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Research Article

### VARIOUS FEATURES OF BREAST MASSES ON HIGH-FREQUENCY ULTRASOUND

<sup>1</sup>Dr Mamoona Aziz, <sup>2</sup>Dr Uzma Afzal, <sup>3</sup>Dr Waqar Iqbal

<sup>1</sup>Ginggangshan University, China., <sup>2</sup>Quaid. e. Azam Medical College, Bahawalpur., <sup>3</sup>Akhtar Saeed Medical and Dental College, Lahore

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**Abstract:**

**Objective:** To determine the frequency of various symptoms and categorize breast mass characteristics using high-frequency 12 MHz ultrasound.

**Study:** A descriptive study

**Place and Duration:** The study was conducted at the Department of Radiology, Bahawal Victoria Hospital, Bahawalpur for one-year duration from August 2019 to August 2020.

**Patients and Methods:** All patients with palpable or undetectable breast tumors, referred to the radiology department for breast ultrasound, were included. Other criteria considered were age 15 to 55 years, pain and nipple discharge. Dense breast flesh and asymmetric density in mammography are also taken into account. Breast diseases confirmed by biopsy and treated were excluded. The main measure of outcome was the presence of abnormal clinical and ultrasound outcomes. Findings were categorized in BIRADS terms. Statistical analysis was performed for descriptive statistics. The mean age, frequency and percentage of benign and malignant lesions were analyzed.

**Results:** 265 adult women took part in the study. 180 (67.9%) had a palpable nodule touch, 45 (16.9%) had a non-palpable nodule, but the remaining cases had nipple discharge and mastalgia. The results of ultrasound examinations were classified according to the term BIRADS. Out of 265 cases, 73 (27.5%) showed malignant features on USG and benign lesions in 140 (52.8%) patients. 30 (11.3%) cases were probably mild and 22 (8.30%) cases were suspect. Mild changes observed in young patients 15 to 30 years of age, except 7, showed suspicious malignant features. Dominance of malignant features over 50 years of age. Distribution of 140 benign lesions were cysts in 52 (37.5%) cases, fibroadenoma in 40 (28.5%) and mastalgia in 25 (17.5%) cases and duct ectasia in 23 (16.4%) cases. Malignant features were found in 73 (27.5%) cases.

**Conclusion:** This study shows that 12 MHz high-frequency ultrasound is an ideal imaging method for classified benign and malignant masses, especially in young and dense breasts. It is also useful with mastalgia. There was mild dominance in young patients and malignant dominance in older patients. Ultrasound categorization helps you avoid unnecessary biopsies and provides better options in your management plan.

**Key words:** BIRADS, biopsy, breast pain, lump, mammography, mastalgia, sonomammography, ultrasonography

**Corresponding author:**

**Dr Mamoona Aziz**

Ginggangshan University, China.

QR code



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## INTRODUCTION:

