Original Research Article

A COMPARATIVE STUDY OF CELL BLOCK VERSUS FNAC IN THE DIAGNOSIS OF PALPABLE BREAST LESIONS IN A TERTIARY CARE CENTRE

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ABSTRACT

Background: Breast lumps are a common concern among women worldwide. Fine needle aspiration cytology (FNAC) is a widely used, minimally invasive method for preliminary diagnosis. Cell blocks (CB) prepared from FNAC samples enhance diagnostic accuracy by preserving tissue architecture and allowing for immunohistochemistry. Histopathology remains the gold standard for confirming diagnosis and guiding treatment. **Aim:** To compare the diagnostic efficacy of FNAC and cell block techniques in palpable breast lesions, using histopathology as the reference standard. **Materials and Methods:** This cross-sectional study was conducted from December 2023 to November 2024, involving 60 patients with palpable breast lumps. Each patient underwent FNAC, CB preparation, and surgical excision for histopathological examination. FNAC and CB findings were compared with histopathology to determine sensitivity, specificity, predictive values, and diagnostic accuracy. **Result:** Among the 60 cases, patients ranged from 15 to 75 years. Combined FNAC and CB showed a sensitivity of 93.75%, specificity of 100%, PPV of 100%, NPV of 97.78%, and diagnostic accuracy of 98.33%. **Conclusion:** While FNAC is effective, the addition of cell block significantly improves diagnostic accuracy by providing better morphological detail. Though cell block preparation can be time-consuming and occasionally limited by inadequate cellularity, the combined approach offers a more reliable preoperative diagnosis of breast lesions.

INTRODUCTION

Breast cancer is a major health issue among women in India, accounting for 13.5% of cancer cases and 10.6% of cancer deaths according to the 2020 GLOBOCAN report.[1] Fine needle aspiration cytology (FNAC) is a widely used diagnostic method due to its ease and cost-effectiveness but has limitations in accuracy and lesion classification. Cell block techniques can improve diagnostic precision by enhancing architectural detail, though sample adequacy can be a challenged.[2] Combining FNAC with cell block preparation offers better diagnostic outcomes,[3,4] especially for differentiating proliferative breast lesions.[5]

Histopathology is the gold standard for diagnosing breast lesions, essential for guiding treatment and prognosis.[9] Correlating FNAC and cell block results with histopathology improves diagnostic accuracy.[5]

The triple test—clinical exam, imaging, and biopsy—can achieve up to 99% diagnostic accuracy.[5] Cell blocks complement FNAC by improving cellular yield and preserving architecture, while also enabling advanced testing like immunohistochemistry.[6] However, challenges include variable cellularity, lack of standardization, and labor-intensive preparation. This study evaluates the diagnostic value of FNAC and cell blocks, recognizing histopathology as the definitive method.

MATERIALS AND METHODS

The present study was conducted for a period of one year, during the period December 2023 to November 2024, at the Department of Pathology, Jorhat Medical College and Hospital, Jorhat. It is a Hospital based Cross-sectional study. All cases referred to the Cytology section, Department of Pathology, from

out-patient and indoor departments of Jorhat Medical College and Hospital, Jorhat, for evaluation of breast lumps by FNAC.

Inclusion & Exclusion criteria: The study included female patients aged between 15 and 75 years who were referred to the Cytology Section, Department of Pathology, for the evaluation of palpable breast swellings using Fine Needle Aspiration Cytology (FNAC). Male patients, female patients younger than 15 years or older than 75 years, individuals with known bleeding disorders due to the risk of hematoma formation, and those who were uncooperative or unwilling to provide informed consent were excluded from the study.

Sample Size: The study was conducted on a total of 60 patients during the study period of one year, and this constitutes our sample size.

Materials and Methods for Fine Needle Aspiration

Fine Needle Aspiration Cytology (FNAC) requires a 22–25 gauge needle or a 10 ml syringe, glass slides, 95% alcohol, antiseptic, and stains like May-Grünwald Giemsa and Papanicolaou. After reviewing the patient's history and conducting an examination, the procedure is explained and informed consent is obtained. The patient is positioned supine, the skin is cleaned, and FNAC or ultrasound-guided FNAC is performed. The needle is inserted at multiple angles, and aspiration is complete once material or blood appears at the hub. Typically, 2–4 passes are made, and smears are prepared on glass slides—air-dried or wet-fixed depending on the stain. Remaining material is preserved in 10% formalin for cell block preparation. In cystic lesions, fluid is centrifuged, and smears are made from the sediment for staining.

