

Role of Closed Pleural Biopsy in the Etiological Diagnosis of Pleural Effusions

P Ramesh¹, Sandeep Jadhav²

Assistant Professor, Department of Pulmonary Medicine, Rajiv Gandhi Institute of Medical Sciences (RIMS) Adilabad.^{1,2}

Abstract

Background: Pleural effusion is accumulation of fluid in pleural cavity due to disequilibrium in the formation and removal of pleural fluid. Pleural effusion is a sign of disease and not a diagnosis by itself. Detecting pleural effusion is easy but finding the etiological cause is difficult since both pulmonary and extra-pulmonary conditions can cause pleural effusion. Aim: present study was undertaken to assess the value of closed pleural biopsy in establishing the etiology of pleural effusion. **Methods:** Prospective observational study conducted in Tuberculosis and Chest Disease Wards at SVRR Government General Hospital, Tirupati. Abrams Needle is inserted into the pleural space by exerting firm pressure on the stylet, or by screw like movements. The biopsy specimen obtained in the notch at the distal end of the outer trocar is collected in to a bottle containing 10% formalin. Biopsy specimens sent to pathology department for histopathological examination. **Results:** Total of 59 patients were taken into the present study adequate specimen is obtained in 57(96.61%) out of 59 patients. In 2 cases pleural tissue not obtained, as patients were not willing, procedure not repeated. Out of 59 cases 39(66.10) were presented with massive effusion and 20(33.89) were moderate effusion. In haemorrhagic effusions out of 23 cases 12 (52.17%) were diagnosed as malignant effusion, 7 (30.43%) were diagnosed as Tuberculous effusion, 4 (17.39%) were non specific. **Conclusions:** closed pleural biopsy provides a very high diagnostic yield especially in Tuberculosis and malignancy, which are two most important causes of exudative pleural effusion. It is safe, simple and cost effective procedure in the diagnosis of pleural effusion. However in arriving at an etiological diagnosis of pleural effusion also requires additional investigations along with pleural biopsy.

Keywords: *Pleural Biopsy, Diagnosis, Pleural Effusion*

Address for correspondence: Dr P Ramesh, Assistant Professor, Department of Pulmonary Medicine, Rajiv Gandhi Institute of Medical Sciences (RIMS) Adilabad- 504001. Mobile: 9966504799. Email: pawarramesh59@gmail.com

Received on: 20/02/2017 Revised: 01/03/2017 Accepted : 03/03/2017

Introduction

Various procedures like Thoracotomy, Needle pleural Biopsy, CT or USG guided Cutting needle biopsy and thoracoscopic pleural biopsy with distinct advantages and disadvantages. The first step in the evaluation of any pleural effusion is to determine whether the effusion is a transudate or exudate.¹ If only pleural fluid is used to determine the etiology of pleural effusion it often remains rather inconclusive even after the biochemical, Pathological and bacteriological analysis. Etiology of the pleural effusion is very important in order to institute an appropriate line of management. The Needle

biopsy of the pleura is now considered one of the useful methods in diagnosing tuberculous effusions. It shows positive granulomatous caseous necrosis in 50-80% of cases. Although pleural biopsy may occasionally demonstrate a malignant effusion, the procedure is of value chiefly in establishing the presence of tuberculosis.² In rare occasion fungal diseases, sarcoidosis, rheumatoid pleurisy produce granulomatous pleuritis, and these are excluded by culture of biopsy specimen for mycobacteria. Levine and Metzger, showed 20 out of 21 specimens positive for mycobacterium tuberculosis either by microscopy or culture.³ In recent years, the availability of ADA and Interferon – Gamma levels assays in pleural

fluid decreased the use of needle biopsy of pleura.^{4, 5} Other drawbacks in establishing diagnosis in tuberculosis effusions are that in the early stages of tuberculous effusions negative result is obtained, since time has not been allowed for the formation of the granulomatous lesions; another possible cause of negative biopsy is early implementation of anti tubercular chemotherapy. In Malignant pleural diseases, the needle biopsy of the pleura will be positive in 39-75% of cases. In general pleural fluid cytology is superior to pleural biopsy in the diagnosis of malignant effusions because in 50% of malignant effusions the parietal costal pleura is not involved, if involved there are patches of malignant infiltration so it depends on the site of biopsy or there may be paramalignant effusion. Pleural biopsy under USG or CT guidance gives good results. One study has shown that USG guided biopsy yielded better results than blind pleural biopsy.⁶ CT guided biopsy is more useful as it makes the visualization of thickened pleura easy. Studies have shown that CT guided biopsy yielded better results especially in malignant effusions.⁷ With background we tried to evaluate the effectiveness of closed pleural biopsy in Etiological diagnosis of Pleural Effusions.

