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Research Article

THE VALUE OF CYTOLOGY IN EVALUATION OF COELOMIC FLUIDS

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A R T I C L E I N F O

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A B S T R A C T

Introduction: Abnormal collection of fluids in pleural and peritoneal cavity constitutes to one of the major causes of morbidity often presenting as a common diagnostic dilemma. Exfoliative cytology is a cost effective, and rapid tool for the evaluation of body fluids.

Aims and objectives: To determine the diagnostic yield of fluid cytology to reach the etiological diagnosis of pleural and peritoneal effusion.

Material and Methods: This was a prospective study conducted on 62 patients of pleural and peritoneal effusion during the period of 6 months between January 2017 to June 2017 presenting to the department of Pathology, Faculty of Medical and Health Sciences, SGT University, Gurgaon.

Result: Out of 62 fluids analysed 36 were pleural and 26 were peritoneal. Most common age of presentation was 21-30 years for pleural effusion and 41-50 years for ascites with male predominance. Most common etiology was tuberculosis (63%) for pleural fluids and chronic liver disease (38.4%) for peritoneal fluids. Fluids were predominantly exudative (80% pleural and 41.6% peritoneal). On cytology most common cases were of chronic effusion (86.1% pleural and 76.9% peritoneal) followed by inflammatory and malignancy.

Conclusion: Cytological examination of fluids is a simple and minimally invasive step in the diagnostic work up of patients. It has high diagnostic sensitivity and helps the clinician in formulating the correct algorithm for treatment purpose.

INTRODUCTION

In healthy individuals the pleural and peritoneal cavities are lined by a single layer of mesothelial cells and contain a small amount of serous fluid. Serous effusions occur when an excessive amount of fluid accumulates in these cavities.[1] It constitutes to one of the major causes of morbidity in India and other parts of the world.[2] Tuberculosis is the most common cause of pleural effusion in our country. Every year approximately 18 lakh people develop tuberculosis and about 4 lakh die from it.[1] Ascites occurs because of conditions directly involving the peritoneum (infection, malignancy) or diseases remote from the peritoneum (liver disease, heart failure, hypoproteinemia). Cirrhosis liver is the commonest cause, with malignancy and less frequently cardiac failure and tuberculosis, peritonitis being responsible for most other cases.[3] Diagnosis of effusion requires a proper clinical, radiological, histological evaluation along with cytological study.

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Aspiration of fluid is a simple and relatively non-invasive technique.[4] Thoracocentesis and paracentesis can be safely performed to collect the fluid from pleural and peritoneal cavity respectively.[5] Fluid cytology is a cost effective, rapid and highly efficient tool for the evaluation of body fluids. The information provided by body fluid analysis serve several functions as it assists the clinician in formulating in order of priority of differential diagnosis and also allows one to follow the result of therapy.[6] In this study an attempt has been madeto determine the diagnostic yield of fluid cytology to reach the etiological diagnosis of pleural and peritoneal effusion.

MATERIAL AND METHODS

A prospective study conducted on 62 patients of pleural and peritoneal effusion during the period of 6 months between January 2017 to June 2017 presenting to the department of Pathology, Faculty of Medical and Health Sciences, SGT University, Gurgaon. A detailed clinical history of the patient was taken and clinical examination was done. Fluids from pleural and peritoneal cavity were obtained by thoracocentesis and paracentesis performed by the clinician and analysed for cytological diagnosis. The samples were processed fresh. If the fluid was haemorrhagic then 2% glacial acetic acid was used

as a hemolysing agent. A cell count was performed with the help of improved Neubauer chamber. Microbiological examination was done by Gram staining and Ziehl - Neelsen staining. Biochemical analysis of the fluids was done according to the Light's criteria, according to which exudative effusions will have at least one or more of the following:

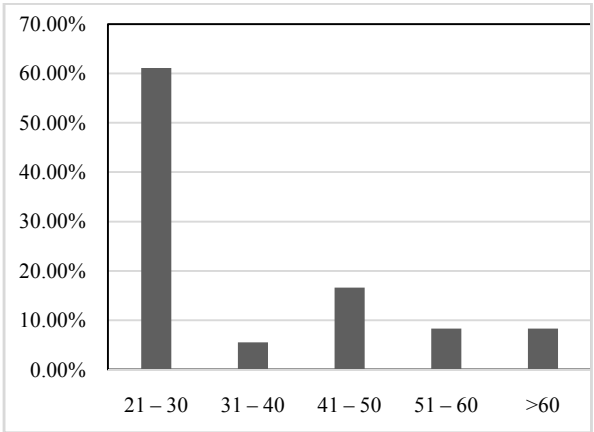
- Fluid protein / Serum protein >0.5.
- Fluid LDH / Serum LDH >0.6.
- Fluid LDH > 2/3 the upper limit of laboratory reference of serum LDH

The fluid was centrifuged for 10 minutes at 2000 rpm (revolution per minute). The sediment was transferred to a clean glass slide and evenly spread as a smear. Smear so prepared was stained with Giemsa stain. In required cases cell block preparation was done for which the fluid specimens were fixed in a solution of alcohol: formalin (9 parts of 90% alcohol and 1 part of 7.5% formalin) for one hour. After fixation, the specimen was centrifuged at 2500 rpm for 10-15 minutes. The supernatant was poured off and a further 3ml of fresh alcohol-formalin was once again added to the sediment and kept for one day. Next day the sediment was completely drained off by inverting the tube over Whatman filter paper. The sediment was then wrapped in the same filter paper and processed in histokinette as part of routine paraffin section in histopathology. Staining with special stains including Periodic Acid Schiff, Alcian blue and Papanicolaou was done. All such stained smears were mounted with a cover slip using DPX. Each individual slide was objectively analysed for cellularity, arrangement (acini, papillae, cell balls, and proliferation spheres), cytoplasmic, and nuclear details. Then clinical diagnosis and cytological findings of all the cases were correlated

OBSERVATIONS AND RESULTS

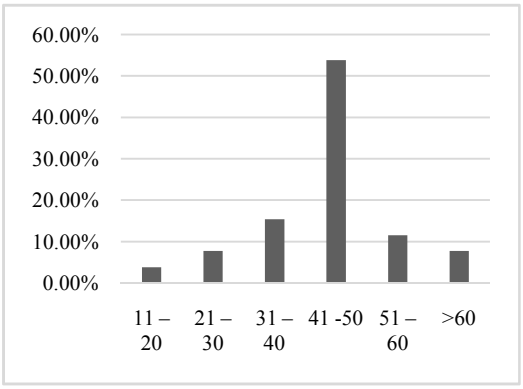
Age and sex distribution of patients with pleural fluid effusion

Age group in years	Male	Female	Total	Percentage%
21 – 30	18	4	22	61.1%
31 – 40	1	1	2	5.5%
41 – 50	4	2	6	16.6%
51 – 60	3	0	3	8.3%
>60	1	2	3	8.3%
Total	27	9	36	100%



Age and sex distribution of patients with ascites

Age group in years	Male	Female	Total	Percentage%
11 – 20	1	0	1	3.8%
21 – 30	0	2	2	7.7%
31 – 40	3	1	4	15.4%
41 -50	10	4	14	53.8%
51 – 60	2	1	3	11.5%
>60	2	0	2	7.7%
Total	18	8	26	100%



Type of fluid	Transudate	Exudate	Total no. of cases
Pleural fluid	7(19.4%)	29(80.5%)	36
Peritoneal fluid	15(58.4%)	11(41.6%)	26
Total	22(35.5%)	40(64.5%)	62

Distribution of presenting complain in patients with pleural fluid

Clinical features	No. of cases	percentage
Fever +cough +chest pain	7	19.4%
Swelling in lower limbs	3	8.3%
Chest pain +cough + shortness of breath + loss of appetite	26	23.2%
total	36	

