ORIGINAL ARTICLE

Diagnostic Accuracy of Ultrasound findings in the Differentiation of Benign and Malignant Breast Lesions

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ABSTRACT

Background: Breast lesions are the most common finding in females of all age groups but are most common in the reproductive age. Breast masses may appear suddenly or gradually. The presence of a breast lesion does not mean an individual has the cancerous disease because 11% of individuals present with breast lesions turned to have cancer of the breast. Pakistan is the seventh-most crowded state worldwide, is a nation in Asia.
Aim: To determine the diagnostic accuracy of ultrasound findings in the differentiation of benign and malignant breast lesions.
Methods: The Cross-sectional study was done to evaluate the diagnostic accuracy of ultrasound in 138 patients who visited the Radiology department and histopathology department Faisal hospital, Faisalabad between September 2019 and May 2020. Those who had breast abnormality on ultrasound were nominated for comparison with the histopathological finding taken from the tumors.
Results: The ultrasonographic features that most consistently characterize lesions are benign or malignant. Sonographically, 91 cases were classified as benign and 46 cases were malignant. 2 breast masses classified as benign on ultrasound were found to be malignant on biopsy. 6 breast masses classified as malignant on ultrasound were found to be benign on biopsy. So the sensitivity and specificity of ultrasonography were 96% and 93.81% respectively, and its negative predictive and positive predictive values were 97.85% and 88.89% respectively.
Conclusion: Diagnostic accuracy of ultrasound was 94.56%. Sonography could help in differentiation of benign and malignant lesions and can be following up.
Keywords: Sonographic features, biopsy, benign breast mass, Breast cancer. Ultrasoun

INTRODUCTION

Breast tumor currently represents the commonest women malignancy in both the developed and developing world. The tumor is a major cause of death, with almost 8 million deaths credited to malignant diseases in 2008 and 2030, 11 million cancer-caused deaths (Simon, Juszczyk et al. 2012). There are several differences between breast cancers in western countries compared with Asia. Mostly Asian nations are low-income nations, so access to effective precaution is limited.(Benson and Jatoi 2012) In Asia Due to the late diagnosis and insufficient care, the survival of females with cancer is less than in western nations.(Yip 2009) Pakistan is the seventh-most crowded state worldwide, is a nation in Asia. Like other developing countries of the world, Pakistan also bears the burden of syndromes with a significant prevalence of breast cancers. The breast cancer prevalence, occurrence of new cancer individuals, mortality rates, and the total number of deaths per year in Pakistan is not identified.(Hanif, Zaidi et al. 2009, Asif, Sultana et al. 2014)

The presence of a breast lesion does not mean an individual has the cancerous disease because 11% of individuals present with breast lesions turned to have cancer of the breast..(Santen and Mansel 2005) Benign diseases of breast consist of the heterogeneous group lump rising from the epithelium or other mammary tissues

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and that can be connected to inflammatory, vascular or traumatic conditions.(Lanyi 2003, Masciadri and Ferranti 2011) Some lumps are palpable masses, which can be nodular, with unspecific or specific appearances, but mostly there are no definite clinical signs, and diagnosis is tough.(Stavros 2004)

Cancer of breast tissues can first appear as a palpable breast mass, so it may be painless and can be felt by hand on the site.(Sotiriou, Neo et al. 2003) Breast carcinoma is generally categorized as lobular which is initiating from the surrounding tissues of the breast ducts, or ductal that is initiating from the breast milk ducts.(Reis-Filho and Pusztai 2011) Cancer of breast tissues is preceded through a series of steps of cellular change, like in atypical hyperplasia the normal breast tissues changed into an abnormal shape, in carcinoma in situ normal tissues develop into localized regions of cancerous tissues and at the end, it can be converted into free breast cancer tissues that maybe extend to other parts of the body. These variations are also categorized by the area like lobular and ductal, therefore sometimes the terms lobular carcinoma in situ and ductal carcinoma in situ are used. Almost 12% of cancers of the breast are lobular and 80% are ductal, and remaining cases are due to the rare causes of breast malignancy. Rare forms of breast malignancy include the extent of cancer tissues from other regions of the body to the breast tissues, breast lymphoma, or malignancies of the blood vessels in the breast tissues.(Chuang, Lee et al. 2007, Weigelt, Horlings et al. 2008) the purpose of this study is to evaluate the sensitivity and specificity of

ultrasound imaging for distinguishing between benign and malignant breast masses, with biopsy results as the reference standard. The application of the established sonographic criteria will reduce the number of unwanted biopsies in our population.

