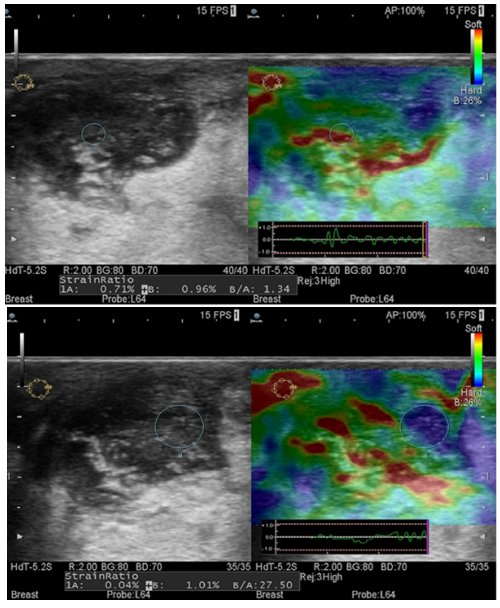


Figure 2 A and B: Breast abscess seen as central hypoechoic area and well defined walls .On elastography central area shows strain ratio of 1.34 and 27.50 in peripheral part.

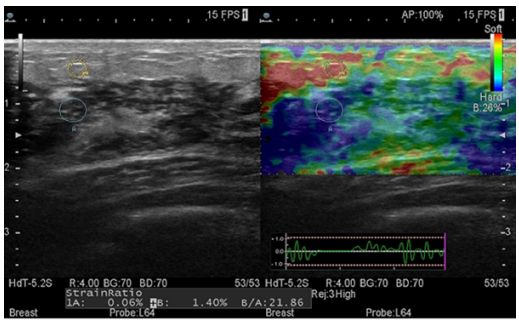


Figure 3: Heterogenous mass showing stiff tissue (dark blue colour) on elastography and strain ratio of 21.86 simulating malignancy.

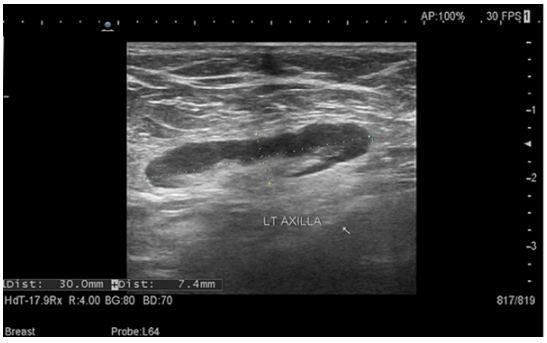


Figure 4: Reactive axillary lymphadenopathy showing oval lymph node with maintained fatty hilum.

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