

# Utility of the United Kingdom National Health Services Breast Screening Program Diagnostic Protocol in Fine-needle Aspiration Cytology with Cell Block Preparation in Cases of Palpable Breast Lumps: A Reliable, Fast, and Accurate Diagnostic Method for the Assessment of Breast Lumps with Histopathologic Correlation

Pratik Bharatbhai Desai, Killol Nathubhai Desai, Nirav Sureshbhai Panchal

Department of Pathology,  
GMERS Medical College,  
Vadnagar, Gujarat, India

ABSTRACT

**Introduction:** A palpable breast lump is a common diagnostic problem for clinicians and surgeons. Fine-needle aspiration cytology (FNAC) has many advantages such as less cost, less sample processing time, less pain, less chance of hematoma, and less discomfort. FNAC with cell block preparation further increased both sensitivity and specificity by nearly 100%. With the cell block preparation, we can also use newer tests like estrogen receptor–progesterone receptor–human epidermal growth factor receptor 2. **Aims:** The aim of this study was to derive conclusions about the correlation, including sensitivity, specificity, positive and negative predictive values (NPVs), and the diagnostic accuracy of FNAC, with or without cell blocks, compared to the final histopathology in cases of palpable breast masses. **Materials and Methods:** A cross-sectional prospective study was conducted after getting approval from the Human Ethics Research Committee from January 2018 to December 2019, which included 65 patients. Patients diagnosed clinically for breast lumps who underwent diagnostic FNAC with cell block, followed by a histopathological examination at our hospital, were included in the study. **Results:** FNAC without cell block sensitivity, specificity, positive predictive value (PPV), NPV, efficiency rate, and diagnostic accuracy are 91.3%, 100%, 100%, 90.1%, 86.2%, and 96.5%, respectively. FNAC with cell block sensitivity, specificity, PPV, NPV, efficiency rate, and diagnostic accuracy are all 100%. All of our results beat the standard estimate. **Conclusions:** Fine-needle aspiration cytology is a patient-friendly, easy, reliable, repeatable, and simple diagnostic test. Whenever it is combined with cell block preparation, improves the accuracy of FNAC diagnosis which is more accurate and comparable to golden-standard biopsy with histopathology examination.

**KEYWORDS:** Breast lump, cell block, fine-needle aspiration cytology, histopathology, United Kingdom National Health Service Breast Cancer Screening Program

**Submitted:** 23-Sep-2023  
**Revised:** 18-Nov-2023  
**Accepted:** 02-Dec-2023  
**Published:** 05-Jul-2024

## INTRODUCTION

A palpable breast lump is a common diagnostic problem for both general practitioners and surgeons. It includes inflammatory lesions, fibrocystic disease, and neoplastic lesions.<sup>[1]</sup> The breast, an anatomical site that is constantly under the varying influence of sex hormones,

**Address for correspondence:** Dr. Nirav Sureshbhai Panchal, 16, Ameer Park Society, Nr. Surya Ami Flats, GST Crossing Road, Ranip, Ahmedabad - 382 480, Gujarat, India.  
E-mail: niravpatho@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Desai PB, Desai KN, Panchal NS. Utility of the United Kingdom National Health Services Breast Screening Program diagnostic protocol in fine-needle aspiration cytology with cell block preparation in cases of palpable breast lumps: A reliable, fast, and accurate diagnostic method for the assessment of breast lumps with histopathologic correlation. *J Mid-life Health* 2024;15:62-8.

