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Pathology

A COMPARATIVE STUDY OF CELL BLOCK AND CONVENTIONAL SMEAR TECHNIQUES IN EXFOLIATIVE FLUID CYTOLOGY.

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ABSTRACT **Introduction:-** The cytological analysis of bodily fluids is crucial for the diagnosis, staging, prognosis, and ongoing patient care. Conventional smears (CSs) of effusions are significantly easier to prepare than paraffin sections, although they are not as sensitive in identifying cancer. **Objectives: -** To evaluate the diagnostic efficacy of both CS and CB as independent tests and as a combined method. **Material And Methods: -** Over the course of six months, from July 2022 to December 2022, an observational cross-sectional study was carried out in a tertiary care hospital in North-East India. During the research period, 101 exfoliative fluid samples were subjected to the CS and CB procedures and examined. **Result: -** The age range of 41 to 60 was the most prevalent. CB had higher cellularity and diagnostic yield than CS. The majority of adenocarcinomas were found in peritoneal fluid, while the majority of squamous cell carcinomas were found in pleural fluid. **Conclusion: -** According to the study's findings, CB is a more accurate diagnostic modality than CS, and should always be used in conjunction with CS to achieve a more accurate diagnosis.

KEYWORDS : Exfoliative Fluid, Pleural Fluid, Ascitic Fluid, Conventional Smear, Cell block.

INTRODUCTION:

Cytological analysis of exfoliating fluids has been utilized for many years to identify malignancy precisely which is useful in cancer diagnosis and staging [1]. One diagnostic hurdle with CSs derived from exfoliative fluids is accurately identifying cells as reactive mesothelial cells that are either benign or malignant. Different laboratory processing techniques, bland morphological features of the cells, cell loss, and cell overlap are the causes of the decreased sensitivity and reduced diagnostic yield [1]. Hence, cell block (CB) has potential applications in prognostication, staging, and diagnosis. In conventional smear (CS) preparations, the presence of reactive mesothelial cells, an elevated number of inflammatory cells, and occasionally a lack of representative cells poses challenges to establishing a conclusive diagnosis. The CB approach is a one of the most widely used techniques for evaluating effusion fluids [2]. When utilizing the CB technique to increase the diagnostic yield, the remaining material can be very helpful. This method can decrease false-positive interpretations and improve the sensitivity of identifying cancers. [3]. Cellularity and morphological features were found to increase in CB preparation employing a 10% alcohol-formalin solution as a fixative [3]. This method is easy to use, repeatable, economical, and doesn't require any additional materials in contrast to other approaches. Studies on utility of CS & CB techniques are very limited from this part of north east India. Therefore, the study was designed to assess the diagnostic value of exfoliative fluid cytology using the CB and CS procedures both separately and in combination.

AIM:

To evaluate the diagnostic outcome and usability of the CS and CB methods independently and in combination for identifying pathology in exfoliative fluid cytology.

OBJECTIVES:

To determine the diagnostic effectiveness of the CB and CS as independent tests and in combination.

MATERIALS AND METHODS:

A six-month observational cross-sectional investigation was conducted on 101 patients between July 2022 and December 2022, using samples of peritoneal fluid, pleural fluid, BAL, and pericardial fluid fulfilling the inclusion criteria the specimens were subjected to both CS & CB and inadequate sampling material were excluded. 10 milliliters of fresh exfoliative fluid the sample was divided into two equally sized portions. The CS technique was used to one portion and the CB technique to the other. A volume of around 5 ml was centrifuged for 15 minutes at 2500 rpm. After discarding the supernatant, the sediment was used to prepare two standard smears. Giemsa stain was used to stain a smear after it had air dried. Papanicolaou stain was use on the other smear right away after it had been fixed in 95% alcohol. The 10% alcohol-formalin solution was used to prepare CBs. For fifteen minutes, the residual sample was centrifuged at 2500 rpm. A cell pellet was made by draining out the supernatant, mixing it with a 10% alcohol-formalin mixture, and letting it stand for four hours. After that, filter paper was used to wrap the cell button, put in a cassette, fixed in 10% neutral buffered formalin, and processed in an automatic tissue processor with other standard histopathological specimens to produce a CB [4,5]. The CBs were embedded in paraffin, sectioned at 4 µm, stained with haematoxylin and eosin, mounted with DPX mountant, and viewed under a microscope after drying. IHC and special stains were used for the suspicious specimens. All the prepared slides were examined by 3 pre-decided pathologists, where each pathologist evaluated all the slides (CS & CB). When H&E stained slides and IHC with available markers on the CB preparation were examined, the preliminary diagnoses made on CSs were compared with the corrected diagnoses on CB.

