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Diagnostic Evaluation of Pleural Effusion and the Role of Needle Pleural Biopsy

Pages with reference to book, From 127 To 130

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Introduction

Pleural effusion is a commonly encountered medical problem. Its clinical and radiological features often fail to identify the underlying cause. Pleural fluid aspiration and needle biopsy of pleura are initial diagnostic procedures to ascertain the aetiology of effusion. Both these procedures are performed under local anaesthesia and carry a low risk of complication. Being a blind procedure, adequate pleura may not be obtained with needle biopsy. The diagnostic yield of pleural biopsy varies according to the underlying disease as well as the number of biopsies taken¹. In our study, we have assessed (a) yield of adequate tissue in needle biopsy of pleura; (b) number in which the histology was diagnostic, (c) complications of biopsy and (d) results of histology in comparison with pleural aspirate. Finally we have suggested a guideline for investigation of pleural effusion.

Patients and Methods

Records of all patients at the Aga Khan University Hospital who underwent pleural biopsy between May, 1991 and December, 1992 were reviewed. Clinical history, chest radiograph, characteristics of pleural fluid and histology of pleural biopsy were recorded and analyzed.

Results

Total of 68 patients (Male:Female = 1.8:1) underwent pleural biopsy. Age range was 16-89 years (Mean 48 years). Thirty-two (47%) patients had a co-existent medical disorder, the three commonest being ischemic heart disease, cirrhosis and diabetes. Seven (10%) gave a previous history of tuberculosis. Effusion was right sided in 34 (50%), left sided in 27 (40%) and bilateral in 7 (10%). Effusion was small in 16 (24%), moderate in 32 (47%) and massive in 20 (29%) patients. Pleural fluid characteristics are presented in Table I.

Table I. Characteristics of pleural fluid (total No. 68).

	%
1. Appearance	
Straw coloured	32
Haemorrhagic	24
Purulent	1
Not noted	43
2. Protein Content	
Exudate	91
Transudate	3
Not known	6
3. Predominant cell type	
Lymphocyte	77
Neutrophil	13
Eosinophil	1
Not known	9
4. Microbiology (Positive result)	
Gram stain	0
Zeihl Neelsen stain	0
Bacterial culture	4
TB culture	1
5. Cytology : (Positive result)	10

Haemorrhagic effusion was noted in 16 patients; of these 4 (25%) had TB and 9 (56%) malignancy. In the remaining 3 patients, no definite cause was found. Pleural biopsy was performed either by Abraham or Cope Needle. Adequate pleura was obtained in 57 (84%) patients. Histology was diagnostic in 31 (46%) biopsies, being TB in 21 and malignancy in 10 patients. The final diagnoses based on clinical features and investigation is presented in Table II.

Table II. Final diagnosis in 68 patients.

	No.	%
1. Tuberculosis	33	49
Histology positive	21	
Histology non-specific but responded to chemotherapy	12	
2. Malignancy	16	23
Pleural histology positive	10	
Histology from other site positive	6	
3. Miscellaneous	8	12
Post-pneumonic	3	
Liver disease	3	
Cardiac failure	1	
Eosinophilic	1	
4. No diagnosis	11	16

It was observed that patients with an initial suspicion of TB may prove to have malignancy and vice versa. Upto half of the patients suspected to have parapneumonic effusion actually had TB or malignancy. In patients under 30 years of age, effusion was caused by TB in 62% of cases. Malignancy was seen mainly above 30 years of age but TB remained equally important cause of effusion in this age group as well. TB produced lymphocytic effusion in 97% of cases. Malignant effusion was also mostly (80%) lymphocytic. Therefore, lymphocytic predominance alone cannot differentiate between TB and malignancy. Etiology in 6 (12%) lymphocytic effusion remained uncertain. Complications of pleural biopsy occurred in 10 (15%) patients, being asymptomatic pneumothorax in 6, surgical emphysema in 3 and inadvertent liver biopsy in 1 patient. There was no mortality associated with the procedure.

