

Cytological Study of Pleural Cavity Effusions in a Tertiary Care Hospital

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Abstract

Introduction: The cytological study of pleural fluids is a very simple and relatively non invasive technique, but one of the oldest cytological methods to achieve diagnosis. Cytological evaluation of the pleural fluid is performed mainly to know the presence or absence of malignant cells and to differentiate between transudate and exudates. Determining the etiologic cause of pleural fluid accumulation in pleural cavity is critical for proper treatment of these disorders. *Aim:* The study was conducted to know the analysis of pleural fluid effusion cases in hospital based population, Nanded district, Maharashtra state. To know the proportion of neoplastic and non neoplastic effusions and to know the pleural effusion caused by bacterial, viral and fungal infections (To rule out Transudates or Exudates), in relation to age, sex, clinical complaints and biochemical investigations. *Material and Methods:* The material for this study is obtained from in-patients attending the Dr SCGMC and Hospital, Nanded, Maharashtra. The study includes 265 cases of pleural fluid analysis, that is the cases of pleural effusion received from all departments namely tb-chest, medicine and surgery during the year 2016. *Results:* Out of 265 cases, 249 cases (93.96%) were negative for malignancy and remaining 12 cases (4.53%) were positive for malignancy. Suspicious cases were 4(1.51%). Majority were exudates and adenocarcinomas predominated in number among the malignant cases.

Keywords: Pleural Fluid; Benign; Malignant; Exudates; Mesothelial Cells.

Introduction

An accumulation of fluid in the pleural cavity, called an effusion, results from an imbalance of fluid production and reabsorption [1]. Cytological smear analysis is performed to rule out the presence or absence of benign or malignant cells in the pleural effusions [2]. Distinguishing benign from malignant cellular changes may require meticulous screening, cautious examination of cellular character and an understanding of the range of reactive changes [3]. The distinction between transudates and exudates requires microscopic examination of cellular smears along with biochemical investigations carried out on pleural fluid samples.

Materials and Methods

The material for this study is obtained from in-patients attending the Dr. SCGMC and Hospital, Nanded, Maharashtra. A total of 265 cases of pleural effusion samples received from various departments namely TB Chest, medicine and surgery over a period of one year from January 2016 to December 2016 were included in the study. All the pleural fluid aspirates were subjected to cytological study, duration between collection and processing was more than one hour and not properly preserved pleural fluid specimens were excluded from the study. There after cytological diagnosis was done.

The pleural fluid specimens were studied grossly, findings noted down and then centrifuged for conventional smear (CS) technique at 2500 rpm for 5 minutes. Minimum of 2 smears were prepared from sediments, from each sample and air dried. The air

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dried smears were immediately fixed in 95% alcohol and after fixation stained with Haematoxylin and Eosin stain and studied under microscope and a part of the sample was given for biochemical investigations.

Results

A descriptive statistical analysis was done on the data collected and the results were compiled in a tabulated form.

The number of samples of effusions from males were 66.04% and that from females were 33.96%.

94.29% males had benign effusions and 4% had malignant effusions and 1.71% effusions from males

were suspicious. 93.33% of females had benign effusions and 5.56% of females had malignant effusions and 1.11% cases were suspicious. 75% of effusions were due to adenocarcinomas of lung and 8.33% were due to squamous cell carcinomas of lung and 16.67% cases were metastasis from other sites. Based on protein content 60.38% of effusions were exudative and 39.62% were transudative. Similarly based on sugar content 67.17% of effusions were exudative and 32.83% were transudative. 52.08% of effusions had TLC > 1000 cells /cumm. and 47.92% of effusions had TLC < 1000 cells/cumm. According to serum LDH and fluid LDH levels, the number of exudates, that is the number of samples with fluid LDH > 2/3rd of serum normal LDH levels was 74.72% and the rest were transudates, that is, 25.28%.