Materials and methods required for cell block preparation

The materials required for cell block preparation using the plasma-thromboplastin method include plasma, thromboplastin, 1% calcium chloride, and 10% buffered formalin. The procedure begins by centrifuging the cell suspension at 2000 rpm for 10 minutes to separate the cell pellet from the supernatant. The pellet is then resuspended in three drops of plasma, followed by the addition of three drops of calcium thromboplastin. This mixture is left undisturbed for 15 to 20 minutes to allow clot formation. Subsequently, 5 to 8 ml of 10% buffered formalin is added to fix the specimen. Finally, the fixed material is transferred to a labeled tissue cassette and processed according to standard histopathological protocols.

RESULTS

Fine needle aspiration was done in cases of breast swelling, including female patients in age groups 15 to 75. In all cases, FNAC conventional slides and cell blocks were studied. However, only 60 cases underwent surgery, and the samples were sent for histopathological study. Thus, the role and diagnostic efficacy of FNAC and cell block were studied using histopathology as the gold standard based on 60 cases only. The data collected were organized into tabular form and categorized, with results and observations expressed as percentages

The following are the results and observations.

Table 1: FNAC Diagnosis

DIAGNOSIS	NUMBER (n)	PERCENTAGE (%)
Nondiagnostic	2	3.33
Acute Mastitis	3	5
Granulomatous mastitis	2	3.33
Cystic lesion	1	1.67
Fibrocystic changes	3	5
Fat necrosis	1	1.67
Epithelial hyperplasia	2	3.33
Fibroadenoma	28	46.67
Low-grade phyllode tumour	3	5
Low-grade Ductal Carcinoma in situ	1	1.67
Ductal carcinoma in situ	11	18.33
High-grade Ductal Carcinoma	2	3.33
Mucinous Carcinoma	1	1.67
TOTAL	60	100%

Table 2: Cell block diagnosis

DIAGNOSIS	NUMBER (n)	PERCENTAGE (%)
Nondiagnostic	6	10
Acute Mastitis	2	3.33
Granulomatous mastitis	1	1.67
Cystic lesion	1	1.67
Inflammatory lesion	2	3.33
Fibrocystic changes	2	3.33
Fat necrosis	0	0
Epithelial hyperplasia	1	1.67
Fibroadenoma	24	40

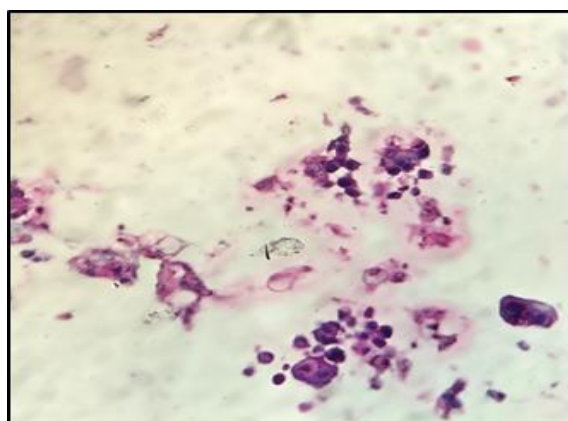|		
Tubular Adenoma	2	3.33
Low-grade phyllode tumour	4	6.67
Low-grade Ductal Carcinoma in situ	0	0
Ductal carcinoma in situ	13	21.6
High-grade Ductal Carcinoma	1	1.67
Mucinous Carcinoma	0	0
Malignant phyllode	1	1.67
Total	60	100