MATERIAL AND METHODS

The study was conducted over 9 months, from September 2019 to June 2020 at our hospital. 138 female patients with a complaint of a breast lesion, those whose clinical examination revealed palpable masses were referred by their managing surgeons for sonographic evaluation were selected. All Patients go through breast ultrasound for an opinion at the Radiology department and histopathology department Faisal hospital, Faisalabad. Breast ultrasound will be performed with ultrasound GE machine or Toshiba machine with 7 MHz probes. All the patients with breast masses were examined by 1 of 3 radiologists and characterized immediately before the biopsy. All radiologists are specialists with extensive clinical experience.(Berg, Gutierrez et al. 2004) Breast tissue biopsy was done on all these individuals. This group of lesions was recognized by prospective evaluation of 138 consecutive individuals before an image-guided biopsy. The results of the histopathological investigation of the open biopsy samples from these cases were compared with the result of ultrasound examination regarding benignancy or malignancy.(Taj-Aldean and Hasan 2009)

All breast ultrasound exams were done before any invasive test. A palpable lump is not identical to progressive cancer and DCIS may extant as a palpable breast lump.(Doshi, March et al. 2007) For the ultrasound tests of the solid breast masses, it was intended to evaluate the following standards, shape like round, oval, irregular, or lobulated, margins which may be circumscribed, spiculated, micro lobulated, or ill-defined, posterior echoes which may be decreased, enhanced, or unaffected, width-to-anteroposterior measurement ratio, echogenicity, echotexture, presence of pseudo capsule and calcifications. The location of the lesion is also noted in the breast tissue, whether or not the breast lump was palpable.(Yang and Tse 2004)

Figure 1: A large irregular solid looking hypoechoic mass of approximately 36 x 27 mm with indistinct and speculated margins is noted in periareolar region of left upper inner quadrant (left 9 - 12 o' clock).
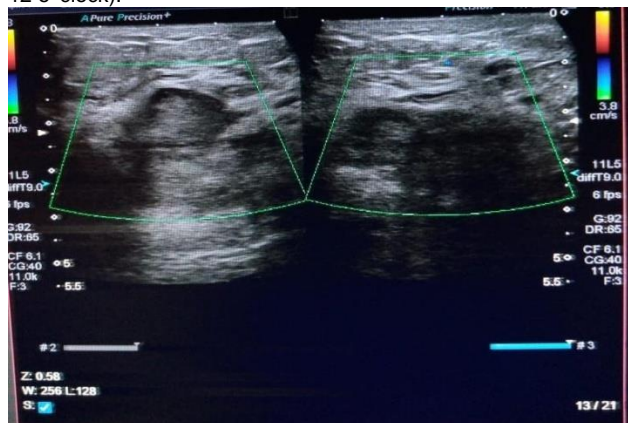

Figure 2: A well-defined bilobed anechoic area is seen at left 2-3 O clock position with posterior acoustic enhancement without internal soft tissue component, vascularity or echoes. It measures 19.6 x 12.1 mm.

Figure 3: A 2.5 x 1.1 cm speculated wider than tall lesion at 4 o clock which was biopsied previously.

RESULTS

One hundred and thirty eight female patients with a complaint of a breast lesion, those whose clinical examination revealed palpable masses were referred by their managing surgeons for sonographic evaluation were selected. All Patients go through breast ultrasound for an opinion at the Radiology department and histopathology department Faisal hospital, Faisalabad. The age of patients included in this study ranged from 16 to 90 years and the mean age of the patients was 41.43±1.16 years table 1 demonstrates the descriptive statistics of the age group.

When I discussing only right side cases, 89.3% of cases were having only right side masses while 10.7% cases were added from both sides to analyze the total right side cases. Now discussing only left side cases, 88.7% of cases were having only left side masses while 11.3% cases were added from both sides to analyze the total left side cases. In one side cases, a total of 130 patients 51.5% cases were right and 48.5% cases were left. Both side cases were separated as right and left individually. So 75 (51%) cases were right while 71(49%) cases were left.

Acoustic enhancement and shadowing in one side patients, on the right side, 15 have posterior enhancement, 36 have posterior shadowing, 16 were unaffected, and in left side cases, 20 have posterior enhancement, 28 have posterior shadowing, 15 were unaffected. When I see margins of mass in one side patients, on the right side, 30 were circumscribed, 0 were defined, 37 were ill-defined,

and in left side cases, 34 were circumscribed, 0 were defined, 29 were ill-defined. Discussing margins of mass in total right side cases (one side cases and both side cases) 37 were circumscribed, 0 were defined, 38 were ill-defined, and in left side cases (one side cases and both side cases), 41 were circumscribed, 1 was defined, 30 were ill-defined. The shape of mass in one side patients, on the right side, 33 were irregular, 21 were oval, 13 were round and in left side cases, 26 were irregular, 23 were oval and 14 were round.

Discussing echotexture of mass in total right side cases (one side cases and both side cases) 19 have posterior enhancement, 38 have posterior shadowing, 18 were unaffected and in left side cases (one side cases and both side cases), 22 have posterior enhancement, 32 have posterior shadowing, 18 were unaffected.

