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Diagnostic Accuracy of Mammographic and Sonographic Findings in the Differentiation of Palpable Breast Masses taking Histopathology as a Gold Standard

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A B S T R A C T

Background: The Presence of palpable breast mass may be an indication of breast cancer. Early and accurate diagnosis for the breast masses is important for therapeutic purpose.

Purpose: To assess the diagnostic accuracy of mammographic and sonographic findings in the differentiation of palpable breast masses taking histopathology as a gold standard.

Materials and Methods: 134 females were involved in the study. Sonographic and mammographic findings of palpable breast masses were obtained with the help of which diagnostic accuracy of ultrasound and mammography was calculated while taking histopathology as a gold standard.

Results: Mean age in 134 females was found to be 44.2±4.7 years. Sn, Sp, PPV, NPV, disease prevalence and accuracy of ultrasound in diagnosis of palpable breast lumps were 99.09%, 79.17%, 95.61%, 95.00%, 82.09% and 95.52% respectively. Sn, Sp, PPV, NPV and accuracy of mammography in diagnosis of palpable breast lumps were 95.45%, 62.50%, 92.11%, 75.00% and 89.55% while disease prevalence was same as that of ultrasound i.e. 82.09% respectively.

Conclusion: Ultrasound showed higher diagnostic accuracy in the evaluation of palpable breast masses than mammography while taking histopathology as a gold standard. It is noteworthy in differentiating breast masses.

Keywords: Palpable Breast masses, ultrasound, mammography, histopathology.

INTRODUCTION

Breast is a gland consisting of various structures that are affected by hormones leading to the formation of different types of masses and lesions, in which 90% of the clinical presentation are related to benign masses [1]. Breast pain is by and large of two sorts: a repetitive coming and going discomfort, which is generally diffuse, on both sides, and is normally connected with feminine cycle, and a noncyclical pain, which is typically one-sided and limited. At the point when patients present with breast soreness, the doctors for the most part play out an intensive history and an actual assessment to assess for any basic masses [2]. A lump in the breast is a matter of great concern and can affect the life expectancy of the

affected individual. Breast cancer is the commonest cancer in females and is the 2nd leading cause of expiry in Asia [3]. In USA, each year almost 31% new cancers cases of breast cancer are diagnosed in females [4]. [5]. In 2012, approximately 1.7 million new cases of breast malignant growth were analyzed around the world [6]. A breast mass that is palpable is described as a presiding mass if it is three dimensional, discernible from neighboring tissues, and asymmetrical in comparison with other side of breast [7]. The clinical distinction of a cancerous mass from a benign one is challenging; the medical as well as possible legal consequences of missing a palpable carcinoma are high [8]. There are different classes of breast lesions relying upon danger of advancement of malignancy. Breast infection and non-proliferative breast abnormality don't build the danger of disease whereas proliferative breast illness presents mellow and moderate danger separately [9]. Early distinguishing tools like mammography can readily identify area, structure, and size of breast abnormalities that can aid in diminishing morbidity and mortality due to breast malignancy essentially [10] [11].

While palpable breast masses appear to be very frequent and usually benign, they must be evaluated thoroughly and diagnosed quickly to rule out malignancy. For an accurate diagnosis of breast masses, an extensive clinical examination, imaging, and sampling of tissue are required. Mammography is used to diagnose occult malignancy in older women and can detect malignant breast masses; however, its sensitivity is lower in women under the age of forty. Ultrasound is a powerful tool for detecting cystic masses and guiding biopsy procedures. [12]. Early clinical recognition of breast cancer with the help of screening will lead to early diagnosis and minimizing the mortality rate. On mammography, the diagnosis of breast cancer has been observed to differ greatly. On the other hand, breast Ultrasonography has attained worldwide acceptance as a diagnostic method for evaluating breast cancer [13]. It is presently recognized to be a precious aid in breast imaging and a preferred imaging modality for identification as well as differentiation of breast masses [14].

