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Diagnostic evaluation of pleural effusion and the role of needle pleural biopsy

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

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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 cariy 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 taken[1]. 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 histoiy 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 perfonned 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 hadTB or malignancy. In patients under3Oyears of age, effusionwas causedby 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 resultfroma large variety of causes. Transudate is caused by a limited number of conditions such as cardiac failure and hypoalbuminemia and clinical evaluationusuálly 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. Ourstudy has shownthatone isunlikely to findacidfastbacilli onZiehl Neelsen stainof 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 yield[2]. Bactec system, which is a radiometric assay system to detect growth of mycobacterium tuberculosis, gives the results of culture much faster than convential 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 effusion[3]. Similarly Gamma interferon[4] and soluble interleukin 2 receptor level[5] were found to be higher in tuberculous effusion as comparedto 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 specific[6]. In malignant pleural effusion cytology is positive in 33-72% cases. Increased levels of carcinoembyoine antigen (CEA) is found in adenocaminoma[7]. Similarly elevated levels of hyaluromc acid is found in malignant mesothelioma[8] and of neurone specific enolase in small cell carcinoma[9]. 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 cases[11]. Needle pleural biopsy is usually performed by Abrahams or Cope Needle and there is no significant difference in their diagnostic yield[12]. Trucut needle has also been found to be useful and safe[13]. 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 reported[14]. 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 effusion[15]. Fiberoptic bronchoscopy is unlikely to be helpful in the diagnosis of lone pleural effusion[16]. Our study has shown that nearly 50% of the cases of pleural effusion in our community were tuberculous and 25% were malignant. Yield of mycobactena 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 tuberculosus effusion. Inlightofourpresent study and review ofotherprevious studies we suggest the following protocol for investigation of pleural effusion when the cause is not apparent clinically (Figure).

