Original Article

Ultrasound Employed to Detect Breast Lumps among Symptomatic Patients in Tertiary Care Hospital

Ameet Jesrani, Pari Gul, Nida Amin Khan, Seema Nayab, Fahmida Naheed, Rizwana Rehman

ABSTRACT

Objective: To assess different pathological breast lesions in ultra sound in a subgroup of population.

Study design and setting: It was a cross sectional study conducted at Bolan Medical Complex Hospital Quetta, Pakistan from June 2018 to January 2019.

Methodology: Total 103 patients with breast swelling, pain and discharge were targeted. Gray scale and Doppler Ultrasound of breast followed by FNAC/biopsy of breast lesion was performed. Data presented as mean ± standard deviation for continuous variables and frequency with percentages for categorical variables.

Results: Out of 48 clinically palpable lumps US detected all of 48 lumps and additionally 12 clinically non palpable masses were detected on US examination. Thus, overall sensitivity of ultrasound in detecting breast lumps was 100%. Fibroadenoma of the breast was diagnosed accurately in 80.3% of women. Ultrasound reliably differentiated cystic from solid breast masses (100%). The sensitivity of ultrasound for detecting breast carcinoma was 63.4% with a positive predictive value of 87.5%, a negative predictive value of 99.5% and accuracy of 58.33%. US findings most suggestive of benign lesions were oval or round shape in 88.3%, well defined margin in 84%, absent lobulation in 86.04% and wider than taller ratio in 90.69% of the cases.US findings of most predictive for malignancy were of irregular shape in 81.8%, ill-defined margin in 90.9% and length to height ratio in 63.6% of cases.

Conclusion: Ultrasound is simple, cheap, safe and relatively accessible imaging modality for evaluation of breast pathologies. Due to its high sensitivity in diagnosing benign breast lesions particularly cystic lesions and fibroadenoma unnecessary interventions can be avoided.

Key words: Breast Ultrasound, Breast FNAC/Biopsy, Breast lump, Nipple Discharge

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INTRODUCTION:

Breast cancer is the leading cause of death among women particularly in the developing world. The incidence of breast masses and associated breast cancer is increasing worldwide resulting 1.6 million new cases in 2010 alone possibly due to more frequent practice of imaging as a screening program. Besides, the incidence of breast cancer is expected to rise causing up to 2.1 million new breast cancer cases by the year 2030.[1] By 2020, 70% of the 15 million new annual cancer cases will be in developing countries.[2] Breast cancer cases are in developing countries present in relatively young age, mostly late presentation and aggressive course and carry a very low 5-year survival rate of 39%.[3] Breast cancer is the most common cancer among women in Pakistan (33%) followed by cervical cancer (17%) and ovary (6%). [4]

Triple assessment using physical examination, mammography and percutaneous biopsy are the most important way of diagnosing breast lesions in those who have well established health care system**.** However, mammography is a very expensive way of investigation modality which is not affordable to many developing countries. Besides the cost, psychological trauma & morbidity of biopsies particularly for supposed benign lesions is very high.

Ultrasound (US) plays a pivotal role in the diagnosis of breast lesions as well as adjunct to mammography and MRI particularly in those who have dense breast tissue.[5] Assurance of the technical quality of US equipment should follow

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specific protocols.[6] As a general suggestion, women should be aware that US equipment older than 10 years may not yield state-of-the-art examination results. [7] Of note, although automated three dimensional whole-breast US systems can be used by radiographers for generating three-dimensional US datasets. [8] the interpretation of the images always requires the experience of an expert in handheld breast US to keep false positive and false negative calls as low as possible.[9]

Automated whole breast US, approved by the Food and Drug Administration in 2009, offers the potential for acquiring a volumetric three-dimensional breast dataset with a standardize examination protocol. [10, 11]

In women younger than 30 years of age, pregnant or lactating mothers with a palpable lump, focal breast pain bloody nipple discharge, US is the primary imaging test, with a sensitivity and negative predictive value of nearly 100%.Symptomatic women older than 30 years usually require both US and mammography, and in these patients, the negative predictive value approaches 100%. In symptomatic women aged 30–39 years, the risk of malignancy was 1.9% and the added value of adjunct mammography in addition to US was low.[12]

Mammography is the gold standard investigation modality in breast screening with a detection rate of 85% of the prevalent breast malignancies.[13] However, for screening, US is increasingly being used to detect early breast cancer worldwide. According to a multicenter trial of combined screening with mammography and US (ACRIN 6666), it reported higher cancer detection in high-risk women who underwent annual ultrasound screening in addition to mammography compared to those that underwent mammography alone, the combined screening detected an additional 4.2 cancers per 1000 women.[14]