Distribution of presenting complain with ascites

Clinical features	No. of cases	percentage
Abdominal distension +swelling in lower limbs +yellowish discoloration of sclera	10	38.4%
Abdominal distension =swelling in lower limbs +loss of weight	2	7.6%
Fever + abdominal distension +pain in abdomen +breathlessness	14	53.8%
total	26	

Distribution of patients of pleural fluid on the basis of clinical diagnosis

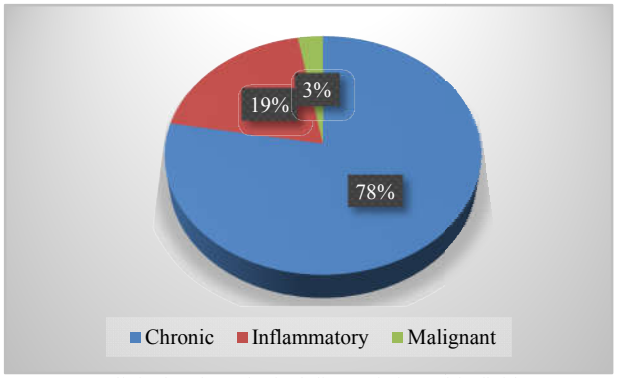
Clinical diagnosis	No. cases	percentage
Tuberculosis	23	63.8%
Paraneumonic	6	16.6%
Filariasis	1	2.7%
Malignancy	1	2.7%
COPD(chronic Obstructrive pulmonary diseases)	3	8.3%
Congestive cardiac failure	2	5.5%
total	36	

Distribution of patients of ascites on the basis of clinical diagnosis

Clinical diagnosis	No. of cases	Percentage%
Cirrhosis of liver	10	38.4%
Abdominal TB	6	23%
Hepatitis B	2	7.6%
AcuteAbdomen	3	11.5%
Malignancy	3	11.5%
Congestive Cardiac failure	2	7.6%
total	26	

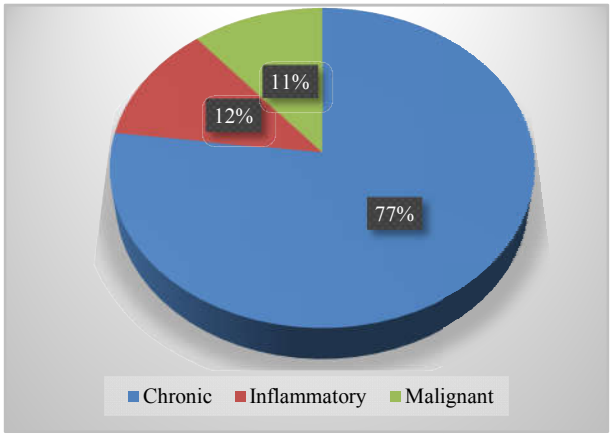
Clinical and cytological diagnosis in pleural fluid

Clinical diagnosis	Cytological findings		
	Chronic	Inflammatory	Malignant cells
Tuberculosis	23		
Paraneumonic		6	
Filariasis		1	
Malignancy suspected			1
COPD	3		
CCF	2		
Total	28(77.8%)	7(19.4%)	1(2.8%)



Clinical and cytological diagnosis in ascitic fluid

Clinical diagnosis	Cytological findings		
	Chronic	inflammatory	malignant
Chronic liver disease	10		
Abdominal TB	6		
Hepatitis B	2		
Acute abdomen		3	
Malignancy suspected			3
CCF	2		
Total	20(76.9%)	3(11.5%)	3 (11.5%)