Materials & Methods

It was a Prospective observational study Tuberculosis and Chest Disease Wards at SVRR Government General Hospital, Tirupati. Ethical Committee Permission for the study was obtained from institutional Ethical Committee and written consent was obtained from all the patients participating in the study. Patients were selected based on Inclusion and Exclusion criteria.

Inclusion Criteria

- Age above 18 years.
- Patients with pleural effusion, clinically and on chest x-ray and confirmed by thoracentesis
- Exudative pleural effusion.
- No visible parenchymal lesions on x-ray.

Exclusion Criteria

- Age below 18 years.
- Patients who are not cooperative, not giving consent.

- Patients with bleeding disorders.
- Patients with severe respiratory impairment.
- Patients with transudative effusion. (Ex: Patients with congestive heart failure, renal failure, cirrhosis of liver)
- Empyema.
- Patients who are sputum positive for AFB and on ATT.
- Patients who are HIV + Ve, Hbs Ag + Ve.
- Underlying lung showing parenchymal lesions on chest x ray.

Data was collected on standard format, the present medical history, and past history, General physical examination and systemic examination and useful investigations were done to confirm the effusion. In this study needle biopsy of the pleura was done with Abrams pleural biopsy needle. Patient comfortably sits on the bed, head and arms resting on the stool, and keeping the chest as vertical as possible. The site of biopsy is determined by locating fluid by percussion and vocal fremitus. Skin and inter costal tissues are anaesthetized with 2% xylocaine infiltrating the skin and neighboring periosteum, the needle is advanced till the pleural fluid is obtained, and pleural effusion is confirmed. 20ml of fluid withdrawn and sent for cytological, biochemical, bacteriological analysis, if the fluid is haemorrhagic or straw colored then proceeded for biopsy.

A small incision is given at the anaesthetized site with a small scalpel blade No.11, Abrams needle is inserted into the pleural space by exerting firm pressure on the stylet, or by screw like movements. Once the resistance is lost, it is in the pleural cavity, the inner stylet is removed, and with the inner cannula in the closed position, a 10ml or 20 ml syringe is attached to the inner cannula. The biopsy needle is then slowly withdrawn with constant mild pressure applied inferiorly until it hooks on to the pleura. When the needle is hooked on to the pleura, the outer trocar is held firmly with one hand while the inner cannula is rotated in to the closed position with the other hand to cut off a small piece of parietal pleura, then the needle is withdrawn from the pleural space in the closed

position, and the biopsy tract immediately occluded with a finger to prevent pneumothorax. The biopsy specimen obtained in the notch at the distal end of the outer trocar is collected in to a bottle containing 10% formalin. Biopsy specimens sent to pathology department for histopathological examination and therapeutic aspiration has been done at the same time. Firm pressure is applied for 24 hours to prevent any oozing of fluid or bleeding from the site, with dressing and tight adhesive plaster.

Results

Total of n=59 patients were taken into the present study. Suspicious cases of malignant and tuberculous pleural effusions were taken. Pleural biopsy was performed to the patients who have given consent for procedure. Pleural biopsy was done with Abrams pleural biopsy needle. In each case pleural fluid was subjected to cytological, biochemical and bacteriological analysis. Successful biopsy i.e. adequate specimen is obtained in 57(96.61%) out of 59 patients. In 2 cases pleural tissue not obtained, as patients were not willing, procedure not repeated. The diagnostic success rate is 49(83.05%) out of 59 patients. See table 1. Out of 59 cases 34 were between 51-70 years age group see table 1. Most of the malignant

cases 13 out of 16 were between 51-70 years age group. Out of 59 cases 39 (66.10%) were presented with massive effusion and 20(33.89%) were moderate effusion. Macroscopic appearance of pleural fluid out of 59 cases 23 (38.98%) were haemorrhagic, 36 (61.01%) were Clear straw colored fluid. See fig 1 In haemorrhagic effusions out of 23 cases 12 (52.17%) were diagnosed as malignant effusion, 7 (30.43%) were diagnosed as Tuberculous effusion, 4 (17.39%) were non specific.

In 59 cases adequate specimen were obtained in 57 (96.61%), out of 57 definitive diagnosis obtained in 49 (83.05%) of which 33 (55.93%) were Tuberculous, 16 (27.11%) were malignant, 8 (13.55%) were non-specific. See table 2.

