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Original Article

Pathology Section

FNAC Versus Core Needle Biopsy: A Comparative Study in Evaluation of Palpable Breast Lump

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ABSTRACT

Introduction: Breast carcinoma is the most common malignant tumour and the leading cause of carcinoma death in women in world. The main purpose of FNAC or CNB of breast lumps is to confirm cancer preoperatively and to avoid unnecessary surgery in specific benign conditions.

Aims and Objective: The objective of the study was to compare between Fine Needle Aspiration Cytology (FNAC) and Core Needle Biopsy (CNB) in the diagnosis of breast carcinoma with final histological diagnosis from excision specimen as it is gold standard.

Materials and Methods: A prospective study was done on 50 cases. Patients undergoing all three procedures (Fine Needle Aspiration Cytology and Core Needle Biopsy done at Department of Pathology; subsequent excision surgeries done at Department of General Surgery) were selected. May Grunwald Giemsa (MGG) and Papaniculou (PAP) staining were performed on cytology smears. Haematoxylin and Eosin (H&E) staining was done on both the CNB and tissue specimens obtained from subsequent excision surgeries to see the histological features.

Results: FNAC showed sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were 69%, 100%, 100%, 38.1%, and 74% respectively in diagnosing carcinoma. CNB had sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of 88.3%, 100%, 100%, 53.3% and 86%. Both FNAC and CNB showed statistically significant correlation with confirmatory HPE of excision specimen (p-value <0.05) in the diagnosis of breast carcinoma.

Conclusion: Fine needle aspiration cytology (FNAC) is a rapid, less complicated, economical, reliable and relevant method for the preoperative pathological diagnosis of breast carcinoma in a developing nation like ours. If the initial FNAC is inadequate, core needle biopsy (CNB) can be a useful second line method of pathological diagnosis in order to minimize the chance of missed diagnosis of breast cancer.

Keywords: Breast carcinoma, Ductal carcinoma, Ductal hyperplasia

INTRODUCTION

Breast carcinoma is the most common malignant tumour and the leading cause of carcinoma death in women, with more than 1,000,000 cases occurring worldwide annually [1]. Fine Needle Aspiration Cytology (FNAC) is a relevant and important method to diagnose breast cancer, but technical problems such as limited cellularity, excessive air drying and/or artifactual mechanical disaggregation can potentially limit the interpretation, as well as contribute to a false-negative or a false-positive diagnosis of malignancy, respectively. However, in our experience as well as that of others, the major current limitation of FNAC is the separation of atypical ductal hyperplasia (ADH) from ductal carcinoma in situ (DCIS) and differentiating DCIS from invasive carcinoma, which affect the patient's treatment. Other limiting factors include occasional inability to make a definitive diagnosis of low-grade carcinoma, such as tubular carcinoma or invasive lobular carcinoma, papillary and fibroepithelial lesions, differentiate primary from metastatic carcinoma. Another major concern in breast FNAC is the potential false-positive diagnoses in the aspiration of a number of benign reactive, inflammatory, and metaplastic breast lesions, prompting inappropriate treatment having clinical and medicolegal implications [2].

These limitations have contributed to increase in the use of Core Needle Biopsy (CNB). Advantages of CNB is, that CNB provide adequate tissue for definitive histological diagnosis, distinguish between invasive cancer and carcinoma in situ patients for whom FNAC is inconclusive due to inadequate samples but having suspicious ultrasound and/or mammography findings; and breast lesions with micro calcifications; and for research purpose tissue banking specimen CNB is of great benefit [3]. Multiple tumour tissue samples can be taken in CNB due to increased cross sectional diameter, with an amount of up to 20 mg for which the diagnostic process is easier. It is reported that an accuracy rate of up to 90.1% can be achieved with the first sample collected CNB. Recent introduction of 14G core biopsy needle and automated large core biopsy gun improves the diagnostic efficacy and the procedure becomes more easier [4]. We therefore carry out this study to compare between Fine Needle Aspiration Cytology (FNAC) and Core Needle Biopsy (CNB) to diagnose breast carcinoma.

