

SONOGRAPHIC AND ELASTOGRAPHIC EVALUATION OF CYSTIC BREAST MASSES.

Radiodiagnosis

Dr.Suresh Phatak

Dr.Nipun Gupta.

ABSTRACT

OBJECTIVES: To study sonographic and elastographic imaging features of the different types of cystic breast lesions with pathological correlation.

METHODS: 70 cases of palpable cystic lesions of the breast were studied with sonography and strain elastography over a period of 18 months.

RESULTS: The majority of the cases [17] were of fibrocystic disease. Maximum numbers of patients (30) were in the age range of 41-50 years.

CONCLUSION: Breasts cystic lesions are usually benign though some radiologically complex masses may be malignant. Elastography is useful particularly in assessing their pathological features.

KEYWORDS

Breast cysts, simple, complicated, complex, sonography

INTRODUCTION

Cystic lesions of the breast may present in women of any age but are more commonly seen between the age group of 30 and 50 years. They may be detected incidentally on screening mammography or due to various signs and symptoms such as nipple discharge or a palpable mass. Differential Diagnosis of Cystic Breast Lesions includes Simple cyst, Complicated or complex cyst, various causes of which include Galactocele, Hematoma, Fat necrosis or oil cyst, Mastitis or breast abscess, Intracystic papilloma, and Necrotizing neoplasm.[1]Cystic lesions were classified into 6 types (types I–VI), which were slightly modified from those mentioned in an article by Berg et al . Simple cysts (type I) are anechoic masses with an imperceptible, circumscribed border and acoustic enhancement. Clustered cysts (type II) were defined as clustered anechoic cysts with no discrete solid components. Cysts containing thin septa (type III) were identified as cysts within septa of less than 0.5 mm in thickness. Complicated cysts (type IV) means according to the American College of Radiology Breast Imaging Reporting and Data System (BI-RADS)4 as lesions with homogeneous low-level echoes that otherwise meet the criteria of simple cysts, including cystic lesions containing fluid-debris levels or floating echogenic debris. Cystic masses with septa or a wall greater than 0.5 mm in thickness or mixed cystic and solid masses with at least a 50% cystic component were classified as cystic masses with a thick wall/septa or nodules (type V). Those masses which were primarily solid but having eccentric cystic foci were considered complex solid and cystic masses (type VI). [2]Cystic breast lesions are commonly observed at ultrasonography (US) performed for the evaluation of palpable or mammographically detected breast masses. Complex cysts contain cystic and solid components and are associated with a variety of benign, atypical, and malignant pathologic diagnoses. Complex cystic breast masses have a high possibility of being malignant; hence percutaneous or surgical biopsy is usually indicated in such cases [3]

Differential Diagnostic Considerations of complex cysts:-

Galactocele: A galactocele forms from the accumulation of milk distal to an obstruction in the terminal ductal unit. The age of the milk products contained in the galactocele will determines its imaging appearance on mammography and sonography. In the acute stage, a galactocele may be seen as a complicated cyst or anechoic fluid with thin septa. As its age increases, the cyst increases in complexity, developing echogenic foci due to separation of the fat components and fat-fluid levels with the echogenic component layering in the nondependent portion of lesion.

Breast Abscess: Sonographically, an abscess appears as an oval, lobulated, or irregular-shaped cyst with internal debris with surrounding edema of the skin and subcutaneous tissues. At color Doppler evaluation, the cyst has thick walls showing hypervascularity. **Intracystic Papilloma:** An intraductal papilloma is a common cause of a cystic lesion with a mural nodule. The papilloma obstructs the duct in which it is located and also secretes fluid to form a cyst. At this point, the lesion is termed an intracystic papilloma. On ultrasound, a cyst with a mural-based nodule is usually identified.

Necrotic Neoplasms: A necrotic neoplasm should always be considered in the differential diagnosis of a complex cyst. Necrosis

most frequently develops in a rapidly growing invasive ductal carcinoma, producing an irregular mass with a central cystic component Peripheral and some internal vascularity is seen associated with the mass can be shown with color doppler. The irregular margins of the lesion increase the possibility of malignancy [1]

Fibrocystic changes (FCCs): USG spectrum of focal fibrocystic changes includes solid mass, cysts, heterogeneously echogenic tissue, and absent sonographically visible focal change. [4]

Complex Fibroadenomas: that consists of sclerosing adenosis, papillary apocrine metaplasia, epithelial calcifications, and/or cysts greater than 3 mm are considered as complex fibroadenoma. The relative risk of developing breast cancer in patients with complex fibroadenoma is more, as compared to noncomplex fibroadenoma. [5]

Tuberculosis of the breast: - is a rare entity. Etiologically it can be subdivided into Primary Breast Tuberculosis and Secondary Breast Tuberculosis. On ultrasound, three different patterns of breast tuberculosis are identified. 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 [6]

Our study includes those cystic lesions of the breast which were clinically palpable as mass.

