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Original Research Article

Comparative study of fine needle aspiration cytology and tru-cut biopsy in the diagnosis of breast lesions

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ABSTRACT

Background: Breast carcinoma is one of the most researched cancers across the world. FNAC is often used as a first priority investigation in patients with breast lump. Tru-cut biopsy is useful in preoperative knowledge of prognostic parameters with the help of IHC markers ER, PR, Her2 neu. The technique is reliable, simple and reproducible which can be used even in resource poor countries like India. To analyze the sensitivity, specificity, positive predictive values and negative predictive values and the diagnostic accuracy (efficacy) of fine needle aspiration cytology and trucut biopsy.
Methods: The study included 82 patients presenting with palpable breast lesions. All patients underwent FNAC followed by Tru-cut biopsy under ultrasound guidance. ER, PR, HER2 Neu, cytokeratin immunostaining was done in malignant cases. The data collected analysed statistically.
Results: The sensitivity, specificity, PPV, NPV of FNAC were 96.61 %, 95.65 %, 98.28%, 90.91% respectively and that of trucut biopsy were 100%, 100%, 100%, and 100 % respectively.
Conclusions: Out of total 82 patients, maximum no of cases (57) were duct carcinoma accounting 69.50% on FNAC and Tru-cut biopsy. IHC was done in all carcinomas. Maximum (46 cases) were luminal type. The present study emphasizes that tru-cut biopsy can serve as confirmative diagnostic tool over FNAC and provides information regarding prognostic factors and treatment modalities based on IHC markers.

Keywords: Breast lump, Core biopsy, FNAC, Immunohistochemistry, Tru-cut biopsy

INTRODUCTION

Breast cancer is one of the most researched cancers across the world and new advancement for the treatment are coming up frequently.

As per the International agency for research on cancer (IARC), Globocan, WHO (2018), a total of 2.088 million new cases of breast cancer were diagnosed in 2018 accounting for 11.6% of all cancers (total cancer cases, 180 million) and 6.26 lakhs died of breast cancer accounting for 6.6% (total cancer deaths, 9.5 million).[1]

The report from National Cancer Registry program, India (2020), the projected incidence of breast cancer is 1 in 29 females with annual estimate of 2,05,424 new cases.[2]

FNAC has been used since a long time for this purpose, along with clinical examination and mammography. It has been proved to be of great value in the diagnosis of

breast lumps, apart from being cost effective, it is also simple and quick while providing cytological diagnosis. FNAC is often used as a first priority investigation in patients with breast lump.[4]

Tru cut biopsy also known as core needle biopsy is now one of the most useful means of obtaining histopathological diagnosis. It is relatively easy and can be performed on an outpatient basis. It also avoids unnecessary excisional biopsy, lower inadequacy rates, allowing ancillary methods, grading and typing of cancer, are the features which help to plan a definitive surgery.[4,5]

METHODS

A 2 years prospective study was carried out from 1stoctober 2020 to 30thSeptember 2022. The present study included 82 cases of breast lesions in tertiary care hospital and other referral hospitals and diagnostic laboratories in North Karnataka. Ethical approval for the study was obtained from the Institute Ethical Committee.

Inclusion criteria

All patients having breast lump of variable duration and age >18 years were included in this study.

Exclusion criteria

Patients with acute and tender breast lumps like breast abscess were excluded.

The patient presenting with palpable breast lump was subjected to detailed clinical history with physical examination. After taking an informed consent from the patient, fine needle aspiration cytology followed by Tru-cut biopsy from the breast lump was performed under ultrasound guidance.

Ultrasound guided FNAC followed by trucut biopsy was done while patients were lying on their back with arm raised above head. Before biopsy, a special, warmed gel was placed on breast. Then a transducer was placed on breast and slowly moved back and forth to locate the area to be biopsied. Once the area was identified, the patients were subsequently subjected to FNAC followed by Tru-cut biopsy.

Ultrasound guided Tru-cut biopsy was done after administering Local Anesthesia, small incision was made over the breast lump using sterile surgical blade (no 11) and cannula introducing a BARD Max- core trucut biopsy “gun” of 16 or 18-gauge needle under all aseptic precautions. The inner trocar was thrust forward approximately 2 cm and at almost the same time the outer cutting cannula was thrust over the inner trocar filling the inside notch with the breast tissue specimen. The specimen was then placed in a container of 10% neutral formalin. Biopsy sample was processed and hematoxylin and eosin sections of this sample was studied and compared with the finding of FNAC. Formalin chamber along with formalin tablets were used to sterilize the trucut needle.

