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Diagnostic Accuracy of Mammography in Patients with Palpable Breast Lump by Using Birads Score

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Abstract | **Original Research Article**

***Background and objectives*:** Various radiographic modalities are readily available to identify breast lesions that are suspicious for breast cancer. Mammography remains a useful radiological tool in breast cancer screening. This study was aimed to determine the diagnostic accuracy of mammography in evaluating palpable breast lumps. ***Methodology*:** The present two year cross-sectional study was conducted from October 2015 to October 2017 on a total of 72 eligible women presenting with palpable breast lump in the Department of General Surgery, A J Institute of Medical sciences, Mangalore. ***Results*:** In the present study commonest age group was between 46 to 60 year who constituted about 34.7% of the patients, nipple discharge was present in 52.7% of the cases. The shape of the lesion was found to be globular in 40.27% and tenderness was present in 59.7% of the patients. The nipple examination revealed retracted nipples in 29.16% of the patients. The consistency of the breast lump was firm in 63.88% of the patients. Clinically Axillary lymph nodes were palpable in 19.44% of the women. Mammography findings revealed grade 3 breast lump in 43.05% of the patients. Malignant lesions were diagnosed in 27.77% of the patients while 72.23% of the women were diagnosed as having benign lesions. ***Conclusion and interpretation*:** Of the 20 patients who had malignant lesions on histopathology/cytology, 17 had malignant lesions on mammography and 2 women had benign lesions. The sensitivity of mammography compared to histopathology/cytology in predicting malignant lesions was 85% with specificity of 96.15% and the diagnostic accuracy was 93.05%.

Keywords: Breast cancer, Cytology, Histopathology, Mammography, Palpable breast lump.

INTRODUCTION

A benign breast condition often causes a lump. It may or may not feel tender. One might find it during daily activities. The younger the age, the more likely it is that a single breast lump will be benign. The most common benign breast lumps are fibroadenomas and a combination of fibrosis and cysts that are collective described as fibrocystic changes. It commonly encountered in surgical practice [1].

No matter the age of a woman, lumps and other changes in the breast must be checked and evaluated appropriately to be sure they are not malignant. Although most lumps aren‘t breast cancer, there is always a chance that a single lump may be breast cancer, even in a younger woman. Breast cancer is the most frequently diagnosed female cancer in the world and is the leading cause of cancer-related mortality in women [2].

In the United States, it is the second most common cause of cancer death in women across all age groups and is the main cause of death in women aged 40-59. The lifetime probability of developing breast cancer is 1 in 6 overall (1 in 8 for invasive disease) [3]. Due to the magnitude of the disease, its psychosocial impact, and associated morbidity and mortality, screening for early diagnosis remains a pivotal part of the struggle against this cancer.

Breast cancer mortality has shown a decline since 1975 [4], which may be attributable to both early diagnosis by virtue of screening mammograms and improvements in adjuvant therapies [5].

Breast lumps, like other symptoms, have to be considered along with other symptoms a woman may be having. Most of them require triple assessment namely clinical assessment, radiological imaging and

Histopathological examination. Early detection through mass screening with mammography has the potential to reduce mortality.

Although various radiographic modalities are readily available to identify lesions that are suspicious for breast cancer, mammography remains the primary radiological tool for breast cancer screening. Role of breast sonogram is confined mainly to the diagnostic follow-up of a mammographic abnormality because it may help clarify features of a potential lesion. The role of magnetic resonance imaging (MRI) for breast cancer screening is still evolving; currently MRI screening, in combination with mammography, is reserved to the screening of high-risk patients only.

Mammography is the preferred examination for breast cancer. It has been used for investigating breast lumps since 1960. The earliest sign of breast cancer is an abnormality depicted on a mammogram, before it can be felt by the woman or her physician. When breast cancer has grown to the point where physical signs and symptoms appear, the patient feels a breast lump (usually painless). Various investigators have evaluated the diagnostic accuracy of mammography. The reported diagnostic accuracy varies from 60% to 90%. Mammographic sensitivity for breast cancer declines significantly with increasing breast density and is independently higher in older women with dense breasts. Hormonal status has no significant effect on the effectiveness of screening independent of breast density [6].

