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Pathology

Diagnostic Utility of Cell Block Preparation of Fine Needle Aspiration Material

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Abstract: In routine FNAC, 15 to 20% are classified as non-diagnostic due to scanty cellullarity. Cell blocks can be prepared from the residual material of FNA obtained by flushing the needle hub. This ensures maximum utilization of all available material. This work aims to study comparative cytopathology in conventional smears & Cell blocks & the advantages and disadvantages of cell block technique over conventional smears. Present study was cross sectional study carried in a tertiary care hospital. Routine FNAC was done on 270 patients, cell blocks were made from residual material left behind after preparing conventional cytology smears. Conventional FNAC smears were adequate in 221 and Cell blocks in 214 cases. In 199 cases both conventional FNAC smears and Cell blocks were adequate, while in 22 only conventional smears were adequate and in 15 only Cell blocks were adequate. Adequacy of conventional FNAC smears and Cell Blocks were 81.85% and 79.25% respectively. Combined adequacy rate of conventional FNAC smears and Cell blocks was 87.40%. The study concluded that Cell blocks from the FNA material remaining in hub or syringe, after conventional smear preparation increases cellular yield, architectural pattern & add to diagnostic efficacy of smear preparation of same patient without repeating the FNA or incurring an additional procedure.
Keywords: Biopsy, cell block, cytology, FNAC, smear.

INTRODUCTION

Fine Needle Aspiration Cytology is routinely employed as a diagnostic procedure in cytopathology. A successful FNA cytology requires an adequate specimen, high quality specimen preparation and experience on part of aspirator and cytopathologist.

Despite this 15 to 30% of FNA specimens are classified as inadequate, depending on site & expertise of aspirators [14]. There is always a risk of false or intermediate diagnosis [1]. Fine needle aspiration smears can diagnose tumors than classify since histological categorization is often lost in the preparation of smears [6].

To make the best possible use of FNA specimen, cell block technique has proved to be of immense use, most important reason being that it is similar to the tissue sections obtained using paraffin blocks thus further clarifying the cellular details and arrive at the diagnosis [1]. A Cell block is a condensed group of cells created from a fine needle aspirate material that is fixed and embedded in paraffin and multiple sections of same material can be obtained and processed for routine stains such as H & E. In addition ancillary studies like histochemical stains, immunocytochemical stains and in situ hybridization can be done whenever required [19].

In view of the added advantages of Cell block technique it should be utilized routinely in cytology to increase the diagnostic efficacy of cytodiagnosis and will obviate the need for repeat FNA for non diagnostic cases. If impression from smears and cell blocks gets concordant then the trauma and risks of biopsy can be avoided [3].

MATERIALS AND METHODS

Present study was cross sectional study carried in a tertiary care hospital in central India. Total 270 patients from OPD and IPD which were sent for FNAC were selected for present study. Patients of all age groups included in the study. Consent was taken after

explaining about the study in local language. Procedure of standard FNA done in cytology clinic and in Radiology department in Ultrasonography/Computed Tomography guidance whenever needed and conventional smears were prepared. After preparation of smears, the material that remained in the needle hub and syringes was used for cell block preparation by flushing it with normal saline.

Entire material obtained was centrifuged in 10 milliliter test tube at 3000 revolutions per minute for 10 minutes to form sediment. The supernatant fluid was decanted off & few drops of blood plasma added to sediment. Then equal drops of thromboplastin solution was added to sediment and mixed and allowed to stand for 15 minutes [7]. Then clot was formed and then this clot was processed as surgical tissue in automated tissues processing machine in histopathology section.

Paraffin blocks were made and then 4 to 5 microns thickness sections were cut of paraffin cell blocks like the routine paraffin blocks and mounted on slides according to standard histologic techniques. Sections were stained with Hematoxylin and Eosin.

First FNAC smears and then cell blocks were examined separately for cellularity and reported. All the FNAC smears and cell blocks smears were dived into, inadequate smears and adequate smears. Inadequate smears were those smears which showed blood or less cellullarity for diagnosis [6].