For ER, PR, HER2 Neu, cytokeratin immunostaining, sections were de-paraffinized, rehydrated, and subjected to microwaving in citrate. Slides were allowed to cool at room temperature for 30 minutes. The D2-40 antibody was applied at room temperature for 2 hours in an automated Stainer and counter stained with secondary antibody. Detection steps was performed using the Detection Kit and Standard Protocol.

BIRADS (Breast Imaging- Reporting and Data System) is a risk assessment and quality assurance tool developed by American College of Radiology.

RESULTS

Total 82 cases were carried out from 1st October 2020 to 30th September 2022 (2 years). Majority of the patients (34.15%) presented within 6-9 months of duration. Duration ranged from 4 months to 14 months and mean duration was 6.6 months.

Table 1: Sex and age distribution.

Sex and age distribution	No. of cases	Percentage
Sex		
Female	81	98.78
Male	1	1.22
Total	82	100.00
Age in years		
18-30	10	12.20
31-40	27	32.93
41-50	10	12.19
51-60	11	13.41
>60	24	29.27
Total	82	100.00

Maximum number of cases (57.32%) were found in premenopausal period. A total of 40 (48.78%) cases presented with right sided breast lump and 34 (41.46%) in left side and 08 (9.76%) cases had bilateral lumps.

Maximum number of cases (53.65%) presented with multiple lumps. Maximum numbers of cases (40) were in the upper outer quadrant accounting to 48.79%. Maximum number of cases (51.23) were found in BIRADS-4 category accounting to 51.23%.

There was statistically highly significant difference in the distribution USG findings among the patients (P<0.001).

Inadequate sampling

Of the total 82 cases inadequate sampling report by FNAC were noted in 2 patients, which on trucut biopsy

revealed infiltrating ductal carcinoma. Inadequate sampling rate of FNAC= 3.65%.

In present study fine needle aspiration cytology shows 96.61% sensitivity and 95.65% specificity. Positive predictive value (PPV) and Negative predictive value (NPV) were 98.28 % and 90.91% respectively. Whereas Sensitivity, specificity, PPV, NPV of trucut biopsy were 100% each. This shows high diagnostic accuracy of trucut biopsy compared to FNAC (Table 1, Table 2, Table 3, Table 4, Table 5, Table 6 and Table 7).

Table 2: FNAC and trucut biopsy findings.

Diagnosis	No. of cases	Percentage	Fisher exact test
FNAC			
Chronic mastitis	1	1.22	P=0.0002
Fibroadenoma	10	12.2	
Fibrocystic disease	8	9.76	
Benign phyllodes	3	3.66	
Suspicious of malignancy	1	1.22	
Duct carcinoma	**57**	69.5	
Inadequate	2	2.44	
Total	82	100	
Trucut biopsy			
Chronic mastitis	1	1.22	P=0.00031
Fibroadenoma	10	12.2	
Fibrocystic disease	4	4.88	
Fibroadenoma with fibrocystic change	4	4.88	
Benign phyllodes	1	1.22	
Ductal carcinoma in situ	1	1.22	
Malignant phyllodes	2	2.44	
Infiltrating ductal carcinoma	57	69.5	
Metaplastic carcinoma	2	2.44	
Total	82	100	

Table 3: FNAC and trucut biopsy correlation.

FNAC	Trucut	Correlation
Chronic mastitis (1)	Chronic mastitis (1)	Concordant
Fibroadenoma (10)	Fibroadenoma (10)	Concordant
Fibrocystic disease (8)	Fibrocystic disease (4)	Concordant
	Fibroadenoma with fibrocystic disease (4)	
Benign phyllodes (3)	Benign phyllodes (1)	Concordant
	Malignant phyllodes(2)	Discordant
Suspicious of malignancy (1)	Ductal carcinoma in situ (1)	Concordant
Duct carcinoma (57)	Infiltrating duct carcinoma (55)	Concordant
	Metaplastic carcinoma (2)	
Correlation coefficient	r = 0.93, P<0.01	

Table 4: Statistical analysis of FNAC and trucut biopsy.[17]

	FNAC (%)	Trucut biopsy (%)
Sensitivity	96.61	100
Specificity	95.65	100
Positive predictive value	98.28	100
Negative predictive value	90.91	100
Diagnostic accuracy	96.25	100
P value	<0.001	

Table 5: IHC markers.

IHC markers	Molecular subtypes	No. of cases	Percentage (%)
ER+/ PR - Her2-, ER/PR +, Her2 –	Luminal	46	76.67
ER/PR - , Her2 +	Her2 enriched	5	8.33
Triple negative	Basal like	9	15
Total	-	60	100

Table 6: Comparison of sensitivity and specificity.