MATERIALS AND METHODS

The study was conducted in the Department of Pathology in association with Department of General Surgery, at I.P.G.M.E.&R Hospital, Kolkata. From October, 2012 to March, 2014. Patients presenting with suspicious palpable breast lump/mass clinically and/or radiologically, attending at Breast Clinic and/or General Surgery Outpatient Department (OPD), I.P.G.M.E.&R, Kolkata was taken. The study was performed after obtaining the approval from ethical committee and total 50 cases was selected.

As per treatment protocol patients undergoing all three procedures (Fine Needle Aspiration Cytology and Core Needle Biopsy done at Department of Pathology; subsequent excision surgeries done at Department of General Surgery, were selected. None of the patients had received chemotherapy, radiotherapy, or hormone therapy between CNB and surgical excision. May Grunwald Giemsa (MGG) and Papanicolaou (PAP) staining were performed on cytology smears. Haematoxylin and Eosin (H&E) staining was done on both the CNB and tissue specimens obtained from subsequent excision surgeries to see the histological features. Regarding diagnosis, outcomes of FNAC and CNB were reported using the standard NHSBSP criteria (National Health Service Breast Screening Programme) [Table/Fig-1].

The histological diagnosis obtained from tissue sections from excision specimens were categorised into two broad groups: carcinoma i.e.

Cytology Reporting		Core Biopsy Reporting	
C1	Unsatisfactory	B1	Unsatisfactory/normal tissue Only
C2	Benign	B2	Benign
C3	Atypia probably benign	B3	Benign, but of uncertain malignant
C4	Suspicious of malignancy	B4	Suspicious of malignancy
C5	Malignant	B5	Malignant

[Table/Fig-1]: NHSBSP Reporting categories for FNAC and for CNB [5].

malignancy- diagnosed and malignancy- not-diagnosed (include all benign, with atypia, suspicious, etc.) following conventional histological protocol for individual diagnosis.

STATISTICAL ANALYSIS

Mean and median values with standard deviation were provided for quantitative variables, whereas proportions represented qualitative variables. The Chi-square test was conducted to assess the relationship between categorical variables including the clinicopathologic parameters of prognostic significance The Fisher's-exact test was used when expected cell counts were less than five. The inter rater reliability was expressed as kappa coefficient.

RESULTS

During the study period of one and half years, a total of 50 patients were selected. The patient age ranged from 26 to 75 years, mean age being 47.4 years ± 21.4 (2SD). Breast carcinoma most commonly was found in the age group of 31-40 years. There was only one male patient who was included in the study, rest were female. The male patient was later confirmed having carcinoma while 83% of females were diagnosed as malignant and in rest malignancy was not diagnosed. Of females, 22 (44%) were in their premenopausal and rest no (55%) were in their postmenopausal status. Right breasts were involved in 26 (52%) patients and rest of 24 (48%) patients had their lesion in left breast. Right breast involvement was slightly higher than the left (52.4% vs. 47.6%) regarding breast carcinoma. Upper Outer Quadrant (UOQ) of the breast was most commonly involved part (UOQ = 50%) followed by central portion i.e. nipple-areolar region (Central = 14%) by palpable and suspicious breast lump/mass which also corroborated regarding involvement by carcinoma. Among 50 patients, size of the lumps ranged from 3 cm to 12 cm, mean = 6.38+4.33 cm (2SD). Of all 42 patients of confirmed malignancy 27 had their breast lesions>5cm (=64.3%) of size.

Forty patients (40), in whom preoperative sono-mammography were suggestive of malignancy (BI-RADS 5); (Breast Imaging Reporting and Data System) all of them were later confirmed as having malignant lesions by HPE of subsequent excision specimens (malignancy outcome = 100%) and none of the patient who was predicted as having benign lesion (BI-RADS 3) was diagnosed other way as having any malignant lesion by final histopathological examination of excision specimens (malignancy outcome = 0.0%) [Table/Fig-2]. All 40 patients of BI-RADS GRADING-5 were subsequently proved as malignant by subsequent of excision specimens.

