Original article

Pattern of pleural effusion at Bahawal Victoria Hospital Bahawalpur

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Abstract

Objective:

To determine the frequency of various diseases presenting with pleural effusion.

Study design:

Case series

Place and duration of study:

The study was conducted at Department of Medicine, Bahawal Victoria Hospital Bahawalpur over a period of one year.

Patients and methods:

One hundred patients of either gender, more than 12 years old, with clinically and radiologically confirmed pleural effusion underwent diagnostic thoracentesis. Pleural

fluid was examined grossly and for sugar, protein, LDH, total and differential white cell count and malignant cells. Pleural fluid culture and pleural biopsy was done in case of exudative effusion. The data was collected on pre-designed Performa and analyzed using SPSS (10.0). Chi-Square test applied as test of significance.

Results:

Tuberculosis was the most common cause (28%) of exudative pleural effusion followed by parapneumonic effusion (25%) and malignant effusion (09%). Congestive cardiac failure (13%) and liver cirrhosis (8%) were the commonest cause of transudative pleural effusion. Renal failure (05%), nephrotic syndrome (02%), pancreatitis (02%), systemic lupus erythmatosus (02%) were the other significant causes of pleural effusion.

Conclusion:

Tuberculosis, parapnemonic effusion and malignancies are the common cause of exudative pleural effusion while congestive cardiac failure, liver cirrhosis and nephrotic syndrome are common causes of transudative effusion.

Key words:

Pleural, effusion, tuberculosis, malignant, pneumonia, exudative, transudative, thoracentesis.

Introduction:

Pleural effusion can be a manifestation of a wide range of local and systemic diseases[1]. The most common symptom of pleural effusion is dyspnea. Pleural effusion becomes clinically detectable when 500-ml fluid is present in pleural space. It is detectable on X-ray chest PA film when 200-ml fluid is present and 50 ml fluid can be visualized on lateral film[2]. As little as 5 to 10 ml of pleural fluid can be demonstrated with a lateral decubitus view[3]. Pleural effusion is classified as exudative and transudative on the basis of Light's criteria[4] which has an overall accuracy of 95% in differentiating exudative and transudative pleural effusions[5].

Common causes of exudative effusion are tuberculosis, malignancy, pneumonia, pulmonary embolism and viral infections while transudative effusion is usually due to heart failure (CCF), liver cirrhosis, nephrotic syndrome, peritoneal dialysis and myxedema.

Pleural fluid analysis is mandatory in all cases of pleural effusion. If the effusion is exudative, then additional tests may be needed. Pleural fluid cytology helps in the diagnosis of malignant effusions. If the cytology is negative but there is strong clinical suspicion of malignancy then thoracoscopy is the procedure of choice[6]. Pleural fluid culture is positive in less than 40% cases of tuberculous effusion[7]. In this situation, the determination of adenosine deaminase (ADA) and interferon gamma levels in pleural fluid are sensitive and specific biomarkers of tuberculous pleurisy[8]. Pleural fluid culture[9] is negative in up to 50% cases of purulent effusion. It is either because of prior antibiotic therapy or lack of facilities for anaerobic culture. No diagnosis is ever established in a

number of patients despite invasive investigations such as thoracoscopy and open pleural biopsy.

There are many studies conducted to find out the pattern of pleural effusion in different parts of Pakistan and all over the world. But there is little work done on this issue in this region (Bahawalpur). Secondly, there is a tendency among doctors that patients with pleural effusion are labeled as tuberculous without proper investigations. This study is conducted to find out the pattern of various causes of pleural effusion in this locality.

Patients and methods:

One hundred adult patients admitted to the medical wards of Bahawal Victoria Hospital Bahawalpur with clinically and/or radiologically confirmed pleural effusion were included in the study.

Besides thorough clinical assessment, pleural fluid was aspirated from all the patients and analyzed grossly and for protein, LDH, total and differential white blood cells and for malignant cells. Light's criteria was applied to classify the exudative and transudative effusions. Pleural fluid culture was done when pleural fluid was turbid or there was high neutrophil count as well as when the patient was febrile or had history of fever. Pleural biopsy was done in those cases of exudative effusion where cause of the effusion was not found on pleural fluid analysis.

All the data was collected on pre-designed Performa. All the information was analyzed using SPSS version 10.0. Chi-square test was applied to find the significance of various observations.

