International Journal of Clinical and Diagnostic Pathology

ISSN (P): 2617-7226
ISSN (E): 2617-7234
www.patholjournal.com
2020; 3(1): 30-33
Received: 15-11-2019
Accepted: 19-12-2019

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Study to assess the effectiveness of cell block technique in analysis of pleural fluids among pleural effusion cases attending a private teaching Hospital, South India

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DOI: https://doi.org/10.33545/pathol.2020.v3.i1a.150

Abstract
Introduction: Cell block is a useful method to evaluate pleural effusion by enabling observation of tissue morphology and also additional sections that are useful for special stains and immunochemistry. Because of its safe and easy collection, pleural fluid cell block is considered an alternative to pleural tissue, especially if the patient not eligible for surgery or biopsy. The cell block technique now takes an intermediate position between histological and cytological examination. So the aim of this study is to know the effectiveness of cell block technique over the conventional smears in pleural fluid analysis.
Methodology: It is a prospective study conducted for a period of 5 months from 1st August 2019 to 31st December 2019 in the Department of Pathology, RVM Institute of medical sciences and Research Centre. During this period, total 50 cases of pleural effusion which were admitted in medical ward of RVMIMS&RC hospital. Pleural fluid samples obtained from aspiration of all the admitted pleural effusion cases are analyzed during the above period.
Results: Out of the total 50 cases included in this study, males were 35 and female were 15 contributing 60% and 40% respectively. Males are more than females. Age range of the study participants was from 20-70 years, with the dominant age group being 31-40 years. In the present study, 16% were diagnosed as malignancy on cell block and only 10% were diagnosed as positive for malignancy on cytosmears.
Conclusion: The present study demonstrates that the pleural fluid cytology cell block techniques are the most useful tests in establishing the diagnosis of pleural effusion. Cytological examination of body fluids is a complete diagnostic modality which aims at pointing out the etiology and prognosis of effusion. But, with the help of cell block technique and it helps in reaching at a near accurate diagnosis.

Keywords: Cell Block, Pleural Effusion, Conventional smears

Introduction
Serous fluid cytology is most preferred investigation. Cytology of serous fluids is having utmost importance not only in detecting cancer cells, but it also provides information regarding various inflammatory conditions with regards to serous membranes, bacterial, viral, fungal infections and parasitic infestations.[1]The accurate identification of cells as malignant or reactive mesothelial cells is a diagnostic problem by cytological smears. A new method of cell block preparation by using 10% alcohol - formalin as a fixative is used, to know the sensitivity between conventional smear study and Cell Block studies. Cell blocks prepared from residual tissue fluids and fine-needle aspirations can be useful adjuncts to smears for establishing a more definitive cyto-pathologic diagnosis. They are particularly useful for categorization of tumors that otherwise may not be possible from smears themselves. There are many studies done to compare the effectiveness of cell blocks with that of smears from fine needle aspiration materials, but only limited studies in the case of serous fluids[2].Although pleural biopsy and pleural effusion cell block are both useful for the diagnosis of malignancy, there are only few studies that compared the diagnostic utility between pleural biopsy and the corresponding pleural effusion.[3]Therefore, it remains unclear whether pleural effusion cell block is a useful diagnostic alternative to pleural biopsy for malignancy. Hence the aim and objective of this study is to assess the diagnostic utility of cell block technique versus conventional cytosmear, in pleural fluids.

Methodology

It is a prospective study conducted for a period of 5 months from 1st August 2019 to 31st December 2019 in the Department of Pathology, RVM Institute of medical sciences and Research centre. During this period, pleural fluids obtained by aspiration were analysed. A total of 50 cases of pleural effusion and their pleural fluids are analyzed during the above period.

Inclusion criteria

Fresh fluid samples which are obtained within 2 hours were taken for cytological examination.

Exclusion criteria

Inadequate fluid and Samples obtained after 2 hours of pleural tap were discarded.

Statistical analysis is done by entering the data in Excel and results were expressed as percentages.

Results

Out of the total 50 cases included in this study, males were 35 and female were 15 contributing 60% and 40% respectively. Males are more than females. Age range of the study participants was from 20-70 years, with the dominant age group being 31-40 years.

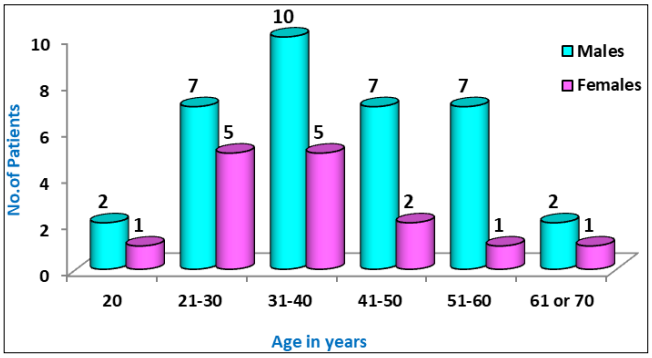

Fig 1: Showing age & sex distribution of the study participants

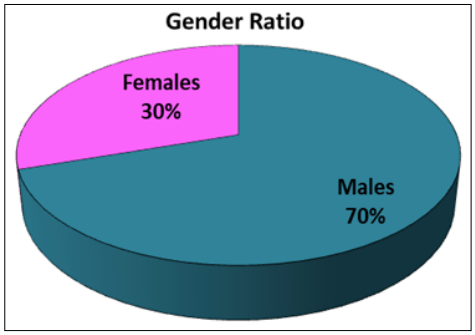

Fig 2: Showing gender ratio among study participants

Table 1: Type of Sample after aspiration/tapping of pleural cavity among study population