Out of 59 cases 40 suspected as tuberculous effusions of which 33 (82.50%) were diagnosed by biopsy, 19 suspected as malignant effusions of which 16 (84.21%) were diagnosed by biopsy. Out of 16 cases diagnosed as malignant effusion 8 (50%) were adenocarcinomatous deposits in pleura, 3(18.75%) were squamous cell carcinomatous deposits, 5 (31.25%) were poorly differentiated. Complications out of 59 cases complications occurred in 3 patients. Pneumothorax in 2(3.38%) patients, Vaso Vagal reaction in 1 (1.69%).

Table 1: Showing age and sex wise distribution of cases

Age	Male	Female	Total	Percentage
18-30	3	1	4	6.78
31-40	2	3	5	8.47
41-50	5	4	9	15.26
51-60	13	6	19	32.2
61-70	10	5	15	25.43
71-80	6	1	7	11.86
Total	39	20	59	100

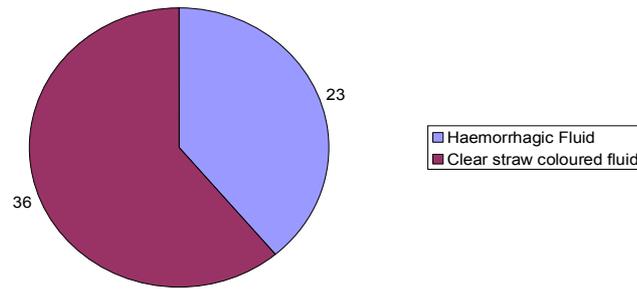
Table 2: Diagnosis of the cases involved in the study

Diagnosis	Male (%)	Female (%)	Total (%)
Tuberculosis	26 (44.06%)	7 (11.86%)	33 (55.93%)
Malignant	9 (15.25%)	7 (11.86%)	16 (27.11%)
Non specific	3 (5.08%)	5 (8.47%)	8 (13.55%)
Inadequate specimen	2 (3.38%)	-	2 (3.38%)
Total	40 (67.8)	19 (32.2)	59 (100)

Table 3: Different diagnosis of the malignant lesions

Malignant Diagnosis	n	Percentage
Adenocarcinoma	8	50
Squamous cell carcinoma	3	18.75
Poorly differentiated carcinoma	5	31.25
Total	16	100

Figure 1: Showing the characteristics of Pleural fluid



Discussion

In the present study 59 cases of pleural effusion, pleural biopsy was done with Abrams pleural biopsy needle, with success rate of 49 (83.05%) out of 59 cases. Out of 59 cases 40 suspected as tuberculosis and 33 (82.5%) were diagnosed as tuberculous effusion on biopsy, 19 cases suspected as malignancy and 16 (84.21%) were diagnosed as malignant effusion. Success rate of biopsy for tuberculous effusion in the present study was comparable with previous studies. According to Prince J et al; diagnostic yield of closed pleural biopsy in tuberculous effusions ranges from 60-95%. In the same study 33 (82.5%) were diagnosed as tuberculous effusion.⁸ In an Indian study DJ Christopher et al; reported that pleural biopsy was diagnostic for 75% of tuberculous effusions.⁹ In another study on role of serial pleural biopsies in the diagnosis of pleural effusion J.C. Suri et al; showed that in case of tuberculous effusions, three serial pleural biopsies increase the yield from 60%-93%.¹⁰ In some of the tuberculous effusions biopsy is negative may be because of in the early stages of tuberculous effusions time has not been allowed for the formation of the granulomatous lesions; another possible cause of negative biopsy is early implementation of anti tubercular chemotherapy.¹¹ Though pleural fluid ADA and Interferon Gamma levels are good indirect markers to diagnose pleural tuberculosis, but in India, further studies are still required to standardize the cut off values of these test. High cost and less availability of IFN gamma assay are other problems. This study shows that pleural biopsy is very important in diagnosis of pleural tuberculosis effectively, and quickly. Missing the diagnosis of pleural tuberculosis may lead to pulmonary and extra pulmonary involvement in up to 60%