However, there are reports stating that, mammograms also lead to overdiagnosis and overtreatment. Since screening preferentially identifies slow- growing tumours (length bias), the harms of unnecessary treatment could reduce or even neutralise any potential benefits. The large number of reviews reflects the controversies surrounding mammography screening and the uncertainties of its effects in women of various ages. There is wide variation in screening policies between different countries, with some countries abstaining from introducing screening partly because of the lack of a documented reduction in all-cause mortality. One area of concern is the potential for radiotherapy treatment of low- risk women, such as those who have their cancers identified at screening, to increase all-cause mortality because of adverse cardiovascular effects. In addition, there is concern that cause of death has not been ascribed in an unbiased fashion in the trials. Finally, carcinoma in situ is much more likely to be detected with mammography and although less than half of the cases will progress to be invasive these women will nevertheless be treated with surgery, drugs and radiotherapy. Also, the diagnostic accuracy of mammography in our hospital setup has not been assessed so far.

Considering the conflicts regarding the diagnostic accuracy and recommendations and the scarcity of data regarding the accuracy of mammography in our hospital set up this study was planned to determine the diagnostic accuracy of mammography in evaluating breast lumps.

MATERIALS AND METHODS

Place: This study was conducted in the Department of General Surgery, A J Institute of Medical Sciences, Mangalore over a period of two years from Oct 2015 to Oct 2017.

Study design: The study design was cross-sectional study.

Study period and duration: The present study was conducted for the period of two years from Oct 2015 to Oct 2017.

Source of data: All women patients with palpable breast lump attending surgical OPD/admitted at Department of General Surgery, A J Institute of Medical Sciences, Mangalore were studied.

Sample size: A total of 72 patients with palpable breast lump were studied.

The sample size was calculated based on the formula as below.
$n = 4Z2 \times p \times q / d2$

Where,
n: Sample size
Z: 1.96 ~2 (taking confidence as 95%)
p: Sensitivity
q: 100 – p
d: Relative error that is 10%

Based on the above formula the sample size was calculated as 72 women with palpable breast lump. However, 72 women fulfilled the selection criteria during the study period and hence were enrolled in the study.

Ethical clearance: Prior to the commencement, the study was approved from the Ethical and Research Committee, A J Institute of Medical science, Mangalore.

Informed Consent: The patients fulfilling selection criteria were informed about the nature of the study and a written informed consent was obtained before enrollment.

Method of collection of data

Patients were interviewed and demographic data such as age and presenting symptoms were noted. Further these patients were subjected to thorough clinical examination. Brest examination was done and variables like discharge, size, shape, tenderness, consistency and axillary lymph node were assessed.

These findings were recorded on a predesigned and pretested Proforma.

Investigations: Patients underwent the investigations such as mammography and biopsy**.**

Procedure of Mammography

Patients were asked to remove any clothing, jewelry, or other objects that might interfere with the procedure. The technologist confirmed the lumps or other changes in either breast. An adhesive marker was placed on the spot(s) prior to the procedure. An adhesive marker was also applied to moles, scars, or other spots that might interfere with the breast image. Patients were made to stand in front of a mammography machine and one breast was placed on the X-ray plate. A separate flat plate, made of plastic, was brought down on top of the breast to compress it gently against the X-ray plate. Compression of the breast was required in order to minimize the amount of radiation used and to ensure optimal visualization of the breast tissue. Patient was asked to hold her breath while the image was being taken. The radiologic technologist stepped behind a protective window while the image was taken. Two pictures cephalo-caudal and lateral views were taken of each breast, requiring the breasts to be repositioned between pictures. After the X-rays have been taken, the films were examined by radiologist to ensure that the films are clear and that no additional films are needed. All the mammograms were evaluated by a single expert radiologist to rule out the interobserver variability. If there was any question about any of the films, additional films were taken. The examination process took approximately 20 to 30 minutes.

