Research Article

Non Palpable Breast Mass : Radiological & Pathological Evaluation

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Abstract

Background: Breast imaging modalities potentiates the detection of early, clinically occult breast masses thus allowing early treatment & reduces the mortality rate from breast cancer.

Objective: (i) To evaluate the diagnostic value of breast imaging modalities (mammography and / or ultrasonography) for the characterization of non-palpable breast masses in conjunction with cytology / histopathology. (ii)To assess the relation between the non-palpable breast mass & the breast density, Body mass index & the location of the mass within the breast.

Patients and method: The results of mammographic, sonographic & cytologic/ histopathologic examination performed in 50 patients with non-palpable breast mass were assessed to determine the diagnostic value of imaging in characterization of breast mass.The BMI of each patient was calculated & the breast density at mammography was assessed, 10 patients were <35 years old &thus had sonographic examination only,40 patients had both mammography and ultrasonography. All the patients underwent guided FNA & only 23 patients had excisional biopsy.

Results : Seven out of 40 mammographically detected masses were malignant (17.5%)and 33 cases (82.5%) were benign ,9 cases out of 50 sonographically detected masses were malignant (18%) and 41cases were benign (82%).These results were correlated with FNAC and /or histopathology. The sensitivity , specificity, positive predictive value negative predictive value & accuracy of mammography was 100%,91.6%,57.1%,100% & 92.5% respectively and for ultrasonography was 100% ,91.1% ,55.5% , 100% & 92% respectively .Most of mammographically detected lesions were in breast of category 2 breast density(72.5%) & the majority of patients were overweight or obese(72%).Most of the lesions were found at the upper outer quadrant of the breast.

Conclusions: Ultrasonography & mammography are both sensitive & specific in the diagnosis & characterization of benign and malignant non-palpable breast masses. Patients with high BMI are more prone to have non palpable breast masses particularly at the upper outer quadrants

Key words: *Non palpable breast mass , Mammography, Ultrasonography , Histopathology*

INTRODUCTION

Radiological examination of the breast is established as an essential part of the multidisciplinary approach to effectively manage breast diseases. With increasing use of screening mammography and ultrasound for various indications, a large number of **non-palpable breast lesions** are being detected. The more widespread use of these modalities has been accompanied by tremendous development of both non invasive and invasive radiological procedures that are implicated to establish the diagnosis of non-palpable breast lesions(1).

The standard practice when dealing with a palpable breast mass relies on the "triple test " concept which incorporates the clinical assessment , radiological evaluation & tissue sampling (2-5)

When the three assessments are performed adequately and produce concordant results, the triple test diagnostic accuracy approaches 100 % (3-5).However when dealing with non palpable breast lesion , one of the corner stones of the triple assessment is missed , that is the clinical evaluation .Here , comes the role of the radiologist & the pathologist to establish the diagnosis & to map the way for future management of the lesion . Several studies had dealt with non palpable breast lesions(6-7) , the major concern of these studies was the breast cancer incidence when the lesion is non palpable . In the present study , the authors aimed at evaluating the diagnostic value of breast imaging modalities(mammography and / or ultrasonography) for the characterization of non palpable breast masses with respect to cytology / histopathology & to find out the possible role of the location of the lesion within the breast & the Body mass index (BMI) in making the mass non palpable