### Access this article online

#### Quick Response Code:



**Website:** <https://journals.lww.com/jomh>

**DOI:** 10.4103/jmh.jmh\_187\_23

is one of the frequent sites of neoplasms in the human body.<sup>[1]</sup> During adolescence and reproductive age, major hormonal changes produce alterations in the mammary tissue. Those are directly or indirectly affecting the disease patterns.<sup>[1,2]</sup> As the site of origin of fibrocystic disease, duct hyperplasia, and most carcinomas is the terminal duct lobular unit, the primary site of solitary papilloma, duct ectasia, and a few rare types of duct carcinoma is the large duct system.<sup>[1,2]</sup> In spite of the fact that over 80% of breast lumps are benign, every breast lump must be examined and evaluated by a surgeon to rule out malignancy.<sup>[3]</sup> Breast cancer is the third-most common cancer in the world, and in females, it is the most common cancer comprising 32% of all malignant lesions.<sup>[1,3]</sup> Breast cancer is the second-most common malignancy in females in India after cervical cancer. At present, 75,000 new cases occur in Indian women every year.<sup>[1]</sup> A palpable breast lump is a common diagnostic problem for both general practitioners and surgeons. Surgical biopsy with histopathology examination is the “gold standard” for the diagnosis of a breast lesion; however, it is an invasive procedure and related to many operative complications.<sup>[4,5]</sup> There are two types of minimally invasive techniques: one is core needle biopsy (CNB) and another is fine-needle aspiration cytology (FNAC).<sup>[4]</sup> Many centers request tissue biopsies before mastectomy even though the lesion is already malignant on FNAC. In our setup, a triple test which includes clinical examination, mammography, and FNAC is considered the choice of investigation. Many studies also considered the triple test as the “golden standard” for rapid and definitive diagnosis of breast lesions.<sup>[4,5]</sup> As compared with CNB, FNAC has many advantages such as less cost, less tissue processing time, less pain, less chance of hematoma, and less discomfort.<sup>[6,7]</sup> The main advantages of FNAC in the present era are less risk of seeding of the tumor along the needle track and no scar formation compared with CNB.<sup>[6,7]</sup> As per previous studies, the diagnostic accuracy of the triple test is 99%, and only FNAC is 98.5%.<sup>[6,8,9]</sup> Whenever FNAC is combined with cell block preparation, it further increases both sensitivity and specificity by nearly 100%.<sup>[10]</sup> With the cell block preparation smear, we can also use newer tests like estrogen receptor–progesterone receptor–human epidermal growth factor receptor 2 (ER-PR-HER2) using immunocytochemistry and fluorescence *in situ* hybridization (FISH).<sup>[10]</sup> The main limitation of this study is smears are acellular, whenever calcification in a lesion, hematoma formation, and highly painful and infected lesions. The aims and objective of this study were to derive conclusions about the correlation, including sensitivity, specificity, positive and negative predictive values (NPVs), and

the diagnostic accuracy of FNAC, with or without cell blocks, compared to the final histopathology in cases of palpable breast masses.

## MATERIALS AND METHODS

A cross-sectional prospective study was conducted after getting approval from the Human Ethics Research Committee (HERC) (GMERS/JUN/HERC/FACULTY/PATHO/04/2017) from January 2018 to December 2019, which included 65 patients giving informed consent. Patients diagnosed clinically for breast lumps who underwent diagnostic FNAC with cell block followed by a histopathological examination at our hospital were included in the study. The procedure was performed on samples received at the Central Diagnostic Laboratory.

### Inclusion criteria

- (1) The age of patients who attended the surgical outpatient department was between 10 and 80 years.
- (2) Palpable breast lump of variable sizes and duration.

### Exclusion criteria

- (1) Patients who had an ulcerated breast lump.
- (2) Patients with recurrent breast lump of a previously operated case of confirmed malignancy by histopathology.
- (3) Patients were not willing to informed consent.

### Fine-needle aspiration cytology

FNAC was performed by a pathologist. The patient was always accompanied by a female attendant. A needle of 22–24 G in length was routinely used. A longer needle was required for deep-seated lesions. The skin over the procedure area was cleaned with proper disinfectant, and the lump was held by hand and stabilized. A needle attached to a 10–20 ml syringe was introduced in the lump with to-and-fro movement till sufficient material was seen in the needle hub. If the material was not enough, then negative pressure was created in the syringe. When the material was seen in the needle hub, then pressure in the syringe was released. A needle with a syringe attached was withdrawn from the lump. In cystic lesions, as much as fluid possible fluid was aspirated, and then, FNAC was taken from the remaining mass. A smear was made after centrifuging the cystic fluid. A needle was detached from the syringe. Air was aspirated in the syringe, and the needle was attached again, and the aspirated material was sprayed onto clean and dry slides, and smears were prepared. An aspirate was best smeared with the flat of a microscopy slide. Light pressure was exerted to achieve a thin, even spread. Samples large enough were divided onto several slides, both air-dried and wet-fixed. Wet fixation slides were dipped into the Cytotfix solution immediately (before the drying started). Wet-fixed slides

were stained with H and E and Papanicolaou stain. For air-dried smears, rapid drying is crucial as slow drying may produce artifacts. Air-dried smears were stained with the modified May-Grunwald-Giemsa stain.<sup>[11,12]</sup>