MATERIALS AND METHODS:-

Collection of Data

This prospective study was conducted with due approval by the Institutional Legal Ethical Committee. 70 Cases were analyzed from March 2016 to September 2017. Patients included were in the age group of 21 to 60 yrs.

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

Conventional Sonographic Examination

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

Technique

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.

Elastography score

The elasticity scores of the target lesions were assessed using the

following Tsukuba scoring system described by Itoh et al. [7]

TSUKUBASCORINGSYSTEM:-

A score of 1 indicated even strain for the entire hypoechoic lesion (ie, 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 (ie, 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 (ie, 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 (ie, 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 (ie, 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

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. [8]

Pathological Diagnosis

In all 70 cases included in the study diagnosis was established by FNAC, or histopathology

METHODS: 70 cases of palpable cystic lesions of the breast were studied over a period of 18 months. (April 2016 to September 2017). Only those cases in which the lump was clinically palpable were included in the study.

RESULTS: Out of 70 cases the majority of the cases were of fibrocystic disease (24.28%) followed by simple cysts (18.57%). The different types of cystic lesions encountered are enlisted in Table 1.

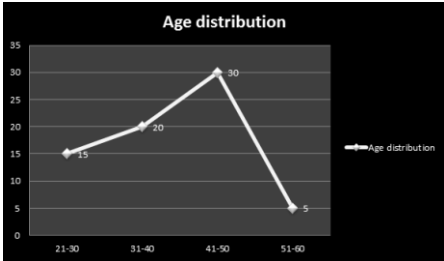
Table 1.

Diagnosis	Number of Patients	Percentage
Fibrocystic disease	17	24.28%
Simple cysts	13	18.57%
Galactocele	10	17.29%
Breast abscess	10	17.29%
Cystic fibroadenoma	6	8.57%
Cystic carcinoma Breast	5	7.14%
Tuberculosis of breast	4	5.71%
Intraductal papilloma	3	4.29%
Axillary Galactocele in ectopic breast tissue in axilla	2	2.86%

Maximum numbers of patients (30) were in the age range of 41-50 years.

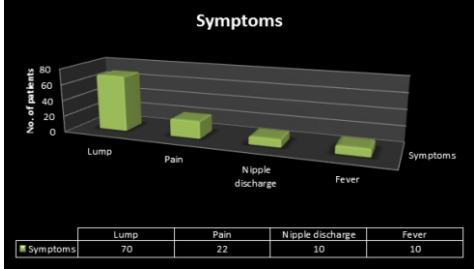
Table 2.

Age in years	Number of Patients	Percentage
21-30	15	21.43%
31-40	20	28.57%
41-50	30	42.86%
51-60	5	17.14%



Symptoms:-

Clinical Presentation	Number of patients	Percentage
Lump	70	100%
Pain	22	31.43%
Discharge	10	14.29%
fever	10	14.29%



Elastographic features:-

Cystic Benign lesion	Classical BGR(BLUE-GREEN-RED) appearance
Malignant complex cystic mass	Large solid component taking dark blue colour on elastography scale (Stiff tissue) and high Strain ratio.
Benign complex cystic mass	Solid component taking soft colours on elastography scale and low strain ratio.

DISCUSSION: Cystic lesions of the breast may present in women of any age but are more common between 30 and 50 years of age. The maximum numbers of cases (46%) were seen between 41-50 years. [9]In our study most common age group was 41-50 yrs followed by 31-40 yrs. radiologically, cysts can be classified into three types, simple cysts, complicated cysts and complex cysts. Simple cysts are the most common and result from dilatation and effacement of the terminal duct lobular unit. [1] 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. [10]A complicated cyst meets all the criteria of a simple cyst except that it contains low-level internal echoes or fluid–fluid or fluid–debris levels that can moves with changes in the patient's position. The causes of internal echoes within an otherwise simple cyst can be cell debris, protein, cholesterol, blood, WBCs, and epithelial cells. [1] Complex cysts contain cystic and solid components and are associated with a variety of benign, atypical, and malignant pathologic conditions. Complex cystic breast masses have a substantial chance of malignancy; which was reported in 23%6 and 31%7 of cases in two series. Complex breast cysts are defined as cysts with thick walls, thick septa, intracystic masses, or other discrete solid components. [11] In our study5 (7.14%) cystic masses were proven malignant. By using criteria adapted from Berg et al, complex cystic breast masses can be categorized into four classes on the basis of their US features: Type 1 masses have a thick outer wall, thick internal septa, or both; type 2 masses contain one or more intracystic masses; type 3 masses contain mixed cystic and solid components and are at least 50% cystic; and type 4 masses are predominantly (at least 50%) solid with eccentric cystic foci. Complex cystic breast masses may be due to a wide range of pathologic entities, including benign, atypical (high-risk), and malignant lesions. [12]

Conclusion:-

Cystic lesions of breast are usually benign though some radiologically complex masses may be malignant. Cystic lesions are commonly encountered in breast imaging. On elastography benign lesions typically show BGR pattern. Careful attention to the detailed characteristics of the cystic mass and correlation with patient history and presentation along with elastographic appearance will help in differential diagnosis and proper management of the patient.