The criteria of reporting the various organ smears were as per Orell (2005) & Koss (1991), and final diagnosis were given. The diagnosis of FNAC smears were correlated with Cell block diagnosis and results were analysed.

RESULTS

A total of 270 cases were included in the study of which conventional FNAC smears and cell blocks were made. Majority of cases were found in 41 - 50 years, followed by 31 - 40 years. Male: Female ratio in this study was 1:1.78

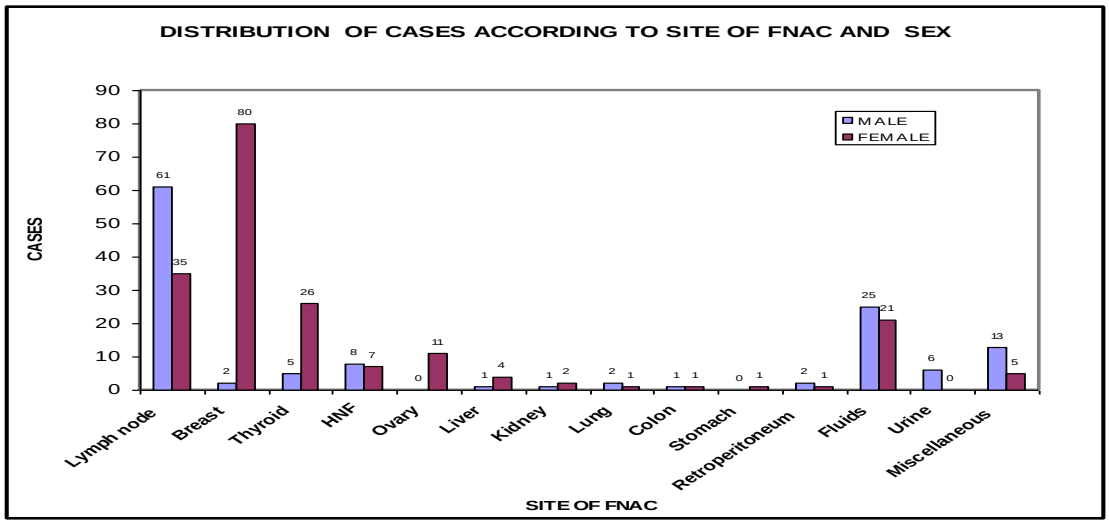

Fig-1: shows distribution of cases according to site of FNA and Sex

Lymph node (35.55%) was the most common site of aspiration followed by breast (29.62%). Other sites of aspiration in decreasing frequency were thyroid and head, neck & face. In males lymph node (62.88%) was the most common site of aspiration. In females breast (46.24%) was most common site of aspiration

Table-1: shows adequacy of Conventional FNAC smears and Cell blocks

Sr. No.	Adequacy	Number of Cases (%)	
		FNAC Smear	**Cell Blocks**
1	**Adequate**	221 (81.85%)	214 (79.25%)
2	**Inadequate**	49 (18.14%)	56 (20.74%)
TOTAL		270	270

Out of 270 cases FNAC smears were adequate in 221 (81.85%) cases and Cell blocks were adequate in 214 (79.25%) cases. While FNAC smears and cell blocks were inadequate in 49 (18.14%) cases and 56(20.74%) cases respectively.

Table-2: shows comparison of adequacy of conventional FNA smears & Cell blocks

Adequacy	Number of Cases	Percentage
Both FNAC smears and Cell blocks are Adequate	199	73.70%
FNAC smears are Adequate and Cell blocks are Inadequate	22	8.14%
FNAC smears are Inadequate and Cell blocks are Adequate	15	5.55%
Both FNAC smears and Cell blocks are Inadequate	34	12.59
TOTAL	270	100

In 199 (73.70%) cases both FNAC smears and Cell blocks were adequate. While in 22 (8.14%) cases only FNAC smears were adequate and in 15 (5.55%) cases only Cell blocks were found to be adequate. In 34 (12.59%) cases both smears and Cell blocks were inadequate.