Seven patients (7) presented with nipple discharge; skin changes in the form of nipple-retraction, peau-de-orange appearance, etc. were seen in 14 patients at presentation; and palpable axillary

		Final HP Diagnoses From ES		Total
		Malignancy Not- Diagnosed	Malignant	
BI-RADS Grading	3	7	0	7
	4	1	2	3
	5	0	40	40
Total		8	42	50

[Table/Fig-2]: Distribution of all the patients under study as per final diagnostic categories in accordance with their BI-RADS grading categories evaluated from sono-mammography reports (n = 50).

lymph node/s was seen in 14. On evaluation of FNAC conducted in the study total 29 patients (58% of all selected patients) were diagnosed as malignant i.e. carcinoma (C5 category) whereas total 35 patients (70% of all selected patients) were diagnosed as malignant (B5 category) by CNB [Table/Fig-3,4]. Of 50 patients, 29 i.e. 58% were confirmed as malignant as assessed by FNAC. Total 35 patients (70% of all selected patients) were diagnosed as malignant i.e. (B5 category). In rest of the patients, CNB could not categorise them as having absolute malignant lesions (benign, with atypia, or suspicious, etc.).

Final confirmatory HPE of excision specimens from subsequent surgery confirmed malignancy i.e. carcinoma in 42 patients (84%) of all the selected patients in the study [Table/Fig-5]. HPE of excision specimens confirmed malignancy in 42 i.e., 84% of all patients.

FNAC showed sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were 69%,

	FNAC Categories				
	C2	C3	C4	C5	
No of Patients In Individual Cytological Categories and Their Percentages	14	02	05	29	50
	28%	04%	10%	58%	100%

[Table/Fig-3]: Distribution all patients according to different cytological categories as assessed by FNAC (n = 50).

	CNB Categories				Total
	B2	B3	B4	B5	
No of Patients in Individual Cnb Categories and Their Percentages	08	03	04	35	50
	16%	06%	08%	70%	100%

[Table/Fig-4]: Distribution all patients according to different CNB categories as assessed by CNB (n = 50).

	Malignancy – Not- Diagnosed	Malignant	
No.of Individual Patient in Each Category and Their Percentages	08	42	50
	16%	84%	100%

[Table/Fig-5]: Distribution of all patients according to their final diagnoses confirmed from subsequent surgeries (n = 50).

		Diagnostic HPE		Total
		Malignancy - Diagnosed	Malignancy- Non- Diagnosed	
FNAC	Malgnancy Diagnosed (C5)	29 (TP)	0 (FP)	29
	Malignancy Non- Diagnosed (C2 + C3 +C4+ C5)	13 (FN)	8 (TN)	21

[Table/Fig-6]: Distribution of all the patients as per their final/confirmed diagnostic category {reallocated into two broad groups as MALIGNANCY–NOT DIAGNOSED (consists of BENIGN, ATYPIA, SUSPICIOUS, etc. if any) and MALIGNANCY–DIAGNOSED (consist of MALIGNANT category)} from HPE of excisional specimens in accordance with different cytological criteria {reallocated into two broad groups as MALIGNANCY–NOT DIAGNOSED (which includes category C2, C3, and C4) and MALIGNANCY DIAGNOSIS(which includes category C5 only)} (n = 50).

100%, 100%, 38.1%, and 74% respectively in diagnosing carcinoma [Table/Fig-6]. Of all 50 patients included in the study, FNAC diagnosed breast lesions of 29 patients as malignant all of which were later confirmed as malignant by subsequent final HPE of excision specimen from subsequent surgeries (True Positive= 29). There was no such patient who was preoperatively diagnosed as having malignant lesion on FNAC and later categorised as not having malignant one on confirmation (False Positive= 0). Thirteen such patients were there in whom FNAC did not give diagnosis of malignancy, but confirmatory HPE diagnosed them as having malignant lesions later on (False Negative= 13). In breast lesions of 8 patients both FNAC and confirmatory HPE could not diagnose malignancy definitely (True Negative = 8).