Out of the 60 breast lesion cases studied, 8 were nondiagnostic—2 by FNAC and 6 by the cell block method. Both FNAC and cell block accurately identified all cases of acute mastitis. For granulomatous mastitis (2 cases), FNAC was fully consistent with histopathology, while the cell block technique misclassified one case as an inflammatory lesion. Among the 3 cases of fibrocystic changes, all were correctly identified by the cell block method, whereas FNAC misdiagnosed one case as a cystic lesion. A single case of fat necrosis was correctly diagnosed by FNAC but interpreted as inflammation on cell block. Two cases of epithelial hyperplasia showed discrepancies—one was reported as fibroadenoma on FNAC and as ductal carcinoma on cell block. Of the 28 fibroadenoma cases, 24 showed consistent findings across FNAC, cell block, and histopathology. The remaining 4 were misclassified by FNAC (as mastitis or fibrocystic change) and cell block (as cystic lesions or nondiagnostic). Two vital cases of tubular adenoma were correctly identified by cell block, but FNAC misdiagnosed one as fibroadenoma and failed to diagnose the other. All four benign or low-grade phyllodes tumors were accurately identified by cell block, though one was missed by FNAC. All 9 cases of ductal carcinoma were consistently diagnosed by both FNAC and cell block. In a total of 6 cases of invasive carcinoma (including ductal and NST types), both techniques reported them as ductal carcinoma, consistent with malignancy. The only case of malignant phyllodes tumor was correctly identified by cell block but misdiagnosed as fibroadenoma on FNAC.
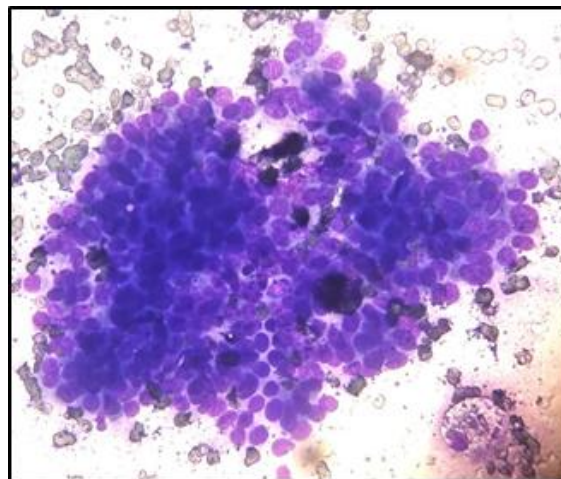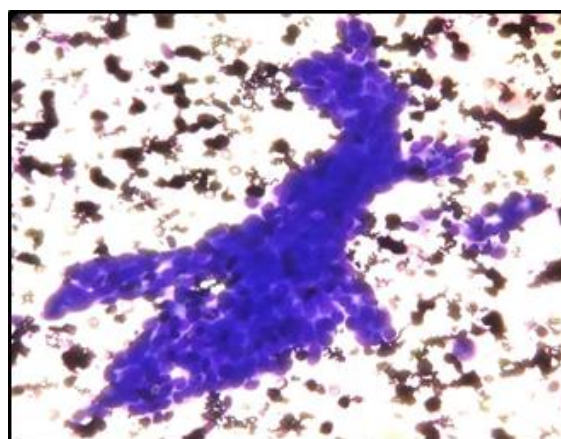

FNAC picture of Ductal carcinoma (MGG, 40x)
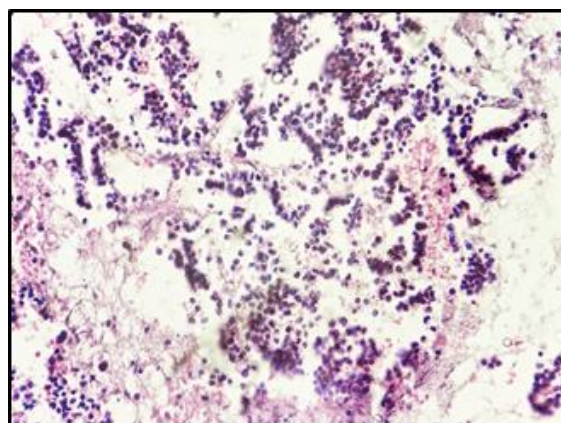
Cell block picture of Fibroadenoma (H & E, 10x)

Cell Block Picture of Ductal Carcinoma H&E 40x

Cell block picture of Fibroadenoma MGG 40x

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Table 3: Comparison of FNAC diagnosis and cell block diagnosis

DIAGNOSIS	FNAC DIAGNOSIS	FNAC PERCENTAGE (%)	CELL BLOCK DIAGNOSIS	CELL BLOCK PERCENTAGE (%)
Nondiagnostic	2	3.33	6	10
Acute Mastitis	3	5	2	3.33
Granulomatous mastitis	2	3.33	1	1.67
Inflammatory lesions	0	0	2	3.33
Cystic lesion	1	1.67	1	1.67
Fibrocystic changes	3	5	2	3.33
Fat necrosis	1	1.67	0	0
Epithelial hyperplasia	2	3.33	1	1.67
Fibroadenoma	28	46.67	24	40
Low-grade phyllode tumour	3	5	4	6.66
Low-grade Ductal Carcinoma in situ	1	1.67	0	0
Ductal carcinoma in situ	11	18.33	13	21.6
High-grade Ductal Carcinoma	2	3.33	1	1.67
Mucinous Carcinoma	1	1.67	0	0
Malignant phyllode	0	0	1	1.67
TOTAL:	60%	100%	60%	100%

Out of 60 cases, the most common FNAC diagnosis of breast lesions is fibroadenoma (28 cases), followed by DCIS; 2 cases were non diagnostic. The most common Cell block diagnosis of breast lesions is fibroadenoma (24 cases), followed by DCIS; 6 cases were nondiagnostic.