A palpable mass that is not detected by both mammography and ultrasonography firmly requires biopsy histology [15]. Albeit, open careful biopsy is the 'best quality level' for analysis of discernible breast lumps, lately two kinds of insignificantly intrusive breast biopsy methods, center needle biopsy and fine needle aspiration biopsy (FNAB), have gotten set up for the symptomatic assessment of substantial breast masses [16]. FNAC of the breast has two primary objectives; to affirm radiological and clinically amiable sores consequently maintaining a strategic distance from pointless medical procedure, and to affirm radiological and clinically dangerous determinations in this way empowering conclusive therapy arranging in such manner, breast cytology has been demonstrated to be profoundly sensitive and precise [17].[18]. Currently, FNAC is renowned for its unmistakable potential benefits of being delicate, explicit, catalyst, effective, and secure, and has become a most important instrument in the analysis of significant breast masses. The approach is more agreeable for the patient and pathologist since no local or general sedation is used [19]. Most of the females visiting the hospitals having complain of palpable breast lump or a doubtful screening mammogram are diagnosed with a benign breast abnormality [20]. The specific spot of these demonstrative apparatuses in the evaluation of breast structure irregularity would rely upon the ability and accessibility of these tools in a clinical arrangement and furthermore on the age factor of the females just as on the clinicians' level of doubt of nature of the lesion. [21].

MATERIALS AND METHODS

A cross sectional analytical study with sample size 134 was performed in the radiology department of a hospital. The duration of study was nine months. All the patients were registered in this study after signing the informed consent form. Convenient sampling technique was used. All the females of 18 to 50 years of age with palpable breast masses were included in the study whereas pregnant females, lactating females and already diagnosed cases were excluded. Mammomat 1000, siemens was used for mammography and Toshiba Voluson with linear probe was used for ultrasonography. During mammography the patient was in standing position facing mammography machine. Cranio-caudal and medio-lateral oblique views of the breasts were obtained. Compression was applied with the help of compression paddle.

During ultrasound patient was lying on the couch in supine position, with hands below the neck. A linear

7-12 MHz probe was used. After applying gel to the whole breast, scanning was done in circumferential way. First in the inner circle and then the outer circle. After this starting from 12'O clock position, in a clock wise manner scanning was done radially. At the end nipple was scanned. Axillary region was scanned for enlarged lymph nodes. On ultrasound, features like echogenicity of mass, margins, lymph-nodes involved or not were used to calculate diagnostic accuracy of ultrasound. On mammography, features like radiodensity, margins and surrounding architectural distortion were used to calculate diagnostic accuracy of mammography.

RESULTS

The total number of patients included in current study was 134 and the calculated mean age was 44.2±SD4.7 (min 27-max 50) years as shown in Table **1**.

Out of 134 cases, 109 were found malignant on both ultrasound and histopathology whereas, 5 cases were diagnosed as malignant on ultrasound but benign on histopathology. 1 lesion was diagnosed as benign on ultrasound but malignant on histopathology and 19 lesions were diagnosed as benign on both ultrasound and histopathology (Table **2**).

The sensitivity, specificity, positive predictive value, negative predictive value, disease prevalence and accuracy of ultrasound in diagnosis of palpable breast lumps while taking histopathology as gold standard was found to be 99.09%, 79.17%, 95.61%, 95.00%, 89.02 % and 95.52% respectively (Table **3**).

Out of 134 cases, 105 were diagnosed as malignant on both mammography and histopathology whereas, 9 lesions were diagnosed as malignant on mammography but benign on histopathology. 5 lumps were diagnosed as benign on mammography but malignant on histopathology and 15 lesions were diagnosed as benign on both mammography and histopathology (Table **4**).

The sensitivity, specificity, positive predictive value, negative predictive value, disease prevalence and accuracy of mammography in diagnosis of palpable breast lumps while taking histopathology as a gold standard were 95.45%, 62.50%, 92.11%, 75.00%, 82.09% and 89.55% respectively as shown in (Table **5**).

Table 1. Descriptive Statistics of the Age of the Patients.

