ORIGINAL RESEARCH PAPER

General Surgery

CORRELATION OF SONOGRAPHIC AND HISTOPATHOLOGIC FINDINGS IN THE DIAGNOSIS OF PALPABLE BREAST MASSES

KEY WORDS: Biopsy, BIRADS, Breast masses, Invasive carcinoma, Ultrasound.

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ABSTRACT

Background: Breast diseases are extremely prevalent across all age groups and include both benign and malignant conditions. The growing number of patients with breast cancer has been significantly impacted by the increased use of imaging methods like ultrasound and mammography, which have proven crucial in the early detection of the disease. The results of imaging tests, biopsies, and clinical examinations are combined to diagnose breast cancer. These tests are conducted in a sequential manner, and in order to properly manage the patient, it is critical that their results corroborate the final diagnosis. **Aim:** To correlate the ultrasonographic and histopathologic findings in the diagnosis of patients with palpable breast masses **Materials and Method:** This was a cross-sectional hospital-based study, which involved 65 consecutive patients who presented with palpable breast masses in General Surgery and oncology out-patient department of Sree Mookambika Institute of Medical Sciences. The study was carried out for a period of 7 months (May 2023–November 2023). All patients underwent clinical breast examination to identify the mass. A breast ultrasound scan was performed to identify the masses using the American College of Radiology Breast Imaging Reporting and Data System classification, followed by a biopsy for obtaining histological findings. The Chi square test was used to examine the association between the data. Additionally, the diagnostic accuracy, sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), and correlation coefficients were ascertained. **Results:** The patients were between the ages of 23 and 72, with a mean age of 48.38 ± 5.43 years. The majority of participants (23, or 35.39%) belonged to the 41–50 age range. Right side preponderance was seen in 31 (47.69%) cases. The majority of the patients (27/41.54%) had symptoms for 4 to 6 months. The symptoms lasted for an average of 4.71±1.33 months. With a p-value less than 0.001, there was a highly significant positive connection between the sonographic and histological results of breast masses. In diagnosing malignant breast lesions, the connection between sonographic observations and histological diagnoses was shown to have the following characteristics: sensitivity, specificity, PPV, NPV, and diagnostic accuracy: 92.3%, 73.07%, 83.72%, 86.36%, and 84.61%, respectively. **Conclusion:** In order to distinguish between benign and malignant tumors, this study demonstrated a correlation between the results of histology and ultrasound. This demonstrates the importance of ultrasonography in the assessment and diagnosis of clinically palpable breast masses.

INTRODUCTION:

Breast lesions in women comprises a variety of benign and malignant conditions.[1] This is a significant global health concern that contributes significantly to female morbidity and mortality in both developed and developing countries. Benign lesions can add to the morbidity and concerns of patients and their families in addition to being a significant public health concern.[2]

The most frequent breast disorders for which women seek medical attention are breast pain, nipple discharge as well as a palpable lump.[3] The triple evaluation method is used to screen patients who have symptoms. It consists of a clinical breast examination (CBE), breast imaging (mammography, breast ultrasound, BUS), and breast cytology or biopsy for a histological diagnosis.[4]

Masses are evaluated according to their shape, margin, and density. The edge can be smooth, obscured, indistinct, or spiculated, while the shape can be round, oval, irregular, or lobulated. Based on imaging, benign lesions are often round or oval and well-defined, while malignant lesions are typically asymmetrical in shape and outline.[5] Benign breast masses are frequently caused by cysts, galactocele, fibroadenoma, fibrocystic disease, and abscesses. Numerous histologic forms, such as infiltrating and in-situ ductal or lobular carcinoma, are included in malignant breast disease.[6,7]

A key component of the multidisciplinary approach to the therapy of breast disease is breast imaging, which serves as the radiologic foundation for the evaluation of breast findings. Ultrasound can detect lesions in younger women with dense breasts, as well as in pregnant and nursing women. It can also be helpful in differentiating masses observed on mammography and in the detection of breast masses.[7] To standardize breast imaging reporting, the American College of Radiology (ACR) developed the Breast Imaging Reporting and Data System (BI-RADS). This method, which consists of categories 0 through 6, makes sure that imaging reports provide a thorough description of every aspect of the breast under examination, whether it is aberrant or normal.[8]