Authors	Sensitivity		Specificity	
	TRU CUT (%)	FNAC (%)	TRU CUT (%)	FNAC (%)
Radhakrishna et al[5] (n=467)	93.25	-	98.4	-
Hari et al[13] (n=72)	46.7	70	100	80
Saha et al[11] (n=50)	88	69	100	100
Shashirekha et al[9] (n=62)	97.1	84.34	100	100
Sagarika et al[6] (n=747)	97	-	100	-
Parikh et al[8] (n=55)	83.3	78	100	89
Sharma et al[3] (n=30)	100	96	100	80
Chaudhary et al[10] (n=50)	98.4	86	94.2	90
Present study (n=82)	100	96.61	100	95.65

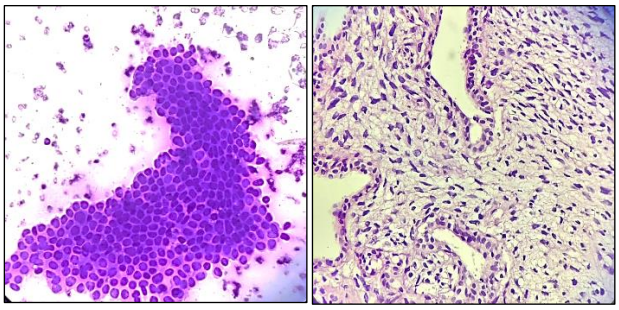

Figure 1: A) Proliferation of stromal cells with minimal pleomorphism (Giemsa stain: 40x). B) Leaf like pattern of showing increased proliferation of stromal component (H & E: 40 X).

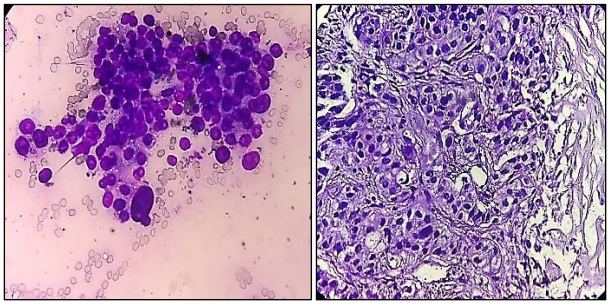

Figure 2: A) Infiltrating Ductal Carcinoma (FNAC): duct carcinoma cells showing prominent nucleoli and coarse chromatin (Giemsa stain; 40x). B) Pleomorphic tumour cells arranged in sheets invading surrounding stroma (H AND E; 40X).

DISCUSSION

Lump in the breast is a common complaint of patients at the surgical outpatient department in all major hospitals. There is a need of accurate diagnosis of breast lesions so that unnecessary surgical treatments are minimized.

FNAC is the primary diagnostic tool to evaluate breast lesions which is cost effective compared to other methods. Sometimes FNAC alone is not helpful in diagnosing breast lesions. In such cases trucut biopsies help in confirmation of diagnosis. It also helps in avoiding unnecessary surgical traumas from excisional biopsies in the present study.

According to population based cancer registry India, maximum number of cases reported were in the age of 45-54 years which is 31.6% of overall cases registered.[28] In the present study the most common age group affected was 31-40 years accounting to 32.93% followed by >60 years accounting to 29.27%. Age range of the cases studied was 18-70 years.

In a similar study done by Mitra et al maximum no of cases were found in age group 31-40 years accounting to 36.8%.[27]

In present study mean age was 43.55 years which is correlating with study done by Krishna et al.[14] This can be due to the fact that maximum number of cases are malignant and increasing age is one of the risk factors for breast carcinoma.[28]

Other risk factors include strong family history, early menarche, late menopause, late first pregnancy, nulliparity, absence of breast feeding, exogenous hormonal therapy, postmenopausal obesity, physical inactivity, and high alcohol consumption.[28]

In present study maximum no of cases presented with right sided breast lump which is similar with the study done by Saha et al.[11]

Maximum no of cases were found in BIRADS IV which is similar with the study done by Hari et al whereas Radhakrishna et al showed BIRADS III as the most common BIRADS category which can be attributed to their higher sample size.[12,5]

Maximum no of cases were malignant lesions on FNAC which is similar with the study done by Sharma et al.[3]

The presences of unsatisfactory and inadequate sampling due to less or no cellular material in the report, lead us to speculate for any error in the method of aspiration. In this study there were two aspirations reporting unsatisfactory, thus resulting in an inadequate sampling rate of 3.65%.

In this study maximum number of cases (10) among all benign lesions (22) were fibroadenoma. These findings correlated with studies done by Garg et al and Mitra et al.[4,27] Duct carcinoma was seen in 98.27% of cases which correlated well with Tikku et al and Mitra et al.[26,27]

One case was diagnosed as suspicious of malignancy on FNAC which was confirmed on trucut biopsy as ductal carcinoma in situ. Here trucut biopsy played a definitive role for giving an accurate diagnosis.