Descriptive Statistics						
	N	**Range**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Age	134	23.00	27.00	50.00	44.2164	4.72294

Table 2. Comparison Between Ultrasound and Histopathology Results.

		Histopathology results		Total
		Malignant	**Benign**	
US results	Malignant	109	5	114
	Benign	1	19	20
Total		110	24	134

Table 3. Sensitivity and Specificity of Ultrasonography While Taking Histopathology as Gold Standard.

Statistic	Value	95% CI
Sensitivity	99.09%	95.04% to 99.98%
Specificity	79.17%	57.85% to 92.87%
Positive Likelihood Ratio	4.76	2.18 to 10.38
Negative Likelihood Ratio	0.01	0.00 to 0.08
Disease prevalence (*)	82.09%	
Positive Predictive Value (*)	95.61%	90.90% to 97.94%
Negative Predictive Value (*)	95.00%	72.76% to 99.27%
Accuracy (*)	95.52%	90.51% to 98.34%

Table 4. Comparison Between Mammography and Histopathology Results.

		Histopathology results		Total
		Malignant	**Benign**	
Mammography results	Malignant	105	9	114
	Benign	5	15	20
Total		110	24	134

Table 5. Sensitivity and Specificity of Mammography While Taking Histopathology as Gold Standard.

Statistic	Value	95% CI
Sensitivity	95.45%	89.71% to 98.51%
Specificity	62.50%	40.59% to 81.20%
Positive Likelihood Ratio	2.55	1.52 to 4.27
Negative Likelihood Ratio	0.07	0.03 to 0.18
Disease prevalence (*)	82.09%	
Positive Predictive Value (*)	92.11%	87.42% to 95.14%
Negative Predictive Value (*)	75.00%	54.68% to 88.18%
Accuracy (*)	89.55%	83.09% to 94.17%

DISCUSSION

The Presence of palpable breast mass may be an indication of breast cancer. Early and accurate diagnosis for the breast masses is important for therapeutic purpose. Current study was designed to assess the diagnostic accuracy of mammographic and sonographic findings in the differentiation of palpable breast masses taking histopathology as gold standard. The triple assessment, which involves a physical examination, mammography, and percutaneous biopsy, is the standard management for palpable breast lesions. Mammography has radiations related bio-effects and biopsy is an invasive procedure but ultrasound is non-invasive and free of radiations related bio-effects. With the improvement in ultrasound modalities, it is now possible to differentiate between malignant and benign breast lesions. The gold standard for the differentiation of benign and malignant breast mass is histopathology.

In this research, the diagnostic precision of mammographic and sonographic findings in the distinction of palpable breast masses was evaluated. Data was collected based on age, gender, and breast masses in married and unmarried women, without the distinction of benign and malignant breast masses.

134 females were studied, with 131 (97.8%) married women and 3 unmarried women (2.2%).

According to a study carried by Donnelly, J *et al*, 58.09 % of these women were under the age of 30, 31.12 % were between the ages of 31 and 50, and 10.78 % were over the age of 50. 70.95% were married, while 29.04% were single. A clinically palpable lump in the breast was found in nearly 64.31% of the patients, and 35.68% had discomfort and other symptoms [22]. Patel *et al*. conducted a similar analysis, finding that 5.7% of the 200 patients were between the ages of 21 and 29, with pain being the most common mode of presentation. According to another analysis, the age and size of the lesion had a substantial relationship with the occurrence of malignancy, but the length of the lump had no such relationship [23]. In our study out of total number of 134 cases, 6(4.5%) cases belong to age group 25-35 years, 76(56.7%) cases belong to age group 36-45 years whereas 52(38.8%) belong to age group 46-55 years.

The axillary nodes were palpable in various experiments, with varying outcomes. While axillary palpation has low sensitivity and specificity, it is frequently used to determine whether an invasive node biopsy or an axillary lymph node dissection should be conducted. The different studies show variable results the axillary nodes were palpable. Study was conducted by Cutuli *et al* who found the

involvement of axillary lymph node, they concluded that upper and lower outer quadrants constituted the highest percentage of axillary lymph node involvement (50/74, 68%), next to it was the central area (nipple and areola complex) (14/74, 19%) and the least incidence was encountered in inner quadrant lesions (10/74, 13%)[24]. In current study result, lymph nodes were involved in 89 (66.6%) cases whereas lymph nodes were not involved in 45 (33.6%) cases.