PATIENTS AND METHODS

This was a prospective study which was conducting at the breast clinic at Al-Imamain Alkadhimain Medical City during the period From September 2013 to June 2014 . The patients presented to the breast clinic either for screening purpose or with sign and symptoms related to the breast. No palpable lesion was detected on the initial clinical breast examination performed by the same surgeon. Then these patients underwent mammography &/or bilateral breast ultrasonography. Those patients in whom a mass was found upon imaging were subjected to recall clinical breast examination by other surgeons unaware of the imaging findings to confirm the initial impression of no palpable abnormality , & these constituted the study sample which included a total of 50 women . Informed consent was obtained from the patients to participate in the study .Clinical data were collected from the patients & the body mass index was calculated . Ten of the patients were <35 years old & thus had sonographic examination only, 40 patients had both mammography and ultrasonography. All the patients underwent guided FNA & only 23 patients had exisional biopsy**.** Mammography was performed for 40 patients using GE health care mammo.senographe device.Mediolateral (MLO) & craniocaudal (CC) views were taken for both breasts & other view as magnifications were performed when indicated. The density of the breast was determined as 1-4 according to American college of radiologist (ACR) criteria(8) . Analysis of the mass detected by mammography was performed by the same radiologist & each mass was assessed regarding its shape , the ease of definition, the margin criteria and the presence of calcifications to determine the Breast Imaging Reporting and Data System (BIRADS) category according to ACR recommendation (8).The location of the mass with respect to breast quadrant was determined. The largest diameter of the mass was used to indicate the size of the lesion. Sonographic examinations were performed for all patients using a high-resolution unit (VERSA; Siemens, Erlangen, Germany 1996) with a linear array probe centered at 7.5 MHz. The ultrasonography was performed by another radiologist & BIRADS category for the lesion was set depending on the shape , the delineation , homogeneity and echogenicity, margin & irregularity , microlobulation & angulation , the posterior shadowing or enhancement and calcification. Both radiologists were not aware of the imaging finding at the other modality to avoid interobserver bias. Ultrasound guided fine needle aspiration cytology was performed for all patients using 18-23 G needles . The tissue samples obtained were placed in a 10%formalin fixative & routine H & E staining was done. The samples were assessed by the same experienced cytopathologist .Twenty three patients with equivocal or suspicious cytological findings underwent exisional biopsy. The results were interpreted by two experienced histopathologists .

Data Analysis

Probability tests, *t*-tests, or Wilcoxon's rank sum tests, as appropriate

Logistic regression techniques were used to obtain diagnostic Values of the two imaging techniques , assessing the major effect of tumor size and BMI in palpability of breast lesions. Then these were correlated with the FNAC/biopsy . The 95% confidence interval (CI), and *P* value were presented to identify the significant difference between the diagnostic ability of the two imaging modalities (mammography and ultrasonography), & between these modalities and FNAC/biopsy .

Data were analyzed to evaluate the sensitivity , specificity , positive predictive value , negative predictive value and over all accuracy for each imaging modality

RESULT

The study included 50 women with non palpable breast mass , the mean patients age 47 years (range 19-69 years). The size of the masses ranged from 3-16.9 mm (mean= 9.9 mm) at mammography & 2.5-16mm (mean= 7.9mm) at ultrasonography

Fifty patients had ultrasonography , 33 patients(66%) were considered benign **(figure 1 a)** and 8 patients(16%)were considered probably benign . Only

18 % were considered as probably malignant or malignant **(figure2 a).** On the other hand 40 patients had mammography , the majority of the lesions were considered benign or probably benign **(figure1 b)** & only 17.5 % were considered as probably malignant of malignant **(figure2 b)** . The distribution of the lesions according to BIRADS categories is shown in table 1

Table 1. BIRAD categories of the lesions on ultrasonography & mammography

BIRAD categories of the lesions on Ultrasonography			BIRAD categories of the lesions on Mammography		
MALIGNANT BIRAD	No. of cases	%	MALIGNANT BIRAD	No. of cases	%
IV	8	16	IV	7	17.5
V	1	2	V	0	0
BENIGN BIRAD	No. of cases	%	BENIGN BIRAD	No. of cases	%
II	33	66	II	24	60
III	8	16	III	9	22.5

The majority of patients (n=29 , 72.5%) were classified as ACR2 density (scattered fibroglandular density) .Table 2 shows the distribution of benign & malignant lesions according to the breast density

Table 2. distribution of Mammographically detected masses according to breast tissue density n=40

Density	No.of cases	Benign		Malignant	
		No.	%	No.	%
ACR I	3(7.5%)	3	7.5	0	0.0
ACR II	29(72.5%)	26	65.0	3	7.5
ACR III	6(15%)	6	15.0	0	0.0
ACR IV	2(5%)	1	2.5	1	2.5

All patients underwent FNAC and only 23 patients had biopsy . the cytological results were correlated with that of mammography and ultrasonography in BIRAD system .All the benign lesions at BIRAD (II,III) in ultrasound and /or mammography were found to be benign on cytology /biopsy comprise 41 & 33 patients respectively, while 4 out of 7 masses suggested to be malignant on mammography and 5 of 9 masses suggested to be malignant on ultrasonography (BIRAD IV,V5)were proved to be malignant at cytology and biopsy (table3,4).

