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Original Research Article

A comparative clinicopathological study between ultrasonography, mammography, fine needle aspiration cytology and core needle biopsy of breast lump

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ABSTRACT

Background: Early presentation and prompt diagnosis is the essential key in treatment of different variety of neoplastic as well as non-neoplastic breast disease. In this study usefulness of high-resolution ultrasonography (HRUSG), mammography, fine needle aspiration cytology (FNAC) and core needle biopsy in correlation with histopathological pattern, was assessed.
Methods: After matching the criteria, 212 cases, were taken for this prospective, single center, observational study.
Results: Out of 212 cases, 163 (76.88%) were benign lesions, 49 (23.11%) were malignant and 1 (0.47%) were of inflammatory pathology. Benign to malignant breast disease ratio was 3.3:1. Out of 49 malignant cases, 45 (91.83%) were ductal cell carcinoma and 4 (8.16%) was apocrine carcinoma. Maximum numbers of cancer patients were found in the 51-60-year age groups. The sensitivity, specificity, positive predictive value and negative predictive value of mammography in detecting carcinoma breast were 87.76%, 64.71%, 87.76% and 64.71% respectively. The sensitivity, specificity, positive predictive value and negative predictive value of HRUSG in detecting carcinoma breast were 85.71%, 90.18%, 72.41% and 95.45% respectively. Among benign lesions, 47 (28.83%) were diagnosed by mammography and 147 (90.18%) were diagnosed by HRUSG. When these modalities were combined, >95% of the lesions was diagnosed accurately.
Conclusions: Ultra sound used liberally as an adjunct to mammography, increase the cancer detection rate. Core needle biopsy is found more accurate but FNAC have limited value in evaluation of benign breast lump. This study also proves that preoperative categorization of breast lesions is utmost important for management of the patient and this will help to avoid unnecessary surgical treatment.

Keywords: Breast lump, Core needle biopsy, Fine needle aspiration cytology, Mammography, Ultrasonography

INTRODUCTION

Breast lump is a very common problem among females attending surgical outpatient department. Breast is a dynamic structure which changes throughout reproductive life, and the cyclical changes during menstrual period are also added with it. About 30% of women suffer from breast disease in their lifetime.[1] The pathogenesis involves disturbance in the breast physiology extending from an extreme normalcy to well defined disease processes. Approximately 40% of all patients with breast problems present with a benign breast lump, and often unnecessary surgeries are performed for benign diseases. Benign breast lumps are the most common lesions accounting for about 60 to 80% of all the breast disease.[2] Aberrations of normal development and involution (ANDI) is a group of benign breast disorder, commonly presents with discrete lump in the breast which may be bilateral but commonly found in the upper outer quadrant. These group includes cyclical nodularity and mastalgia, cysts, fibroadenoma, duct ectasia and periductal mastitis.[3] Studies have shown that there is a

relationship between benign breast disease and breast cancer. Risk of cancer varies according to the histological grading of benign breast disease.[4-6]

There are various modalities for evaluation of breast lump such as high-resolution ultrasonography (HRUSG), mammography, fine needle aspiration cytology (FNAC), core needle biopsy, but they have varied sensitivity.[5,7] Clinical evaluation, followed by HRUSG and mammography are simple method to detect causes as these are inexpensive and non-invasive. These methods are very effective in resource poor areas.

Malignant neoplasm is more frequent in old females like other cancerous conditions. Delay in diagnosis causes management more complicated, as most of them usually present in advanced stage. Mammography is very useful investigation to detect breast carcinoma as well. Chances of missing carcinoma persist in few cases with HRUSG. There is lack of structured breast screening programs in most of the resource poor areas. Traditional belief, lack of awareness, poor socioeconomic conditions is also contributing in late detection of cases. A test therefore should provide a degree of diagnostic accuracy so that unnecessary biopsy can be prevented. Breast cancer can be diagnosed with thorough clinical examination and diagnostic aid such as HRUSG, Mammography, and Core needle biopsy.[7] Strategy in managing breast lump is to decide whether the lump is due to normal variation or it is an abnormality. If the lump is found abnormal, then it is to be determined whether malignant or not. Preoperative diagnosis using a combination of clinical examination, high resolution ultrasonography, mammography and either biopsy (using a wide bone cutting needle) or aspiration cytology (using a narrow hypodermic needle in resource poor areas) is commonly used.