For cytology reporting, we follow the United Kingdom National Health Service Breast Cancer Screening Program (UK-NHSBSP):<sup>[3,6,11,12]</sup> 5-tier Reporting Scheme for breast pathology, which consists of C1: Inadequate/Nondiagnostic: Acellular, presence of only blood, fat, bipolar nuclei, and macrophage, a too few epithelial groups. C2: Benign – includes normal breast and benign lesion from mastitis to a fibroadenoma. C3: Atypical probably benign: Predominantly benign pattern with atypical features either nuclear enlargement or pleomorphism. C4: Suspicious probably malignant: Limited cell discohension and minimal nuclear pleomorphism. Bipolar nuclei in the background. Caution to be exercised of the lesion reported as suspicious. C5: Malignant included epithelial and metastatic tumors to the breast: Nuclear pleomorphism, abnormal nucleoli, and irregularity of nuclear margin. Low grade: Mild-to-moderate pleomorphism. High grade: Marked nuclear pleomorphism – many mitoses often bizarre.

### Cell block analysis

In the cell block analysis technique, the remaining material which was present in the aspirating syringe was pushed in the test tube and centrifuged at 2500/rpm for 10 min. The cell button was formed. Then, it was allowed to fix in 10% formalin overnight. Then, the cell button was processed as a routine biopsy specimen and stained with hematoxylin and eosin staining.<sup>[10]</sup>

### Histopathological processing of biopsy

The excision/CNB biopsy specimens or mastectomy specimens received were examined grossly for their size, shape, color, and consistency. Changes in the nipple and skin and the presence of lymph nodes were also noted wherever relevant. In modified radical mastectomy specimens, as many nodes as possible were dissected out in a fresh state, and their number and size were noted. Mastectomy specimens were cut serially at a distance of 1 cm. Cut surfaces were noted for tumor, color, size, extension, involvement of the skin, base of resection, nipple and areola, and secondary changes such as necrosis, cystic degeneration, hemorrhage, and fibrosis. They were then fixed in 10% formalin for 24 h. Sections were taken from the tumor proper, its margins, nipple, and lymph nodes. They were processed by the routine paraffin embedding technique, and multiple sections were taken of 4–6 microns thickness and stained with routine hematoxylin and eosin stain.<sup>[11,12]</sup>

FNAC with or without cell block preparation and histopathology findings were correlated with the following parameters.<sup>[12]</sup>

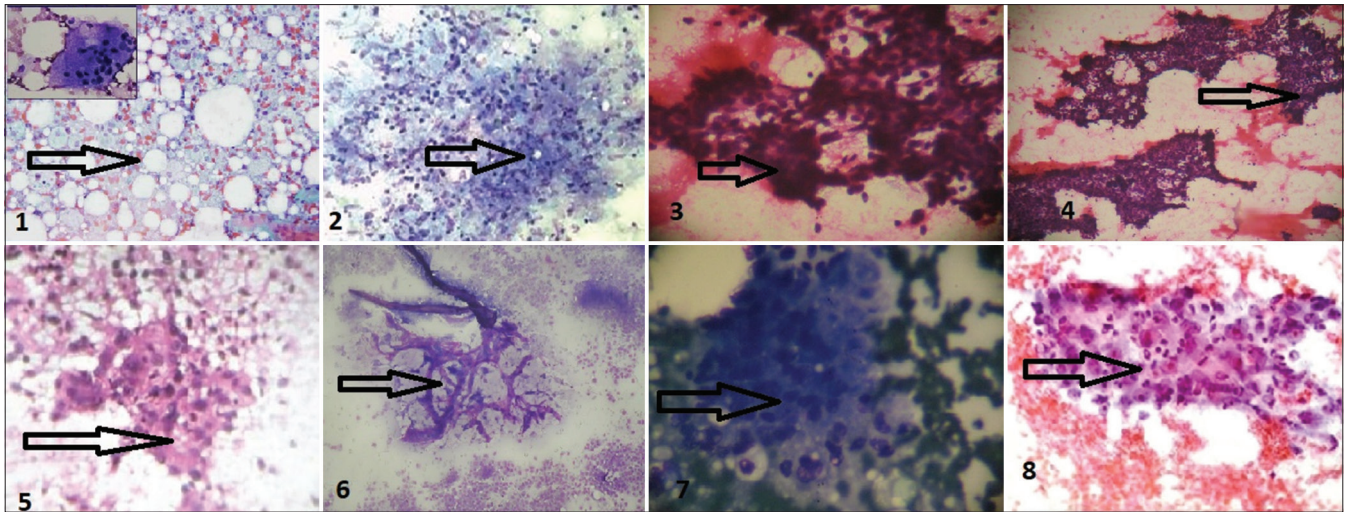
- Sensitivity True Positive (TP)/TP + False Negative (FN) × 100
- Specificity True Negative (TN)/TN + False Positive (FP) × 100
- Positive predictive value (PPV) TP/TP + FP × 100
- NPV TN/TN + FN × 100
- Efficiency rate TP + TN/Total cases × 100
- Diagnostic Accuracy TP + TN/TP + True Negative (TN) + FP + FN × 100%.