of cases over the subsequent five years. Success rate of biopsy for malignant pleural effusions in the present study is correlating well with previous studies. In the present study 16 (84.21%) were diagnosed as malignant effusion. In cases of malignant pleural effusion previous studies shows that the diagnostic yield of pleural biopsy is less than pleural cytology. Pleural fluid cytology yield ranges from 40-87% and for pleural biopsy 39-75% Marco FP et al; reported diagnostic yield of 44% for closed pleural biopsy, 62% for cytology in malignant effusions.¹² Prince J et al; also reported a diagnostic yield 57% for pleural biopsy.⁸ Christopher reported diagnostic yield for pleural biopsy in 71% in malignant effusions.⁹ In some of the suspected malignant effusions biopsy is negative may be because of in 50% of malignant effusions the parietal coastal pleura is not involved, if involved there are patches of malignant infiltration so it depends on the site of biopsy or there may be paramalignant effusion.⁵ Thoracoscopy provides a direct visualization of parietal and visceral pleura, and thus the diagnostic yield of thoracoscopic guided pleural biopsy increases up to 95%. But it involves high instrument cost and intensive training, which makes it a rare entity in India. Thoracoscopic procedure also requires chest tube drainage, and increases the hospital stay and as well as health care cost. In comparison to this closed pleural biopsy can be done as a day care procedure and cost is less. So closed pleural biopsy should be offered to all the patients with exudative pleural effusion. Pneumothorax and hemothorax are known complications of closed pleural biopsy, various studies show about 4-11% incidence rate of pneumothorax with pleural biopsy.^{12, 13} In our study there was 2 (3.70%) cases had pneumothorax, there is no incident of hemothorax they were successfully managed.

Conclusion

In the diagnostic work up of pleural effusion, closed pleural biopsy provides a very high diagnostic yield in Tuberculosis and malignancy, they are two most important causes of exudative pleural effusion. Closed pleural biopsy is safe, simple and cost effective procedure in the diagnosis of pleural effusion. In arriving at an etiological diagnosis of pleural effusion it often also requires other investigations along with pleural biopsy.

Conflict of Interest: *None declared*

Source of Support: *Nil*

Ethical Permission: *Obtained*

References

1. Broaddus VC, Light R W. What is the origin of pleural transudates and exudates. *Chest* 1992; 102: 628-29.
2. S Bhattacharya, TD Bauragya, A Das, A Mandal, SK Das. Closed pleural biopsy is still useful in the evaluation of malignant pleural effusion. *J Lab Physicians* 2012; 4(1):35-38.
3. Valdes L, Alvarez D, San Jose E, Penela P, Valle JM, Gracia-Pazos JM, Saurez J, Pose A. Tuberculous pleurisy: a study of 254 patients. *Arch Intern Med* 1998;158:2017-21.
4. Light RW. *CP-14 Pleural Diseases*, 5th ed. Philadelphia, Lippincott Williams &Wilkins 2007; 145-54.
5. Light R W. Closed needle biopsy of the pleura is a valuable diagnostic procedure. Con closed needle biopsy. *J Bronchol* 1998;332-36.
6. Koegelenberg CF, Bolliger CT, Theron J, Walzl G, Wright CA, Louw M, Diacon AH. Direct comparison of the diagnostic yield of ultrasound-assisted Abrams and Tru-cut needle biopsies for pleural tuberculosis. *Thorax* 2010; 65(10): 857-62.
7. Maskell NA, Gleeson FV, Davies RJ. Standard pleural biopsy versus CT-guided cutting needle biopsy for diagnosis of malignant disease in pleural effusions: a randomized controlled trial. *Lancet* 2003; 361(9366):1326-30.
8. Prince J, Richa Gupta D. J. Christopher, T. Balamugesh. Evaluation of the diagnostic yield and safety of closed pleural biopsy in the diagnosis of pleural effusion. *Indian J Tuberc* 2010; 57:19-24.
9. D J Christopher, JV Peter, A M Cherian. Blind pleural biopsy using a tru cut needle in moderate to large pleural effusion-an experience. *Singapore Med J* 1998; 39(5) 196-99.
10. Suri JC, Goel A, Gupta DK, Bhatia A. Role of serial pleural biopsies in the diagnosis of pleural effusion. *Indian J Chest Dis Allied Sci* 1991; 33:63-67.
11. Gillian Hanson and Trevor Philips. Pleural Biopsy in diagnosis of thoracic disease. *BMJ*1962; 2: 300-03.
12. Marco FP, Esther SJ, Lucia F, Antonio G, Jose A, et al; Role of blind closed pleural biopsy in the management o pleural exhudates. *Can Respir J* 2013; 20(5):362-66.
13. Gouda AM, Dalati TA, Al-Shareef NS. A comparison between Cope and Abrams needle in the diagnosis of pleural effusion. *Ann Thorac Med* 2006;1:12-15.