Discussing DW ratio of the mass in total right side cases (one side cases and both side cases) minimum DW ratio of mass was 0.3 and maximum was 2.5 so mean DW ratio of the mass is 1.0 and in total left side cases (one side cases and both side cases) minimum DW ratio of mass was 0.3 and maximum was 1.8 so mean DW ratio of the mass is 0.9

In table 3 of 138 cases, 91 were found benign and 48 malignant on ultrasound and biopsy. 2 cases were found benign on ultrasound but that were malignant on biopsy, and also 6 cases were malignant on ultrasound but that were found benign on biopsy. So the sensitivity and specificity of ultrasonography were 96% and 93.81% respectively, and its negative predictive and positive predictive values were 97.85% and 88.89% respectively. Diagnostic accuracy of ultrasound was 94.56%.

Table 1: Cross-tabulation between Side (Right and Left) Involved sides (one side and both sides)

			Involved sides		Total
			one side	Both sides	
Side	Right	Count	67	8	75
		% within side	89.3%	10.7%	100.0%
		% within Involved sides	51.5%	47.1%	51.0%
	Left	Count	63	8	71
		% within side	87.5%	12.5%	100.0%
		% within Involved sides	48.5%	52.9%	49.0%
Total		Count	130	18	147
		% within side	89%	11%	100.0%
		% within Involved sides	100.0%	100.0%	100.0%

Table 2: Cross-tabulation between involved sides and acoustic enhancement and shadowing

Count

Involved sides			Echostic Rt			Total
			Enhanced	Shadowing	unaffected	
One	Side	Right	15	36	16	67
		Left	20	28	15	63
	Total		35	64	31	130
Both	Side	Right	4	2	2	8
		Left	2	4	3	9
	Total		6	6	5	17
Total	Side	Right	19	38	18	75
		Left	22	32	18	72
	Total		41	70	36	147

Table 3: Cross-tabulation between Sonographic Suspected and Biopsy Result

Count

		Biopsy Result		Total
		Benign	Malignant	
sonographic suspected	Benign	91	2	93
	Malignant	6	48	54
Total		97	50	147

DISCUSSION

At this time ultrasound is considered the first-line modality in the diagnosis and description of breast masses.(Pan 2016) The first time in 1951 ultrasound was used to study the breast. Meanwhile, the ultrasound scan is well-known as an important procedure for the diagnosis of different breast problems. The most essential part of ultrasonography of the breast tissues is the differentiation of solid and cystic masses. When all conditions for a cyst are observed, the diagnostic accuracy of ultrasonography is 96% to 100%.(Hasni, Meah et al. 2004) This is not insignificant because due to the use of ultrasonography the total surgical excisions which are done for benign breast cysts have significantly reduced thus the patient's anxiety, discomfort, and expense which are associated with surgery have been reduced.(Sakorafas 2010)

The results in my study are inconsistent with results by Stavros et al(Stavros, Thickman et al. 1995) and Abdulsattar OA(Abdulsattar 2015) who found the specificity 67% while the sensitivity of ultrasound 98%, this variance can be described by our little practice compared to Stavros et al(Stavros, Thickman et al. 1995) in additions to a less number of cases and the shorter duration of study in my study, and Sensitivity of ultrasound in Abdulsattar OA(Abdulsattar 2015) study was 75% and specificity was 88%. My findings might be improved if other imaging modalities like mammography were jointly involved in making the sonographic conclusion. I have found that 50% of fibroadenomas were isoechoic relative to breast fat, while about two thirds of malignant lesions were noticeably hypoechoic compared with breast fat. Though, about one third of malignant lesions are almost isoechoic. This diagnosis is consistent with the results by Stavros et al whose results marked hypo echogenicity is a symbol of malignancy some features were not consistent in differentiation of benign and malignant breast tumors.(Kuhl, Schrading et al. 2005)'(Shahid, Ghaffar et al. 2005)

Ultrasound morphological criteria used in the descriptions of the images were, contour, shape, echotexture, echogenicity, limits, orientation, secondary signs, and echo transmission. The sensitivity and specificity of ultrasonography were 96% and 93.81% respectively, and its negative predictive and positive predictive values were 97.85% and 88.89% respectively. Diagnostic accuracy of ultrasound was 94.56%. The value of negative prediction of this imaging technique can extent to 100%, whereby the essential assurance for follow up of ultrasound will be provided, and the need for breast mass biopsy will be reduced.

CONCLUSION

The results of this study, the specificity and sensitivity of ultrasonography and its negative and positive predictive values in the diagnosis of benign and malignant breast masses were high. Diagnostic ultrasonography is effective for differentiation of benign mass and malignant masses of breast. Also, the diagnostic accuracy of ultrasonography was high for detection breast masses.

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