The data were also analyzed using the Z test. The Z test was used to determine the association between different variables.  $P < 0.05$  was used to find out the statistical significance.

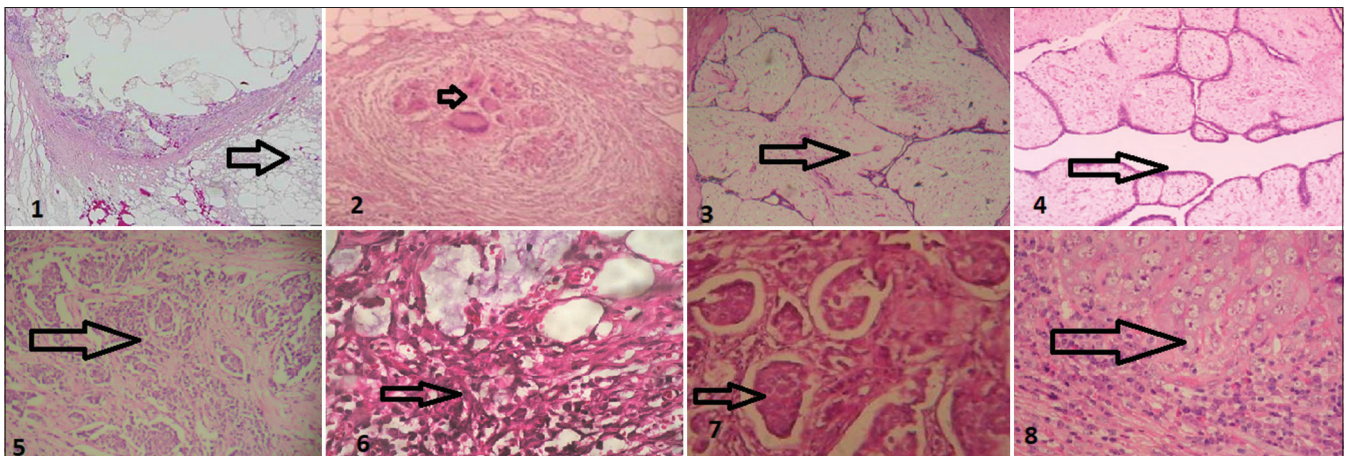
## RESULTS

The present study was conducted on 65 patients prospectively who had a lump in the breast. Out of 65 cases of breast lesions subjected to FNAC, all 65 cases were followed by tru-cut biopsy/excisional biopsy/lumpectomy/mastectomy. Out of 65 patients, 61 (93.8%) were female and 4 (6.2%) were male. Hence, the male-to-female ratio was 1:15.25. Out of 65 cases of breast lumps, 23 cases were benign and 42 cases were malignant [Tables 1 and 2]. The highest numbers of cases in the present study were 26 (40.0%) cases in the 31–40 years of age group, next in order of frequency were 16 cases (24.6%) in the 41–50 years of age group. In the present study, cases above 61 years of age were 14. Out of them, 13 cases were malignant. Case distribution of benign and malignant lesions was shown in [Tables 1 and 2]. Out of 23 benign lesions, 13 cases (56.52%) were on the left side, 7 (30.34%) were on the right side, and 3 (13.04%) had bilateral breast involvement. Out of 42 malignant lesions, 22 (52.38%) cases were left-sided, 19 (45.23%) cases had right breast, and 1 (2.38%) case had bilateral breast involvement. Overall lumps were the most common in the upper outer quadrant of the breast, in 26 cases, of which malignant was 47.61%. The benign lumps were most common in the upper inner quadrant (34.78%). Tables 1, 2 and Figures 1, 2 show a comparison of FNAC with/without cell block diagnosis as per the UK-NHSBSP diagnostic protocol and histopathological diagnosis. Figures 1 and 2 also show the comparison of microscopical findings of FNAC and histopathology. In this study, most of the benign cases were fibroadenomatoid hyperplasia and fibroadenoma combined (30.4%) [Table 1]. In this study, most of the malignant cases were invasive ductal carcinoma (NOS) (78.6%) [Table 2].