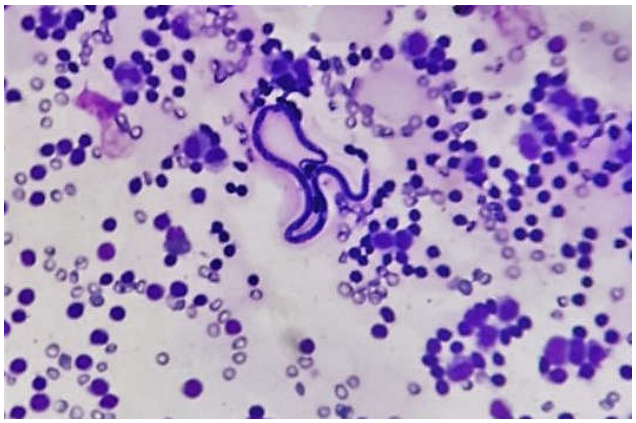


Figure 1 Microfilaria in pleural effusion (Giemsa stained smear 400x)

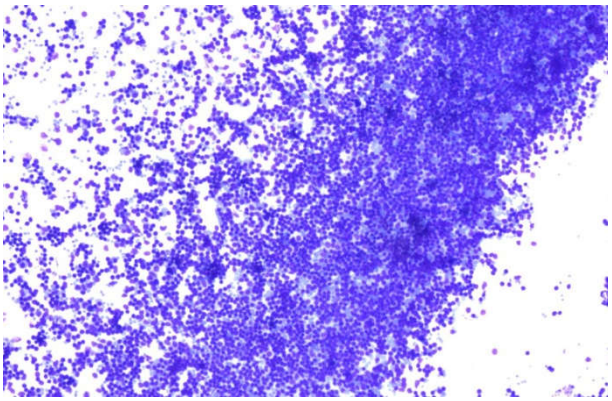


Figure 2 Effusion showing predominantly lymphocytes (Giemsa stained smear 100x)

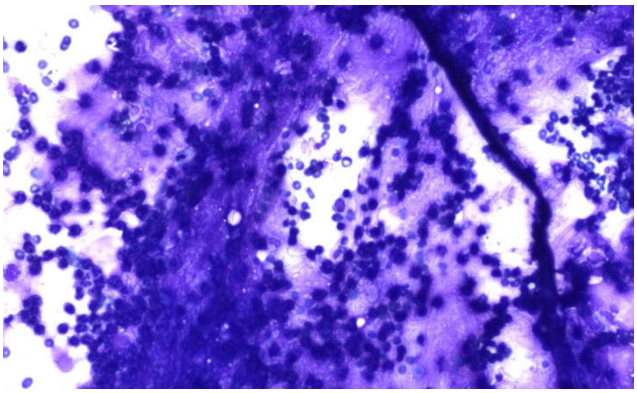


Figure 3 Effusion showing predominantly neutrophils (Giemsa stained smear 100x)

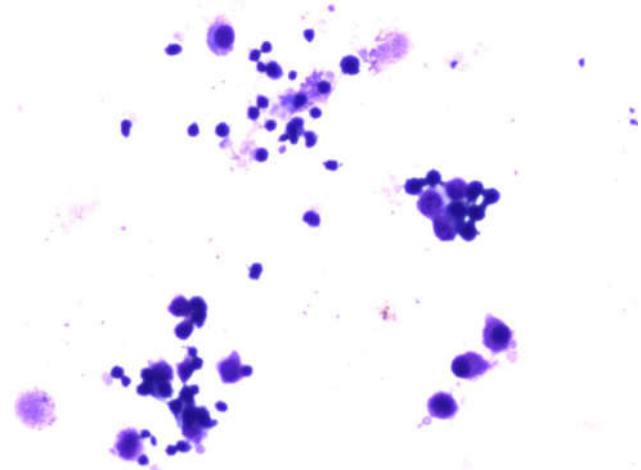


Figure 4 Effusion showing mesothelial cells with lymphocytes (Giemsa stained smear 400x)