The use of Color Doppler ultrasound (CDUS) for characterizing breast lesions has increased in recent years. On CDUS malignant lesions were more vascular than benign lesions. Blood vessels were detected in 97.4% of the malignant group and in 35% of the benign group.[15]

Among those < 35 year of age the sensitivity, specifity and positive predictive value of US in diagnosing malignant breast masses was found to be higher compared with those > 35 year of age. In addition, the chances of missing a lesion or indeterminate results were less in those < 35(11.11% vs. 14.29%).[16, 17]

In a setup with lack of resources and unaffordable patients; ultrasound can play a key role as first line of investigation for benign lesions where other modalities like mammography, CT scan and MRI are unavailable and unaffordable and indeed it was the rationale of the study.

Hence, the aim of the study was to assess different pathological breast lesions in ultra sound in a subgroup of population.

METHODOLOGY:

This cross sectional study was conducted at Bolan Medical Complex Hospital for a period of 7 months from June 2018 to January 2019 after approval from ethical review committee and includes 103 patients. The source of population were all women with breast mass, pain and discharge referred to radiology department from inpatient and outpatient care units at Bolan Medical Complex Hospital. Individuals with history of proven malignancy and on treatment, breast surgery or recurrent breast cancer were excluded. Consecutive sampling technique was employed to select samples.

A comprehensive standard breast ultrasound examination was performed on all subjects by the principal investigator using TOSHIBA (XARIO 200) machine. All patients were examined in supine position using a high frequency linear-array transducer (7.5 MHz) that provided adequate penetration and a high resolution image. Scanning of both breasts and axillae were done in different planes. Real time imaging of breast lesions was performed using both gray-scale and color Doppler techniques. The imaging characteristics of a mass (location, size, shape, margins, echogenicity, contents and vascular pattern) were identified. FNAC results were collected from pathology department using their chart number.

All completed questionnaires, ultrasound and pathologic result data checked daily for completeness and consistencies. Then data has been coded and entered into a personal computer using Epi-data version 3.1. Data was cleaned with consistence checks and analyzed using STATA version 14 packages. Tables were used to summarize frequency distributions and percentage of the data. Data presented as mean ± standard deviation for continuous variables and frequency with percentage for categorical variables.

RESULTS:

A total of 103 patients were studied with a mean (±SD) age of 31.1±10.1 (range: 8–60) years. Of the 103 women, 60.19% (62 out of 103) were in the age group of 20-35 followed by 32.04% (33 out of 103) in the age group of 35-50 years. Majority of them were married (77.67) and were Christians (94. 17%). Slight majority (51.46%) lived in rural areas (53 out of 103 candidates). 70.87% (73) of candidates had history of breast feeding (82.19% feed for more than 2 years).

In this study, most of patients had late presentation with a meantime of (±SD) 1.62 ±2.14 yrs (range: 0.19 – 10yrs). Most patients had presented with a complaint of breast lump 53(51.4%) and seven (6%) subjects having breast pain 45(43%) and breast discharge.

On clinical evaluation, mass was detected in 46% (48) of patients, breast size asymmetry in 26 (25.24%) cases and skin thickening in 5(4.85%) of patients. Majority of the masses (70%) were located on the right breast, 28% occurred on left and the rest 2% on both breasts. Of all 48 palpable

masses, US detected all lumps with additional 10 masses not reported on clinical evaluation. Axillary lymph nodes were palpable in only two (1.9%) patients.

On US examination, mass was detected in 58 cases, from these 42.8% were identified on right outer quadrant followed by 25% on left outer quadrant. Total 74.13% of masses appeared as solitary masses but the remaining 24.13% presented as multifocal masses involving either a single quadrant or multiple quadrants. Both breasts were involved in only 4 % of patients.

Calcifications were detected in 13 masses. From these nine (69.23%) were coarse, three (23.08) were punctuate and one (7.69%) rim like calcification. Six (46.15%) of calcifications were seen in benign masses but the other six (46) were seen in malignant lesions. On pathologic correlation, four (66%) coarse and two (33.33%) punctuate calcifications were seen among malignant masses (pr-0.009).

From 58 breast masses evaluated for their shape, 28 (48.2%) had oval shape, 16 (27.5%) had irregular outline and the 14 (24.13) had round shape. Among benign masses the predominant reported shape was oval 27 (62.7%), followed by round 11(25.5%) and five (11.6%) had irregular shape but nine (81.8%) malignant masses showed irregular outline (pr-0.001). Figure 1 show hypoechoic mass with lobulated margins and perifocal fat thickening is suggestive of malignant lesion on ultrasound which was later proven by histopathological findings.