**Figure 1:** Fine-needle aspiration smear suggestive of, (1) Insufficient cells for cytological analysis C1: A dirty background, granular debris, fat droplets, fragments of adipose tissue, foamy macrophages, multinucleated giant cells, and absence of epithelial cells seen. (2) Chronic granulomatous mastitis C2: Histiocytes, epithelioid cells, multinucleated giant cells, and plasma cells seen. (3) Benign lesion of breast C2: Cell-rich smear with the branching fragment of the ductal epithelium and numerous single bipolar nuclei. (4) Atypical probably, benign lesion of breast C3: Mildly atypical cells with loose tissue fragments and bland epithelial duct. (5) Cells suspicious but probably malignant C4: Atypical ductal epithelial cells with necrotic debris and calcium granules. Nuclear crowding and overlapping seen. Myoepithelial cells are not present. (6) Definitely malignant, Mucinous carcinoma C5: Abundant background mucin and chicken wire blood vessels. Moderate nuclear atypia. (7) Definitely malignant, Ductal carcinoma C5: Poorly cohesive malignant cells in the cluster, nuclear enlargement, pleomorphism, and irregular chromatin. (8) Definitely malignant, medullary carcinoma C5: Numerous dispersed malignant cells with large, pleomorphic nuclei, and many scattered lymphoid cells seen



**Figure 2:** Histopathology of, (1) Fat necrosis – Cystic space formed by necrosis of adipose tissue and lined by foamy macrophages (H and E,  $\times 40$ ) (2) chronic granulomatous mastitis shows Langhans giant cells (H and E,  $\times 40$ ). (3) intracanalicular pattern of fibroadenoma (H and E,  $\times 40$ ). (4) phyllodes tumor of the breast (H and E,  $\times 40$ ). (5) infiltrating duct carcinoma of the breast (H and E,  $\times 40$ ) (6) mucinous carcinoma of the breast (H and E,  $\times 40$ ). (7) IDC with neuroendocrine differentiation of the breast (H and E,  $\times 40$ ). (8) medullary carcinoma of the breast (H and E,  $\times 40$ )

### Fine-needle aspiration cytology without cell block

All 13 cases diagnosed as C<sub>2</sub> benign were also diagnosed as benign by histopathology examination. All 36 cases diagnosed as C<sub>5</sub> malignant were also diagnosed as malignant by histopathology examination. Out of nine, two cases of atypical, probably benign C<sub>3</sub> by cytology were diagnosed as malignant by histopathology examination. Out of four, one case of suspicious, probably malignant C<sub>4</sub> by cytology was diagnosed as benign by histopathology examination. In the study,  $P < 0.05$ , so there is no any significant difference in diagnosis ability between FNAC cytology

and histopathology. In the study, the z-value is 0.73, so the FNAC result is less deviated from the mean of the histopathology result. All parameters such as sensitivity, specificity, PPV, NPV, efficiency rate, and diagnostic accuracy beat the required standard [Tables 3 and 4].

### Fine-needle aspiration cytology with cell block

All 65 cases diagnosed by cell block were diagnosed the same by histopathology. In the study,  $P < 0.05$ , so there is no any significant difference in diagnosis ability between FNAC cytology and histopathology. In the study, the z-value is 0, so the FNAC result is not deviated from the mean of the histopathology result.