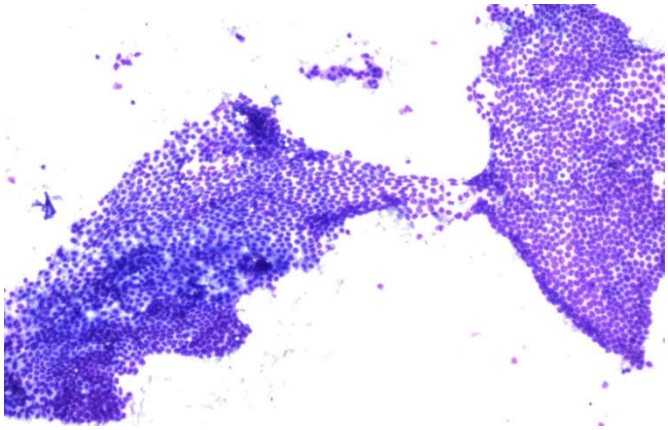


Figure 5 Sheets of malignant cells (Giemsa stained smear 100x)

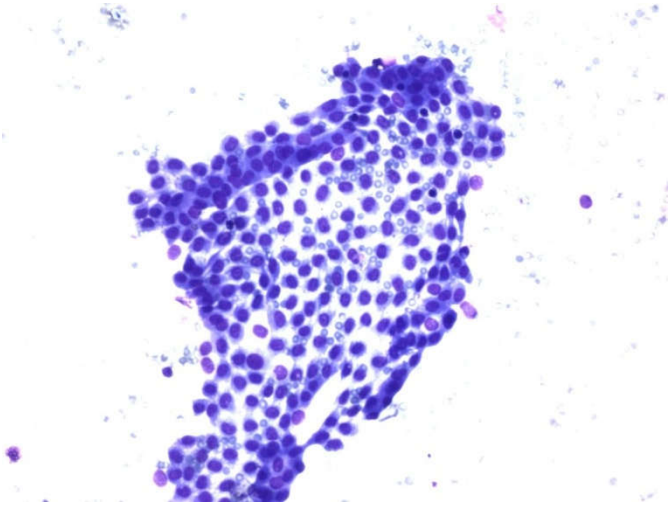


Figure 6 Sheets of malignant cells (Giemsa stained smear 400x)

DISCUSSION

Fluid analysis and cytology remains the main stay for diagnosing various diseases. Both malignant and non-malignant cases of effusion can be identified by relative technique of fluid cytology.[7] Cytologic examination of body fluids have been universally recognized as the important diagnostic tool in the recognition of malignant tumors in effusions.[8] It may give information about the cause, presence of metastatic cells, typing of unknown cases, and the primary tumor sites when unknown or detection of possible recurrence of malignancy in follow-up patients.[9] In malignant disease, the cytological examination of fluid is by far more accurate than a pleural biopsy. In infectious diseases, particularly in tuberculosis, the pleural biopsy is superior to cytologic examination.[10] Immuno-cytochemistry is an essential adjunct to cytomorphology in selected cases and substantially improves diagnostic accuracy.[11] The cytological examination of fluids by means of smears, even though carefully prepared, leaves behind a large amount of residual fluid, that is not further investigated but that might contain valuable diagnostic material. This residual material can be evaluated by treating it as cell block in a simple and expedient fashion, and examined in addition to the routine smears.[12]

Out of 62 fluids analysed maximum cases were of pleural effusion (58%) and remaining were of peritoneal effusion. Maximum cases showed male preponderance (75% cases of pleural effusion and 69.2 % of ascites). These findings are comparable with the study of Kumavat *et al*[13] and Agrawal T *et al*[14].

Majority of the fluids were exudative 64.5%. This result is similar to the study of Agrawal T *et al*[14] in which exudates were more common (76%) than transudates.

In the present study most common age of presentation was 21-30 years for pleural effusion and the most common etiology was found to be tuberculosis. As India is prevalent country for it so it is common among young age groups. This result is comparable to the study of Parikh P *et al*[15].