RESULTS

Table 1: Distribution Of Cases According To Gender And Age

Age group (In years)	Male		Female		Total	
	No.	%	No.	%	No.	%
0-20	01	2%	02	6%	03	3%
21-40	10	15%	08	23%	18	18%
41-60	39	58%	21	62%	60	60%
61-80	13	19%	03	9%	16	15%
81-100	04	6%	00	0%	04	4%

Table 2: Distribution Of Primary Location For Metastatic Effusion

Sl. No.	Primary Location	Male	Female	Total	%
1.	Ovary	0	2	2	8%
2.	Breast	0	1	1	4%
3.	Lung	3	0	3	13%
4.	GIT	1	0	1	4%
5.	Liver	3	0	3	13%
6.	Others	0	0	0	0%
7.	Unknown	8	6	14	58%
	Total	15	9	24	100%

Table 3: Distribution Of Type Of Malignant Cases

Type of sample	Type of malignancy	Number of cases
Pleural fluid	Squamous cell carcinoma	8
	Adenocarcinoma	2

Peritoneal fluid	Squamous cell carcinoma	2
	Adenocarcinoma	7
BAL	Squamous cell carcinoma	3
	Adenocarcinoma	2
Pericardial fluid	Squamous cell carcinoma	0
	Adenocarcinoma	0

Table 4: Distribution Based On Cellularity

Cellularity	Conventional smear		Cell block	
	No.	%	No.	%
Mild	68	67%	08	8%
Moderate	23	23%	15	15%
Marked	10	10%	78	77%
Total	101	100%	101	100%

Table 5: Distribution Of Architectural Patterns In CS & CB

Patterns	Conventional smear		Cell block	
	No.	%	No.	%
Dispersed cells	62	61%	9	8%
Cell balls	4	4%	6	6%
Cell clusters	21	21%	27	27%
Papillae	3	3%	15	15%
Glands	4	4%	20	20%
Sheets	7	7%	24	24%
Total	101	100%	101	100%

The above table shows there is prominent change in presence of architectural pattern that we noted in cellblocks.

Table 6: Distribution Of Cytological Diagnostic Yield

Category	Conventional Smear		Cell Block	
	No.	%	No.	%
Pleural Fluid				
Benign	37	82%	33	73%
Suspicious	02	4%	00	0%
Malignant	06	14%	12	27%
Total	45	100%	45	100%
Peritoneal Fluid				
Benign	42	90%	39	83%
Suspicious	03	6%	00	00%
Malignant	02	4%	08	17%
Total	47	100%	47	100%
BAL				
Benign	04	50%	04	50%
Suspicious	03	38%	00	00%
Malignancy	01	12%	04	50%
Total	08	100%	08	100%
Pericardial fluid				
Benign	01	100%	01	100%
Suspicious	00	00%	00	00%
Malignancy	00	00%	00	00%
Total	01	100%	01	100%

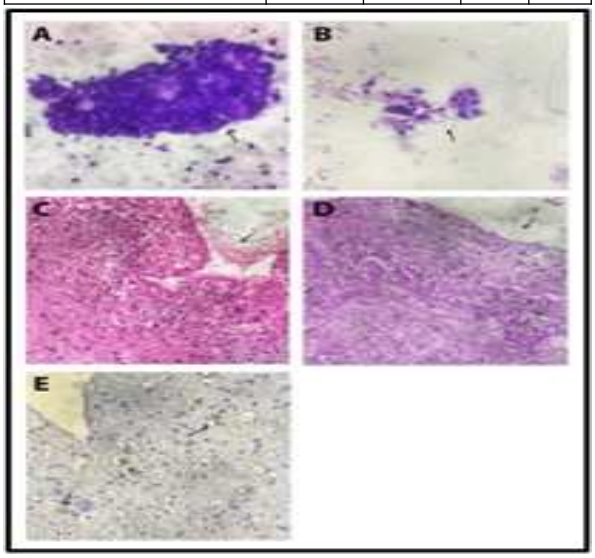

Figure 1:- A. Squamous cell carcinoma, conventional smear, Leishman stain (100X), **B.** Squamous cell carcinoma, conventional smear, PAP stain (100X), **C.** Squamous cell carcinoma, Cell Block, H&E stain (100X), **D.** Squamous cell carcinoma, Cell Block, PAS stain (100X), **E.** Squamous cell carcinoma, Cell Block, PanCK stain (100X)

