

Study of Plural Fluid Analysis in Tertiary Care Hospital at Bagalkot

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Abstract

Background: Pleural effusion is an abnormal accumulation of fluid in the Pleural space. The pleural space lies between the lung and chest wall and normally contains a very thin layer of fluid, which serves as a coupling system. Excess fluid results from the disruption of the equilibrium that exists across pleural membranes. **Material and Methods:** This is a prospective and observational study conducted on patients arriving at OPD/IPD services of SNMC/HSK with history and clinical features suggestive of pleural effusion between 2021 to 2022 with sample size estimated is 91 which is rounded off to 100. All patients aged more than 18 years with clinical features and radiological evidence of pleural effusion. **Results:** Maximum number of patients of Pleural effusion is between 31-50 years of age. Most of the patients were male 69% and rest were female 31%. The mean value of pleural fluid glucose is 69.85 mg/dL and extremely low sugar was seen in patients with malignancy and pyogenic infections. In all the 18 transudative effusions, the pleural fluid protein/serum protein ratio was found to be < 0.5. In all the 82 exudative effusions, the pleural fluid protein/serum protein ratio was found to be > 0.5. **Conclusion:** While evaluating a case of pleural effusion, a combined approach, involving clinical evaluation, radiographic and sonographic evaluation, pleural fluid analysis, pleural fluid cytology, and in cases where possible thoracoscopic pleural biopsy, must be utilized to fruitful and accurate diagnosis.

Keywords: Plural fluid, Pleural effusion, Pleural biopsy.

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Introduction

Pleural effusion is the abnormal and excessive accumulation of fluid in pleural space. Pleural effusion can be a manifestation of a wide range of diseases, both local and systemic.^[1] Pleural effusion results from either excess fluid accumulation in pleural space or decreased absorption by pleural lymphatics. Normally, 0.13 mL/kg of body weight of fluid is present in pleural space. This small amount of fluid acts as a lubricant to allow the smooth sliding of parietal and visceral pleura during respiration.^[2] Normal amount of fluid is maintained by the balance between hydrostatic, oncotic pressure of pleural capillaries and intrapleural pressure, oncotic pressure of pleural fluid. Any imbalance of the above mechanism will lead to excess fluid accumulation in pleural space.^[3]

They can be caused by several mechanisms including increased permeability of the pleural membrane, increased pulmonary capillary pressure, decreased negative intrapleural pressure, decreased oncotic pressure, and obstructed lymphatic flow. Pleural effusion indicates the presence of disease which may be pulmonary, pleural or extra pulmonary.^[4]

When clinicians detect a previously undiagnosed pleural effusion, a methodical evaluation can usually establish the definite or, at least, the probable cause of the effusion. This evaluation begins with a comprehensive history and physical examination complemented by various imaging studies and serum tests to construct a probable differential diagnosis. Establishing a definite diagnosis, however, usually requires thoracentesis and pleural fluid analysis.^[5]

Pleural fluid analysis can (1) diagnose a specific pleural disorder, such as empyema or a malignant pleural effusion (MPE) when pleural fluid contains pus or cancer cells respectively; (2) diagnose a specific extra pleural disease as the cause of an effusion, such as a pancreatico-pleural fistula due to chronic pancreatitis when pleural fluid has a very high amylase concentration; (3) suggest an underlying condition that requires further evaluation, such as myxedema, amyloidosis, or liver disease when a transudative effusion is detected in the absence of congestive heart failure (CHF); or (4) eliminate a specific diagnosis and thereby simplify subsequent management, as occurs when pleural fluid analysis excludes intrapleural infection in a patient with pneumonia.^[6]

Material and Methods

This is a prospective and observational study conducted on patients arriving at OPD/IPD services of SNMC/HSK with history and clinical features suggestive of pleural effusion between 2021 to 2022 with sample size estimated is 91 which is rounded off to 100.

Inclusion criteria

All patients aged more than 18 years with clinical features and radiological evidence of pleural effusion.

Exclusion criteria

1. Patients less than 18 years.
2. Patients with ICD insertion.
3. Patients with history of trauma to chest or whose effusion was due to trauma were excluded from the study

Data collection

1. After obtaining approval and clearance from the institutional ethical committee, the patient fulfilling the inclusion criteria were enrolled for the study after obtaining informed consent. Total of 100 patient who diagnosed with pleural effusion were taken as cases.
2. A questionnaire were used to collect identification data including age, sex, address, occupation, past history, personal history, presenting history, and other comorbidities.

Sample

Diagnostic 10ml of pleural fluid and venous blood samples (into 2ml of EDTA tube and another 2ml in plain tube) for required blood investigation and other required investigation were done.

Statistical analysis

All the information collected on the proforma was analyzed using SPSS version 10.0. Tables were made for various variables (age, sex, disease and laboratory parameters). Since it was an observational study, statistical test of significance not needed.

Results

In [Table 1], maximum number of patients of Pleural effusion is between 31-50 years of age.