Among the 199 (73.70%) cases with adequate conventional FNAC smears and Cell blocks were divided in two categories depending upon correlation of diagnosis: Correlated Cases & Non-Correlated Cases.

Table-3: Shows Correlation of Diagnosis between Conventional FNAC smears and Cell Blocks

Diagnosis of FNAC Smears & Cell Blocks	Number of Cases	Percentage of Adequate cases
Correlated	196	98.50
Non-Correlated	3	1.50
Total	199	100

In 196 (98.50%) cases diagnosis of FNAC smears and Cell blocks were correlated. In 3 (1.50%) cases diagnosis of FNAC smears and cell block were not correlated.

Table-4: Shows Distribution of Non-Correlated cases

No.	Organ	Conventional smear Diagnosis	Cell block Diagnosis
1	Lymph Node	Suppurative lymphadenitis	Granulomatous lymphadenitis
2	Lymph Node	Reactive lymphadenitis	Metastatic deposits of Ductal Carcinoma
3	Lymph Node	Reactive lymphadenitis	Granulomatous lymphadenitis

There were 3 cases with non-correlated diagnosis between FNAC smears and Cell block. One case which showed Supurrative lymphadenitis on FNAC smears showed Granulomatous lymphadenitis on Cell block. Two cases showed Reactive lymphadenitis on FNAC smears. Out of these 2 cases one showed Metastasis of Ductal carcinoma and other one showed Granulomatous lymphadenitis.

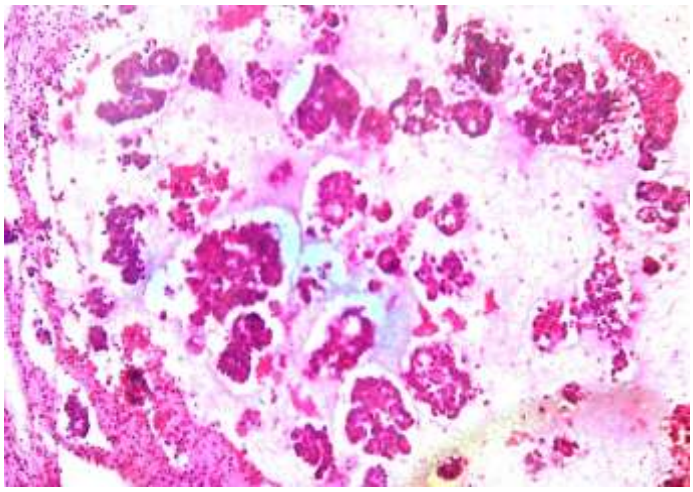

Fig-1: Ductal Carcinoma 4X (Cell Block)

Table-5: shows distribution of cases with inadequate fnac smears and adequate cell blocks according to site

Sr. No.	Site of FNA	Number of cases Inadequate on FNAC
1	Lymph node	8
2	Breast	6
4	Head Neck Face	1
TOTAL		15

Out of 15 cases with inadequate conventional FNAC smears but adequate on cell block, 8 cases were from lymph node and showed Metastasis of epithelial malignancy in 7 cases and features of reactive lymphadenitis in one case. In breast 6 cases were inadequate on conventional smears showed features of Ductal Carcinoma. One case from submandibular mass inadequate on conventional FNAC smears showed Squamous cell carcinoma on cell block.

Combined adequacy of FNAC smears and Cell blocks was 87.40% (Table-7).