DISCUSSION

A detailed comparison of sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy with previous studies is shown in the table below. It is evident from the comparison that the sensitivity, specificity, and positive predictive value in this study are consistent with similar studies, with the current study showing superior accuracy and negative predictive values.

Table 4: Statistical Indices of FNAC

Studies	Sensitivity	Specificity	Positive predictive Value	Negative predictive Value	Diagnostic Accuracy
Divya et al[7]	82.6%	87.23%	76%	91.11%	85.71
Kawatra et al.[4]	97.6%	15.6%	68.6%	77.8%	69.2
Indranil et al[8]	92%	100%	100%	71%	93%
Present study	92.6%	100%	100%	97.4%	98%

The sensitivity, specificity, positive predictive value and negative predictive value, and also accuracy of cell blocks are 100%, 97.4%, 92.86%, 100%, and 98% respectively. The table below shows the comparison of different studies with our current study. Thus, from the table, it is evident that the sensitivity, specificity negative predictive value and negative predictive value of the current study are comparable to other similar studies. As for the accuracy, it is higher in the current study.

Table 5: Statistical indices of cell block

Studies	Sensitivity	Specificity	Positive predictive Value	Negative predictive Value	Diagnostic Accuracy
Divya et al[7]	79%	93.47%	86.36%	89.58%	88.57%
Kawatra et al.[4]	100%	81.8%	77.7%	100%	88.8%
Indranil et al[8]	94%	100%	100%	76%	95%
Present study	100%	97.4%	92.86%	100%	98%

- The role and diagnostic effectiveness of FNAC and cell blocks were evaluated using histopathology as the gold standard, based on these 60 cases.
- The most common age group among patients was 31 to 40 years
- FNAC was found to be satisfactory in 96.67% of cases, while cell block was adequate in 90%. This indicates that FNAC has a higher adequacy rate than cell block. Since no extra passes were made during FNAC, many tissue fragments remained on the smears, leaving less material for the cell block. Furthermore, issues such as sample loss during the separation of the supernatant from the clot, dilution from excess plasma and thrombin, and insufficient pellet formation could affect the cell block results.
- The cell block illustrated superior architectural and cellular features, particularly in accordance of nuclear characteristics, compared to conventional FNAC slides.

- The most frequent diagnosis across FNAC, cell block, and histopathology of breast lesions was fibroadenoma, while ductal carcinoma was the most common malignant lesion.
- In relation to consistency, 75% of FNAC cases had results that matched histopathology. The Pearson correlation coefficient was approximately 0.983 with a p-value of <0.01, indicating a strong positive correlation. Discrepant results were likely due to morphological overlap between different entities.
- For cell block, 78% of cases showed consistent findings with histopathology, which was higher than FNAC. The Pearson correlation coefficient for cell block was approximately 0.982, with a p-value of <0.01, indicating a strong positive correlation as well.
- False negative results can occur in cases with dual pathology. In such situations, it is recommended to obtain samples from a representative site using USG-guided FNAC.
- The diagnostic performance of FNAC showed a sensitivity of 92.86%, specificity of 100%, positive predictive value of 100%, negative predictive value of 97.4%, and an accuracy of 98%.
- The cell block results had a sensitivity of 100%, specificity of 97.4%, positive predictive value of 92.86%, negative predictive value of 100%, and an accuracy of 98%.
- When FNAC and the cell block were used together, sensitivity increased to 93.75%, specificity remained 100%, positive predictive value stayed at 100%, negative predictive value was 97.78%, and diagnostic accuracy reached 98.33%, suggesting an improved diagnostic performance when both methods were combined.

Overall, the cell block offered more advantages than FNAC, with superior architectural and cellular morphology, including nuclear features, sensitivity, and diagnostic accuracy. Although, cell block preparation can be skill-dependent and time-consuming, and cellularity is not always sufficient. The combined use of FNAC and cell block overcomes these challenges, improving adequacy, reducing false negatives and positives, and assisting in more accurate lesion diagnosis.

CONCLUSION

FNAC is one convenient, low-cost, minimally invasive diagnostic tool used for the pre-operative assessment of patients presenting with breast lumps. The utilization of cell blocks offers additional advantages by providing better architectural and cellular morphology, including detailed nuclear features, which amplifies sensitivity and diagnostic accuracy. This highlights their significant role in ensuring accurate and reliable diagnoses. When combined with FNAC, cell blocks improve diagnostic effectiveness. Therefore, it is recommended to perform cell-block analysis in all FNAC cases involving breast lesions, whenever possible, as it reduces the risk of errors, false negatives, and false positives, while also improving diagnostic accuracy. This ultimately helps surgeons create a more effective treatment plan for the patient.

Conflicts of Interest: None Declared
Source of support: Nil

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