Results:

One hundred patients (61 males and 39 females, male to female ratio of 1.56:1) of 12 to 80 years of age were included in this study. Most of the patients (70%) were illiterate or had low educational status. Breathlessness was the most common symptom (86% patients) followed by cough (64%), fever (59%), chest pain, expectoration (sputum) and ankle swelling. Tuberculosis (28%) was the most common cause of exudative pleural effusion followed by parapneumonic effusions (25%) and malignant effusions (9%) while CCF (13%) was the most common cause of transudative effusions. (Table no. I)

More than half (56%) pleural effusions were right sided while 30% were left sided and 14% were bilateral. Among exudative effusions, 41% were right sided and 26% were left sided. While six cases (8%) out of 73 cases of exudative effusion had bilateral effusion, 8 (28%) out of 29 cases of transudative effusion had bilateral effusion. Bilateral pleural effusions were secondary to CCF, renal failure, nephrotic syndrome and malignancy. The frequency of right sided pleural effusion was significantly more than left sided effusion and exudative pleural effusion was significantly more than transudative effusions. Among bilateral effusions, transudative pleural effusion was significantly more than exudative effusion ($p \leq 0.01$).

Pleural fluid protein ranged from 0.24 gm/dl in transudative effusions to 8.1 gm/dl in exudative effusions. The highest pleural fluid protein level (8.1 gm %) was found in parapneumonic effusion followed by malignant effusion. Pleural fluid protein level was lowest (0.73 gm%) in nephrotic syndrome. Pleural fluid lactate dehydrogenase (LDH) level in exudative effusions was 260 U/L to 1160 U/L. White blood cell count was highly

variable. Lymphocytes were the predominant white blood cells in transudative and tuberculous effusion while neutrophils were predominant in parapneumonic effusions. Malignant cells were positive in 4 (44%) cases out of 9 cases of malignant pleural effusion. Acid Fast Bacilli (AFB) was not found in any pleural fluid sample. Pleural fluid Amylase level was raised in patients with pleural effusion due to pancreatitis. Pleural fluid culture was positive in 11 cases of exudative effusion. (Table no.II)

Pleural biopsy was done with Abram's needle in patients with lymphocytic exudative effusion. Closed needle biopsy was done in 33 patients. Twenty-two (66%) specimens showed granulomatous inflammation while 5 (15%) specimens showed malignant infiltration of the pleural tissue. There was chronic non-specific inflammation in 6 (18%) specimens. However, these patients had other features suggestive of tuberculosis. These patients responded to anti-tuberculous therapy. So, they were included among cases of tuberculous effusion. Pleural biopsy was not done in four patients with malignant pleural effusion whose pleural fluid cytology was positive for malignant cells. Carcinoma of bronchus was the most common cause of malignant effusion followed by pelvic malignancies. (Table no. III)

The diagnosis of pancreatitis as cause of pleural effusion among two patients was based on the clinical features and raised amylase level in serum and pleural fluid. One patient was diagnosed to have pleural effusion secondary to pulmonary embolism as he had radiologically confirmed deep venous thrombosis and exudative effusion as well as positive d-dimer. One patient with no previous pleural effusion and ascites had

sclerotherapy of esophageal varices and developed right sided exudative effusion. There was no other explanation for this effusion.

Table No. I

CAUSES OF PLEURAL EFFUSION

Disease	Males (n)	Females (n)	Total (n)
Tuberculosis	16	12	28
Parapneumonic	16	9	25
Malignant	6	3	9
CCF	9	4	13
Liver cirrhosis	3	5	8
Renal failure	5	0	5
Nephrotic syndrome	1	1	2
Pancreatitis	2	0	2
SLE	0	2	2
Pulmonary embolism	0	1	1
Scleroderma	0	1	1
Sclerotherapy	1	0	1
Liver abscess	1	0	1
Hypothyroidism	1	0	1
Cushing syndrome	0	1	1
Total	61	39	100

n= number of patients

Table No. II
Bacteriology of parapneumonic effusion

Bacteria	Males (n)	Females(n)	Total(n)
Staph aureus	2	2	4
Strep pneumoniae	2	1	3
Gram +ve diplococci	3	0	3
Pseudomonas aeruginosa	1	0	1
Total	8	3	11

Table No. III

Sources of malignant effusions

Malignancy	Males (n)	Females(n)	Total(n)
CA bronchus	3	0	3
Pelvic growth	0	2	2
CA prostate	1	0	1
Hodgkin's disease	0	1	1
NHL	1	0	1
Primary unknown	1	0	1
Total	6	3	9