CNB had sensitivity, specificity positive predictive value, negative predictive value, and diagnostic accuracy of 88.3%, 100%, 100%, 53.3% and 86% [Table/Fig-7]. Of 35 patients, who were categorized as malignant (B5) by CNB, all were confirmed as malignant by

		Diagnostic HPE		Total
		Malignancy - Diagnosed	Malignancy- Non- Diagnosed	
CNB	Malignancy– Diagnose (B5)	35 (TP)	0 (FP)	35
	Malignancy- Not-Diagnosed (B2 + B3 + B4)	7 (FN)	8 (TN)	15
	Total	42	8	50

[Table/Fig-7]: Distribution of all the patients as per their final/confirmed diagnostic category {reallocated into two broad groups as MALIGNANCY–NOT DIAGNOSED (consists of BENIGN, ATYPIA, SUSPICIOUS, etc if any) and MALIGNANCY–DIAGNOSED (consists of MALIGNANT category)} from HPE of excisional specimens in accordance with different CNB criteria { reallocated into two broad groups as MALIGNANCY–NOT DIAGNOSED (which includes category B2, B3, and B4) and MALIGNANCY DIAGNOSED (which includes category B5 only)} (n = 50).

		CNB				Total
		B2	B3	B4	B5	
FNAC	C2	7	2	3	2	14
	C3	1	0	0	1	2
	C4	0	1	1	3	5
	C5	0	0	0	29	29
TOTAL		8	3	4	35	50

[Table/Fig-8]: Distribution of all the patients under study among their individual cyotological category as determined FNAC and individual CNB category as assessed by CNB (n = 50).

subsequent HPE of excision specimens (100% positive predictive value).

False negativity was lower in case of CNB than that of FNAC (7 cases vs.13 cases). Both FNAC and CNB showed statistically significant correlation with confirmatory HPE of excision specimen (p-value <0.05) in the diagnosis of breast carcinoma. Statistically significant correlation was also seen in between FNAC and CNB themselves in regard to breast carcinoma diagnosis [Table/Fig-8]. Statistical analysis using Fisher's exact test between individual diagnostic categories within FNAC and CNB reporting criteria reveals p-value <0.05. So, significant correlation is present between FNAC and CNB in the diagnosis of breast malignancy.

So, on comparative analysis between FNAC and CNB in the diagnosis of breast carcinoma; sensitivity, negative predictive value, diagnostic accuracy were higher in case of CNB than those in case of FNAC. Detection of false negative cases was also lower in CNB assessment. Regarding specificity, positive predictive value, and detection of true negative cases (i.e. which patients really did not have definite malignant lesion); both the procedures turned out to be similar. Both the procedures were shown to have statistically significant correlation with the confirmatory HPE of excision specimens (p-value <0.05). Statistically significant correlation also established between FNAC and CNB among themselves in the diagnosis of breast carcinoma (<0.05).

DISCUSSION

Excision biopsy is considered to be the gold standard for the diagnosis of breast lump. Emphasis has been placed now-a-days on improving method for establishing a definitive diagnosis of breast mass prior to surgery. Several studies have been conducted to compare the role of FNAC and other histological investigations like Core Needle Biopsy, etc [6,7]. This study reflects the comparability between Fine Needle Aspiration Cytoloy and Core Needle Biopsy in the diagnosis of breast carcinoma considering the histological diagnosis from excision specimen being gold standard. In our study, total 50 patients were included (49 female and 1 male). Age range was 26-75 years (mean = 47.4 years; SD = 10.71). Carcinoma was most commonly diagnosed in the age group of 31-40 years in female patients (31%) followed by in the group of 51-60 years (28.6%). Study by A Khemka et al., expressed that the peak incidence of breast carcinoma was between 40-44 years [6]. Our study is also nearly supportive to it. As per statistics from Breast Cancer India (BCI), the average age of developing a breast cancer has undergone a significant shift over last few decades. An increasing numbers of patients are in the 25 to 40 years of age [8].