Another study was conducted by Morris KT *et al* has stated that Triple test that is physical examination, radiography and pathology have diagnostic accuracy of 100%. They have observed that out of 50 patients 33 were benign lesions. Out of that 13 were benign solid and 20 were cystic, 16 cases were fibro adenoma [25]. In current study result, Benign on ultrasound were 20(14.9%) and the cases diagnosed as malignant were 114 (85.1%). On mammography palpable breast masses of 115 patients (85.8%) were presented with irregular margins whereas palpable breast masses of remaining 18 patients (14.2%) were presented with regular margins. Benign on mammography were 20(14.9%) and the cases diagnosed as malignant were 114 (85.1%). In out of total number of 134 cases, 24(17.9%) were diagnosed as Benign on Histopathology whereas 110(82.1%) were diagnosed as malignant on Histopathology. A study conducted by Fatima ST *et al* depicted ultrasound sensitivity 94.1%, specificity 89.3%, positive predictive value 77.4%, negative predictive value 97.5% and diagnostic accuracy 90.7% [26]. Various studies have looked into the diagnostic accuracy of ultrasonography. According to a Gonzaga report, ultrasonography had a sensitivity and specificity of 57.1 % and 62.8% in detecting breast cancer, respectively [27].

Ahmed ZT *et al*, 2020 conducted research on the diagnostic accuracy of Ultrasound and revealed that the mean age of females was 47.8 years and the sensitivity of Ultrasound was 94.1%, specificity 89.3%, Positive predictive value 77.4%, Negative predictive Value 97.5% and diagnostic accuracy was 90.7% [28]. According to the findings of current study research, ultrasound has a sensitivity of 99.09% Specificity 79.17%, Positive Predictive Value 95.61% Negative Predictive Value 95.00% and Accuracy 95.52%.

Berg WA *et al*. performed another study in which they found that all benign lesions identified by ultrasonography (41 cases) were benign at histology. On ultrasonography, there were 62 lesions with malignant characteristics, with 52 true positives and 10 false positives. Thus, ultrasonography had an overall sensitivity of 100 percent and a specificity of 80.4 percent, with a positive predictive value of 83.9 and a negative predictive value of 100, which are comparable to the results of Kolb *et al*, who found that ultrasonography's sensitivity, specificity, negative and positive predictive values, and accuracy were 75.3 percent, 96.8%, and 100 percent, respectively [29]. Regarding mammography 14.8 % of the 54 cases with malignant features on mammography were histologically benign. This study's overall sensitivity of mammography was 73.0 percent, with a precision of 80.0 percent, a positive predictive value of 85.2, and a negative predictive value of 65.3. Various studies have indicated reduced sensitivity of mammography in younger females, even after amending breast density [30]. According to results of current study research the sensitivity of mammography is 95.45%, Specificity 62.50%, Positive Predictive Value 92.11%, Negative Predictive Value 75.00% and Accuracy 89.55%.

The diagnostic accuracy of mammography in the pre-operative interrogation of breast lesions was determined by Berg WA *et al*, 2004. There were 177 malignant lesions in 121 cancerous breasts studied, with 89 (50%) lumps palpable. The sensitivity of mammography reduced from 100 percent in fatty breasts to 45 percent in exceptionally dense breasts. For the diagnosis of Invasive Ductal Carcinoma, the US had a higher sensitivity than mammography [31]. In our study the sensitivity of ultrasound is also higher 99.09% than that of mammography which is 95.45%.

CONCLUSION

Ultrasound showed higher diagnostic accuracy in the evaluation of palpable breast masses than mammography while taking histopathology as a gold standard. It is significant in differentiating breast masses therefore should be used for the evaluation of palpable breast masses.

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