When a breast lesion is highly indicative of malignancy (BIRADS V) or suspicious for malignancy (BIRADS IV), image guided biopsy is taken into consideration. Every case should have its correlation between radiological and pathological data evaluated to make sure that pathologic investigation findings sufficiently explain imaging findings. While imaging is used to assess the malignancy of suspicious lesions, histological testing is the only method that can provide a firm diagnosis. The diagnosis of preoperative pathology is a crucial component in the examination of breast lesions.[9]

The authors decided to use mammography and ultrasound findings of breast masses to compare the foundation of the BIRADS system with the pathological findings because of the significance and prevalence of breast cancer in women as well as the impact of our ability to detect it early through examination, mammography, and ultrasound in promoting health and disease management and increasing patient survival.

Aims And Objectives:

To correlate the ultrasonographic and histopathologic

findings in the diagnosis of patients with palpable breast masses

MATERIALS AND METHODS:

This was a cross-sectional hospital-based study, which involved 65 consecutive patients who presented with palpable breast masses in General Surgery and oncology out-patient department (OPD) of Sree Mookambika Institute of Medical Sciences. The study was carried out for a period of 7 months from May 2023 to November 2023. Patients with breast lumps who visited the oncology or general surgery outpatient departments were evaluated. The clinical evaluation encompassed the demographic information of the patients, their reproductive history, any family history of breast disorders, and a physical assessment. For an ultrasound evaluation, the patients were referred to the department of radiodiagnosis. A small number of patients traveled directly from other hospitals for ultrasounds. Following ultrasonography, the radiologist took a tissue sample from each patient using ultrasound guidance, and the tissue samples were sent to the pathology lab.

The breast lumps were examined using ultrasound technology by a qualified sonologist/radiologist at the radiodiagnosis department. Both longitudinal and transverse scans were obtained after the transducer was gently placed. Information on the four characteristics of the breast was included in the scans: 1. Form: round, oval, or irregular; 2. Boundaries: bounded or unbounded; 3. Breadth: AP ratio greater than or equal to 1.4; and 4. Echogeneity: hyperechoic, isoechoic, or hypoechoic. These BI-RADS ultrasonography descriptions were used to determine the final assessment category, which is as follows:

- Category 2: Benign
- Category 3: Probably benign
- Category 4: Suspicious
- Category 5: Highly suggestive of malignancy.

The radiologist performed the Core biopsy under ultrasound guidance after obtaining the patient's written consent. Under local anesthesia with 2% plain lignocaine, a 16 G automated biopsy gun was used to perform a core biopsy. After removing two to three cores and fixing them in buffered formalin, every core was processed. Sections were obtained and stained with hematoxylin and eosin. Two pathologists from the same institution read sections. The opinion of the senior pathologist was deemed definitive in the event that there was even a slight disagreement between the two pathologists.

The data and outcomes obtained from patients who had palpable breast lumps were collated into an Excel spreadsheet and then subjected to statistical analysis using SPSS version 23.0. Tables were created by statistically analyzing the sonographic characteristics of palpable breast masses and the corresponding histology results. Descriptive statistics were used to start the analysis, with percentages for the qualitative data and mean and standard deviation for the quantitative data and frequency. Utilizing the Chi square test, relationships between categorical variables were ascertained. A 95% confidence interval with a significance level of $p < 0.05$ was used. Additionally, the sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), and diagnostic accuracy were determined.

OBSERVATION AND RESULTS:

The age of the patients ranged between 23 and 72 years, with a mean of 48.38 ± 5.43 years. Most of the participants 23(35.39%) were in the age group of 41 to 50 years followed by 51 to 60 years in 18(27.69%), more than 60 in 10(15.38%), 31 to 40 years in 8(12.31%) and 21 to 30 years in 6(9.23%) patients. Among the 65 patients presented with breast lump, 11 (16.92%) patients had associated breast pain, whereas only 8 (12.3%) had associated nipple discharge.

Right side predominance was noted seen in 31(47.69%) cases, 29(44.61%) and 5(7.7%) patients had left side and bilateral breast lesions respectively. The majority of patients, 27 (41.54%) had symptoms for four to six months, 19 (29.23%) for less than three months, 13 (20%) for seven to nine months, and only 6 (9.23%) for more than nine months. The symptoms persisted for a mean of 4.71±1.33 months.