**Table 1: Case distribution of breast lesions with correlation of cytological with and without cell block (as per the United Kingdom National Health Services Breast Screening Program) and histopathological diagnosis**

Cytology	Histopathology		Granulomatous mastitis (%)	Fibroadenomatoid hyperplasia (%)	Acute mastitis (%)	Granulomatous mastitis with fibrocystic disease (%)	Benign phyllodes tumor (%)
	Number of cases without Cell block	Number of cases with Cell block					
C1: Inadequate	3	0	-	-	-	-	-
C2: Benign	13	16	4	1	3	1	-
C3: Atypical probably, benign	9	7	-	3	-	-	2
C4: Suspicious, probably malignant	4	3	-	-	-	-	-
C5: Malignant	36	39	-	-	-	-	-
Total cases	65	65	4 (17.4)	4 (17.4)	3 (13)	1 (4.35)	2 (8.7)

Cytology	Fibroadenoma (%)	Sclerosing adenosis (%)	Fat necrosis (%)	Simple duct hyperplasia (%)	Granulomatous mastitis with atypical duct hyperplasia (%)	Fibrocystic disease with focal atypical duct hyperplasia (%)	Fibrocystic disease with focal florid ductal hyperplasia (%)	Malignant lesions (%)
C2: Benign	3	1	-	-	-	-	-	-
C3: Atypical probably, benign	-	-	-	1	1	-	-	2
C4: Suspicious, probably malignant	-	-	-	-	-	1	-	3
C5: Malignant	-	-	-	-	-	-	-	36
Total cases	3 (13)	1 (4.35)	1 (4.35)	1 (4.35)	1 (4.35)	1 (4.35)	1 (4.35)	42 (64.61)

**Table 2: Correlation of cytological and histopathological diagnosis of malignant lesions**

Cytopathology: Histopathology	Invasive ductal carcinoma (NOS)	Mucinous carcinoma	Invasive lobular carcinoma	Medullary carcinoma	Intraductal papillary neoplasms (intracystic)	Mixed invasive ductal with cribriform carcinoma	Neuroendocrine carcinoma
C1: Inadequate	-	1	-	-	-	-	-
C2: Benign	-	-	-	-	-	-	-
C3: Atypical probably, benign	1	-	1	-	-	-	-
C4: Suspicious, probably malignant	3	-	-	-	-	-	-
C5: Malignant	29	2	1	1	1	1	1
Total cases	33	3	2	1	1	1	1

NOS: Not otherwise specified

**Table 3: Correlation of cytological without cell block (as per the United Kingdom National Health Services Breast Screening Program) and histopathological diagnosis (statistical correlation)**

Cytological diagnosis without cell block	Number of cases	Histopathological diagnosis		Z	P
		Benign	Malignant		
C1: Inadequate/nondiagnostic	3	2*	1*	NA	NA
C2: Benign	13	13	0	0	>0.05
C3: Atypical, probably benign <sup>^</sup>	9	7 <sup>^</sup>	2 <sup>^</sup>	1.53	>0.05
C4: Suspicious, probably malignant	4	1*	3*	1.57	>0.05
C5: Malignant	36	0	36	0	>0.05
Total (%)	65	23 (35.38)	42 (64.61)	0.73	>0.05

Statistical parameters	Number of cases
TP	36
TN	20
FP	0
FN	2

<sup>^</sup>The numbers of C2 (benign lesions) cases to derive TN and FN values, \*Not included for calculation of diagnostic accuracy purpose.

TP: True positive, TN: True negative, FP: False positive, FN: False negative, NA: Not available

All parameters such as sensitivity, specificity, PPV, NPV, efficiency rate, and diagnostic accuracy are 100% [Tables 4 and 5].

## DISCUSSION

In our setup, a triple test which includes clinical examination, mammography, and FNAC is considered the choice of investigation. Many studies also considered the triple test as the “golden standard” for rapid and definitive diagnosis of breast lesions.<sup>[4,5]</sup> Whenever FNAC is combined with cell block preparation, it further increases both sensitivity and specificity by nearly 100%.<sup>[10]</sup> With the cell block preparation smear, we can also use newer tests like ER-PR-HER2 using immunocytochemistry and FISH.<sup>[10]</sup>

The benefit of combining cell blocks with cytologic smears is the ability to see a few critical histologic findings correlates of cytologic findings. Some cytologic FNAC criteria cannot be translated into histologic criteria completely; hence, the complementary nature of cell blocks and FNAC smears would help avoid the pitfalls of using either cytology or histology alone and also give extra information.<sup>[13]</sup>