Grading of mammographic findings

- Category 0 – Incomplete requires additional imaging evaluation.
- Category 1 – Negative
- Category 2 – Benign
- Category 3 – Probably benign
- Category 4 – Suspicious probably malignant
- Category 5 – Highly suggestive of malignancy
- Category 6 – Histologically confirmed malignancy
- Above 4 mammography grades were considered as malignant.

Histopathology / Cytology report

Depending upon the triple assessment viz. clinical examination, mammography and FNAC/core biopsy patients received treatment. When the triple assessment indicated benign lesion, the lump was excised, the malignant lesions were treated according to the stage of the disease. Histo Pathological Report was available in both these groups of patients, when there was no indication for surgical excision, FNAC or core biopsy findings were taken for calculation of sensitivity and specificity.

Statistical Analysis

The data obtained was coded and entered in Microsoft Excel Spreadsheet. The categorical data was expressed as rates, ratios and percentages and comparison was done using chi-square test. Continuous data was expressed as mean ± standard deviation. The diagnostic accuracy of mammography in predicting breast lumps was determined by sensitivity, specificity, positive predictive value and negative predictive value. Kappa agreement was used to correlate the agreements between diagnosis. 'p' value of less than or equal to0.05 was considered as statistically significant.

OBSERVATION AND RESULTS

This two year cross-sectional study was conducted from October 2015 to October 2017. A total of 72 eligible women presenting with palpable breast lump in the Department of General Surgery, A J Institute of Medical Sciences, Mangalore were studied.

In the present study fifty percent of the women presented with age between 46 to 60 years followed by 60 and above (34.70%), 31 to 45 years (15.30%) and none were below 30 yeas of age (Figure-1). Nipple discharge was present in 53% of the patients (Figure-2). Shape of the lesion was globular in 40.27%, irregular in 22.22%, oval in 16.66%, pea nut in 11.16% and spherical in 9.72% (Figure-3). In this study the nipple examination revealed retracted nipples in 29% of the patients (Figure-4). Tenderness was present in 59.7% of the patients (Figure-5). The consistency of the breast lump was firm in 63.88% of the patients while hard in 36.11% (Figure-6). The axillary lymph nodes were palpable in 19.44% of the patients (Figure-7). In this study, based on the breast examination, the clinical diagnosis was malignant breast lump in 16.66% of subjects and benign in 83.33% of patients, whereas, mammography findings revealed BIRADS grade 3 breast lump (probably benign) in 43.05% of the patients (Figure 8 & 9). In the present study 27.77% of the patients were diagnosed to have malignant lesions while 72.22% of the women were diagnosed as having benign lesions, based on histo-pathological examination (Figure-10).