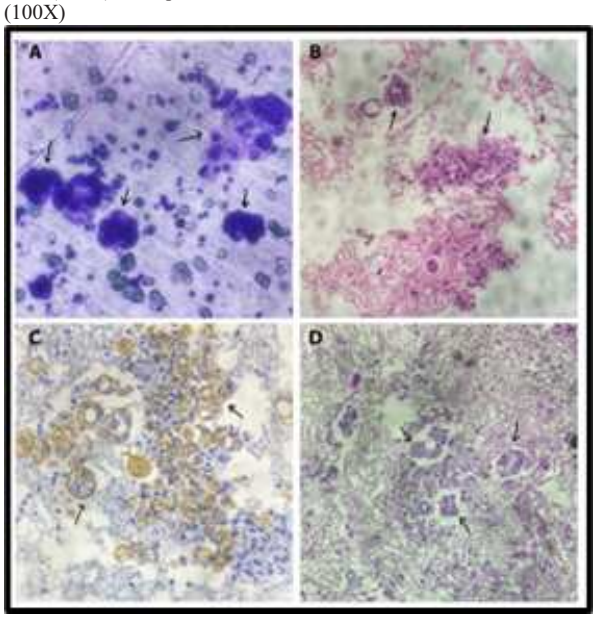

Figure 2: - A. Adenocarcinoma, conventional smear Leishman stain (100X), **B**. Adenocarcinoma, Cell Block, H&E stain (100X), **C**. Adenocarcinoma, Cell Block, PanCK stain (100X), **D**. Adenocarcinoma, Cell Block, PAS stain (100X)

DISCUSSION

The present study with 101 cases, had 44% pleural fluid, 46% peritoneal fluid, 8% of BAL and 2% pericardial fluid. Majority cases in all samples was benign non-specific inflammation. Moreover, out of 24 malignant cases the majority of adenocarcinomas were found in peritoneal fluid and majority of squamous cell carcinomas were found in pleural effusion and BAL.

For prognostic and diagnostic purposes, cytological analysis of these exfoliative materials is crucial. As seen in result CS although being an easy process has low success rate in diagnosing the disease due to paucity of cells. In our technique we used 10% alcohol-formalin as a fixative which was easy prepare and readily available even in small setups. This technique helped us to obtain better cellularity as confirmed in our results.

An increase in the occurrence of malignancies among the elderly is shown by the fact that 59% (60/101) of the cases in the present study occurred in people between the ages of 41 and 60. This result was similar to the studies conducted by Bansode et al, Padmavathi et al, Raghuwanshi P et al, Udasimath et al & Dehariya et al but on the contrary Datta P et al & Dey et al shows majority cases in 61-70 years (25% {26/104}) age group [1,3,6,7,8,9].

Additionally, the current study demonstrated that CB had higher cellularity and diagnostic yield than CS, which is in line with results from prior investigations[1,2,3,6,7,8,9,10,11,12,13,14,15,16,17].

Comparison Of Various Studies About Primary In Metastatic Effusion Is Given Below.

Sl. No.	Primary Site	Present study			Katti et al[12]			Udasimath et al[6]		
		M	F	Total (%)	M	F	Total (%)	M	F	Total (%)
1.	**Ovary**	0	2	2 (8%)	0	2	2 (7%)	0	5	5 (22%)
2.	**Breast**	0	1	1 (4%)	0	1	1 (4%)	0	3	3 (13%)
3.	**Lung**	3	0	3 (12%)	4	0	4 (15%)	1	1	2 (9%)
4.	**GIT**	1	0	1 (4%)	3	0	3 (11%)	1	2	3 (13%)
5.	**Liver**	3	0	3 (12%)	3	0	3 (11%)	0	1	1 (4%)
6.	**Others**	0	0	0 (0%)	0	0	0 (0%)	1	1	2 (9%)
6.	**Unknown**	8	6	14 (60%)	11	3	14 (52%)	3	4	7 (30%)
	Total	15	9	24 (100%)	21	6	27 (100%)	6	17	23 (100%)

As previous research has also verified, these tumors displayed relatively few malignant characteristics in CS, making CB an effective technique for detecting malignancy overall [1,2,3,6,7,8,9,10,11,12,13,14,15,16,17].

Architectural features such as papillae, glands, sheets, dispersed cells, cell balls, and clusters are crucial for identifying different types of malignant lesions. Compared to CS, architectural pattern was more clearly retained in CB in the current study. Similar results were found in other studies [2,6,12]. Background elements like haemorrhage, necrosis and degenerating cells may help in diagnosis, but sometimes it may obsure the cell of interest during diagnosis. Background components that obscured the cellular features in the current investigation were less prevalent in CB than in CS. Similar results to our work were found in Katti et al. and Udasimath et al., although in Bista et al., obscuring background was more noticeable in cell block formation[6,11,12].

CONCLUSION

According to the study's results, CB is a more accurate diagnostic modality with a higher diagnostic yield. If CS is performed, it should always be accompanied with CB, which helps with more accurate diagnosis. The most impacted age groups were those aged 41–60 years, followed by those aged 21–40 years, and those aged 61–80 years and males were most commonly affected. The characteristic architectures were more predominantly seen in CB. The cellularity & diagnostic yield increased markedly in CB. The majority of malignant cases out of 24 malignancies determined by cell block preparation were from pleural fluid, followed by peritoneal fluid. This study will undoubtedly pave the way for more exfoliative fluid cytology research in the future.

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