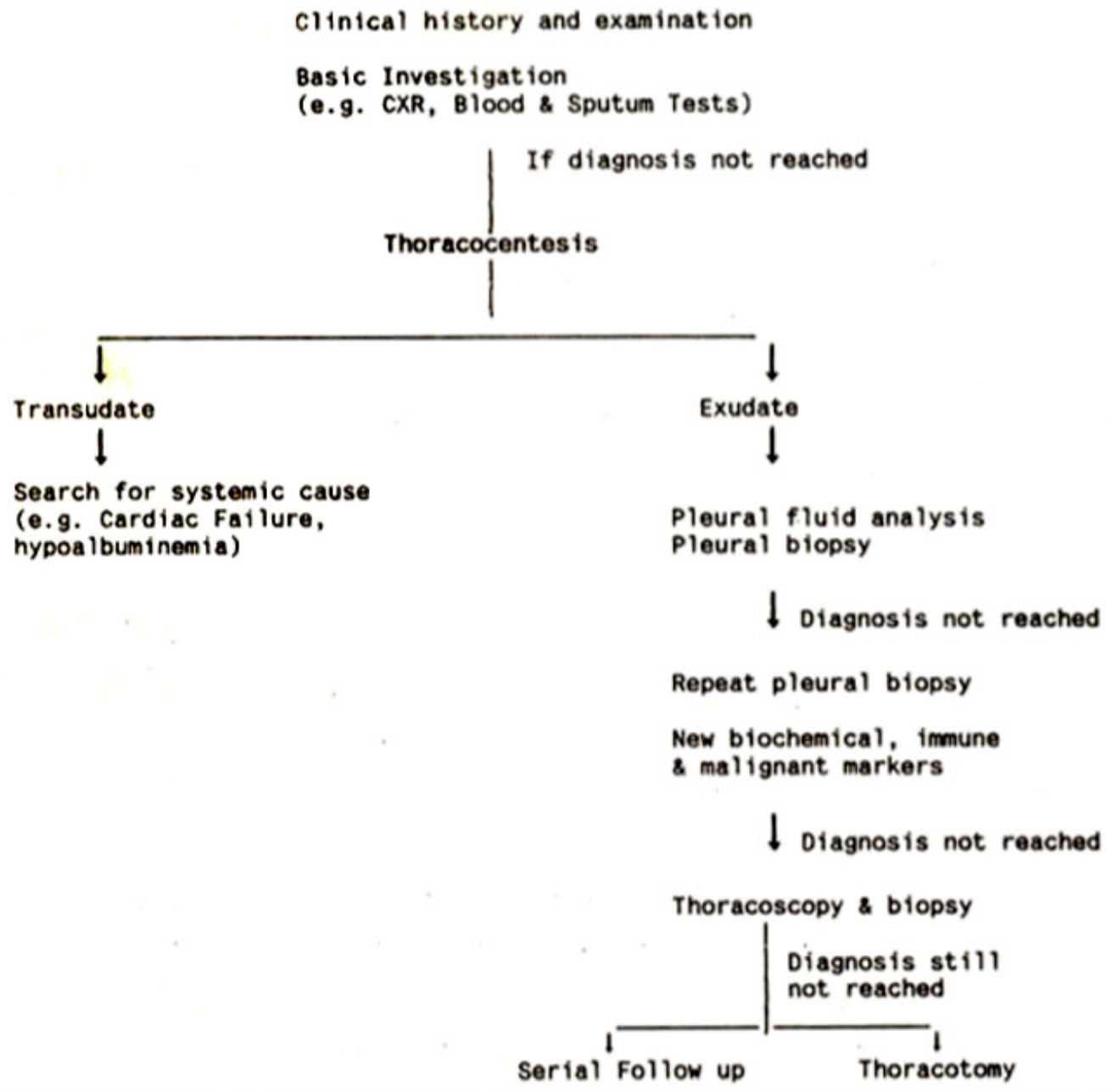

Figure. Guideline for evaluation of pleural effusion.

Pleural fluid aspiration and analysis should initially be performed. Zeihl Neelsenstainis usually recommendedbut 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 mycobactenal 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 upto 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 thorâcotomy and biopsy.

References

1. Prakash, U. B. S. and Reiman, H. M Companson of needle biopsy with cytologic analysis for the evaluation of pleural effusion: Analysis of 414 cases. Mayo Clin. Proc.. 1985;60:158-64.
2. Martens. G. and Bateman, E. D. Tuberculouspleural effusions: Increased culture yield with bedside inoculation of pleural fluid and poor diagnostic value of adenosinedeaminase. Thorax, 1991 ;46:96-9.
3. Ocana. I., Martinez-Vazquez, J. M., Segura, R. M. et al. Adenosine deaminase in pleural fluids: test for diagnosis of tuberculous pleural effusion. Chest, 1983;84:51-53.
4. Ribera, E.. Ocana, I., Martinez-Vasquez, J. M. et al. High level of interferon gamma in tub&culous pleural effusion. Chest, 1988;93 :308-11.
5. Ito, M., Kojiro. N.. Shirasaka, T. et al. Elevated levels of soluble interleukin-2 receptors in tuberculous pleural effusions. Chest. 1990;97: 1141-43.
6. Wadee, A. A., Boting, L. and Reddy, S. G. Antigen capture assay for detection of 43-Kilodalton mycobacterium tuberculosis antigen. 3. Clin. Microbiol., 1990;28:2786-91.
7. McKenna, 3. M., Chandrasekhar, A. 3. and Henkin, R. E. Diagnostic value of carcinoembryonic antigen in exudative pleural eflusions. Chest, 1980;78:587-90.
8. Petterson, T., Froseth, B., Riska, H. et al. Concentration of hyaluronic acid in pleural fluid as a diagnostic aid for malignant mesothelioma. Chest, 1988;94: 1037-39.
9. Shimokata, K., Niwa, Y., Yamamoto, M. et al. Pleural fluid neuron-specific enolase. Chest, 1989;95:602-603.
10. Bueno, C. E., Clemente, M. G., Castro, B. C. et al. Cytologic and bacteriologic analysis offluid and pleural biopsy specimens with Cope's needle. Arch. Intern. Med., 1990;150:1190-94.
11. Nance, K. V., Shermer, R. W. and Askin, F. B. Diagnostic efficacy of pleural biopsy as compared with that of pleural fluid examination. Mod. Pathol.. 1991 ;4:320-324.
12. Morrone, N., Algranti, E. and Barreto, E. Pleural biopsy with Cope and Abrams needles. Chest, 1987;92: 1050-52.
13. Mcleod, D. T., Temouth, 1. and Nkanza, N. Comparison of the Tm- cut biopsy needle with the Abrams punch for pleural biopsy. Thorax, 1989;44:794-6.
14. Lai, J. H., Yan, H. C., Kao, S. J. et al. Intercostal arteriovenous fistula due to pleural biopsy. Thorax, 1990;45:976- 8.
15. Boutin, C., Astoul, P. H. and Seitz, B. The role ofthoracoscopy in the evaluation andmanagementofpleuraleffusions. Lung, 1990;168(suppl):lll3-21.
16. Kelly, P., Fallouh, M., O'Brien, A. et al. Fiberoptic bronchoscopy in the management of lone pleural effusions. A negative study. Eur. Respir. J., 1990,3:397-8.