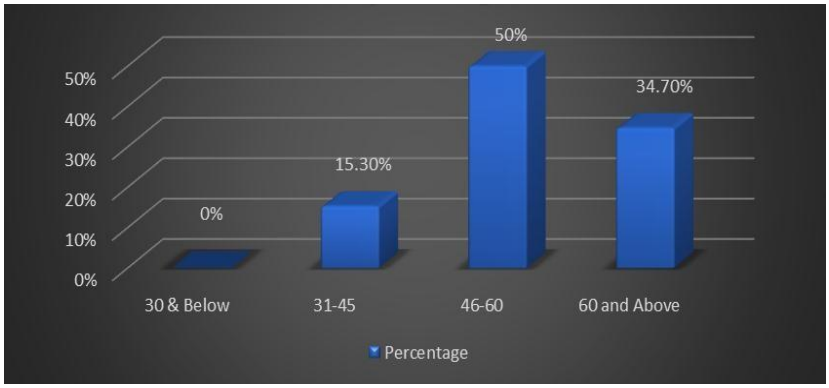

Figure-1: Bar diagram showing the age distribution of the study subjects

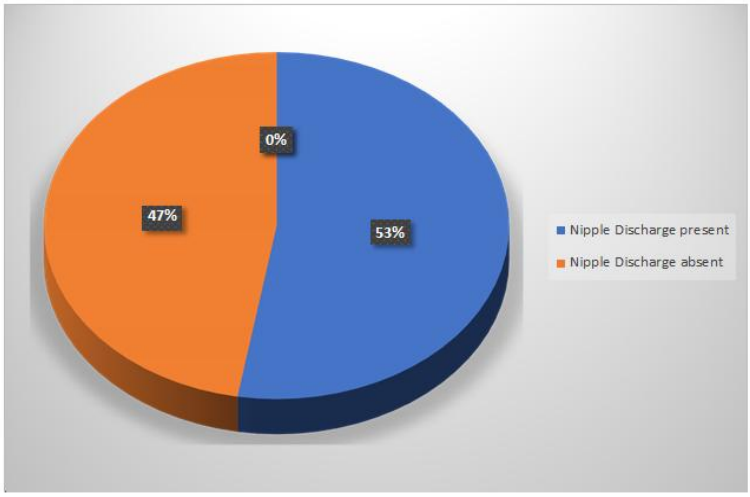

Figure-2: Pie-diagram representing the percentage of study subjects who had nipple discharge at the time of presentation

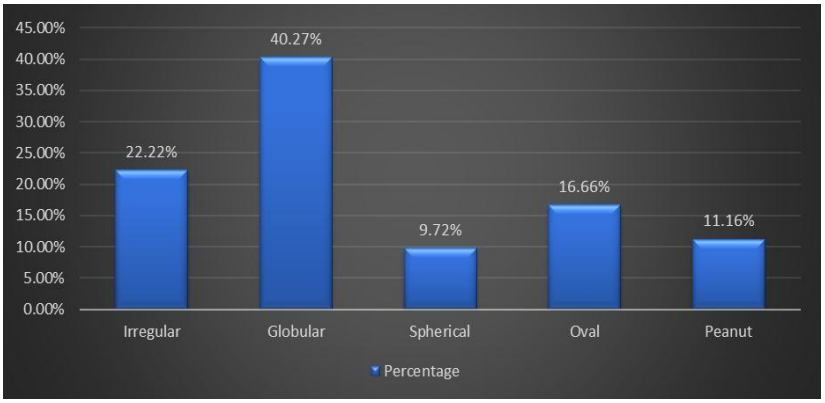

Figure-3: Bar graph representing the percentage of study subjects presenting with lumps of the above mentioned various shapes

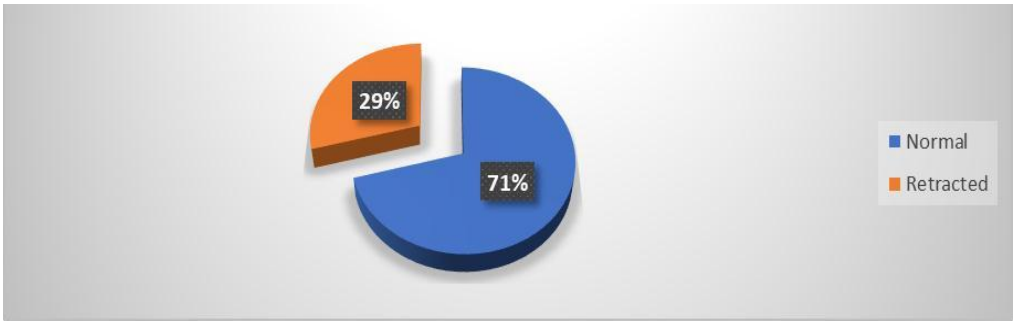

Figure-4: Pie diagram showing the percentage of study subjects presenting with retraction of the nipple

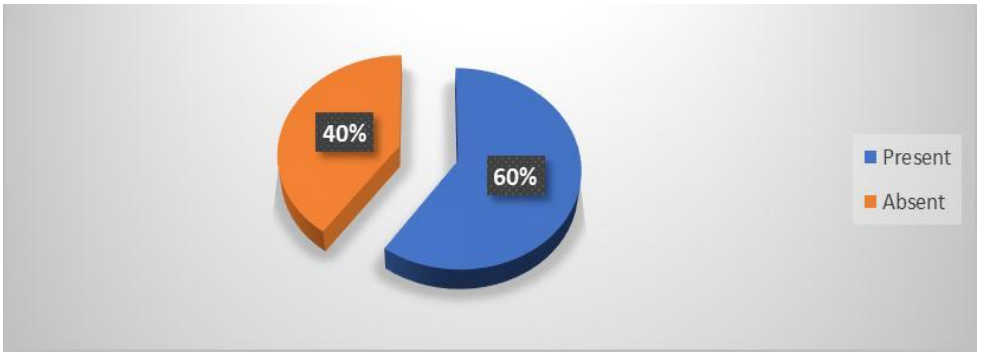

Figure-5: Pie diagram showing the percentage of study subjects who had tenderness