The margins of 58 masses were evaluated. The majority of the masses, 39 (67.2%) had well defined border and 19 (32.7%) had ill-defined margin. Among those evaluated 14(24.13%) had lobulations whereas 10 (17.2%) had > three lobulations and four (6.7%) cases had < three lobulations. In addition, 44 breast masses (91.6%) found to have wider than taller configuration but 11 (18.9%) had taller than wider configuration. None of the masses evaluated had speculation.

On Doppler flow study 7(12.0%) had hyper vascular flow, two (3.4%) hypo vascular and the remaining 49(84.4%) didn't show any color flow. All malignant masses (100%) showed hypervascularity.

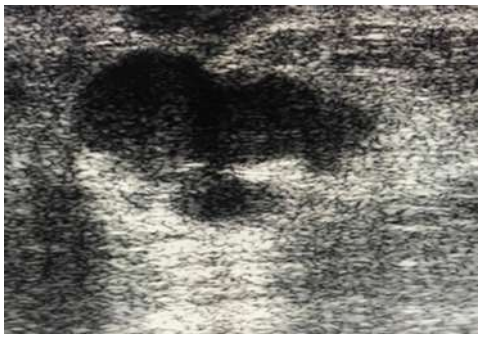
In evaluation of ductal abnormalities on ultrasound, 22 patients had dilated and only one patient had intraductal mass.

Overall 42 patients were reported on US as having normal finding but on pathologic study only 4(9.52%) of them were reported as normal and 37 (90.48%) became benign, one turned out to be suspicious and none diagnosed as malignant. Thus, US have low calculated sensitivity (9.5%) as compared to histopathological study in detecting subtle benign breast lesions. On the contrary US had high sensitivity (92.1%) in predicting grossly visible benign breast lesions. (Graph 1). Eight masses were diagnosed as malignant masses on US study and among these masses 7(87.5%) became malignant and one suspicious. On pathology, totally 11 masses were reported as malignant so the calculated sensitivity of US was 63.4 %, positive predictive value of 87.5 % and accuracy of 58.33%. (Graph 2)

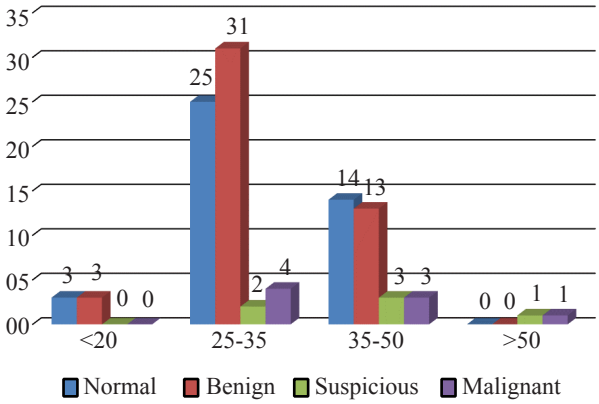
DISCUSSION:

In recent years, breast ultrasound has become an imaging modality of choice in imaging of patients with breast diseases including those who have clinically palpable breast mass or non-specific breast pain even though mammography plays main role in diagnosis and screening of breast lesions. In resource limited countries like Pakistan where mammography

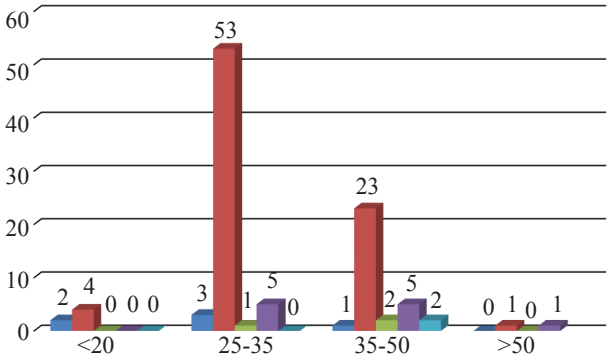
Figure 1: Lobulated hypoechoic mass with perifocal fat thickening



Graph 1: Ultrasound findings in relation to age



Graph 2: Distribution of pathologic findings in relation to age



is not widely available and the availability of high resolution US machines in most of the hospitals, US can play a significant role in diagnosing breast pathologies.

In this study; presence of clinically palpable lumps as the only clinical manifestation alone was seen in 46.6% of patients. This finding is different from the result of Mubuuke et al and Monu et al [18] which showed clinically palpable lumps as the only symptom among 80% of women. The likely explanation for this lower detection of palpable lumps by patients could be due to inadequate awareness in breast self-examination.

