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RESEARCH ARTICLE

A Diagnostic Approach on Pleural Fluid Analysis

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Abstract: **Introduction:** Collection of an abnormal quality and quantity of fluid in the pleural cavity is called pleural effusion. Cytological analysis of pleural effusions plays an important role in the diagnosis of various lesions. **Aims & Objectives:** To evaluate the utility of pleural effusion cytology as an attempt to diagnose the underlying etiology **Study design:** A cross-sectional study **Study period;-** Two years duration from February 2023 to February 2025 **Sample size;-** Fifty-three case. **Materials and methods:** Pleural fluids received for cytological analysis from all the departments were included in the study. After a thorough physical examination, microscopic evaluation was done. The smears were stained with Giemsa, Papanicolaou stain and Haematoxylin and Eosin Stains. Ziel Nielson stain was done in suspected cases of tuberculosis. **Inclusion criteria:** All the cases of pleural fluids received in department of cytology. **Exclusion criteria:** Consent not given.**Results;** Total fifty-three (53)cases of pleural effusion were evaluated out of which 61% of patients were males and 39 %were females. Out of 53 cases 56% showed right sided pleural effusion, 25 % showed left sided pleural effusion and 19 % showed bilateral pleural effusion. All the smears were screened for malignancy and resulted in 13% of positive cases.

Keywords: Pleural fluid, Utility, approach.

INTRODUCTION

Cytological study of body fluids is simple, inexpensive and preliminary investigation for the diagnostic evaluation and aids the clinician to make the diagnosis (1). Pleural effusion is the accumulation of fluid in the pleural cavity (A space between the parietal and visceral pleura). Pleural fluid analysis provides information regarding pathological process whether reactive, infectious or neoplastic aetiology. Cytology of pleural fluid is feasible, quick and safe investigation especially in diagnosis of cancer and for staging and prognosis of the patient. The study of pleural fluid is of at most importance in identifying atypical cells in effusions which helps in identifying the spread of the disease process in the body.

Aim To evaluate the diagnostic utility of pleural fluid cytology

Objectives

1.To study the age and sex incidence of pleural effusions

2.To diagnose inflammatory, neoplastic, infective or immune mediated lesions in pleural fluid

3. To differentiate neoplastic and non-neoplastic lesions in pleural fluid

4.To subtype malignant lesions in pleural fluids

MATERIALS AND METHODS

It is a prospective study of two years duration conducted in department of pathology, ASRAMS, Eluru. We received samples for cytology along with requisition form which included clinical details along with other supportive investigations. Physical examination of fluid for volume, colour and odour was done. The sample was centrifuged for five minutes at 2000 rpm. Smears were prepared from the drop of sediment after discarding the supernatant.

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RESULTS

Table 1: Distribution of the sample by Age and Sex

Age range	No of males	Percentage of males	No of females	Percentage of females	Total	Percentage
0-10 yrs	-	-	-	-	-	-
11-20yrs	1	3%	4	19%	5	22%
21-30 yrs	0	-	1	4%	1	4%
31-40 yrs	4	12%	3	14%	7	26%
41-50yrs	4	12%	1	4%	5	17%
51-60 yrs	6	19%	5	23%	11	42%
61-70 yrs	4	12%	5	23%	9	35%
71-80yrs	11	34%	2	9%	13	43%
81-90yrs	2	6%	0	0	2	6%

Table 2: Types of effusions

Type of lesions	Number of lesions
Non-Specific	Seventeen (17)
Acute suppurative inflammation	Two (2)
Tuberculous effusion	One (1)
Malignant effusion	Six (6)
Reactive effusion	Twenty-Six (25)
Fungal effusion	Two (2)

Table 2: Distribution of Non- Neoplastic Effusion

Distribution of non-neoplastic effusion	Number	Percentage
Changes of acute inflammation	Two (2)	7.40%
Changes of chronic inflammation	Twenty-five (25)	92.5%
Total	Twenty-seven	100%

Table 3: Cytodiagnosis of pleural fluid effusion

Sex	Non-Neoplastic Number (percentage)	Neoplastic Number (percentage)	Total Number	Total Percentage
Male	27	5	32	60.3%
Female	19	2	21	39.6%
	36	7	53	100%

Table 4: Distribution of Neoplastic effusion with primary identified.