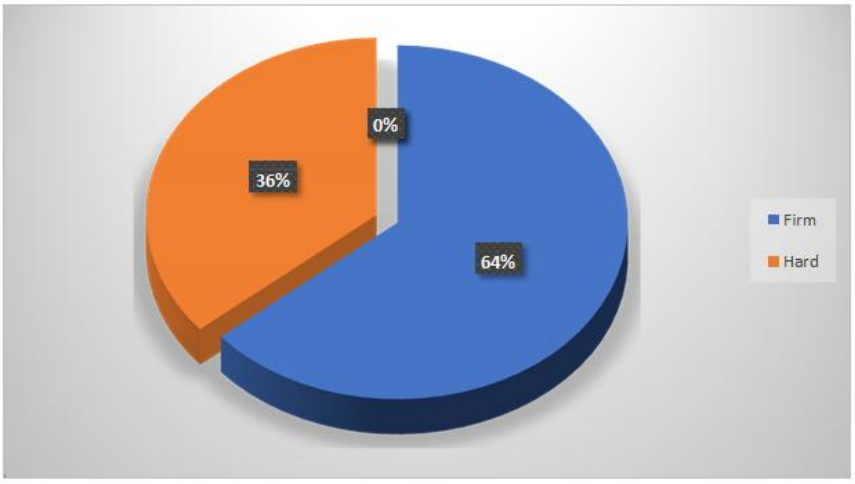

Figure-6: Pie diagram showing the percentage of study subjects who presented with breast lumps of different consistencies

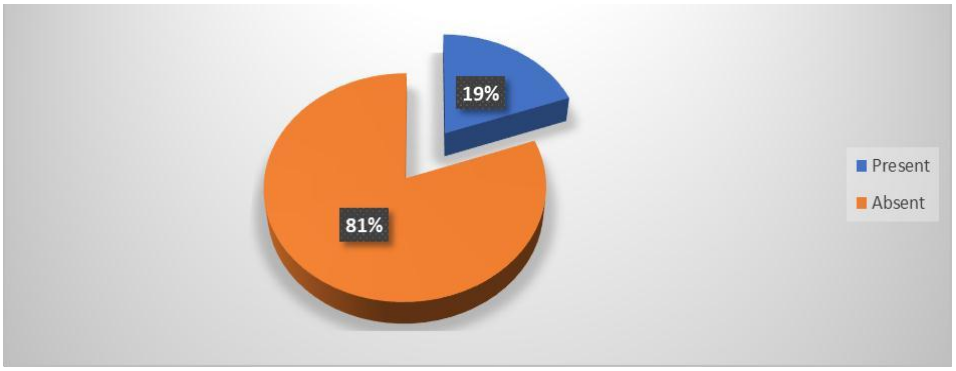

Figure-7: Pie diagram showing the percentage of study subjects who had palpable axillary lymph nodes