The usefulness of breast ultrasound was discovered in 1951, after it became the conventional method of detecting a palpable and undetectable breast lump. With the induction of high-frequency ultrasound probes, high-quality images of normal and abnormal breast can be obtained. The presence of a tumor in the breast creates physical and emotional problems for women. Breast cancer is the most common cause of death in women. It is the fifth most common cancer after the lung, stomach, liver and colon. According to WHO, there were 519,000 deaths from breast cancer in 2005. This means that every 100 deaths worldwide and every 15 cancer deaths were due to breast cancer. Previously, there was a great deal of debate about assessing breast problems, but with the invention of high-frequency ultrasound probes 7.5 - 12 MHz, they have resulted in success in the diagnosis of breast problems. 12MHz high frequency driver provides better resolution, reduces near field artifacts and reverberation. High-resolution U / S is the ideal imaging method for identifying cystic and solid breast masses and characterizing breast masses based on reliable criteria for shape, margin, ecotexture, echogenicity and A.P. These criteria were found to differentiate benign from malignant tumors in palpable or non-palpable breast lumps, and these features help in further evaluation. Damage to the dense breast parenchyma cannot be detected by X-ray mammography and ultrasound plays a very valuable role. Breast ultrasound is a good additional device for troubleshooting mammography diagnostic problems. Ultrasonography not only determines the need for a biopsy, but also reduces the frequency of unnecessary biopsies, especially in benign lesions. By means of Doppler ultrasound, blood flow in the mass can be assessed, which helps in further analysis of the changes. The presence of abnormal vascularization on a color Doppler scan helps to distinguish benign from malignant lesions. Benign lesions usually appear less vascularized with low flow resistance. This enables us to distinguish the intravascular mass of a vascular tumor from sterile mucus or hemorrhagic content. The Breast Imaging Reporting System and BIRADS Data System for Ultrasound is designed to standardize the criteria for interpreting and reporting breast masses. The ultrasound image of the breast is variable depending on age and hormonal status (lactation versus postmenopause). It also depends on the amount and distribution of fat, connective tissue, glandular and ductal tissue. The appearance of the breast parenchyma can range from marked stratification to a homogeneous to heterogeneous appearance. The young non-lactating breast flesh is fibrous-glandular with a very small

amount of subcutaneous fat. With age and childbirth, more and more fat is deposited in the subcutaneous and retrograde nipple space. The aim of our research is to determine the frequency of various symptoms and to classify breast masses according to specific ultrasound criteria. These features will be helpful in assessing breast masses without ionizing radiation and in a non-invasive manner to eliminate the need for an unnecessary breast biopsy.

## PATIENTS AND METHODS:

The study involved 265 patients who were referred by general practitioners or a hospital consultant to the Radiology Department of the Department of Radiology, Bahawal Victoria Hospital, Bahawalpur for one-year duration from August 2019 to August 2020 for a breast ultrasound. Inclusion criteria included breast lump, palpable or not, breast lump, nipple discharge, and pain. Previously diagnosed and treated cases of breast disease were excluded from the study. This test was carried out by a 12 MHz high frequency probe on Toshiba devices. Ultrasound was performed in all female patients aged 15-55 with breast problems. The radiologist physically examined the breast before the ultrasound. The scanning protocol included both real-time transverse and longitudinal breast imaging. This scan was performed by experienced sonologists and checked by a qualified radiologist. The standard position for breast ultrasound examination is the patient's supine position with the arm of the examined side raised above the head to stabilize and thin the breast tissue. In the case of large breasts, the examination is performed in the lateral position, the arm on this side is raised above the head in order to dilute and stabilize the breast. When scanning to an area of interest, a certain degree of compression is applied to eliminate superficial artifacts. The damage was visualized in two perpendicular planes. The location of the lesion was marked on the image according to the mammogram clock to ensure proper observation and location of the biopsy.

The following criteria were included in the breast examination:

- (i) Shape: round / oval or irregular
- (ii) Margins: limited or undefined
- (iii) Width: AP ratio > 1.4 or = 1.4
- (iv) Echogenicity: hyperechoic, isoechoic or hypoechoic
- (v) Echo texture: homogeneous / heterogeneous

Based on the above criteria, an impression was made about the diagnosis. The sonological appearances were classified based on the Breast Imaging, Reporting, and Data System (BIRADS). The data was entered into MS excel and descriptive statistics

for age and incidence of various symptoms were calculated, along with measures of central tendency.