PRIMARY ORGAN	Number	Percentage
Metastasis from Ovary	one	14%
Metastasis from lung	one	14%

DISCUSSION

The most common pleural disease affecting patients in India is Pleural effusion (2). The cause may lie within lung parenchyma, pleura, or may be due to systemic disease. There may be infections (tuberculosis or bacterial), pulmonary emboli, lymphatic blockade which may cause pleural effusion. The etiological spectrum of pleural effusion includes malignancy and heart failure (10). Pleural fluid aspiration and cytology is a valuable diagnostic tool in finding out the underlying cause of effusion. Primary versus metastatic malignancy can be made out in pleural fluid cytology. Adenocarcinomas were diagnosed with cytology as the cell population is abundant, whereas the yield is less in squamous cell carcinomas, Hodgkin's disease and sarcomas (3). The most common type of tumour to produce metastasis in pleural cavity is the broad group of adenocarcinomas, most often from lung and common are from breast, Gastrointestinal tract. Tissue biopsies are imperative for diagnosis in lymphomas. The advantage of cytology is that it has better scope for retrieval of malignant cells than needle biopsies. It also represents cells from larger representative area than needle biopsies. The diagnostic yield of the cytological analysis may be attributable to the cell population present in the sediment that is representative of much larger surface area than the pleural biopsy.

In the present study out of fifty-three cases of pleural effusion, forty-six cases effusions were non- neoplastic exudates, seven cases were

neoplastic transudates. In the study of Prashant et al non neoplastic lesions were common (5). Non neoplastic lesions were more common compared to neoplastic lesions in our study. The present study correlated with Prashant et al 2015 and in concordance with Gojiya P and Ishan Arora et al. Most common non -neoplastic lesion is chronic inflammatory. The lesions had predominantly lymphocytes in 80% of cases and 20% of cases with lymphocytes and histiocytes. Similar findings were noted by Priavadhana Rajan Prasad et al (6). The chronic inflammatory exudates are commonly caused by infection of the organs involved by serosal membranes or occasionally by tumours of these organs (Priavardhana et al 2016). We had total of twenty-five (92.5%) cases in our study. Male comprised the majority with male to female ratio of 1.5:1, which is in concordance with studies conducted by Gojiya P (7), Rasik Hathila et al (8), Priyanka Kiyawat et al (9) and Ishan Arora et al.

Tuberculous effusion revealed predominantly lymphocytes in one case (1), none of the cases had predominantly neutrophils or mesothelial cells. Kushwaha et al (2008) and PV Kumavat et al (2013) documented similar findings in Tuberculosis and Pneumonia (12).

Sear D, Hajdu (1987) and light et al (1973) reported that adenocarcinoma was the commonest malignancy (66% and 58.1%) (10). The present study three cases (43%) correlated with the above author's study. DiBinito et al (1993) reported one case of adenocarcinoma lung with pleural effusion (11).Kumavat et al 2013 reported one case. The present study one case correlated with Kumavat et al study. In present study two (2) cases showed reactive mesothelial cells and mimickers of malignancy. Careful study is needed to rule out underlying cause of malignancy.

Among 360 cases of effusions, fifty-three (53) cases were sent for the detection of malignant cells, of which seven (7) cases were positive for malignant cells. Our study correlated with Kushwaha et al 2008 and PV Kumawat et al 2013 (12). Priyavardhan Rajan prasad et al 2016 reported 41.3% of malignancy in pleural effusions. The present study correlated with above authors.

In the present study one case of squamous cell carcinoma of lung noted in middle aged male. The smears were moderately cellular with sheets of neoplastic squamous cells and occasional multinucleate giant cells. Kumavat et al reported one case of squamous cell carcinoma, similar to our study.

Cell block technique and cytospin are useful in improving cell yield of pleural fluid effusions and ensure higher diagnostic efficiency when cellularity is low. They have better preservation of cellular morphology compared to conventional methods.