The statistical characteristics of imaging modalities(mammography and ultrasonogrphy) & their role in diagnosis of non-palpable breast mass are shown in table 5:

Table 3. Mammography vs. cytology in differentiation between benign and malignant breast mass (n=40)

	Mammography		Cytology/Histopathology		P value
	No.	%	No.	%	
Benign	33	82.5	36	90.0	0.3301
Malignant	7	7.5	4	10.0	

Table 4. Ultrasound vs. cytology in differentiation between benign and malignant breast mass (n=50)

	Ultrasonography		Cytology/Histopathology		P value
	No.	%	No.	%	
Benign	41	82.0	45	90.0	0.249
Malignant	9	18.0	5	10.0	

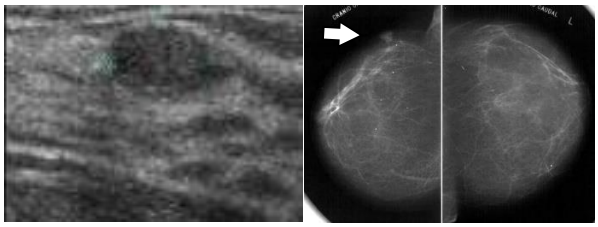
Table 5. Statistical analysis of Mammography & Ultrasonography

	Statistical potential for mammography in non-palpable breast masses	Statistical potential for Ultrasonography in non-palpable breast masses
Sensitivity	100%	100%
Specificity	91.6%	91.1%
accuracy	92.5 %	92 %
Positive predictive value	57.1%	55.5%
Negative predictive value	100%	100%

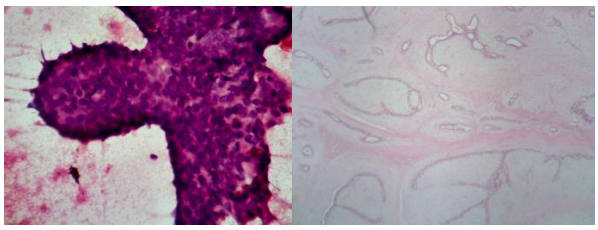
Most of patients with non-palpable breast mass were obese (BMI> 30) while those with BMI <18.5 are the least who had non-palpable breast mass.The distribution of patients with respect to the BMI is shown in table 6

Table 6. Distribution of non-palpable breast masses according to body mass index

BMI	No . of cases	Benign		Malignant	
		No.	%	No.	%
Underweight <18.5	2(4%)	2	4.0	0	0.0
Normal 18.5-24.9	12(24%)	11	22.0	1	2.0
Overweight 25-29.9	17(34%)	15	30.0	2	4.0
Obese >30	19(38%)	17	34.0	2	4.0

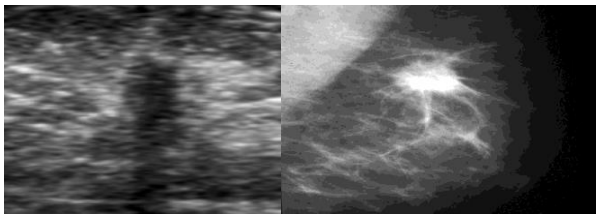


(a) **(b)**

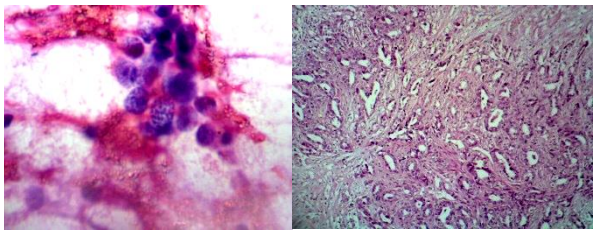


(c) **(d)**

Figure 1. A 55 year patient with mastalgia ,no palpable abnormality at clinical examination .(a)Rt. breast ultrasound revealed well defined oval mass lesion (9.4x5.4mm) with posterior enhancement (BIRAD II) (b) A crainocaudal view OF mammography shows well defined oval mass at the outer quadrant (arrow) (BIRAD II, (c) A cytology smear shows sheets of benign looking ductal epithelial & myoepithelial cells X40 ,(d)Histopathology: variable size slit like structures lined by benign ductal epithelial & myoepithelial cells with surrounding fibrous stroma(fibroadenoma) X40