Table 1: Distribution of Age of the Patients: (100 cases)

Age (years)	Frequency	Percentage
18-30	31	31%
31-50	43	43%
51-70	25	25%
>71	1	1%

Table 2: Distribution of Gender of the Patients: (100 cases)

Gender	Frequency	Percentage
Male	69	69%
Female	31	31%
Total	100	100%

Most of the patients were male 69% and rest were female 31% in [Table 2].

Table 3: Distribution of Clinical Symptoms (100 Cases)

Symptoms	Frequency	Percentage
Dyspnea	63	63%
Cough	43	43%
Fever	46	46%
Pleuritic chest pain	46	46%
Anorexia	41	41%
Weight Loss	31	31%
Pedal edema	18	18%
Night sweats	17	17%
Abdominal distension	11	11%
Hemoptysis	7	7%
Abdominal pain	3	3%
Anasarca	2	2%
Jaundice	1	1%

Table 4: Side of Pleural Effusion: (100 cases)

Side	Frequency	Percentage
Bilateral side	19	19
Right side	53	53
Left side	28	28

Table 5: Examination & Analysis of the Pleural Fluid Appearance

Appearance of pleural Fluid	Frequency	Percentage
Straw colored	53	53%
Clear	19	19%
High colored	17	17%
Pus	7	7%

Turbid	2	2%
Hemorrhagic	2	2%

Table 6: Pleural Fluid Biochemical Analysis

Parameters	Mean
Glucose (mg/dl)	63.52

Table 6a: Pleural Fluid Biochemical Analysis

Parameters	Mean SD
ADA	Present
>16.5	11
<16.5	47
LDH	
<485 U/L	27
>485 U/L	23

The mean value of pleural fluid glucose is 69.85 mg/dL and extremely low sugar was seen in patients with malignancy and pyogenic infections.

Table 7: Pleural Fluid Protein: (100 cases)

Pleural fluid protein	Frequency	Percentage
Exudates	80	80%
Transudates	20	20%

In all the 80 transudative effusions, the pleural fluid protein/serum protein ratio was found to be < 0.5. In all the 80 exudative effusions, the pleural fluid protein/serum protein ratio was found to be > 0.5

Table 8: Gram Staining and AFB Staining

Staining	Frequency	Percentage
Gram Staining	3	3%
AFB Staining	0	0%

Only 3 patients showed Gram positive in [Table 8].

Table 9: Pleural Fluid Cytology

Cell count	cells/cmm
Cells	5-120000

The cell count varied from 5-120000 cells/cmm in transudative effusion and tubercular effusion respectively. In 4 cases of malignant pleural effusion the cytology for malignant effusion was positive for 2 cases only in [Table 9].

Table 10: Pleural Fluid Culture

Diagnosis	Organism grown in culture
1. Pyopneumothorax	Pseudomonas
2. Pneumonia/Synpneumonic effusion	Klebsiella

Table 11: Pleural Biopsy

Total No. of Pleural Biopsy done	N=10	Percentage
Tuberculous granuloma	7	70%
Nonspecific inflammation	3	30%

Discussion

Pleural effusions are a common clinical and radiological finding, with presenting symptoms that include shortness of breath, cough and chest pain. The most common causes of a pleural effusion are heart failure, cancer and pneumonia but there are over 50 documented causes. Diagnosing the cause of a pleural effusion requires a combination of clinical, radiological and laboratory investigations.^[6]

Pleural fluid (PF) accumulation is a result of disruption in the balance between production and reabsorption. PF is produced primarily by the parietal pleura and reabsorbed via the pleural lymphatics. In healthy individuals, the pleural cavity contains approximately 0.3 mL/kg of fluid. A pleural effusion occurs either when production exceeds reabsorption or when the mechanisms of reabsorption have been disrupted, the latter being more common.^[7]

An understanding of the clinical situation is vital when investigating the cause of a pleural effusion. In patients with known congestive cardiac failure (CCF) and bilateral effusions, it is highly likely that this is the cause of the effusions.^[8] Unless there is a suspicion of dual pathologies, which are more common than previously thought, diuresis should be undertaken rather than immediate thoracentesis, with a subsequent review to confirm treatment response.^[9] Conversely, patients with an effusion and high inflammatory markers, fevers or chest pain should always have thoracentesis due to the possibility of pleural infection.^[10]

Radiology can also aid in making a diagnosis; an ultrasound showing an echogenic, septated collection with air bubbles, raises the possibility of pleural infection. There are also several computed tomography (CT) criteria suggesting malignant pleural disease and so a pleural effusion in this context would be highly suspicious for a malignant pleural effusion (MPE).^[11-17]

Conclusion

While evaluating a case of pleural effusion, a combined approach, involving clinical evaluation, radiographic and sonographic evaluation, pleural fluid analysis, pleural fluid cytology, and in cases where possible thoracoscopic pleural biopsy, must be utilized to fruitful and accurate diagnosis.

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