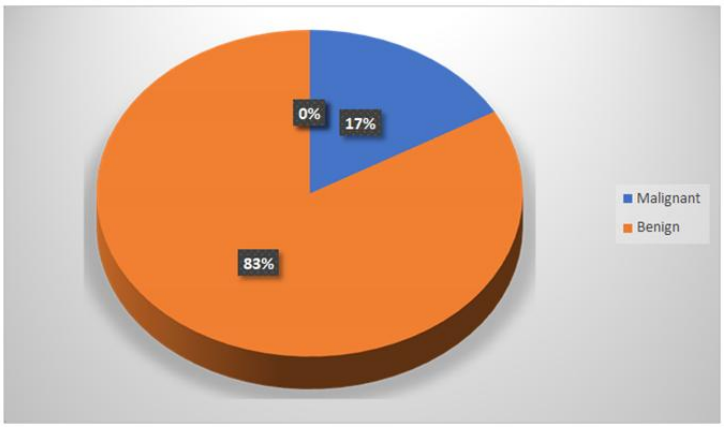

Figure-8: Pie diagram representing the type of lesion

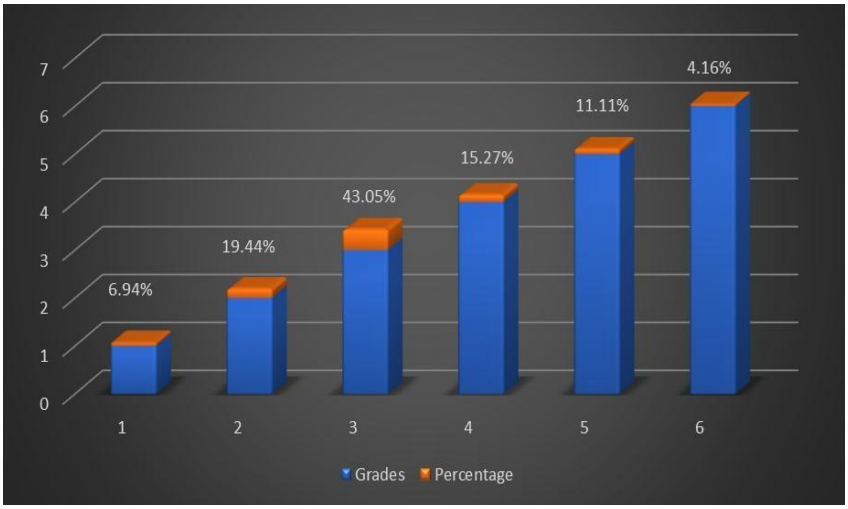

Figure-9: Bar diagram showing the percentage of the study subjects found to have various BIRADS grades on mammography

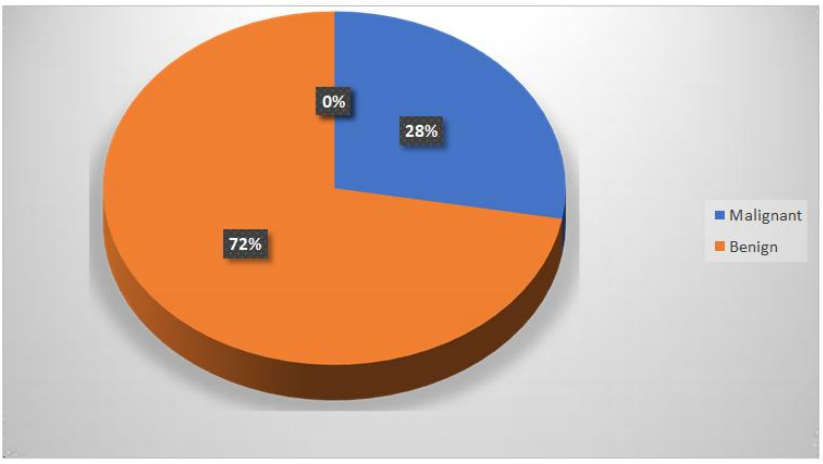

Figure-10: Pie diagram representing diagnosis on histopathological examination

Table-1: Accuracy of mammography in comparison to histopathology

Mammography	**Histopathology**		**Total**
	Malignant	**Benign**	
Positive for malignancy	17	2	19
Negative for malignancy	3	50	53
Total	20	52	72

In the present study of the 20 patients who had malignant lesions on histopathology. Of these patients with biopsy proven malignancy, mammography revealed to be correctly positive (true positive) in 17 patients, but it was falsely negative in 3 women had benign lesions (Table-1). The sensitivity of mammography compared to histopathology in predicting malignant lesions was 85% and specificity was found to be 96.15%. The positive predictive value of Mammography was found to be 89.47%, whereas its negative predictive value was found to be 94.33. The diagnostic accuracy of the mammography was 93.05%.