Discussion

Pleural effusion can result from a large variety of causes. Transudate is caused by a limited number of conditions such as cardiac failure and hypoalbuminemia and clinical evaluation usually reveals the primary cause. Exudative effusion on the other hand has diverse etiologies and the cause of effusion is not clear at times even after a thorough clinical evaluation and basic investigations e.g., blood counts, chest radiograph and sputum examination. The two common conditions causing exudative effusion which often need to be differentiated are TB and malignancy. It is in these patients that pleural fluid aspiration and pleural biopsy is performed. The diagnostic yield of these procedures varies greatly in different studies. Our study has shown that one is unlikely to find acid fast bacilli on Ziehl Neelsen stain of pleural fluid. When the fluid was sent for culture, not only one had to wait for several weeks for results,

the culture was positive in only a very small number of cases. Inoculation of pleural fluid into the culture medium at bedside rather than in laboratory has been shown to significantly increase the culture yield². Bactec system, which is a radiometric assay system to detect growth of mycobacterium tuberculosis, gives the results of culture much faster than conventional mycobacterial culture (18 versus 33 days)². Newer diagnostic tests are being developed to increase the diagnostic yield of tuberculosis. Adenosine deaminase, an enzyme found in T lymphocyte, is markedly elevated in tuberculous effusion³. Similarly Gamma interferon⁴ and soluble interleukin 2 receptor level⁵ were found to be higher in tuberculous effusion as compared to malignant effusion. ELISA methods have been able to detect tiny amounts of mycobacterial antigen in body fluids, the technique had the advantage of being rapid, sensitive and specific⁶. In malignant pleural effusion cytology is positive in 33-72% cases. Increased levels of carcinoembryonic antigen (CEA) is found in adenocarcinoma⁷. Similarly elevated levels of hyaluronate acid is found in malignant mesothelioma⁸ and of neuron specific enolase in small cell carcinoma⁹. The common primary tumors causing malignant effusion are adenocarcinoma of lung, lymphoma and carcinoma of breast, ovary and pancreas. Closed pleural biopsy is indicated if cause of exudative pleural effusion remains undiagnosed even after pleural fluid analysis. In tuberculous effusion, where culture is positive in less than 15% of cases, closed pleural biopsy increases the diagnostic yield to over 80%¹⁰. In malignant effusion, on the other hand, cytology alone is positive in upto 70% of cases¹¹. Needle pleural biopsy is usually performed by Abrams or Cope Needle and there is no significant difference in their diagnostic yield¹². Trucut needle has also been found to be useful and safe¹³. Needle pleural biopsy has been found to be generally safe, though asymptomatic pneumothorax may occur in upto 10% of cases. Isolated case reports of more serious complications (e.g., arteriovenous fistula) has been reported¹⁴. The cause of pleural effusion may remain undiagnosed in 20% patients even after pleural biopsy and in these thoracoscopy is recommended to differentiate between malignant and benign effusion¹⁵. Fiberoptic bronchoscopy is unlikely to be helpful in the diagnosis of lone pleural effusion¹⁶. Our study has shown that nearly 50% of the cases of pleural effusion in our community were tuberculous and 25% were malignant. Yield of mycobactera was extremely low in pleural fluid whereas cytology was positive in over 60% of malignant effusions. Needle biopsy of pleura was found to be a safe procedure and was specially useful in the diagnosis of tuberculous effusion. In light of our present study and review of other previous studies we suggest the following protocol for investigation of pleural effusion when the cause is not apparent clinically (Figure).

Clinical history and examination

Basic Investigation
(e.g. CXR, Blood & Sputum Tests)

