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Diagnostic accuracy of fine needle aspiration cytology in the diagnosis of malignant breast lesions

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Abstract
Introduction: For cases with breast lump, distinguishing benign from malignant lesions is of paramount importance not only for patient care but for proper management as well. The present study was carried out to assess the diagnostic accuracy of FNAC when compared against the gold standard of histopathological examination in the diagnosis of carcinoma breast.
Methodology: We included patients referred to our department with palpable breast lump. These patients underwent FNAC procedure, after which histopathological examination was done. Data were collected and analysed to present descriptive statistics. Using histopathological diagnosis as the gold standard, diagnostic accuracy of FNAC was determined.
Results: We included 54 patients. The most common age group was 51 to 60 years (27.78%) and 88.8% were married. Of the 30 benign patients on histopathological diagnosis, fibroadenmoa was seen in 15 patients (50% of all benign) and among the 24 cases diagnosed with malignant lesions on histopathological examination, 20 had intraductal carcinoma. On FNAC, we observed 57% of the patients (n=31) to have benign lesions and rest 43% (n=23) to have malignant lesions. Using histopathological diagnosis as gold standard, we calculated the diagnostic accuracy of FNAC for the diagnosis of carcinoma breast to be 98.1% (Table 3). The sensitivity was 95.8%, specificity was 100%, positive and negative predictive values were 96.8% and 100% respectively.
Conclusions: FNAC is an efficient, safe and inexpensive method which can provide reasonably accurate differentiation between benign and malignant cases.

Keywords: breast cancer, cytology, diagnostic accuracy, fine needle aspiration cytology

Introduction
Globally, breast cancer is the most frequent cancer in women and represents the second leading cause of cancer death among women (after lung cancer) [1]. Management of breast cancer is immunologically and histologically heterogeneous in character and requires multidisciplinary treatment. As a result, the cytological diagnosis is a very important step not only for diagnosis but for successful management of these cases as well. Breast lump is the clinical presentation which represents numerous breast diseases ranging from benign cysts to malignant lesions. Distinction of benign from malignant is of paramount importance for patient care and proper management [2]. Even though majority of the cases with breast lumps have benign pathology, they result in enormous anxiety to patients, until they undergo clinical assessment, receive necessary investigations and are eventually diagnosed. Fine needle aspiration cytology (FNAC) of breast lumps is an established method for determining the nature of the lump, especially when it is difficult to determine if it malignant purely based on clinical examination. It is a cheap and rapid method, which helps in early diagnosis of breast lumps and also in planning treatment. Moreover, it has been demonstrated that FNAC can reduce the number of open biopsies [3]. In addition, FNAC offers these advantages with a high level of accuracy in diagnosis of breast lumps. By combining clinical information, imaging results and cytologic results, the "triple test process", it is possible to overcome some of the limitations of FNAC [4]. The present study was carried out to assess the diagnostic accuracy of FNAC when compared against the gold standard of histopathological examination in the diagnosis of carcinoma breast.

Methodology
The present cross-sectional observational study was conducted in the Department of Pathology in which we included patients referred to our department with palpable breast

lump. These patients underwent FNAC procedure, after which histopathological examination was done. We excluded inadequately fixed and autolysed specimens, breast specimens for which FNAC was not done before histopathology and FNAC smears with inadequate cellularity.

Using a pre-designed semi-structured study proforma, the demographic information like age, socio-economic status and marital status were noted. We also noted the clinical history of the patients and findings of the clinical examination. The patients were informed about the procedure and an informed consent was obtained from all patients. We used 10 ml syringe bearing a 23-gauge needle. The mass was located clinically and fixed in place with free hand. The skin over the puncture was sterilized with betadine or spirit. Once the tumor was fixed full vacuum was applied, while the needle was moved back and forth in the mass with short strokes. The syringe piston was slowly released and allowed to return to the neutral position. The needle was then withdrawn from the mass. The needle was temporarily removed from the apparatus and the syringe was filled with air by pulling back the plunger. The syringe was reattached. The specimen was expressed on a glass slide. It was then immersed in a fixative of 95% methyl alcohol. The slides were stained with Papanicolau or Geisma stain. The interpretation of the slide was made by the same cytopathologist. The cytological diagnosis was based on the physical findings, age along with the microscopic examination of the aspirated cells. The final cytological diagnosis was made and informed to the patient.

Data were collected and analysed to present descriptive statistics. Using histopathological diagnosis as the gold standard, diagnostic accuracy of FNAC was determined.