DISCUSSION

Breast cancer mortality has shown a decline since 1975 [7], which may be attributable to both early diagnosis, by virtue of screening mammograms and improvements in adjuvant therapies [6]. Although various radiographic modalities are readily available to identify lesions that are suspicious for breast cancer, mammography remains vital in breast cancer screening and diagnosis.

Mammography has been used for investigating breast lumps since 1960. The earliest sign of breast cancer is an abnormality depicted on a mammogram, before it can be felt by the woman or her physician. This makes mammograms essential aid in screening process for the dysplastic and neoplastic changes. When breast cancer has grown to the point where physical signs and symptoms appear, the patient feels a breast lump, usually painless. A diagnostic mammogram is the first imaging modality performed for a woman with a new palpable breast lump [7-9].

The majority of breast cancers are associated with abnormal mammographic findings. As an example, in the Breast Cancer Detection Demonstration Project (BCDDP), fewer than 10 percent of cancers were detected solely by physical examination and over 90 percent were identified using mammographic aid [10, 11].

This study, conducted for two years, from October 2015 to October 2017 was aimed to determine the diagnostic accuracy of mammography in evaluating palpable breast lumps. A total of 72 eligible women presenting with palpable breast lump in the Department of General Surgery, A J Institute of Medical Sciences, Mangalore were studied.

In the present study most of the women presented with age between 46 to 60 years. Women with age 60 or above constituted 34.7% while, 15.3 % were aged between 31 to 45 years, depicting the high prevalence in fifth and seventh decade of life. This in accordance with the study by Chopra et al., where they observed the peak in the disease occurrence in ages 40-60 years, with a peak proportion between ages 45- 49 years [12].

Nipple discharge was seen in 52.70% of the cases with palpable lumps. The shape of the lesion was found to be globular in 40.27%, retracted nipples were found in 29.16% of the patients and the consistency of the breast lump was hard in 36.11% of the patients. The axillary lymph node was present in 19.44% of the women and these features led us to make a clinical diagnosis of malignancy in about 17% of patients.

In our study, mammography findings revealed, BIRADS grade 4 and above breast lesions in 30.54% of the patients. For a positive confirmation, the standard histopathological/cytological testing was done and reports suggested 27.77% of the patients, diagnosed to have malignant lesions while 72.22% of the women were presented with benign histology changes in the lesions.

On correlation of the mammography to histopathological findings, of the 20 malignant patients diagnosed via histopathology, 17 had malignant lesions found on mammography and 3 women had benign lesions. Therefore, reflecting a statistically significant sensitivity of mammography compared to histopathology, in predicting malignant lesions at about 85% with a credible specificity of 96.15%. Hence, the diagnostic accuracy of the mammography was 93.05%. In other words, the probability of having a positive mammography in a patient with breast cancer is found to be 85%, indicative of the good sensitivity of the test. Whereas, the probability that the mammography will be negative when the lesion is benign is about 96%, which indicates the high specificity of mammography. The probability that a patient who is found to have a BIRADS grade 4 and above lesion on mammography, actually has a malignant breast lump is 89.47%. This suggests that the positive predictive value of mammography is reasonably high whereas the probability of a patient who is found to have a BIRADS Grade 3 and below lesion on mammography to have a lesion that is benign on histopathology is about 93% suggesting that a high negative predictive value for mammography can be observed.

However, the diagnostic acumen of an observer dictates the net accuracy and predictive capacity of the mammography, in addition to the other limitations that interfere with the accuracy of mammography such the age of the patient, the density of the breast, the size of the lump with respect to the size of the breast and past surgical and radiation status of the breast.

Among the various imaging modalities for the breast cancer, mammography based screening procedures are most suited in early diagnosis and facilitating early intervention [13]. It has been reported that the sensitivity of mammography to detect breast cancer ranges from 63% to 98%, but has been reported to be as low as 30%– 48% in dense breasts [14]. Several groups have evaluated the preoperative use of supplemental magnetic resonance (MR) imaging [15-17], ultrasonography [13, 18], or both [19, 20] after mammography and clinical breast examination to assess the extent of disease within the breast(s). It has thus been found that mammography provides reasonably accurate and useful information for the diagnosis and treatment planning of breast lumps [14].