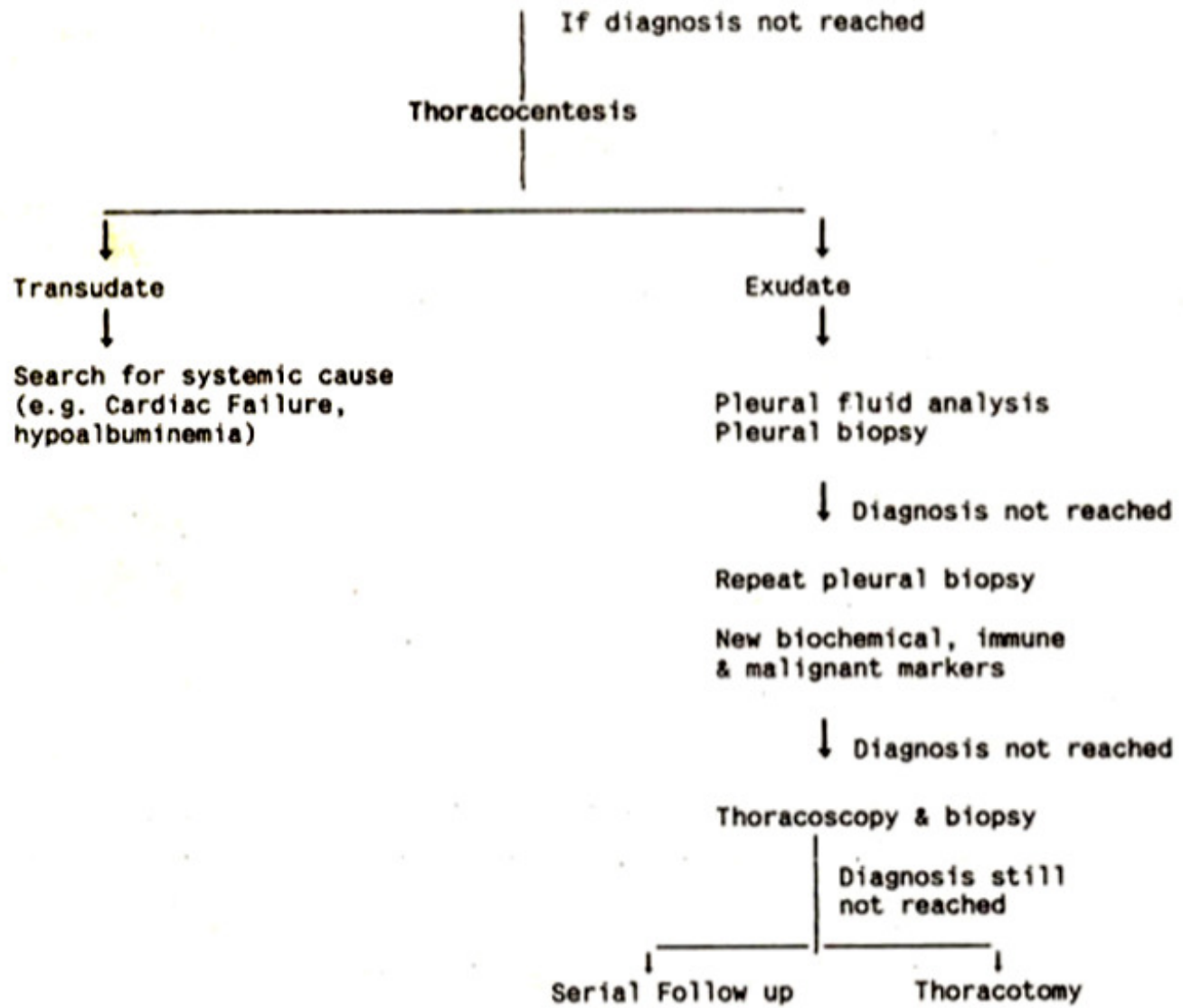


Figure. Guideline for evaluation of pleural effusion.

Pleural fluid aspiration and analysis should initially be performed. Zeihl Neelsen stain is usually recommended but we question its value as it is invariably negative. TB culture is positive in only a small number of patients, but when positive, is very valuable as it identifies the organism and gives the drug sensitivity. Pleural fluid amylase should be measured if pancreatitis, oesophageal rupture or malignancy is suspected. Newer techniques for detection of biochemical, immune and malignant markers and for detection of mycobacterial antigen would be helpful when available. If initial results of pleural fluid analysis are inconclusive and the fluid is an exudate then repeat thoracocentesis with multiple closed pleural biopsy should be performed. The biopsy should be sent both for histopathology and TB culture. By this stage diagnosis is likely to be established in up to 80% of cases. In the remaining undiagnosed cases thoracoscopy with guided biopsy can be performed. If the diagnosis still remains in doubt, then a decision needs to be taken on individual case to case basis, whether to simply follow the patient or to perform open thoracotomy and biopsy.

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