Results

In the present study, a total of 54 patients were included. The most common age group was 51 to 60 years (27.78%) and 31 to 40 years (20.37%), 88.8% were married. Socioeconomic assessment revealed that 96% of the cases were from middle class. On physical examination, breast consistency was soft in 44.4%, firm in 27.7%, hard in 24% and rest had cystic consistency (Table 1). Nipple was inverted in 9.2%, puckered in 11.11%, retracted in 22.2% and had pus discharge in 5.5%. The most commonly involved quadrant was left upper outer (22.2%) and right lower outer (22.2%). Least involved quadrant was left lower inner and right lower inner, with one patient each. Histopathological examination diagnosed benign conditions in 30 patients, while malignant lesions were found in 24 patients. Of the 30 benign patients on histopathological diagnosis, fibroadenmoa was seen in 15 patients (50% of all benign) and acute mastitis in 4 patients (13% of all benign). There were two patients each of breast abscess, duct hyperplasia, fibrocystic disease and granulomatous mastitis. There were one patient each of benign proliferative disease, complex fibroadenoma and cystic lesion (Table 2). Among the 24 cases diagnosed with malignant lesions on histopathological examination, 20 had intraductal carcinoma, two had phylloids tumor and one patient each had fibromyxoid sarcoma and invasive solid carcinoma. On FNAC, we observed 57% of the patients (n=31) to have benign lesions and rest 43% (n=23) to have malignant lesions. Using histopathological diagnosis as gold standard, we calculated the diagnostic accuracy of FNAC for the diagnosis of carcinoma breast to be 98.1% (Table 3). The sensitivity was 95.8%, specificity was 100%, positive and negative predictive values were 96.8% and 100% respectively.

Discussion

FNAC is a diagnostic method widely used for evaluating both palpable and non-palpable radiologically identified breast lesions [5] During early years, FNAC gained tremendous popularity because it was easy and economical to use. However, after the advent of tru-cut biopsy, the reported false-negative cases and unacceptably high inadequacy rates led to a decline in the use FNAC as the initial diagnostic procedure. The present study was conducted to assess the diagnostic accuracy of FNAC in diagnosing malignant breast carcinoma. We observed that the most common age group was 51 to 60 years (27.78%). In a similar study, Mukharji et al also assessed the diagnostic accuracy of FNAC in palpable breast lesions [6] They studied 105 patients, with the most common age group being younger (21 to 30 years) as compared to our study. The difference in the age structure of the patients could be because of the composition of the patient population, which comprised of 74 benign cases and 31 malignant ones, while there were 30 benign and 24 malignant cases in our study. Kiran and Mahesh reported 21 to 40 years to be the most common age group[7], while a study from Nepal reported the mean age to be 46.12 years [8]. Kanchana et al also found 21 to 40 years to be the most common age group in their study.[9] Mohan et al studied 200 cases of breast lesions and found a predominance of malignant lesions. However, Vasavada et al [10], Rathi et al. [11] and Chandanwale et al. [12] have reported a predominance of benign lesions in their study, which is similar to our findings. Furthermore, we observed that fibroadenoma was the most common diagnosis of the 30 benign patients and among the 24 cases diagnosed with malignant lesions on histopathological examination, 20 had intraductal carcinoma. Mohan et al also reported fibroadenoma to be the most common benign lesion. Similar results were obtained in the study by Kiran and Mahesh.

In our patient population, the overall accuracy was found to be 98%. Mukherji et al were able to detect all malignant cases on FNAC, not misdiagnosing even a single case, thereby achieving the diagnostic accuracy of 100%. Kiran and Mahesh observed that on comparison of FNAC findings with histopathology, about 17.3% of the patients diagnosed as benign breast disease had fibro adenoma on histopathology and 12% with suspicious malignancy turned out as invasive duct carcinoma. Kanchana et al demonstrated a sensitivity of 87.5%, specificity of 100% with an overall diagnostic accuracy of 97.62%. These results show that FNAC is an accurate biopsy technique for evaluating breast malignancy if rigorous criteria are used. With high sensitivity and specificity, most benign and malignant breast lesions can be reliably diagnosed by FNAC. The data from our patient sample corroborates these findings. However, the importance of training and experience cannot be undermined. Compared to core-needle biopsy, interpretation of FNAC is more dependent on the skill of the cytopathologist. It is because of these variability in expertise and experience that the results of the present study might not be generalizable to other medical centres. Still, FNAC has advantages that is inexpensive, does not require anesthesia, less traumatic and quicker in the management of breast lesions.