Table 1: Sex wise distribution of samples

Sex	No of Cases	Percentage (%)
Male	175	66.04%
Female	90	33.96%
Total	265	100%

Table 2: Sex wise distribution of Cytological diagnosis of Malignant, Benign and Suspicious Cases in Pleural Fluid analysis in Males and Females

Gender	Number of benign cases	Number of malignant cases	Number of suspicious cases	Total
Male	165(94.29%)	7(4%)	3(1.71%)	175(100%)
Female	84(93.33%)	5(5.56%)	1(1.11%)	90(100%)
Total	249(93.96%)	12(4.53%)	4(1.51%)	265(100%)

Table 3: Distribution according to the type of malignancy

Adenocarcinoma	Squamous cell carcinoma	Metastasis from other carcinomas	Total
9(75%)	1(8.33%)	2(16.67%)	12(100%)

Table 4: Distribution of pleural fluid samples according to protein content:

Pleural fluid protein/serum protein >0.5	Pleural fluid protein/serum protein <0.5	Total
160(60.38%)	105(39.62%)	265(100%)

Table 5: Distribution of pleural fluid samples according to sugar content:

Pleural fluid glucose/serum glucose > 0.5	Pleural fluid glucose/serum glucose < 0.5	Total
178(67.17%)	87(32.83%)	265(100%)

Table 6: Distribution of pleural fluid samples according to total leucocyte count:

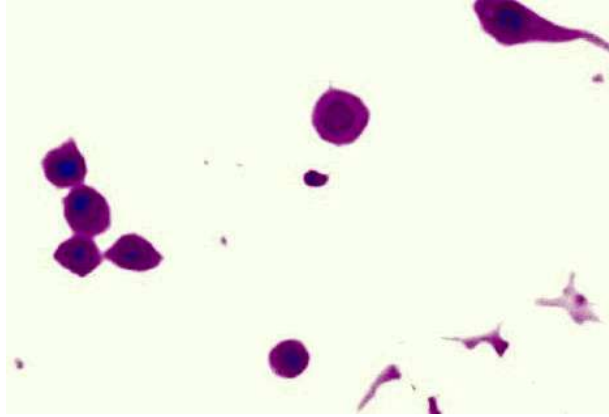
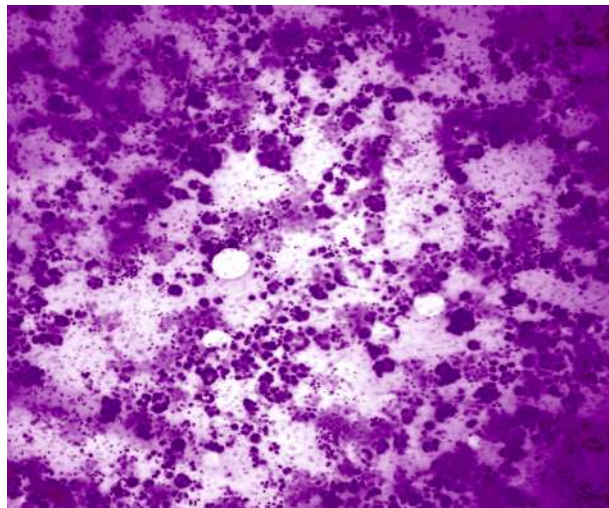
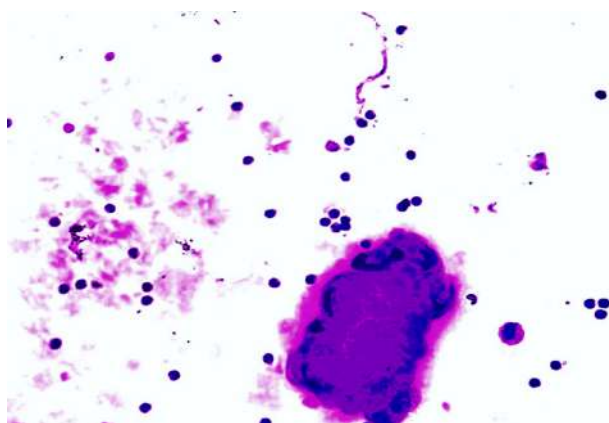
Fluids with TLC >1000cells/cu.mm	Fluids with TLC <1000cells/cu.mm	Total
138(52.08%)	127(47.92%)	265(100%)

Table 7: Distribution of pleural fluid samples according to lactate dehydrogenase(LDH) enzyme levels:

Fluids with LDH > 2/3 of upper limit of normal serum LDH	Fluids with LDH < 2/3 of upper limit of normal serum LDH	Total
198(74.72%)	67(25.28%)	265(100%)

Table 8: Distribution of transudates and exudates

Number of exudates	Number of transudates	Total
198(74.72%)	67(25.28%)	265(100%)

**Fig. 1:** Deposits from a case of squamous cell carcinoma of lung showing tumor cells with eosinophilic cytoplasm and hyperchromatic nucleus**Fig. 2:** Deposits from case of adenocarcinoma lung showing malignant cells in clusters and glandular pattern**Fig. 3:** Deposits of tumor cells from a known case of osteosarcoma of bone in pleural effusion**Fig. 4:** Increased lymphocyte count in a case of tuberculous pleural effusion

Discussion

It has long been recognized that the initial classification of a pleural fluid as a transudate or an exudate greatly simplifies the process of arriving at a correct final diagnosis. Moreover, it determines whether further testing is needed [1]. It is now well accepted that test combinations increase sensitivity, improve accuracy, and serve as the basis for the well established Light's criteria: Accordingly, an exudate meets one or more of the following criteria: (1) Pleural fluid /serum protein ratio greater than 0.5; (2) Pleural fluid /serum LD ratio greater than 0.6; and (3) Pleural fluid LD level greater than two thirds of the serum upper limit of normal [1]. Accordingly in our study 74.72% of pleural fluids satisfy atleast one criteria of being labelled as an exudate and the rest, that is 25.28% are transudates.

The glucose level of normal pleural fluid, transudates, and most exudates is similar to serum levels. Decreased pleural fluid glucose, accepted as a level below 60mg/dl or a pleural fluid/serum glucose ratio less than 0.5, is most consistent and dramatic in rheumatoid pleuritis and grossly purulent parapneumonic exudates [1]. Most of the exudates have total leucocyte count > 1000 cells/cu.mm.

The most useful test in establishing the diagnosis of pleural effusion is pleural fluid cytology and pleural fluid cell count. Cytologic study of pleural fluid is a complete diagnostic modality which aims at pointing

out the etiology of effusion as well as, in certain cases, a means of prognostication of disease process [4]. The diagnostic performance of the cytologic study of the fluid may be attributable to the fact that the cell population present in sediment is representative of a much larger surface area than that obtained by needle biopsy [4,5]. One study showed that the incidence of dull chest pain is higher in malignant disease, while pleuritic chest pain is higher in patients with benign disease. Symptoms of less than seven days occur mostly in benign diseases. Marel et al. [6], also reported similar findings. Most of the benign exudative pleural effusion cases were clinically and biochemically proved to be of tuberculous etiology. Our study is in accordance with the study done by Epstein et al. [7] and showed that the majority of tuberculous effusions had more than 50% lymphocytes, had greater than 3 gm/dl of protein (pleural fluid protein/serum protein >0.5) and glucose greater than 60 gm/dl (pleural fluid glucose/serum glucose >0.5). Aggarwal et al. [8] showed that tuberculous effusions rarely contain more than 5% mesothelial cells which is in agreement with our study. Abnormal body fluids provide a readily accessible source of diagnostic information. The clinician uses the information provided by body fluid analysis to formulate, in order of priority, a list of differential diagnoses and to follow the results of therapy [9]. In the current study, most of malignancy was detected on evaluating the first specimen similar to other study [10].

Conclusion

Rapid evaluation of pleural fluid samples after collection without the addition of preservatives improves the diagnostic accuracy. Benign causes of pleural fluid effusions predominantly that caused by tuberculosis comprise the majority of the cases. In this study 66.04% of pleural fluid samples were of males whereas 33.96% of samples were of females. In the present study, the number of malignant cases were 4.53% as compared to the number of benign cases which were 93.96% and 1.51% cases were suspicious.

And the number of exudates was much higher (74.72%) than the number of transudates (25.28%).

Key Messages

Pleural fluid smear study is the initial step in the diagnostic workup and its accuracy improves with rapid preparation of smears after sample collection.

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