Although mammograms may detect malignancy as small as 0.5cm, 10% to 20% of malignancies exclude detection by mammography, even when they occur at a much larger size. In a patient with a solid, dominant mass (suspicious mass) the primary purpose of the mammogram is to screen the normal surrounding breast tissue and the opposite breast for non palpable cancers and not just to aid the diagnosis of the palpable mass.

It must be noted that even though mammography has been found to have a good sensitivity and specificity, a negative mammogram is no guarantee of absence of malignancy, as mammography has its own set of drawbacks, limiting its accuracy. Thus a mass that does not disappear or collapse with aspiration must be assumed to be a malignancy and biopsied [21].

CONCLUSION

In this study, 72 patients, with clinically palpable breast lump, were assessed to compare the accuracy of mammogram with that of histopathology. Mammography was proven to be a beneficial diagnostic tool for detecting breast lesions, as it has reasonably

high positive and negative predictive values. In patients with palpable breast lumps, mammography serves as a useful adjunct to rule out breast malignancies and therefore it is recommended to be an integral part of the diagnostic algorithm for breast lumps. The combined use of mammography and clinical examination can provide more sensitive and reliable diagnosis of the breast lump, wherever feasible. Even in the setting of a palpable breast lump, image guidance by means of a ultrasound may improve diagnostic accuracy, especially in case of smaller lumps which are accidentally detected using mammogram.

Having concluded this, it must be borne in mind that the algorithms for clinical and imaging evaluation of palpable breast lumps are stratified by the age of the woman. The utility of mammography in young women with breast lumps and dense breasts may be limited and a biopsy is warranted even if the mammography is negative. In contrast, in an older woman, if a palpable breast lump is appreciated, bilateral diagnostic mammography should be performed, even if the mass is clinically suspicious for cancer. A mammogram in such a setting, not only aids the diagnosis, but also helps us to identify other suspicious areas or calcifications in either breast that might impact the treatment. Mammography produced results for the detection of malignancy with good accuracy. Therefore, the accuracy of mammography should be recognized and included post clinical diagnosis of the symptoms.

However, the sensitivity of mammography, when compared to histopathology in predicting malignant lesions was found close to 85% and specificity of 96.15% was found. Clinically suspicious mass should be biopsied regardless of the imaging findings, owing to the finding that a small percentage of the mammographic harmless appearing lesions may be in fact malignant.

Based on our findings, we recommend the use of mammography following clinical detection of a breast lump, with or without further radiological aid, to come to a reasonably certain diagnosis. Even though the accuracy and the application of mammography may be limited by various factors such as the experience of the observer, the size of the lump, the lump:breast ratio, the breast density and the hazards of radiation exposure, it continues to be an invaluable tool for evaluation of breast lumps and hence must be performed in all patients who present with clinically palpable breast lumps, as a first line of radiological investigation. The mammography results should be further supplemented with histo-pathological confirmation, to reach the final diagnosis.

SUMMARY

Although various radiographic modalities are readily available to identify lesions that are suspicious for breast cancer, mammography remains the mainstay of breast cancer screening and also an important part of the diagnostic algorithm for palpable breast lumps. This study was aimed to determine the diagnostic accuracy of mammography in evaluating breast lumps.

The present two year study was conducted from October 2015 to October 2017. A total of 72 eligible women presenting with palpable breast lump in the Department of General Surgery, A J Institute of Medical sciences, Mangalore were studied.

In the present study it was found that mammography showed to have a reasonably high diagnostic accuracy (93.05%). Even though the accuracy and the application of mammography may be limited by various factors such as the experience of the observer, the size of the lump, the lump:breast ratio, the breast density and the hazards of radiation exposure, it continues to be an invaluable tool for evaluation of breast lumps and hence must be performed in all patients who present with clinically palpable breast lumps, as a first line of radiological investigation. The mammography results should be further supplemented with histo-pathological confirmation, to reach the final diagnosis.

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