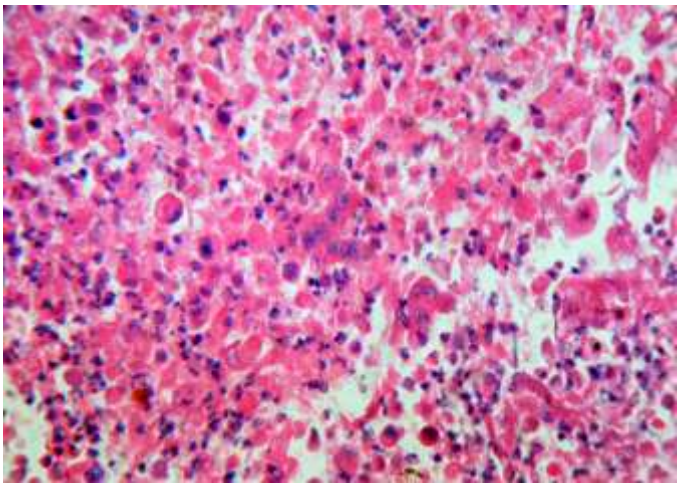

Fig-2: Squamous cell carcinoma 10X (Cell Block)

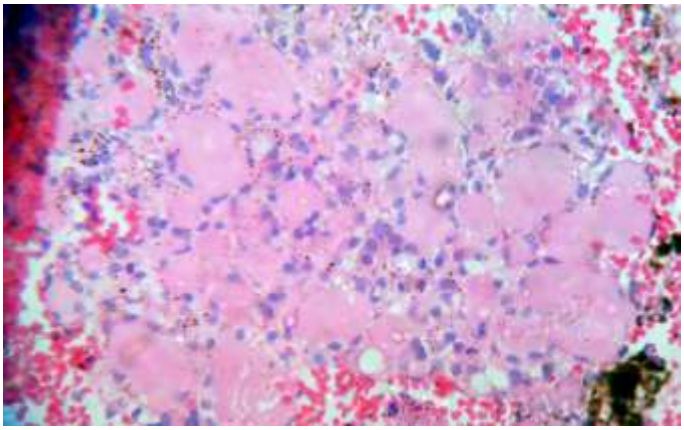

Fig-3: Colloid Goitre 10X (Cell Block) (Well preserved architecture of follicles)

Table-6: shows distribution of cases with adequate fnac smears and inadequate cell blocks according to site

Sr. No	Site of FNA	Number of cases Inadequate on Cell block & adequate on conventional FNA smears
1	Lymph node	3
2	Breast	8
3	Thyroid	3
4	Head Neck Face	2
5	Ovary	4
6	Lung	1
7	Miscellaneous	1
TOTAL		22

Table 7: showing adequacy of Conventional FNAC smears and cell blocks

TECHNIQUE	PERCENTAGE of ADEQUACY
FNAC smears	81.85%
Cell blocks	79.25%
Combined FNAC smears & Cell blocks	87.40%

DISCUSSIONS

Cell block technique is one of the oldest techniques but with the advent of newer techniques such as cytocentrifuge, fluroscence techniques, preparation with membrane filters like nucleopore and Millipore, electron microscopy, flow cytometry and molecular techniques, it was abandoned and kept aside by many laboratories.

Cell block method was first introduced by Bahreenburg in 1896 which was later improved by Dr. F. S. Mandelbaum in 1900. Since then cell block has been prepared from various specimens like urine, pleural, peritoneal, ascetic, pericardial, tissue scrapings and hemorrhagic aspirates [2].

In the present study adequacy rate of cell blocks of all organs as well from lymph node aspirates and breast were comparable with the study of Kern W *et al*. [6].

In the present study adequacy rate was more with conventional smears as compared to cell blocks but it doesn imply that conventional FNA smears are superior as they are made first and cell blocks are made from material remaining in the hub.

In the present study, correlation with respect to diagnosis between FNAC and cell blocks was 98%. Thus the finding of present study was consistent with the finding of Wojcik E *et al*., [17] and D-Lima *et al*. [5]. In correlated cases, though diagnosis on smears and cell blocks were same, cell block showed architectural pattern, which confirms FNAC diagnosis. In Adenocarcinoma, glandular formation was better appreciated on Cell block while in case of Squamous cell carcinoma, keratin pearls were better appreciated on Cell blocks than FNAC

In 3 cases of present study, diagnosis of FNAC and Cell blocks were not correlated i.e. Cell block showed additional features than FNAC smears. Out of these 3 non-correlated cases which were from lymph node two showed, acute suppurative lymphadenitis and Reactive lymphadenitis on FNAC which on Cell block showed features of Granulomatous lymphadenitis. One case of lymph node showed Reactive Lymphadenitis on FNAC which showed features of Metastasis of Ductal carcinoma on Cell block. According to Yamamoto *et al*. [18], tumor morphology, which could not be identified on cytology, could be better appreciated on cell blocks. According to De Bore *et al*. [4] and Nathan *et al*. [8], Cell blocks may give a better idea of tissue architecture.