NHL= non-Hodgkins lymphoma

Biochemical parameters of pleural fluid and serum

Etiology	Pleural fluid LDH	Serum LDH	Pleural fluid protein	Serum protein
Tuberculosis (28)	492 ± 169	407 ± 120	3.5±1.47	4.0 ± 0.50
Parapneumonic (25)	591 ± 82	625 ± 110	4.9±0.89	4.8 ± 1.0
Malignant (09)	244 ± 24	620 ± 102	5.3±1.23	4.4 ± 0.60
CCF (13)	160 ± 29	415 ± 89	1.6±0.44	4.1 ± 0.33
Liver Cirrhosis (08)	157 ± 27	690 ± 136	1.37±0.78	3.3 ± 0.65
Renal failure (05)	173± 21.3	587 ± 168	1.2 ± 0.44	3.8 ± 0.22
Nephrotic syndrome (02)	135 ± 0	456 ± 0	0.73 ± 0	2.5 ± 0
Pancreatitis (02)	270 ± 0	311 ± 0	6.45 ± 0	4.5 ± 0
SLE (02)	215 ± 0	240 ± 0	5.6 ± 0	4.7 ± 0
Pulmonary embolism (01)	560 ± 0	600 ± 0	5.64 ± 0	4.9 ± 0
Scleroderma (01)	600 ± 0	600 ± 0	5.0 ± 0	4.5 ± 0
Sclerotherapy (01)	360 ± 0	376 ± 0	4.3 ± 0	3.9 ± 0
Liver abscess (01)	272 ± 0	300 ± 0	3.8 ± 0	4.5 ± 0
Hypothyroidism (01)	240 ± 0	296 ± 0	4.1 ± 0	4.8 ± 0
Cushing syndrome (01)	146 ± 0	327 ± 0	1.7 ± 0	4.9 ± 0

DISCUSSION

Tuberculosis was the most common cause of pleural effusion. Tuberculosis is very common in Pakistan and is the commonest cause[10] of exudative effusion in Pakistan. Up to 53% cases of lymphocytic exudative effusion are tuberculous in nature[11]. Although tuberculosis is less common in developed countries, 25% cases of pleural effusion were found to be tuberculous in nature in Spain[12]. AFB stain was not positive in any case of tuberculous effusion. Mycobacterium tuberculosis/AFB is rarely positive in tuberculous pleural effusions[13]. It is because there are few bacilli in the effusion and tuberculous pleuritis is due to hypersensitivity to tuberculo-protein rather than actual infection[7].

Among parapneumonic effusions, pleural fluid culture was positive in 11 cases (25%) and Staph. aureus was the most common organism isolated followed by Streptococcus pneumoniae. In literature, Streptococci and Staph aureus are the commonest organisms that cause parapneumonic effusion while recent studies[9] show that Pseudomonas is becoming a common pathogen. A local study[14] showed that among pleural biopsies that were cultured, 92% had positive culture with growth of Pseudomonas (32%), E.coli (20%), Staph aureus (10%) and S.pneumoniae (8%). In our study, culture was positive in 44% cases of parapneumonic effusion that is similar to other studies[15] in which less than 50% cultures were positive. This low culture positivity may be due to prior administration of antibiotics[9].

Carcinoma of bronchus was the most common cause of malignant effusion in males while pelvic malignancies were most common cause in females. A recent study from Nepal showed that 18% of pleural effusions were malignant in nature[16]. The low

percentage of malignant effusions in our study may be due to relatively high prevalence of tuberculosis in our country.

Among the transudates, CCF was the most common cause. The low number of cases of CCF in this study may be because most cases of CCF are managed in Cardiology wards[17]. Liver cirrhosis was the second most common cause of transudative effusion. It may be because of high incidence of viral hepatitis. Five (62%) out of 8 patients were HBsAg positive while remaining were anti HCV positive. None of the patient had dual infection.

Five cases of pleural effusion resulted from chronic renal failure. Three cases were transudative while 2 were exudative in nature. Patients on hemodialysis can have exudative or transudative effusion[18]. Transudative effusions in patients with uremia in this study may be due to volume overload. Two (2%) patients had pleural effusion secondary to nephrotic syndrome. Other diseases constituted a small number of cases of pleural effusion including scleroderma, hypothyroidism, SLE, sclerotherapy of esophageal varices and liver abscess.

Overall these results are identical to other studies with variations which are also reflected in other local studies such as high proportion of tuberculous pleural effusion. However the diagnosis was presumptive and of exclusion in a number of patients including pancreatitis, sclerotherapy, Cushing syndrome and hypothyroidism. Had strict criteria be applied, the cases could have been labeled as undiagnosed.

Conclusion

Tuberculosis, parapneumonic effusion and malignancies are the common cause of pleural effusion in this area while heart failure (CCF) and liver cirrhosis are the causes of transudative pleural effusion. Less common causes include renal failure, nephrotic syndrome, hypothyroidism, pulmonary embolism and SLE.

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