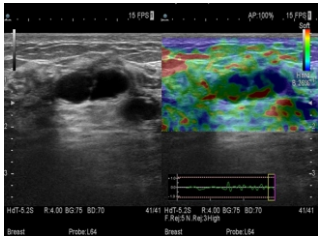


Fig1] Simple cysts of breast showing classical BGR pattern on Elastography colour scale.

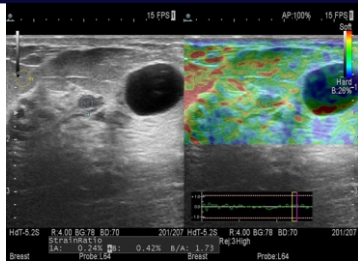


Fig2] Breast parenchyma shows solid lesions, cystic areas and heterogeneously hyperechoic tissue. Elastography shows BGR pattern in cystic areas and soft colours in solid areas suggestive of Fibrocystic disease.

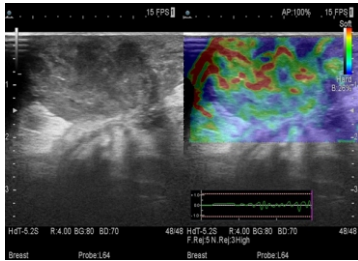


Fig3] Breast abscess is seen as heterogeneously hypoechoic central part (necrotic area) which takes soft colours on elastography (red and green) surrounded by stiff tissue seen in dark blue colour (solid portion).

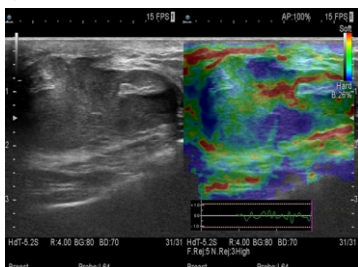


Fig4] A patient in post partum period presented with a large lump in breast. On USG heterogeneous lesion is seen with internal debris and fluid levels taking BGR pattern on elastography scale suggestive of Galactocele. On aspiration white coloured fluid was seen.

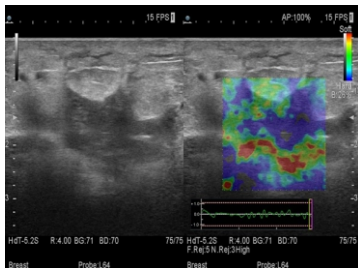


Fig5] Tubercular mastitis confirmed on FNAC is seen as large hypoechoic lesion in breast associated with inflammation of fat and subcutaneous tissue seen on elastography as BGR pattern in lesion. Reactive axillary lymphadenopathy was also present.

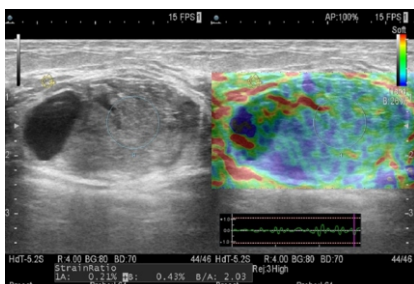


Fig6] Large oval, encapsulated wider than taller solid mass in breast suggestive of fibroadenoma. Cystic degeneration in lesion seen on elastography as BGR pattern.

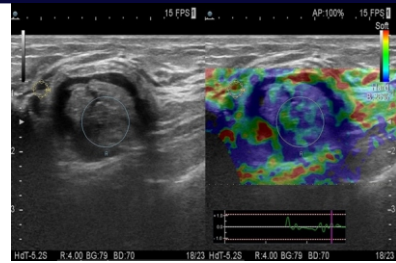


Fig7] Dilated mammary duct showing solid mass. On elastography stiff as well as soft colours are seen in lesion with strain ratio of 2.4 suggestive of intraductal papilloma confirmed later on.

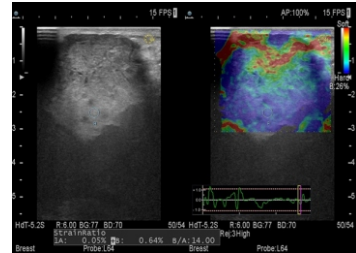


Fig8] Large solid cystic complex breast mass showing a large solid component which is taking stiff colour (Dark blue) on elastography. Strain ratio was 14 suggestive of malignant mass. Biopsy revealed invasive ductal carcinoma.

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