In 15 cases, FNAC were inadequate, while cell blocks were adequate. Lymph node was the most common site followed by breast. Out of these 15 cases, 14 cases on FNAC showed only blood while cell block showed diagnostic material. This may be due to entrapment of tissue fragments in clot which was further processed for cell blocks. Orell observed that when samples are heavily admixed with blood, smears may show only blood and a few distorted cells caught in blood clots, and,yet, surprisingly good tissue fragments may be found in sections of Cell blocks [10]. Rofaga *et al*. [12] found that cell block samples were particularly useful in cases with aspiration of thyroid and recurrent carcinoma.

In the present study, 8.14% cases adequate on FNAC and were inadequate on cell blocks. Maximum numbers of such cases were from lung and ovary. This may be because of using most of the aspirated material for making smears and remaining for Cell blocks as second prick is time consuming in USG guided FNAC's.

In the present study, in 12.59% cases, both FNAC smears and Cell blocks were inadequate. Maximum such cases were from abdomen. In abdominal lesions, FNA's were done mostly for malignancies and they have tendency to bleed. Abdominal aspirations were done under USG guidance and while passing needle inside, it might hit any vascular structure hence chance of hemorrhagic aspirates were more. Also the expertise and training of sonologist plays a significant role in successful guided FNA's.

Due to fibrosis in the lesion even multiple passes leads no cellularity and due to high vascularity of certain organ even few passes for obtaining cellularity leads to hemorrhagic aspirate [14].

As seen from the table 7, when we used cell block as an adjuvant to FNAC there was increase in adequacy rate of 87.40% as compared to conventional. FNAC smears alone 81.85%. According to Nathan *et al*. [8], Cell blocks are adjuvant to FNAC smears for establishing a more definite cytopathologic diagnosis. They observed improvement in 15.2% cases when cell blocks were studied with smears. According to Power C. [11], cell blocks are additive and supportive to the smear impression. In the present study, combined adequacy of FNAC smears and cell blocks was 87.40%. Nathan *et al*. [8] studied 409 cases, combined adequacy of FNAC smears and cell blocks increased by 15.2%. Significant improvement was noticed in present study,

when FNAC smears and Cell blocks were combined and studied. This finding was consistent with above mentioned studies.

In present study, the observed advantages of Cell Block were:

- Less cellular dispersion helps in microscopic examination.
- Preserved tissue architecture.
- Multiple sections could be taken for specific stain whenever needed.
- By using residual material in needle hub and syringe ensures maximum utilization of all available material.
- Storage of fine needle aspirates as Cell blocks.

In the present study, the disadvantages of technique observed were

- As compared to FNAC smears, cellular details were less clear in cell blocks.
- Increased processing time and hence delay in diagnosis.
- Cost of cell blocks was high as compared to smears.

CONCLUSIONS

The cell block preparation increases cellular yield of FNA by capturing any small fragments in hemorrhagic aspirates. Architectural pattern of tissue is preserved in Cell block preparation and there is less cellular dispersion.

The preparation of the Cell blocks from the FNA material remaining in hub or syringe, after smear preparation, can add to diagnostic efficacy of smear preparation of same patient without repeating the FNA or incurring an additional procedure.

Special stains & Immunohistochemistry can be performed on serial sections. This can help to subtype certain tumors & metastases. Based on this open biopsies can be avoided

Fine needle aspiration material can be stored for a long period for future studies as Cell block.

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