The most often involved quadrants of the breast were found to be the upper outer and upper inner, with 23(35.38%) and 19(29.23%) of lumps, respectively, whereas the lower outer as well as inner quadrants showed the least amount of involvement, with 15(23.08%) and 8(12.31%), respectively.

Table 1 shows the final BI-RADS classifications: benign, probably benign, suspicious of malignancy, and highly suggestive of malignancy. The histological diagnosis was classified as benign, proliferative breast disease with atypia, carcinoma in situ, and invasive cancer. The most frequent categories in histology and ultrasonography were malignancy (invasive carcinoma) in 30 cases (46.15%) and BIRADS 5 in 23 cases (35.38%), respectively.

Table 1: Descriptive analysis of BIRADS and histopathological categories

	Category	Number (Percentage)
BIRADS	2 (Benign)	10(15.38%)
	3 (Probably benign)	12(18.46%)
	4 (Suspicious of malignancy)	20(30.78%)
	5 (highly suggestive of malignancy)	23(35.38%)
Histopathological diagnosis	Benign	21(32.3%)
	Proliferative breast disease with atypia	5(7.7%)
	Carcinoma in situ	9(13.85%)
	Invasive Carcinoma	30(46.15%)

Table 2 shows the histopathological diagnosis of breast masses. The most common benign pathology was fibroadenoma (12.46%), while invasive carcinoma No Special Type (NST) was the most prevalent malignant lesion seen in 29 (44.62%) cases.

Table 2: Descriptive analysis of histopathological diagnosis

Histopathological Diagnosis	Number (%)
Fibroadenoma	3(4.61%)
Benign Phyllodes tumor	12(18.46%)
Fibrocystic disease	4(6.15%)
Ductal Papilloma	2(3.08%)
Usual ductal Hyperplasia	2(3.08%)
Atypical Ductal Hyperplasia	3(4.61%)
Ductal Carcinoma In situ	9(13.85%)
Invasive Carcinoma breast NST	29(44.62%)
Invasive Lobular Carcinoma	1(1.54%)

The majority of study participants with benign masses were under the age of 40, while those with premalignant and malignant tumors were older than 40 years. At $p = 0.000$, this was statistically significant. With a p value less than 0.001, there was a highly significant positive connection between the sonographic and histological results of breast masses. (Table 3).

Table 3: Correlation between BIRADS category and the histopathological diagnosis

BIRADS category	Histopathological diagnosis				p value
	Benign	Proliferative breast disease with atypia	Carcinoma in situ	Invasive Carcinoma	
2	8(38.09%)	2(40%)	0(0%)	0(0%)	<0.001
3	9(42.86%)	0(0%)	3(33.33%)	0(0%)	

4	4(19.05%)	1(20%)	4(44.44%)	11(36.67%)	
5	0(0%)	2(40%)	2(22.22%)	19(63.33%)	
Total	21	5	9	30	65

The sensitivity, specificity, PPV, NPV, and diagnostic accuracy for the correlation of the sonographic findings and histopathological diagnoses in diagnosing malignant breast lesions were found to be 92.3%, 73.07%, 83.72%, 86.36%, and 84.61% respectively, all at 95% confidence interval.

DISCUSSION:

Among breast disorders, both benign and malignant, a palpable breast lump is the most common symptom. It is important to correctly classify palpable breast lumps into benign and malignant masses prior to surgery in order to handle oncologic surgical cases appropriately and prevent unnecessary surgical procedures. Even though benign breast lesions are frequent, every patient needs to be examined to rule out or confirm malignancy since more aggressive surgery and adjuvant medication are needed to treat malignancy. There is fear associated with having a breast mass because the general public is becoming more aware about breast cancer.[10]

Breast sonography is the preferred examination for dense breasts and young people since it is dynamic, safe, and radiation-free. High-frequency ultrasonography can detect malignant characteristics early, which lowers morbidity and enhances overall therapy. The gold standard for diagnosis and a confirmatory test for breast lumps has been determined to be histology.[11]

The patients were between the ages of 23 and 72, with a mean age of 48.38 ± 5.43 years. The majority of participants (23, or 35.39%) belonged to the 41–50 age range. This was similar to the mean age of 40.27+4.48 years in the study by Malik N et al.[12] The majority of cases (44%) in the study conducted by Chaitanya IN et al.[13] were in the fifth decade. In a similar vein, Fard MM et al.[14] noted that the majority of patients belonged to the 41–50 age group, with a mean age of 40.59±13.03 years (11–82 years).