Majority of (91.6%) of lumps were detected in the reproductive age group (62.5% between 20-35 years of age and 29.16% between 35-50 years). This result is comparable in a great extent with that of Mubuuke et al (40% between the age of 30-39 years and 20% between 20-29 years) and Kailash et al [19] (44% in the age group between 20-29 years).

US has detected all 48 clinically palpable breasts lumps and additional 10 masses, thus giving 100% sensitivity. This corresponds well with the results of Kailash et al of 95% and Mubuuke et al of 92.5%.

The detection rate of US for cystic lesions in our research was 100% (4 out of 4). This finding is consistent with the findings of Kailash et al of 92%% and Mubuuke et al of 100%. The presence of breast abscess was accurately diagnosed in 85.17% of women. This result is higher than the above researches (both showed a detection rate of 60%).

Overall 42 masses were reported on US as having normal finding but on pathologic study only 4(9.52%) of them were reported as normal and 37 (90.48%) became benign, one turned out to be suspicious and none diagnosed as malignant. Thus, US have low calculated sensitivity (9.5%) as compared to histopathological study in detecting subtle benign breast lesions. The possible explanation for this significant difference between pathology and US could be the subtle benign cellular changes which are reported as benign lesions.

On the contrary US had showed high sensitivity (92.1%) in grossly visible benign breast lesions. Particularly the sensitivity of US in the diagnosis of fibroadenoma was 80.9%. This finding is consistent with the findings of the Kailash et al of 81.6% and slightly better than the result of Mubuuke et al of 75%.

US findings most suggestive of benign lesions were oval or round shape in 88.3% of cases, well defined margin in 84%, absent lobulation in 86.04%, wider than taller ratio in 90.69%. This result was comparable to the findings of Kailash et al which showed oval or round shape in 95%, well defined margin in 86% and wider than taller configuration in 87% of cases. It was also consistent with the findings of Shukla et al [20] which showed oval or round shape in 88.24%, well defined margin 87.1% and wider than taller configuration in 84.38% of the cases.

Most of benign masses (67.4%) had hyperechoic texture followed by heterogeneous in 16.2%, isoechoic in 11.6% and hypoechoic in 4.65% of patients. This result relatively coincides with the result of Shukla et al which showed isoechoic and hyperechoic masses appear benign in 81.2% & 80% of women respectively.

Breast cancer was histologically diagnosed in 11 patients and from these, US correctly diagnosed seven of them as malignant and the other four as suspicious, thus a sensitivity of 63.4%,PPV 87.5 % and accuracy of 58.33% in detecting malignant masses and 100% sensitivity in identifying malignant and potentially malignant breast masses. This diagnostic accuracy was better compared to Kailash et al of 65%sensitivity and higher than Mubuuke et al of 57.1% sensitivity and comparable with Stavros et al [21] who reported 98.4% sensitivity of ultrasound in classifying breast masses as indeterminate or malignant. In another study a sensitivity value of 95%, specificity of 94.10%, positive and negative predictive values of 95.50% and 93.75% were noted.

US findings of most predictive for malignancy were of irregular shape (81.8%), ill-defined margin (90.9%) and length to height ratio (63.6%). This finding was significantly higher than results seen in the study of Kailash et al: irregular shape 53%, non-circumscribed margins 41% and width AP ratio 39% but consistent with the result of Shukla et al that is irregular shape 73.33%, non-circumscribed margins 61.11% and taller than wide ratio in 70.59%.

From the results of this study and other published articles, it was obvious that US plays a significant role in the diagnosis of breast pathologies particularly clinically palpable masses.

Emerging findings like Resistive Index can be utilized in differentiating benign from malignant masses as well as velocity in neovascularity is also another emerging feature which can be applied for better depiction of differentiation.

In our study US showed higher negative predictive value in diagnosing malignancies. Thus, US can be used to reassure women who have no malignant features.

There were few limitations in our study, like this is single centre based study and sample size is small. We need to have large sample size in order to increase sensitivity and specificity for detection of breast pathologies, especially malignancies.

CONCLUSION:

Ultrasound is simple, cheap, safe and relatively accessible imaging modality for evaluation of breast pathologies. Ultrasound should be the first line imaging modality for pregnant and young women for which mammography is not advisable. Due to its high sensitivity in diagnosing benign breast lesions particularly cystic lesions and fibroadenoma unnecessary interventions can be avoided.

Author Contribution:
Ameet Jesrani: Study design and concept, data analysis, data Interpretation, initial and final drafting of manuscript.
Pari Gul: Data collection and questionnaire design
Nida Amin Khan: Initial drafting of manuscript, data interpretation and literature search
Seema Nayab: Critical revision of the manuscript
Fahmida Naheed: Data collection
Rizwana Rehman: Data collection

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