The purpose of the present study was to categorize breast lumps, to find out mode of presentation and demographic pattern if breast lump in female patients and to compare between different diagnostic modality like HRUSG versus mammography and fine needle aspiration cytology versus tissue biopsy with respect to histopathology findings.

METHODS

This is an institution based (single center) prospective, observational hospital based, comparative, cross sectional study. The study population comprised of 212 cases of breast masses (who attended OPD from March 2018 to August 2019 in general surgery department of BSMCH medical college). This study was divided into two parts: 1. prospective-patients presenting in OPD and 2. Retrospective-analysis of the patients of breast lump from the preceding 18 months at BSMCH. Here, detailed history, clinical examination and biopsy of the breast lump were carried out. The subjects satisfied the inclusion and exclusion criteria mentioned below. The primary data for this study were the investigation reports of the subjects.

Inclusion criteria

All female patients attending surgery outpatient department with complaint of clinically palpable breast lump (solitary/multiple and unilateral/bilateral) irrespective of age, socioeconomic status, duration was included.

Exclusion criteria

Patients who refused to give consent. Male and pregnant female patients excluded from the study. Some patients did not follow-up, hence they were excluded from the study. Patients with acute and tender breast lump like breast abscess were also excluded.

In outpatient department a detailed history and thorough physical examination of the presenting palpable breast lump has been carried out and data was saved. All the subjects were then undergone HRUSG and mammographic scanning. The subjects with suspicion of malignancy were undergone FNAC and core needle biopsy. The lumps were then excised (in case of benign lesion) or proper oncological surgery were done in malignant cases. Post operatively all specimens were sent for histopathological examination. All the statistical analysis was carried out using available standard statistical software. Odds ratio with 95% confidence interval (CI) and multivariate analysis has used establish the interrelationships between pre-operative and intra operative findings. All statistical tests have two tailed and p value <0.05 has taken as significant.

RESULTS

In the present study, majority of the patients 64(30.2%) belongs to the 21-30-year age group, the next highest numbers of patients being in the 31-40-year age group stood at 49 (23.1%). Of the various conditions diagnosed, most of the fibroadenoma belongs to the <20-year category being 32 (37.20%) total number of fibroadenoma), most of the fibro adenosis belongs to the 21-30 years of categories (50%).

The most common lesion was fibroadenoma 86 (40.56%), followed by fibro adenosis including other benign breast lump followed by malignant tumor 49 (23.11 %) in that order.

In this study, sensitivity and specificity of clinical breast examination for detection of malignancy is found to be 93.87% and 96.44% respectively.

Mammography can detect only 47cases (28.83%) cases and not able to detect accurately 116 cases (71.16%) most of which are under 35 years of age.

Ultrasound has an established role in assessing breast abnormality as an adjunct to mammography in older women and is a first line investigation in young women with mammographically dense breast. Some malignant breast lesion is not visible on mammography but are detected by high resolution ultrasound. The use of high-resolution ultrasound in addition to clinical examination and mammography may result in an increased rate of breast cancer detection. The study was undertaken to calculate the predictive value of high-resolution ultrasonography in patients presenting with breast lumps. The sensitivity, specificity, positive and negative predictive values were comparable to the data obtained by different studies conducted elsewhere. HRUSG is more specific in diagnosis of lumps in younger females (<35 years), due to dense breast tissue.

In comparative analysis of FNAC and histopathology diagnosis, authors observed 9 cases of cytologically interpreted errors; which were 6 cases of false positive and 3 false negative cases. One false negative case diagnosed as BPPD with atypia turn out to be malignant cases (Mucus secreting CA of breast). In 2 false positive cases; one was multiple solid papilloma's with area of adenosis and one case was benign fibrous histiocytoma. FNAC of breast lesion is sensitive, specific, and highly accurate as the initial investigation of palpable breast lesions in this hospital.

In comparative analysis of core needle biopsy report and histopathology diagnosis, authors observed 3 cases of cytologically interpreted errors which were 2 cases of false positive and 1 case of false negative cases. 1 False negative case diagnosed as BPPD with atypia turn out to be malignant cases (Mucus secreting CA of breast). In 2 false positive cases were multiple solid papilloma's with area of adenosis. Core needle biopsy of breast lesion is sensitive, specific, and highly accurate as the final investigation of palpable breast lesions in this hospital.

Table 1: Age wise distribution of different breast lumps.