Color of pleural fluid	Total number of cases
Non-hemorrhagic fluid	37
Hemorrhagic	13

On physical examination 13/50 (26%) were hemorrhagic on appearance.

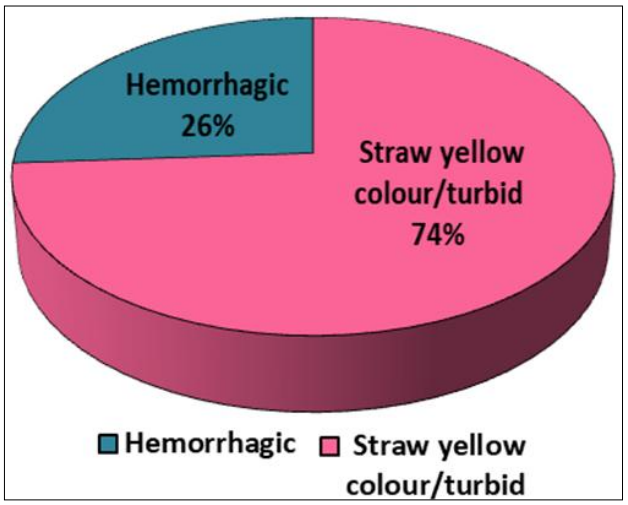

Fig 3: Showing the predominant sample type after aspiration among study population

Table 2: Laterality of pleural effusions in study population

Side	Males	Females	Total
Right	20	10	30
Left	10	6	16
Bilateral	3	1	4
Total	33	17	50

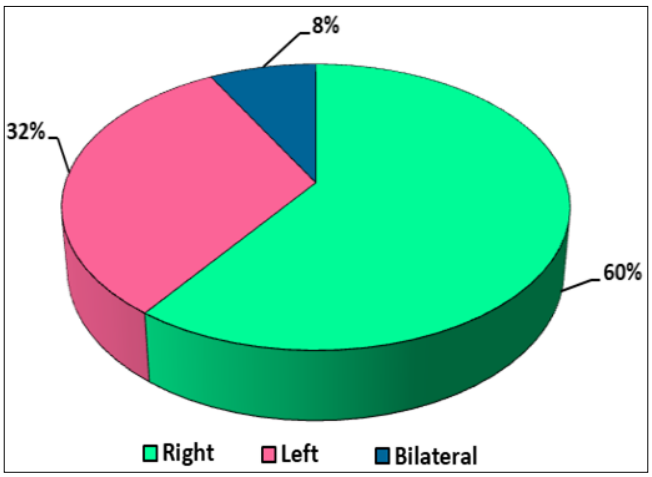

Fig 4: Showing laterality of pleural effusion among the study population

Table 3: Type of diagnosis arrived from cytosmear

Sl. No.	Diagnosis	No of cases	Percentage
1	Benign/inflammatory	31	62
2	Suspicious of malignancy	14	28
3	Malignancy	05	10
	Total	50	100

On conventional smear method, benign/inflammatory condition cells are 62% which outnumbered malignancy that is only 10%, followed by suspicious for malignancy 28%.

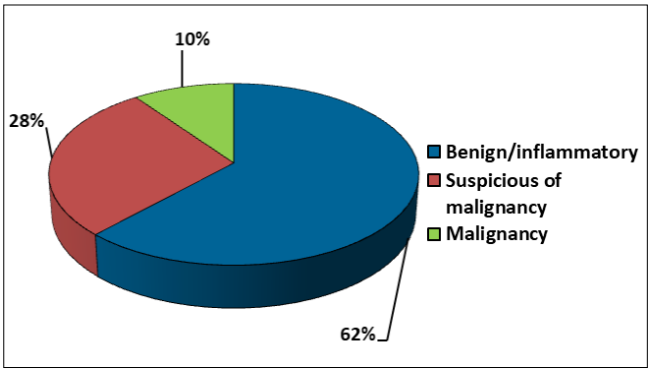

Fig 5: Type of Diagnosis arrived from cytosmear

Table 4: Type of diagnosis arrived from cell block

Sl. No	Diagnosis	No of Cases	Percentage
1	Benign/inflammatory	37	74
2	Suspicious for malignancy	0	0
3	Malignancy	13	26
Total		50	100

On cell block method, majority of the cases diagnosed were of benign/inflammation (74%) and then malignancy (26%).

