



DIAGNOSTIC UTILITY OF CELL BLOCK TECHNIQUE IN CYTOPATHOLOGY ALONG WITH CONVENTIONAL SMEAR METHOD – A RETROSPECTIVE STUDY AT TERTIARY CARE CENTER OF WESTERN INDIA

Pathology

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ABSTRACT

Background: The cytological examination of body fluids helps in early diagnosis, staging and prognostication of benign, premalignant and malignant conditions. Combined approaches of conventional smear and cell block have helped in gained importance in cytopathology because of its pivotal role in diagnosis, supporting classical cytology, increases the efficiency of diagnosis and can be combined with other additional ancillary tests. **Methods:** A Retrospective observational study was conducted at Cytology section, Pathology Department, GMERS Medical College and Hospital, Gotri, Vadodara for period of one year from February 2023 to January 2024. 151 samples received including various body fluids consisting of pleural, peritoneal, synovial, BAL and FNAC from various cystic lesion analysis from patients attending GMERS medical college and Hospital, Gotri, Vadodara. **Result:** In our study, a total of 151 cases were screened. Out of them in conventional smear, 22 cases (14.57%) were positive for malignancy and 129 cases (85.43%) were benign, while in cell block technique 30 cases (19.87%) were positive for malignancy and 121 cases (80.13%) were benign. Improved cellularity and yield for detection of malignancy by the cell block technique from 14.57% to 19.87%. **Conclusion:** Cell block method is an excellent tool for improving cytological diagnosis in various serous effusions and aspirations of cystic lesion along with conventional smear by providing better architectural details, morphological pattern as serving a bridge between cytology and histopathology

KEYWORDS

Conventional smear (CS), Cell Block (CB), Cytopathology, Body Fluids, Cystic lesion, Bronchoalveolar Lavage (BAL)

INTRODUCTION

Body fluids from serous cavities and fluid aspirated from cystic lesions through FNAC are an important part in routine cytological examination. Cytological examination of various fluids is of paramount importance not only to detect malignancy, but they may also reveal information regarding various non-malignant conditions like inflammatory, immunological and infective etiology. It also helps to differentiate between benign, premalignant and malignant lesions and helps in taking prompt management.^{[1][2]}

FNAC is simple, rapid, convenient and economical mode of preoperative diagnosis and helps in making prompt diagnosis of varying swelling including cystic lesions in the body.^{[3][4]}

The routine conventional smear cytology of body fluids as well as aspirate from cystic lesions by FNAC have varied efficacy in terms of sensitivity and specificity due to it leaves behind a large residue, cell particles, cell loss that yield diagnostic importance; especially in case of cystic lesions like in thyroid lesion, neck swelling where in FNAC, large tissue left behind, presence of cellular overcrowding, low cells yield with highly dispersal of cells on centrifuged conventional smears (CS) or sparse cellularity, lack of architectural details. That leads to diagnostic challenges to cytopathologists for evaluation specifically in presence of reactive or malignant cells.^{[5][6][7][8][9]} This residual material can be evaluated in cell block preparation which gives additional diagnostic yield. Therefore, CB technique is recommended along with CS method for diagnosing body fluids cytology to increase diagnostic accuracy.^[10] Along with high rate of the positive results by providing definite architecture, helping to retrieve small tissue fragments from fluid obtained by FNAC from cystic lesions. Cell block also helps to preserve it for future like for IHC and other ancillary studies which help in improving diagnosis and management.^{[11][12][9]}

Both cell block and conventional smears methods used simultaneously with same procedure not only helps in to reach appropriate diagnosis and further management but also helps to avoid injudicious exposure of Biopsy and unnecessary further interventions.^[13]

MATERIALS AND METHODS:

A Retrospective observational study was conducted at Cytology section, Pathology Department, GMERS Medical College and Hospital, Gotri, Vadodara for period of one year from February 2023 to January 2024. A total of 151 cases were included of patients of all age groups and any genders referred to Pathology department for FNAC for palpable cystic lesions and serous body fluids analysis received

from indoor patients at GMERS medical college and Hospital, Gotri, Vadodara. In present study samples included all fluids obtained from the cystic lesions by FNA including thyroid, breast, cervical neck swelling and various body fluids including peritoneal fluid, pleural fluid, synovial fluid, others including urine should be adequate in quantity at least 5ml of fluid required for both Conventional smear and Cell block preparation.