## RESULTS:

Most of the patients in our study had a palpable breast lump. The incidence of benign lesions was higher in young patients and malignant features in the older age group. These findings were based on ultrasound features. The most reliable ultrasound features to characterize the masses as benign or malignant are shown in Table 1. These criteria were strictly followed by the reporting radiologist / sonologist to improve the overall performance of the cancer biopsy. The study was conducted on 265 adult female patients. 180 (67.9%) had a palpable lump, 45 (16.9%) had a non-palpable lump, but nipple discharge in 18 (6.75%) and mastalgia in the remaining 22 (8.3%) cases. The distribution of breast

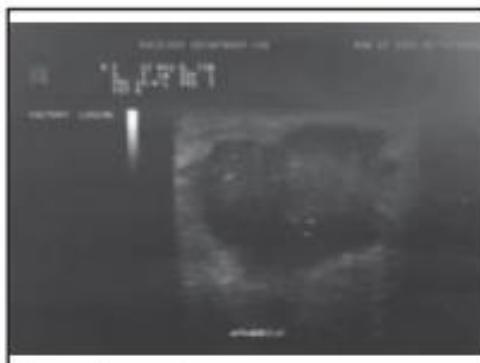
masses among 265 cases was as follows, 73 (27.5%) showed malignant features on ultrasound (Figures 1, 2, and 3), such as heterogeneous, greater than wider width to the anterior-posterior size ratio (AP) 1, 4 and less with irregular margins and architectural distortions. while mild changes in 140 (52.8%) patients. Of the 140 benign lesions, cysts in 52 (37.5%) cases (Figure 4), adenomas in 40 (28.5%) cases, mastitis in 11 (7.8%) cases, duct ectasia in 23 (16.4%) cases %) and fibrocystic disease in 14 (10.0%) cases. 30 (11.3%) cases were probably mild and 22 (8.30%) cases were suspicious abnormalities, as shown in Table 1. Adult female patients 15 to 30 years of age showed mild lesions, except 7 with suspect malicious. Patients over 50 showed malignant features. There are some exceptions with mild symptoms in the elderly group.

**Table 1: Ultrasound Criteria to Differentiate Breast Masses in 265 Cases**

Ultrasound Features	Frequency
Shape	
Round / oval	126
Macrolobulations	29
Microlobulations	25
Irregular	85
Margins	
Circumscribed	140
Microlobulated	28
Spiculated Ill-defined	64
	33
Width AP ratio	
> 1.4	190
< 1.4	75
Echogenicity	
Anechoic	52
Hyperechoic	30
Isoechoic	56
Hypoechoic	127
Echotexture	
Homogenous	167
Heterogenous	98

**Table 2: Distribution of 265 Breast Mass Lesion in Terms of BIRA D.**

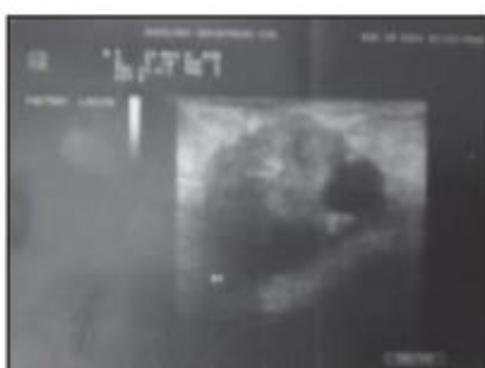
Categories	Mass Lesion	Frequency	Percentage
BIRA DS II	Benign:	140	52.8%
	Cyst	52	37.5%
	Fibroadenoma	40	28.5%
	Duct ectasia	23	16.4%
	Fibrocystic disease	14	10%
	Mastitis	11	7.8%
BIRA DS III	Probable benign	30	11.3%
BIRA DS IV	Suspicious	22	8.3%
BIRA DS V	Malignant	73	27.5%



**Figure 1:** Malignant Characteristic Features: Heterogenous hypoechoic mass with irregular margins, architectural distortion and calcification