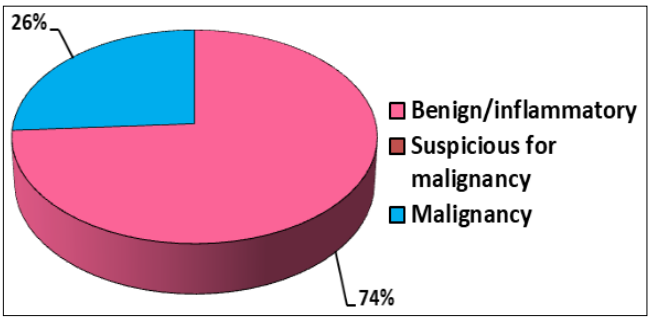

Fig 6: Type of diagnosis arrived from cell block

Discussion

In the present study pleural effusions are studied by using a comparative approach of routine cytosmears and cell block technique methods. We attempted to prepare and analyze all the two techniques from the pleural fluid received and compare the diagnostic efficacy of each of the two techniques. Current study results are similar to the study conducted by Cuneyt tetikkurt *et al*. showing males affected are more than females. Age range from 20 years to 70 years. The oldest patient of 68 years was case diagnosed as malignant pleural effusion, thus emphasizing that malignancy should be suspected in older age group. On gross appearance of aspirates found in this study had 13/50 hemorrhagic fluid. Out of which 10/13 were diagnosed as positive. The above findings stands along with the literature that hemorrhagic fluid should always be viewed in suspicion. In present study out of 50 cases on cytosmear examination 31 cases were diagnosed as chronic inflammatory effusion. Out of 31 cases of chronic inflammation, lymphocytes were predominant cells followed by macrophages and reactive mesothelial cells. 5 cases were of tuberculosis origin out of which 4 presented with only pleural effusion therefore our analyses of pleural fluid with predominance of lymphocytes and supported raised ADA levels helped the patient with the diagnosis. 4 out of 10 cases were known patients of tuberculosis.

In a study by Archana et.al, out of 120 inflammatory cases, 34 (28.3%) were found cytologically to be consistent with the diagnosis of acute inflammation, 2 cases (1.67%) were found to be eosinophilic in nature (> 10% of cells were eosinophils) and 84 (70%) cases were of chronic inflammation with granulomatous lesion seen in 53 (63.1%) cases, whereas non-granulomatous inflammation composed of mainly chronic inflammatory cells in 31 (36.9%) cases. On comparison with other studies with the present study the results are similar and comparable with other studies conducted in case of Conventional Smear versus cell block

Table 5: Comparison of results in other studies vs present study between cytosmear and cell block method

	Archana *et al.*	**Sujathan K *et al.***	**Present study**
Total cases	150	85	50
Inflammatory/TB	77	63	31
Positive for malignancy	29	19	5
Unsatisfactory/negative	10	2	0
Positive for malignancy on cell block	39	21	13

In the present study on conventional cytosmear examination 14/50 cases were suspicious for malignancy. On cell block sections 13 were proven to be malignant whereas in conventional smear only 5 cases were positive for malignancy. Our study had 5/5 (10%) positive of malignancy on cytology. Histopathology confirmed the diagnosis in all the 5 cases.

Out of 150 cases studied by Archana *et al*. [5], 39 (26%) were positive for malignancy by cell block method, while by routine method only 29 samples were reported as positive for malignant cells. Thus, it was found that there was significant difference between the results obtained by direct smears method and cell block method. In the study by Sujathan *et al*., out of 85 samples studied, 21 (24.71%) cell blocks were malignant. Two samples diagnosed as negative for malignancy by smear technique, were diagnosed as malignancy by cell block method. Thus, the use of cell block increased the diagnostic yields of malignancy from 19 to 21 samples. In a study by Meenu Thapar *et al*., [6] combined cell block and smear technique was 13% more diagnostic than that of specimens observed by smears only. In the present study similar results were observed that is on conventional smear the number of positive cases for malignancy was observed in 5(10%) cases when compared with Cell Block method which was 13 (26%) cases.

Conclusion

The present study demonstrates that the pleural fluid cytology cell block techniques are the most useful tests in establishing the diagnosis of pleural effusion. Cytological examination of body fluids is a complete diagnostic modality which aims at pointing out the aetiology and prognosis of effusion. But, with the help of cell block technique and it helps in reaching at a near accurate diagnosis. Cell block technique by using 10% alcohol-formalin as fixative is simple, inexpensive and does not require any special training or instrument. The diagnostic performance of cytological study of fluid may be attributable to the fact that cell population present in sediment is representative of larger surface area than that obtained by needle biopsy. Morphological features were

better identified by Cell block technique, when compared to cytological smear and additional yield of malignancy was more in cellblock method. There is adequate cellularity and delineation of nucleus and cytoplasmic details. Among the inflammatory effusions lymphocytic predominance is noted in majority of cases. Malignant pleural effusion was more common in males; the primary tumor was in the lung. In the present study, 16% were diagnosed as malignancy on cell block and only 10% were diagnosed as positive for malignancy on cytosmears. We conclude that the cell block technique method when used as an adjuvant to routine smear.

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