As per larger studies on sex-incidence of breast carcinoma, it is an uncommon neoplastic condition in men, accounting for not more than 1% of all breast carcinomas [9]. In our study 2% of the study population were male. This discrepancy is most probably due to selection of lesser number of patients in the study. Of all 50 patients 52% patients had their lesions in the right breast. Right breasts were also slightly more involved in cases of carcinoma (52.4%) than left one. A Aljarrah et al., stated that breast cancer occurs almost equally in the right and left breasts [10]. Among all 50 patients in study, 50% presented with breast lumps in upper outer quadrant of breast followed by central quadrant (14%). Upper outer quadrant was also mostly involved part of the breast by carcinoma in our study (18 patients out of 42 i.e. 42.9%) followed by central quadrant (7 patients i.e. 16.7%) followed by other quadrants of breast. Hussain in his series had 58% of patients in whom upper outer quadrant was involved in breast lumps [11]. As per study done by A Aljajarrah et al., breast carcinoma most commonly affected the upper outer quadrant (UOQ) of the breast [10]. Early breast cancers situated in central/internal quadrants have a worse prognosis compared with those in lateral quadrants, thats why tumour location is an important part in prognosis in terms of distant metastases and survival [12]. In another study, medial location was associated with a 50% excess risk of systemic relapse and breast cancer death compared with lateral location [13,14]. In our study, among 50 patients, size of the lumps ranged from 3 cm to 12 cm. Of all 42 patients having malignancy 27 patients (64.3%) had their breast lesions >5cm of size. The measured size represented by the largest dimension of a mammary carcinoma is one of the most significant prognostic variables. Numerous studies have shown that survival decreases with increasing tumour size and that there is a coincidental rise in the frequency of axillary nodal metastases [9].

Nipple discharge is a less common finding that is most worrisome for carcinoma when it is spontaneous and unilateral. The risk of malignancy in a woman with nipple discharge increases with age; it is associated with carcinoma in 7% of women younger than age 60 but in 30% of older women [15].

HI Vargus et al., and MH Seltzer et al., in their study revealed that nipple discharge is the presenting symptom for 3–9% of patients seen in breast cancer [16,17]. In our study of all 42 patients confirmed for malignancy for breast carcinoma; about 16.7% had discharge from nipple at presentation.

Nipple retraction is an important sign because it may be the first indication of malignancy Invasive cancers tend to become adherent and fixed to the pectoral muscles or deep fascia of the chest wall and the overlying skin, with consequent retraction or dimpling of the skin or nipple.

Involvement of the lymphatic pathways may result in localized lymphoedema. In such cases, the skin becomes thickened around exaggerated hair follicles, giving an appearance known as peau d'orange ("orange peel"). In our study, of all 42 patients confirmed for malignancy; 33.3% show different skin changes at presentation.

Axillary lymph nodes are usually the first anatomic site to be involved by metastases in patients with breast carcinoma. Axillary lymph nodes are often first detected by palpation, either by the patient or physician. The regional lymph node status is the most important prognostic factor in patients with breast cancer and adjuvant therapy protocol after excision of the primary tumour is determined according to lymph node status [18].

loachim et al., opined that axillary lymph nodes are palpable in 50% to 60% of patients with clinically detected primary breast carcinomas and the frequency of palpable lymph nodes is much lower in patients in whom the primary breast neoplasms are not detected by physical examination and usually identified by mammography [19]. In our study, of all 42 patients who were for breast carcinoma; about 16.7% had discharge from nipple at presentation. This is slightly higher than other studies which may be due to lower number study patients, patients presenting after long duration of having symptoms, etc.

In our study, of all 42 patients who were suspicious clinically and confirmed for malignancy; 33.3% had palpable axillary lymph node/s at presentation. This discrepancy may be due to selection of lesser number of patients in the study.

Studies carried out by Homesh NA et al., Usami S et al., to compare CNB & FNAC have reported very high sensitivity (91–99%), specificity (96–100%), positive predictive value (100%), and negative predictive value (100%) for CNB which are better than results for FNAC for both palpable and nonpalpable lesions [20,21]. In our study sensitivity and PPP were higher in case of CNB; specificity and NPP were same for both the procedures.

LIMITATIONS

As it is a single institute based study and the study period being very short, the number of case is small. So it is not sufficient to give generalised result to comment on whole population. Survival analysis of breast carcinoma patients cannot be done as follow up was not possible for the short time limit.

CONCLUSION

FNAC is a rapid, less complicated, economical, reliable and relevant method for the preoperative pathological diagnosis of breast carcinoma in a developing nation like ours. With high sensitivity and specificity, most malignant breast lesions can be reliably diagnosed by FNAC. If the initial FNAC is inadequate, CNB can be a useful second line method of pathological diagnosis in order to minimize the chance of missed diagnosis of breast cancer. One should be mindful of the limitations of each technique and the choice between fine needle aspiration and core biopsy should be individualized for the patient. Excision biopsy should be the last option to obtain a pathological diagnosis.

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