Conclusion

FNAC in case of palpable breast lesion is a very efficient, safe and inexpensive method. It gives rapid diagnoses with minimal discomfort to the patient. It can be easily repeated and it can be employed in multiple lesions. As compared to histopathology, FNAC can provide reasonably accurate differentiation between benign and malignant cases. However, the results of FNAC should be correlated with clinical examination and imaging when there are suspicious samples, so as to prevent false positives and negatives.

Table 1: Baseline characteristics of the patients included in the study

Variables	N	%
Age Group		
≤ 20	6	11.11%
21-30	5	9.26%
31-40	11	20.37%
41-50	10	18.52%
51-60	15	27.78%
> 60	7	12.96%
Marital Status		
Unmarried	6	11.11%
Married	48	88.89%
Socio-economic Status		
Poor Class	1	1.85%
Middle Class	52	96.30%
Below Poverty Line	1	1.85%
Breast consistency		
Cystic	2	3.70%
Soft	24	44.44%
Firm	15	27.78%
Hard	13	24.07%
Condition of Nipple		
Eczematous	2	3.70%
Inverted	5	9.26%
Normal	26	48.15%
Puckered	6	11.11%
Pus Discharge	3	5.56%
Retracted	12	22.22%
Quadrant		
Left Lower Inner	1	1.85%
Left Lower Outer	6	11.11%
Left Upper Inner	5	9.26%
Left Upper Outer	12	22.22%
Right Lower Inner	1	1.85%
Right Lower Outer	12	22.22%
Right Upper Inner	6	11.11%
Right Upper Outer	9	16.67%

Table 2: Distribution of patients according to histopathological and FNAC diagnosis

Type of diagnosis	N	%
Histopathological diagnosis		
Benign		
Fibro adenoma	15	50%
Acute Mastitis	4	13%
Breast Abscess	2	7%
Duct Hyperplasia	2	7%
Fibrocystic Disease	2	7%
Granulomatous Mastitis	2	7%
Benign Proliferative Disease	1	3%
Complex Fibroadenoma	1	3%
Cystic Lesion	1	3%
Total	30	100%
Malignant		
Intra Ductal Carcinoma	20	83%
Phylloids Tumor	2	8%
Fibromyxoid Sarcoma	1	4%
Invasive Solid Carcinoma	1	4%
Total	24	100%
FNAC diagnosis		
Benign	31	57%
Malignant	23	43%

Table 3: Operating characteristics of FNAC for the diagnosis of carcinoma breast

	Histopath Diagnosis		Total
FNAC	Benign	Malignant	
Benign	30	1	31
Malignant	0	23	23
Total	30	24	54
Operating characteristics of FNAC			
Sensitivity	95.80%		
Specificity	100.00%		
PPV	96.80%		
NPV	100.00%		
Accuracy	98.10%		

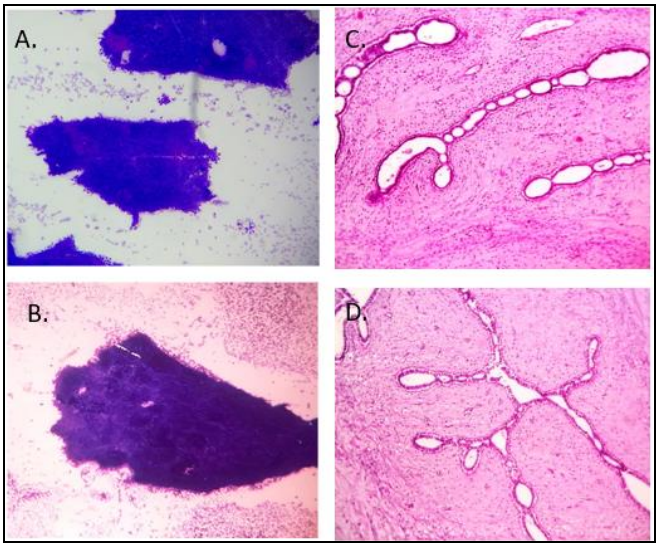

Fig 1: Pathological examination of fibroadenom; cytology (A,B) and histology (C, D)

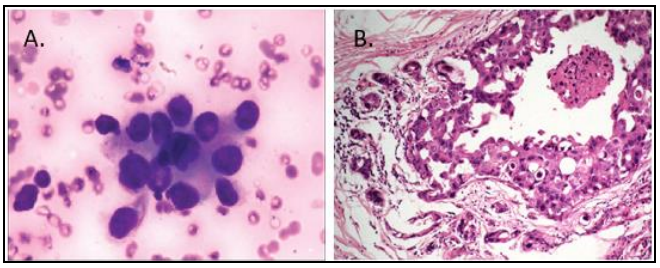

Fig 2: Pathological examination of ductal carcinoma breast; cytology (A) and histology (B)

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