Clinical history, clinical examination and other investigations were obtained from requisition form for various body fluids. Detailed history, clinical examination of patients were carried out including general, systemic and local examination who came for FNAC.

FNAC was performed under all aseptic precautions as an OPD procedure with the help of 23-gauge needle and disposable 10ml syringes. Various body fluids received in cytopathology, were examined for physical characteristics such as appearance, color and coagulum. Divide fluid into two equal parts. One of the parts is used for Conventional smears. These are prepared from the centrifuged deposit and stained with MGG, Papanicolaou (Pap) and H&E stain.

The residual material obtained from FNAC as well as another part of cytological fluid were used for cell block preparation. The cell block (CB) technique refers to the processing of sediments, blood clots or grossly visible tissue fragments from cytological specimens must fix overnight in 10% buffer formalin followed by centrifuged at 1500 rpm for 10 min. The cell button obtained was kept on filter paper, made a cell cassette and processed through the tissue fixation for 16 to 20 hours followed by embedded on paraffin blocks then sections taken with a semiautomated rotary microtome and stained by the same method used for histopathological biopsy section.

Ethics: The study was undertaken after the Institutional Ethics Committee gave its approval.

Statistical Significance: Bimodal distribution was performed to account for to assess comparison between CS and CB methods. By using windows 7 excel sheets and analysis by Chi-square test. P value <0.05 considered as statistically significance at 95% confidence interval.

RESULTS:

In present study, a total of 151 cases of various body fluids and FNAC aspirates from cystic lesions were received over period of one year.

Out of 151 cases, Age-wise distribution most 69(45.7%) cases fall within 31-50 years age group seen in [Table-1]. This highlights a higher prevalence of cases in middle-aged adults in present study.

Table [1] Age-wise Distribution of Cases

AGE (IN YEARS)	NUMBER OF CASES	PERCENTAGES (%)
<20	16	10.60
21 to 30	19	12.58
31 to 40	31	20.53
41 to 50	38	25.17
51 to 60	24	15.89
61 to 70	16	10.60
71 to 80	4	2.65
> 80	3	1.99
TOTAL	151	100.00

In our study, distribution of cases according to gender were 79 males (52.31%) and 72 females (47.68%) among a total of 151 cases. The data reveals a slight male predominance in the study population.

Distributions of types various fluids in our study seen in Table[2]. Pleural and peritoneal fluid samples contribute about 61.58% followed by FNAC 21.19%.

Table [2] Distributions Of Types Of Various Fluids

SAMPLES	NUMBER OF CASES	PERCENTAGES (%)
PLEURAL	48	31.78
PERITONEAL	45	29.80
BAL	14	9.27
SYNOVIAL FLUID	10	6.62
URINE	02	1.32
FNAC	32	21.19
TOTAL	151	100

Among 151 cases, Color distribution of body fluids, includes yellow, reddish followed by whitish include 77 cases (50.99%), 62 cases (41.06%) and 12 cases (7.95%) respectively. Appearance of body fluids included turbid 121 cases (80.13%), while clear fluids 30 cases (19.86%).

Out of 48 cases of Pleural fluid, 40 cases (83.33%) were benign and 8 cases (16.66%) malignant. Majority of benign cases were due to infective conditions like tuberculosis or reactive effusion. Among 48 cases, the CS method identified 42 benign and 6 malignant cases, while in CB method identified 40 benign and 8 malignant cases.

Out of 45 cases of Peritoneal fluid 43 cases (95.55%) benign and 2 cases (4.44%) identified as malignant. Benign conditions due to alcoholic, reactive or infective etiology. Peritoneal fluid malignancy was rare, either due to metastasis from pelvic organs or abdominal viscera. Out of 43 total cases, CS method identified 42 cases as benign and 1 case as malignant. In comparison, CB method identified 41 cases as benign and 2 cases as malignant, that shows suspicious case confirmed as malignant in CB by better cellularity and architecture.

Out of 14 cases of BAL, 12 (85.71%) cases were benign, while 2 cases (14.28%) were malignant. Majority of BAL fluid cases benign due to infective etiology mostly due to Tuberculosis. On CS method identified 13 benign cases and 1 malignant case, while the CB identified 12 benign and 2 malignant cases.

In our study, all 10 cases (100%) of Synovial fluid were identified as benign on both techniques. That shows synovial fluid analysis associated with infective and inflammatory etiology like osteoarthritis, traumatic injury etc.