Clinical diagnosis	Age (in years)						Total (%)
	<20	21-30	31-40	41-50	51-60	>60	
Fibroadenoma	32	31	14	6	3	-	86 (40.56)
Fibro adenosis	1	8	4	3	-	-	16 (7.54)
Fibrocystic mass	2	13	15	6	-	1	37 (17.45)
Phylloids	-	4	4	1	-	-	9 (4.24)
Others	2	5	6	1	-	1	15 (7.07)
Malignant	1	3	6	18	16	5	49 (23.11)
Total	38 (17.9%)	64 (30.2%)	49 (23.1%)	35 (16.5%)	19 (8.96%)	7 (3.30%)	212 (100)

Table 2: Histopathological findings.

Nature of the tumour	Number of subjects
Benign	163
Malignant	49
Total	212

Table 3: Histological correlation in patients cytologically diagnosed as benign and malignant disease.

Types as diagnosed histologically	Total no. of cases	No. of cases tissue received	Histopathological correlation	
			Consistent (%)	In consistent (%)
Fibroadenoma	86	86	81 (94.18)	5 (5.81)
Fibrocystic ds	37	37	31 (83.78)	6 (16.21)
Fibro adenosis	16	15	15 (100)	-
Phyllodes tumor	9	9	7 (77.77)	2 (2.22)
Tuberculosis	1	1	1 (100)	-
Other	14	14	3 (21.42)	11 (78.57)
Total (benign)	163	162	138 (85.18)	24 (14.81)
Ductal carcinoma	44	44	43 (97.72)	1 (2.27)
Lobular carcinoma	2	2	2 (100)	-
Papillary carcinoma	2	2	-	2 (100)
Mucin secreting carcinoma	1	1	-	1 (100)
Total (malignant)	49	49	45 (91.83)	4 (8.16)

Table 4: Mammographic diagnosis of different breast lump.

M. diagnosis	Palpable	Tumour (n=212)	
	BIRADS scoring	No	Percentage
Inconclusive, more towards benign	0, 1	104	49.05
Benign	2	47	22.16
Significant, more towards malignant	3 and 4	19	8.96
Malignant	5 and 6	42	19.81
Total	-	212	100

Table 5: Analysis of mammographic data in benign and malignant disease.

Data	Malignancy	HPE	Diagnosis
		Disease	Not diseased
Mammography	Disease	43	6
Diagnosis	Not diseased	6	11
Mammographic	Benign disease	(n=163)	
Findings	No	Percentage	
Detected	47	28.83%	
Not detected	116	71.16%	
Total	163	100%	

Table 6: Validity of mammography.

Source	Total patients	No. of CA patients	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Tan et al[8]	326	74	49	89	53	88
Tewari[9]	53	10	77.77	97.72	87.5	95.55
Brown et al[10]	568	77	85.7	91.4	47.1	98.6
Kolb et al[11]	11130	221	77.6	98.8	35.8	99.8
Yang et al[12]	480	480	92	94	84	-
This study	212	49	87.76	64.71	87.76	64.71

Table 7: USG finding in different breast lump.

HRUSG features		Total	Palpale	Tumours	(N=212)	
			Benign	%	Malignant	%
Shape	Round/oval	155	148	90.79	7	14.28
	LOB/irregular	56	14	8.58	42	85.71
Define	Well defined	150	145	88.95	5	10.20
	Ill defined	40	17	10.42	44	89.79
Vascularity	Normal	77	150	92.02	26	53.06
	Increased	15	12	7.36	23	46.93

DISCUSSION

In the present study, most of the patients belongs to the active reproductive year (20-40 years) depicting the occurrence of aberrations as depicted in literature, in the most active years. At the same time, there are patients presented with breast carcinoma in postmenopausal age group.

Fibroadenoma was the most common breast lesion in this study as well as in reports elsewhere from India.[23,24]

Most fibroadenomas occurring at a slightly earlier age group than fibro adenosis depicts the fact that fibrocystic changes are variants of the repeated cyclical changes in the form of menstruation, pregnancy and lactation. A higher incidence of fibroadenoma and a lesser frequency of fibrocystic disease in Indian women have been explained on the basis of early menarche, early marriage, and multi parity. Most of the breast cyst belonging to the 30-40 age groups in this study and is described as an evolutional change.

Most common presentation of breast lumps in female patient was a painful lump (52%), followed by painless lump. Pattern of pain is very commonly non-cyclical (81%). The side of breast involved shows no significant difference between left (46) and right (42). Bilateral involvement is only seen in 12% of the cases.

Though pain in the breast lump is the commonest symptoms, systemic symptoms like fever, wound with discharge, redness and pain in opposite breast are also seen.