80.5% of pleural fluids were exudative which is similar to the study of Kumavat *et al*[13] (81.5%), Valdes[16] (74.31%), Ram KN[17] (67.5%), Amethiya P[18] (94%), Parikh P[15](91%). This can explained by the fact that pleural effusion in India with exudative etiology is more prevalent.

Pleural effusion is caused by pulmonary or non pulmonary diseases. Although the etiologic spectrum is wide, most effusions occur due to tuberculosis, malignancy, heart failure or bacterial infections[19,20,21]. In the present study incidence of tuberculous effusion was (63%) followed by other inflammatory causes (34%) and malignancy (3%) which is comparable with the study of Thiruvengadam[21] (64%), Amethiya P[18](68%), Alusi *et al*[7] (38%) which were done in India. While in various other studies incidence of tubercular pleural effusion was low, which can be explained by the fact that tuberculosis is more prevalent in India.

Filaria is still a major health problem in many endemic areas of India, especially along the sea coasts and along the banks of major rivers. Filarial parasites have been isolated only in few cases of pleural effusion.[22,23] Ours was one such case of Filarial pleural effusion. Filarial effusions are mostly chylous in nature due to leakage of chyle from the occluded thoracic duct whereas non-chylous are rare.[24] In our case, it manifested as an exudative pleural effusion which responded to treatment with Diethylcarbamazine. Also similar study was done by Navaz *et al* [25] in which pleural effusion of filarial etiology was detected.

On cytology most common cases of pleural effusion were of chronic effusion (86.1%) followed by inflammatory and malignancy. This result is similar to the study of Anita B *et al*[4] in which out of 31 cases of pleural effusion 24 cases (77.4%) were of chronic effusion.

The most common etiology for ascites was chronic liver disease (38.4%) which is comparable to the study of Anita B *et al*[4] in which out of 34 cases of ascites, 24 cases were diagnosed as chronic liver disease (70.6%). Similarly in the study done by Hwangbo *et al*[26] the frequency of cirrhotic ascites was 59.6%. This can be explained by the fact that liver cirrhosis is the leading cause of ascites, especially alcoholic cirrhosis has significantly increased. Maximum cases of peritoneal effusion were transudative (58.4%). This result is comparable to the study of Kumavat *et al*[13] in which 76% cases of ascites were transudates.

On cytology most common cases of ascites were of chronic effusion 76.9% followed by inflammatory and malignancy.It is in concordance with the study of Anita B *et al*[4] in which out of 34 cases of ascites 94.1% were of chronic effusion.

In a patient with acute abdominal pain, abdominal paracentesis and diagnostic peritoneal lavage often yield fluid samples for

cytologic and biochemical examination. Cytology of a patient with acute abdominal diseases can be a crucial tool for the rapid diagnosis necessary for initiation of timely and appropriate therapy.[27]

CONCLUSION

Tuberculosis is the most common cause of pleural effusion and chronic liver disease is the most common cause of ascites. Tuberculous effusion was more common in younger age group (below 40 years) while malignant effusion was more common in older age group. Lymphocytes were predominantly seen in patients with chronic effusion. Fluid cytology is a useful, rapid and a highly sensitive method for the diagnosis of effusions. While reviewing all the results, it is concluded that cirrhosis is the most common cause of ascites while malignancy is the least common cause. The exudative ascites is seen with tubercular, acute infective and malignant ascites, while the transudative ascites as seen commonly with cirrhotic ascites. Cytological examination of fluids is a simple and minimally invasive step in the diagnostic work up of patients. It has high diagnostic sensitivity and helps the clinician in formulating the correct algorithm for treatment purpose. Integration of fluid cytology with clinical and laboratory findings further increases the diagnostic yield. In developing country like India where health facilities are inadequate and cost of investigations and management in often unaffordable, fluid analysis and cytology should continue to be the first line of investigation to screen out the malignant and suspicious for malignancy effusion cases.

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