Out of 32 cases of FNAC fluid, with 16 cases (50%) as benign and 16 cases (50%) as malignant. On CS 20 benign cases and 12 malignant cases, while the CB method identified 16 benign and 16 malignant cases. It shows improved diagnostic efficacy for detecting malignancy by cell block method.

Two cases of urine cytology both cases were malignant in both CB and CS techniques, however architecture and morphology better visualized on cell block.

On Comparison of cellularity between CS and CB methods show 6 cases acellular in both methods. However, scanty cellularity was more frequently noted in CS, in CS shows 21 cases compared to CB shows 11 cases. That show cellularity improved on CB. Conversely, adequate cellularity was higher in CB methods 134 cases compared to CS 124 cases. The key finding was that cell block method tends to provide cellular samples.

Distribution of cases among total cases among conventional smear and cell block show in Tabel-3

Table [3] Distribution Of Cases Among Total Cases

DIAGNOSIS	CONVENTIONAL SMEAR (NO. CASES)	CELL BLOCK (NO. CASES)
Benign	129 (85.43%)	121 (80.13%)
Malignant	22 (14.57%)	30 (19.87%)
Total Cases	151 (100%)	151 (100%)

Table- 4 compares distribution of benign and malignant lesion found in various body fluids by both methods. Benign lesions are predominant across all fluid types while malignant lesions were less frequent.

Table [4] Diagnostic Distribution Of Various Body Fluids Cases

Type Of Fluid Diagnosis	Pleural Fluid		Peritoneal Fluid		Bal Fluid		Synovial Fluid		FNAC Fluid		Urine Fluid		Total
	CS	CB	CS	CB	CS	CB	CS	CB	CS	CB	CS	CB	
Benign	42	40	44	43	13	12	10	10	20	16	00	00	121
Malignant	06	08	01	02	01	02	00	00	12	16	02	02	30
Total	48	48	45	45	14	14	10	10	32	32	02	02	151

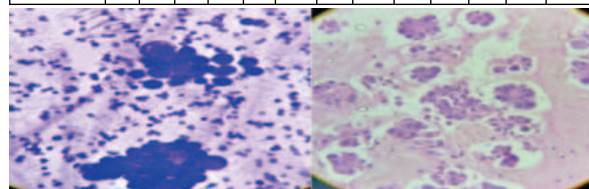


Figure 1) Malignant Pleural Effusion [CS- (MGG stain- 40x), CB- (H & E stain – 40 x)]

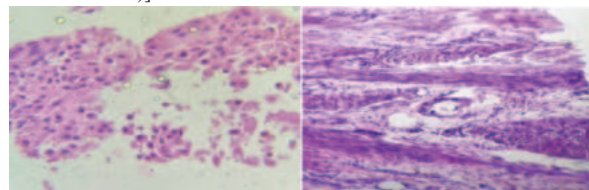


Figure -2) Cell block, Metastatic epithelial malignancy, Invasive Ductal Carcinoma [H & E stain- 40x]

DISCUSSION:

The cytological examination of serous body fluids are gaining importance because of detecting atypical cells which help in guiding further management. It is not only helps in detecting the primary site but also helps in identify metastasis if present, based on morphological features and architectural pattern. Applying of CB with CS cytology improving diagnostic efficacy by having advantages of viewing the slide like a histopathology section. Bahrenburg in 1896 was the first to introduce cellblock technique. It was Quincke in 1882, who first described cancer cells in abdominal and pleural fluids. Cellblock is a simple, rapid and inexpensive method, which can be used to complement the cytological smear.^{[6][7]} Zemansky in 1928 had concluded that cellblock is a superior technique compared to the conventional smear preparation.^[14] In CB technique, cells can be concentrated in a small area that can give better histological architectural patterns, cellularity with clear background overcome disadvantages of CS. Multiple sections can be taken like routine histopathological tissue section and also used for special staining and IHC. Also preservation of slides, tissue block for a longer duration for ancillary studies if required.^[14]

CB method also applied to FNA aspirate material after centrifugation of fluid obtained and used as adjuvant to CS to improve the diagnostic accuracy specifically in cystic lesions.^[15] Karnauchow et al., was the first to emphasize that cell block technique could be used in thick tissue particles aspirated by FNA, which provided sufficient material for a good tissue block section, special stains and IHC.^[15]

Age Group:

Our study revealed the age distribution of 151 cases, majority of cases within the 31 to 50 years age group (45.70%). This highlights a higher prevalence of cases in middle-aged adults. Middle aged men presented with reactive peritoneal effusion, pleural effusion most commonly due to secondary alcoholic liver disease and infective etiology, like tuberculosis respectively. In our study, by both techniques malignant cases detected in elderly age group, 23 cases show malignant lesion in 50 – 85 years age-group with a median age of 65 years, except 7 cases placed younger age category as discussed earlier majority above 50 years. Our study correlate with Kadam, G. et al.^[16], UshaKiranRaina et al.^[17], Shivakumarswamy Udasimath et al.^[7], Vidyashree V. et al.^[18] studies show majority cases was fall on middle age group, mean age was 58± 13years presented benign etiology while malignancy prevalence above 45 year of age.

Gender Distribution:

In our study, gender distribution of cases with 79 males (52.31%) and 72 females (47.68%) among a total of 151 cases. The data revealed a slight male predominance in the study population. These correlated with Shwetha J.H. et al.^[19], Kadam, G. et al.^[16], UshaKiranRaina et al.^[17], Shivakumarswamy Udasimath et al.^[7] studies show male predominance. In our study, malignant peritoneal effusion seen in 2 cases of female due to metastasis from ovarian tumors while malignant pleural effusion seen in 8 cases in which 6 cases in males and 2 cases in females, correlated with Shivakumarswamy Udasimath et al. study.^[7]

FNAC fluid aspirated from cystic lesion showed 22 malignant cases in which male presented with 17 cases and female with 5 cases. In males 17 cases showed metastatic epithelial malignancy, having strong positive history of tobacco chewing and smoking. While 3 cases of females presented with metastatic epithelial malignancy having no significant history. Remaining two cases were of Invasive ductal carcinoma of breast and anaplastic thyroid carcinoma present in females.^{[20][21]}

Color And Appearance Of Fluid:

Our study revealed that the color distribution of body fluids in 151 cases, majority were yellowish 77 cases and whitish 12 cases which transudate in nature due to benign etiology followed by reddish 62 cases due to malignancy or haemorrhagic effusion. While majority of fluids were turbid 121 cases followed by clear fluids made up 30 cases. This indicates turbid fluids were significantly potential underlying pathological conditions. These correlate with UshaKiranRaina et al.^[17] Vidyashree V. et al.^[18] studies.

Distribution Of Cases:

In our study, pleural fluids out of 8 cases of malignancy, 6 cases were positive due secondary to adenocarcinoma of lungs and 2 cases due to mesothelioma rest were due to benign etiology. These findings correlate with Shwetha J.H. et al.^[19], Kadam, G. et al.^[16], Sriet al.^[22] studies. While in peritoneal fluid out 45, 2 cases positive for malignancy secondary to ovarian tumors. These correlated with Shivakumarswamy Udasimath et al.^[7], Vidyashree V. et al.^[18] studies for peritoneal fluid samples. In BAL fluid 2 cases out of 14, positive for malignancy which better visualized on cell block.

In cystic lesion of FNAC out of 32, 16 cases positive for malignancy on CB compared to CS shows 12 cases, which shows CB provide better diagnosis. That also show in UshaKiranRaina et al.^[17], Nathan et al.^[23] studies improved cellularity in cystic FNA aspirates on CB.

Cellularity On CB:

In our study shows improved significant cellularity by CB from scanty to adequate. The significant finding was the high percentage (88.74%) of adequate cellularity in CB, suggesting superior performance in preserving cellularity compared to CS from (82.11%). These findings also seen in Shivakumarswamy Udasimath et al.^[7], UshaKiranRaina et al.^[17], Vidyashree V. et al.^[18], Shwetha.J.H. et al.^[19], Bansode, S et al.^[24], Basnet et al.,^[25] studies, a comparison between the cell block (CB) and conventional smear (CS) methods revealed that CB yielded higher cellularity.

Key Finding: Benign lesions were more common in body fluids, while FNAC fluid showing the most malignant etiology, which is secondary to metastatic epithelial malignancy from oral cavity growth in present study.

CONCLUSION:

CB method is an excellent complementary tool for improving cytodiagnosis in body fluids and aspirates of cystic lesions. Though CB method is supplementary to CS in the overall categorization of benign and malignant cases, they appeared to be more useful in diagnosis of malignancy by better preserved architectural, morphological patterns with histopathology sections along with providing material for ancillary techniques like IHC.

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