As obvious in most of these studies the most of the breast lump was firm in consistency (74%) and mobile (64%).

The total 212 of female patients were studied, out of which (74%) had benign lesion and (26%) had malignant lesions.

Table 8: Validity of USG.

Source	No. of patients	No. of cancer patients	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Tan et al[8]	326	74	82	84	60	94
Chen et al[13]	243	82	97.6	79.5	70.8	98.5
Tewari et al[9]	53	10	55.55	97.72	83.33	91.48
Lingaraju et al[14]	80	14	85.8	96.4	66.7	100
Kolb et al[11]	11130	221	75.3	96.8	20.5	99.7
This study	212	49	85.71	90.18	72.41	95.45

Table 9: Validity of FNAC.

Source	No. of patients	No. of CA patients	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Saha et al[15]	50	50	69	100	100	38.1
Giri et al[16]	277	12	90.32	100	100	86.36
Ligaraju et al[14]	80	14	98.5	97.1	73.3	100
Hua et al[17]	143	46	92.7	92.1	-	-
Kamphausen et al[18]	354	354	90	100	100	90
This study	212	49	93.88	96.32	88.46	98.12

Table 10: Validity of core needle biopsy.

Source	No. of patients	No. of CA patients	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Saha et al[15]	50	50	88.3	100	53.3	100
White et al[19]	1042	240	97	94	88	98
Ballo[20]	124	124	90	100	-	-
Fattahi et al[21]	116	116	92.6	100	100	91.8
Hari et al[22]	36	30	46.7	100	100	27.3
This study	212	49	97.96	98.77	96	99.38

The highest incidences of breast lumps in this study were in the age group of 21-30 years. The least incidence of breast lesions was in the age group of 11-20 years. The maximum numbers of benign breast lesions are in the age group of 21-40 years and maximum number of malignant lesions was seen in the age group above 50 years (50%). An increasing numbers of patients are in the 20 to 40 years of age, and this definitely is a very disturbing trend. In India, the average age of developing a breast cancer has undergone a significant shift over last few decades.

In the present study, menstrual irregularity is seen in a few cases, whether his carries any significance is inconclusive. Most of the malignant cases were seen in postmenopausal age group.

Least half the cases of breast lump have been treated conservatively (9%). Rest of them is treated by surgery, which includes excision biopsy mastectomy, simple mastectomy and MRM.68% of benign breast lumps were treated conservatively.

Some of the cases subjected to cytological/histological diagnosis, most were fibroadenoma and fibrocystic disease of breast, as was expected. 26% of breast lump presented with histologically proved malignancy.

In this study, sensitivity and specificity of clinical examination to detect malignancy was 87.5% and 95.6% respectively. Most of these women presented with large masses in the breast. The average size of presentation of malignant breast lump was 5.17×4.38 cms. These masses were discovered accidentally and only a rare patient carried out regular self-examination or underwent screening mammography. More than half of the patients with breast lump seek medical advice after 6 months. Previous studies have identified ignorance, fear and fatalistic attitude, socioeconomic conditions, traditional belief, low customs are important factors resulting in delay.[25-29]

The proportion of married women was 80.5%. Only 2% had used birth control pills for contraception for duration of more than 1 year. Nineteen percent were nulliparous, 38% had borne 1-2 children. 28% had 3-5 children, and 15% had 6 children or more.

Ultrasound is recommended in all cases where there is a clinical suspicion of malignancy even if the mammogram is normal. Any focal mammography or ultrasound abnormality should undergo needle biopsy. Breast ultrasound does not expose the patient to ionizing radiation and with its relatively easy availability and cost effectiveness; it has already proven to be an important adjunct to the other radiological and pathological studies for the breast.

CONCLUSION

Ultrasound used liberally as an adjunct to mammography, increases the cancer detection rate by almost 15%. It was found that HRUSG is more accurate in dense breast tissue, female <35 years of age and mammography is more accurate in old ages, >35 years. Different studies have shown that the most common lesions are benign and needs proper diagnosis. Thus, the FNAC smears have very high accuracy in diagnosis of breast lump. The FNAC of breast is cheap, safe and highly accurate preoperative method for diagnosis of breast lesions. But core needle biopsy is the diagnostic method of choice for malignant lumps. Preoperative categorization of breast lesions is utmost important for management of the patient. Increase of awareness, in general population, is the utmost important tool for early detection as well as decrease in mortality and morbidity of patients suffering from malignant breast disease.

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