**Figure 2:** Malignant characteristic features: Taller than wider with irregular margins & architectural distortion



**Figure 3:** Malignant lesion histopathology report confirms infiltrating Ductal Carcinoma



**Figure 4:** Characteristic feature of breast cyst well defined anechoic lesion with posterior acoustic enhancement

## DISCUSSION:

The aim of this study is to characterize the different appearances of breast masses in ultrasound. The

primary role of ultrasound has been to distinguish cystic from solid tumors, but 12 MHz high-frequency ultrasound differs from malignant breast tumors on

the basis of their characteristics. Breast ultrasound is the examination of choice for young and dense breasts because it is safe, dynamic and does not use ionizing radiation. Early identification of malignant features by high-frequency ultrasound reduces morbidity and improves overall treatment. Increasing the use of sono-mammography in clinical practice, in 2003 ACR developed a standardized lexicon for sono-mammography in light of the counterpart in X-ray mammography. The main goal of the BIRAD DS sonographic lexicon was to provide an integrated language for reporting and ultrasound examinations to avoid ambiguity in the communication and teaching of ultrasound interpretation. The ACR BIRAD system also introduced an intermediate group between benign and malignant, which probably includes the benign BIRAD III, and the suspicious BIRAD IV. With advances in imaging technology, breast imaging has become a challenge not only to identify malignant cancer early, but also to reduce the frequency of benign biopsies. Guidelines for the ultrasound characterization of breast masses have been published. Real-time ultrasound helps guide intervention procedures. Doppler ultrasound examination additionally helps to differentiate benign from malignant changes based on abnormal vascularization. In our study, benign features were found in 140 (52.4%) cases in the 18–30 age group. This largely corresponds to the result of Khanna et al, which was 39.8% in the 21-30 age group. Among 140 mild cases, simple cysts were common symptoms with a frequency of 52 (37.5%). The accuracy of ultrasound diagnosis of simple cysts is almost 100%, as reported by Jackson. Simple cyst diagnosis is made when the edges are sharp, well-defined, anechoic lesions with posterior enhancement. In contrast, complex cystic masses with thickened, echogenic walls, indistinct margins, and the presence of an internal echo. Breast cysts are common and are usually multiple and bilateral. They occur in a quarter of patients between the ages of 35 and 50 and are increasingly occurring over the age of 50 due to the use of hormone replacement therapy. In our study, cysts with low-level inhomogeneous echoes, thick septum, or an intracellular solid component were suspected of being malignant, in which case FNAC and biopsy were recommended. In our study, fibroadenomas of cysts occurred most frequently at a young age, aged 18–30. Usually the image was smooth, round or oval, wider than taller, and freely movable. In a study conducted at the University School of Medicine in Atlanta, 128 patients under the age of 20 were biopsied, and 71% had fibrous adenoma, at their peak at age 18. Other data from the American Medical School showed that the percentage is 77%. It was an important aspect

from our study that fibroid adenoma is the most common benign mass in young patients. This can help eliminate the need for a biopsy in younger patients. Fibrocystic disease was diagnosed in 6 patients over 20 years of age, with visible solid and cystic masses. Khanzada conducted a Benign Breast Disease Spectrum Study that showed an increased incidence of fibrocystic disease in women over the age of 20, and that incidence increases with age. Several studies have already shown that ultrasound can show small, imperceptible, invasive tumors not seen on mammography. There are some limitations to breast ultrasound to recognize, including the difficulty of being light solids due to iso-echogenicity (especially in intraductal carcinoma), and the difficulty of identifying intra-ductal micro-calcifications that can be easily demonstrated by mammography in the absence of a tumor. A limitation of this study was a snap shot / no follow-up, i.e. bias towards selection. In our study, the aim was to describe the frequency of the various symptoms and to characterize the breast masses to use this information in a management plan.

### CONCLUSION:

Ultrasound is a simple, safe, widely available, cost-effective, and time-saving imaging method for assessing breast masses. This should be the first test to be performed in young or pregnant women for whom mammography is not indicated. It is the preferred imaging method for categorizing benign and malignant masses. Its sensitivity in detecting cystic tumors is very high, therefore it plays a decisive role in differentiating cysts from solid breast masses. Ultrasound characterization helps to avoid unnecessary biopsies and provides better options in your management plan.

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