The clinical findings alone would not suffice to differentiate Tuberculous effusion from malignant pleural effusion and require more invasive diagnostic interventions. Eosinophils play an important role in idiopathic, allergic conditions, drug reactions and traumatic cases.

CONCLUSION

Though cytological analysis is valuable tool in confirming diagnosis in pleural fluid effusion, other techniques like immunohistochemistry, cytochemistry, proliferation markers and ploidy studies are very useful. Non neoplastic effusions were more common in the present study and among neoplastic lesions adenocarcinoma was the commonest malignancy. Pleural fluid cytology is valuable, cost-effective tool for diagnosing, staging and prognosis, management of the disease.

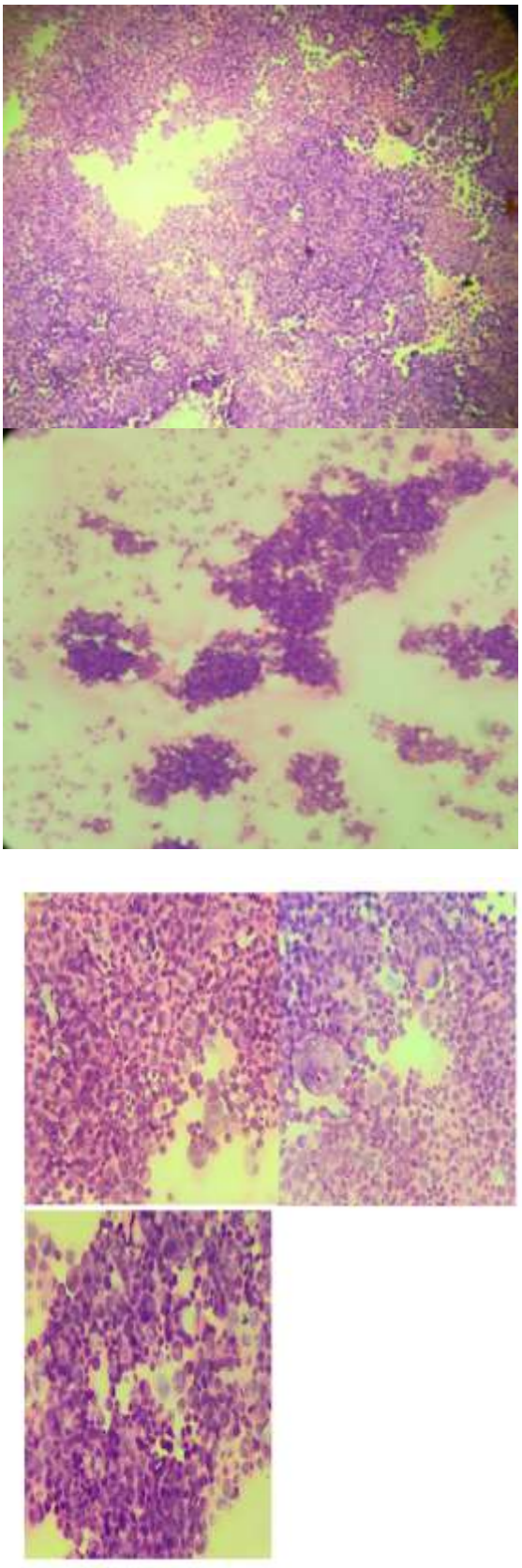

Fig 1 :Adenocarcinoma ,Hematoxylin & eosin stain, cytology x40, x10

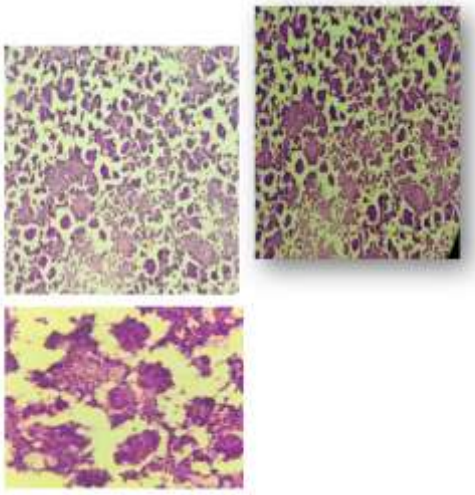

Fig 2:Serous papillary neoplasm, Haematoxylin & eosin magnification x10, x40

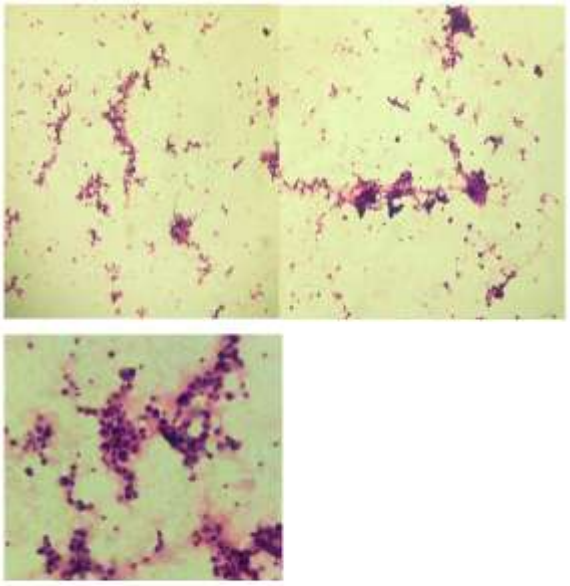

Fig 3:Metastatic carcinoma, Haematoxylin & eosin stain, cytology,magnification X10,X10, x40

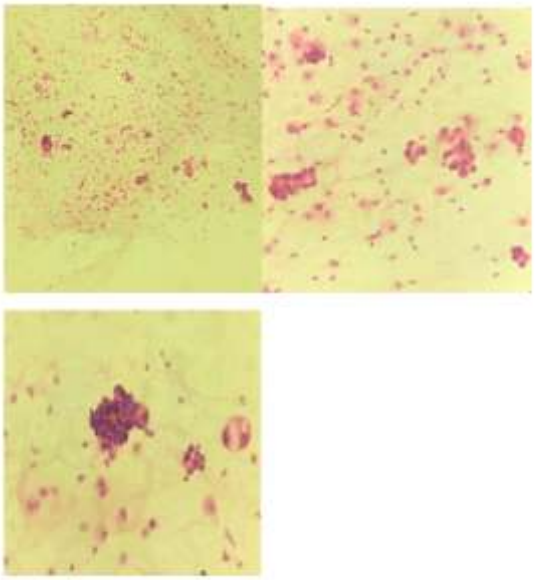

Fig 4:Epithelial malignancy, Hematoxylin & eosin stain, magnification X 10, X40

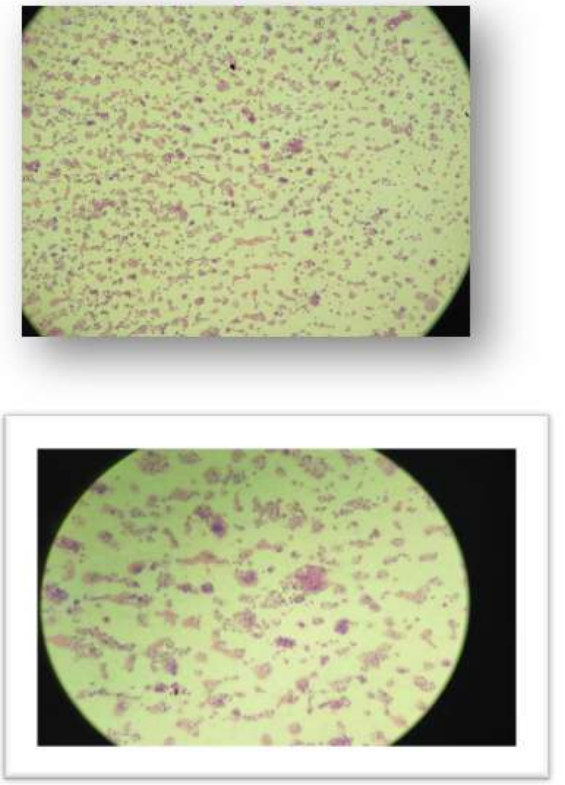

Fig 5: Adenocarcinoma, Haematoxylin & eosin stain, cytology, magnification, x10, x 40

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