(a) **(b)**



(c) **(d)**

Figure 2. : A 42 year old patient with Lt .breast nipple discharge.(a) ultrasound revealed hypoechoic mass (13 x10.6mm) with microlobulations & focal posterior shadowing (BIRADS IV) . (b)mammography MLO speculated mass lesion (BIRAD V).(c) A cytology smear shows discohesive malignant pleomorphic cells with variable size hyperchromatic nuclei X40 (d) Histopathology reveals infiltrative moderately differentiated ductal carcinoma X40

DISCUSSION

Screening mammography remains the primary imaging modality for the detection of clinically occult cancer at an earlier stage and thus permitting early treatment(9) , however at many times, other imaging modalities are needed to overcome some of limitations of mammography & to assist in making the diagnosis .Ultrasonography is a perfect adjunct to the mammography particularly in the evaluation of dense breasts which represent a challenging entity for mammography usually below 35 years of age. In the breasts where solid lesions and cysts are obscured at mammography due to dense fibroglandular tissue, ultrasonography help in diagnosis and to decrease the number of surgical biopsies .

In the present study mammography had 100% sensitivity with 91.6% specificity in differentiation of nonpalpable breast masses ,its positive predictive value was as high as 57.1% & the negative predictive value was 100% . These figures are consistent with those of Ohlinger et al (10) and Leconte et al.(11) , the higher sensitivity in our series can be attributed to the mammographic breast density as most of our patients (72.5%) had ACR 2 breast density which facilitate the lesion detection & thus increasing the mammographic sensitivity . Ultrasonography was very valuable in the differentiation of benign from malignant lesions with sensitivity and negative predictive value of 100%, specificity of 91.1% and overall accuracy of 91.9%. Both mammography & sonography have comparable high sensitivity & specificity in the evaluation of non palpable breast mass.

Concerning the tumor size , Its well known that the size is one of prognostic factors in patients with breast carcinoma (12) and its assessment in patient with breast cancer is based on radiologic assessment when pathological measurement are equivocal . In the current our study the average size of mammographically detected breast mass was 9.92 mm (range 3-16.9 mm) and the average tumors size detected by ultrasonography was 7.9mm (range 2.5 -16 mm) which indicate that the ultrasound imaging modality can predict the smallest size tumor . These figures agree with the results of Leconte *et al.* (11)Buchberger *et al.* (13), , Crystal *et al.* (14) and Kolb *et al.* (15), who were also able to show that it is feasible to use ultrasonography for the detection of early breast cancer <1 cm which were in fact mammographically occult in those studies.

Regarding the location of the breast mass the present study revealed that most of the non-palpable breast masses are located in the upper outer quadrant , this may be considered as one of the causes for the lesions being

non palpable because it is more mobile & thicker than the inner quadrants that are relatively fixed .

The role of the patients body mass index(BMI) had been observed as a contributing factor for the mass to be non-palpable. The present study identified that a high percentage of non-palpable breast mass were detected in obese (38%) and over weight women (34%) and the most detected malignant lesions affect over weight and obese patients , this fact confirmed by Vecchia et al (16).

Conclusions & recommendations

- Mammography and ultrasonography are highly sensitive and specific tool for the detection of breast masses which are not palpably by clinical breast examination . Ultrasonography and mammography cannot replace each other but to suggest single modality, ultrasonography is better in younger population with ACR breast density of 3 & 4 where as mammography is better & more sensitive in older population with ACR breast density of 1 & 2 . However, sono-mammographic correlation is best in both. ultrasonographic examination need to be considered in every patients who have a dense breast at mammography to detect occult or non palpable lesion

- Patients with high BMI are more prone to have non palpable breast mass particularly at the upper outer quadrants

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