In our study, all 13 cases diagnosed as C<sub>2</sub> benign were also diagnosed as benign by histopathology examination. All 36 cases diagnosed as C<sub>5</sub> malignant were also diagnosed as malignant by histopathology examination. Out of nine, two cases of atypical, probably benign C<sub>3</sub> by cytology were diagnosed as malignant by histopathology examination. Out of four, one case of suspicious, probably malignant C<sub>4</sub> by cytology was diagnosed as benign by histopathology examination. In the study,  $P < 0.05$ , so there is no any significant difference in diagnosis ability between FNAC cytology and histopathology. In the study, the  $z$ -value is 0.73, so the FNAC result is less deviated from the mean of the histopathology result. All parameters such as sensitivity, specificity, PPV, NPV, efficiency rate, and diagnostic accuracy beat the required standard. As per many literature of FNAC, breast sensitivity is 80%–98% and specificity is up to 100%.<sup>[14-16]</sup> However, there are some difficulties and limitations that need to be mentioned about FNAC without a cell block. In that, both false-negative and false-positive results may occur.<sup>[9]</sup> The most significant difficulty in making a diagnosis is the overlapping features of different lesions, and it is the same as our study.<sup>[17]</sup> Even after repeated sampling,

**Table 4: Comparison of fine-needle aspiration cytology without cell block and fine-needle aspiration cytology with cell block results with histopathological diagnosis: A threshold of performance**

Parameters	Required standard (%)	Present study (%)	
		FNAC without cell block (%)	FNAC with cell block (%)
Sensitivity	>90	91.3	100
Specificity	>90	100	100
PPV	>98	100	100
NPV	>85	90.1	100
Efficiency rate	>85	86.2	100
Diagnostic accuracy	>95	96.5	100

PPV: Positive predictive value, NPV: Negative predictive value, FNAC: Fine-needle aspiration cytology

**Table 5: Correlation of cytological with cell block (as per the United Kingdom National Health Services Breast Screening Program) and histopathological diagnosis (statistical correlation)**

Cytological diagnosis with cell block	Number of cases	Histopathological diagnosis		Z	P
		Benign	Malignant		
C1: Inadequate/nondiagnostic	0	0	0	NA	NA
C2: Benign	16	16	0	0	>0.05
C3: Atypical, probably benign <sup>^</sup>	7	7 <sup>^</sup>	0 <sup>^</sup>	0	>0.05
C4: Suspicious, probably malignant	3	0	3 <sup>*</sup>	0	>0.05
C5: Malignant	39	0	39	0	>0.05
Total, n (%)	65	23 (35.38)	42 (64.61)	0	>0.05
Statistical parameters		Number of cases			
TP		39			
TN		23			
FP		0			
FN		0			

<sup>^</sup>The numbers of C2 (benign lesions) cases to derive true-negative and false-negative values, <sup>\*</sup>The numbers of C5 (malignant lesions) cases to derive true positive. TP: True positive, TN: True negative, FP: False positive, FN: False negative, NA: Not available



one can get either acellular aspiration or suspicious or atypical cells. So in similar conditions whenever above all difficulties are faced, FNAC with cell block is advised which resolves majority of the above problems.

In our result of FNAC with cell block, all 65 cases diagnosed by cell block were diagnosed the same by histopathology. In the study,  $P < 0.05$ , so there is no any significant difference in diagnosis ability between FNAC cytology and histopathology. In the study, the  $z$ -value is 0, so the FNAC result is not deviated from the mean of the histopathology result. All parameters such as sensitivity, specificity, PPV, NPV, efficiency rate, and diagnostic accuracy are 100%. This result is also comparable and more accurate than Thapar *et al.*<sup>[18]</sup> study in which sensitivity and specificity are between 95% and 100%.

## CONCLUSIONS

Fine-needle aspiration cytology is a patient-friendly, easy, reliable, repeatable, and simple diagnostic test.

Hence, we have no hesitation in concluding that FNAC in conjunction with clinical examination and mammography is a very important preliminary diagnostic test in palpable breast lumps. In expert hands, the results show a high degree of correlation with the final histopathology report. FNAC with cell block helps in processing very small amount of cellular material and hence better classification of tumor when reviewed along with cytological smears. It is simple to perform and does not need extra expertise to handle the specimen. Hence, the routine preparation of the cell block improves the accuracy of FNAC diagnosis which is more accurate and comparable to golden-standard biopsy with histopathology examination.

## Acknowledgments

I acknowledge this research and express enough thanks to my mentor and guide Respected Dean sir for their continued support and encouragement. I offer my sincere appreciation for the learning opportunities provided by the Research Committee of the institute.