There was a noticeable right side predominance in 31 cases (46.79%). In contrasted with the current study, Humayun S et al.[15] reported that 88 (52%) of the female participants had left-sided breast lesions, whereas 88 (48%) had right-sided lesions. The majority of patients (27, 41.54%) experienced symptoms for 4 to 6 months. The symptoms persisted for an average of 4.71±1.33 months. The most frequent cause of early consultations among females may be education and self-examination of the breasts.

The BI-RADS was developed by the ACR to standardize reporting on breast imaging and prevent confusion in interpretation and communication. The most prevalent category in ultrasonography, with 23 patients (35.38%), was BIRADS 5. Of the 100 cases in the study conducted by Chaitanya IN et al.[13], 55 (55%) were classified as BIRADS 4, 37 (37%) as BIRADS 5, 6 (6%) as BIRADS 3, and 2 (2%) as BIRADS 2. In the study by Fard MM et al., the majority of patients (40.6%) reported having BIRADS 4a breast lesions.[14] BI-RADS 4 was the predominant type of lesion with 122 (52.1%) instances, followed by BIRADS 5 with 61 (26.1%) cases in the study by EngYC et al.[16]

Fibroadenoma was the most prevalent benign diagnosis in 12(18.46%) patients, while invasive carcinoma NST was the most common malignant lesion observed in 29 cases (44.62%). Chaitanya IN et al.[13] reported that the majority of the lesions in their study, 61(61%) patients out of 100, were invasive ductal carcinoma. This was similar to the current study.

The majority of research participants with benign masses were under 40 years old, while those with premalignant and malignant tumors were older. At p = 0.000, this was statistically significant. With a p-value less than 0.001, there was a highly significant positive connection between the sonographic and histological results of breast masses. This was similar to the studies done by Fard MM et al.[14] and Eng YC et al.[16] where there was a strong association between the histological findings and ultrasonography results (p-value < 0.001).

In the current study, it was found that the association between sonographic observations and histological diagnoses in diagnosing malignant breast lesions was 92.3%, 73.07%, 83.72%, 86.36%, and 84.61% in terms of sensitivity, specificity, PPV, NPV, as well as diagnostic accuracy. Alawi A et al.[17] in contrast to the current study observed that there was no significant difference between the examination performed using MRI and ultrasonography when compared to the histological results with a p value > 0.05.

According to Malik N. et al.[12] BI-RADS classifications have a sensitivity and specificity of 75% and 82%, respectively, and an 80% diagnostic accuracy when using histology as the gold standard. With ultrasound, there was a strong positive connection (r-value 0.279 and p-value 0.001) between lump size and BI-RADS categorization. Regarding the correlation between the final ultrasound diagnosis and the histological diagnosis, Bello N et al.[18] reported that the correlation had the following characteristics: 89% sensitivity, 94% specificity, 89% positive predictive value, 94% negative predictive value, and 92% accuracy.

The study conducted by Mohan R et al.[19] found that the imaging modalities (ultrasonogram and mammography) had the following characteristics: sensitivity, specificity, PPV, NPV, and diagnostic accuracy for diagnosing breast lesions were 95.06%, 94.96%, 92.77%, 96.58%, and 95%, respectively. Similar results were obtained by Akinnibosun-Raji HO et al.[20] who observed that the corresponding values for accuracy, PPV, NPV, sensitivity, and specificity were 93.8%, 98.3%, 93.9%, and 93.7%. A statistically significant positive association (p = 0.000, r = 0.846) was seen between the histological diagnoses of the breast masses and the sonographic results.

CONCLUSION:

Early identification of breast cancer is crucial because it is the leading cause of cancer-related death among young females. It was determined that ultrasonography is a first-line imaging modality that may effectively distinguish between benign and malignant findings based on BI-RADS classifications. Additionally, it can help guide the biopsy site. In this investigation, there was minimal discrepancy between the histopathologic and imaging results. Triple assessment is advised for an appropriate diagnosis of all palpable breast lumps because the degree of suspicion varies while evaluating a breast lesion. The maximum accuracy may be obtained by combining radiological imaging, pathology, and clinical evaluation.

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Conflicts Of Interest:
There are no conflicts of interest

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