It was observed that out of 82 cases, maximum 62(75.60%) were malignant histopathologically and 20 (24.40%) benign, which correlated with Sharma et al, probably due to increased utility of trucut biopsies in malignant cases for further classification.[3]

Fibroadenoma accounted to 50% of cases followed by fibrocystic disease (8). These findings correlated with study done by Mitra et al.[27]

In present study, one case of benign phyllodes was diagnosed on trucut biopsy. On palpation the tumour was having irregular borders and was occupying entire breast.

It was showing cystic changes along with solid areas on ultrasonography. It was a recurrent case of phyllodes which was previously surgically resected 6 years back.

Phyllodes tumour is distinguished from fibroadenomas by increased stromal cellularity and overgrowth giving rise to typical leaf like pattern.

In the present study, out of total 62 malignant cases, maximum number of cases (57) were infiltrating ductal carcinoma accounting to 91.93% and was similar to the study done by Sagarika et al, Mitra et al.[6,27]

In this study, 2 cases were diagnosed as malignant phyllodes on trucut biopsy which were diagnosed as benign phyllodes on FNAC. These 2 false negative cases were discordant in the present study. This shows that tru-cut biopsy has more diagnostic accuracy over FNAC.

In this study, 2 cases were diagnosed as metaplastic carcinoma on trucut biopsy. On FNAC they were diagnosed as duct carcinoma, hence histologic typing of the cases was done accurately on trucut biopsy compared to FNAC. Sagarika et al also showed 3 cases of metaplastic carcinoma.[6]

All these diagnosed carcinomas were further evaluated for prognostic status by using IHC markers ER, PR, Her 2 Neu. It helped in preoperative knowledge of prognostic parameters which guided surgeons for ideal modern therapeutic strategy in surgical decision making. It also permitted the use of neoadjuvant therapy in early stage. It helped to reduce the volume of tissue removed and breast deformity as compared to open surgical biopsy.

In this study IHC was done in 60 cases. Maximum number of cases (46) were found to be Luminal type which are similar with the studies done by Sagarika et al, Chand et al and Bhatta et al.[7,30,31]

Breast cancers are classified into 3 major molecular groups, luminal i.e., ER positive, Her-2 enriched and triple negative i.e., basal like. These types of cancers are treated with estrogen deprivation done by oophorectomy, aromatase inhibitors.

Her2 type cancers are treated with Her2 inhibitors such as antibodies to Her 2 like trastuzumab, cytotoxic therapy linked to Her 2 antibodies, tyrosine kinase inhibitors.

Triple negative breast cancers lack ER, PR and Her 2 expression and are often associated with defect in DNA repair. This group has relatively poor prognosis. Cytotoxic therapy combined with selectively active agents with defective homologous recombination results in complete response in about a third of cases.

In present study maximum numbers of cases were found in luminal. In two cases of metaplastic carcinoma, pan cytokeratin was used and showed strong positivity. Hence small biopsy tissue core helps not only in specific histological typing but also in providing preoperative knowledge regarding prognosis, early diagnosis and in starting Neoadjuvant chemotherapy especially in triple negative cases (Table 8).

This study has few limitations. The study was conducted at a single tertiary care hospital with different demographics and health care access and the sample size

might not represent the broader population showing breast lump.

CONCLUSION

The results from the present study reveal that Tru-cut biopsy is more accurate than FNAC in the diagnosis of malignant breast lesions. Though the ability of trucut biopsy to provide histologic diagnosis with additional details on the receptor status, tumor grade and type with lymphovascular invasion, FNAC stands as an effective and valid tool as the first line diagnostic modality in the preoperative diagnosis of both benign and malignant lesions. Analysis of various studies showed the high diagnostic accuracy of FNAC. The results obtained by FNAC for a lump in breast is equal and in par with trucut biopsy in diagnosing benign diseases, and is widely acceptable procedure. When complemented with USG and FNAC, trucut biopsy can accurately diagnose most of the benign and malignant lesions. The present study emphasizes that trucut biopsy can serve as confirmative diagnostic tool over FNAC and provides information regarding prognostic factors and treatment modalities based on IHC markers. Tru-cut biopsies are replacing excisional biopsy to avoid unnecessary surgical trauma, also minimizing financial burden to the patients. While in resource poor countries like India FNAC continues to be a valuable method in the diagnosis of palpable and non-palpable breast lesions, the practice of Trucut biopsy provides the most accurate and optimal diagnostic information.

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Ethical approval: The study was approved by the Institutional Ethics Committee of the Institute of MRMC, Kalaburagi (IEC number-2102101 dated 25/02/2021)

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