## Authors contribution

All authors have contributed equally.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Kumar V, Abbas AK, Aster JC. Robbins and Cotran Pathological Basis of Diseases. 9<sup>th</sup> ed. Chicago, Illinois, USA: Elsevier Health Sciences; The University of Chicago; 2021. p. 1037-65.
2. Rosai J. Breast. In: Rosai and Ackerman's Surgical Pathology. 9<sup>th</sup> ed., Ch. 20. New York, NY, USA: Elsevier Health Sciences, Weill Cornell Medical College; 2004. p. 1787-839.
3. Obaseki DE, Olu-Eddo AN, Ogunbiyi JO. Diagnostic accuracy of fine needle aspiration cytology of palpable breast masses in Benin City, Nigeria. West Afr J Med 2010;29:259-62.
4. Ukah CO, Oluwasola OA. The clinical effectiveness of fine needle aspiration biopsy in patients with palpable breast lesions seen at the University College Hospital, Ibadan, Nigeria: A 10-year retrospective study. J Cytol 2011;28:111-3.
5. Jindal U, Singh K, Kochhar A. Fine needle aspiration cytology of breast lumps with histopathological correlation: A four year and eight-month study from rural India. Internet J Pathol 2012;13:45-9.
6. Ellis IO, Humphreys S, Michell M, Pinder SE, Wells CA, Zakhour HD, *et al.* Best practice no 179. Guidelines for breast needle core biopsy handling and reporting in breast screening assessment. J Clin Pathol 2004;57:897-902.
7. Garbar C, Curé H. Fine-needle aspiration cytology can play a role in neoadjuvant chemotherapy in operable breast cancer. ISRN Oncol 2013;2013:935796.
8. Al-Mulhim AS, Sultan M, Al-Mulhim FM, Al-Wehedy A, Ali AM, Al-Suwaigh A, *et al.* Accuracy of the "triple test" in the diagnosis of palpable breast masses in Saudi females. Ann Saudi Med 2003;23:158-61.
9. Bukhari MH, Arshad M, Jamal S, Niazi S, Bashir S, Bakhshi IM, *et al.* Use of fine-needle aspiration in the evaluation of breast lumps. Patholog Res Int 2011;2011:689521.
10. Basnet S, Talwar O. Role of cell block preparation in neoplastic lesions. J Pathol Nep 2012;2:272-6. Available from: <https://www.nepjol.info/index.php/JPN/article/view/6876>. [Last accessed on 2022 Apr 19].
11. Ibikunle DE, Omotayo JA, Ariyibi OO. Fine needle aspiration cytology of breast lumps with histopathologic correlation in Owo, Ondo State, Nigeria: A five-year review. Ghana Med J 2017;51:1-5.
12. Daramola AO, Odubanjo MO, Obiajulu FJ, Ikeri NZ, Banjo AA. Correlation between fine-needle aspiration cytology and histology for palpable breast masses in a Nigerian tertiary health institution. Int J Breast Cancer 2015;2015:742573.
13. Tsai YY, Lu SN, Changchien CS, Wang JH, Lee CM, Eng HL, *et al.* Combined cytologic and histologic diagnosis of liver tumors via one-shot aspiration. Hepatogastroenterology 2002;49:644-7.
14. Wilkinson EJ, Bland KI. Techniques and results of aspiration cytology for diagnosis of benign and malignant diseases of the breast. Surg Clin North Am 1990;70:801-13.
15. Ellis IO, Galea M, Broughton N, Locker A, Blamey RW, Elston CW. Pathological prognostic factors in breast cancer. II. Histological type. Relationship with survival in a large study with long-term follow-up. Histopathology 1992;20:479-89.
16. Gukas ID, Nwana EJ, Ihezue CH, Momoh JT, Obekpa PO. Tru-cut biopsy of palpable breast lesions: A practical option for pre-operative diagnosis in developing countries. Cent Afr J Med 2000;46:127-30.
17. Bakhos R, Selvaggi SM, DeJong S, Gordon DL, Pitale SU, Herrmann M, *et al.* Fine-needle aspiration of the thyroid: Rate and causes of cytohistopathologic discordance. Diagn Cytopathol 2000;23:233-7.
18. Thapar M, Mishra RK, Sharma A, Goyal V, Goyal V. Critical analysis of cell block versus smear examination in effusions. J Cytol 2009;26:60-4.