ORIGINAL ARTICLE

Diagnostic yield and safety of closed needle pleural biopsy in exudative pleural effusion

Govind Singh Rajawat, Supreet Batra[1], Rajendra Prasad Takhar[2], Lalit Rathi, Chand Bhandari, Manohar Lal Gupta

Department of Chest and Tuberculosis, SMS Medical College, Jaipur, [2]Department of Respiratory Medicine, Government Medical College, Kota, Rajasthan, [1]Department of Respiratory Medicine, VP Chest Institute, University of Delhi, New Delhi, India

Access this article online

Website: www.avicennajmed.com

DOI: 10.4103/ajm.AJM_112_16

Quick Response Code:

ABSTRACT

Background: Closed pleural biopsy was previously considered a procedure of choice in cases of undiagnosed pleural effusion with good efficacy. Currently, the closed pleural biopsy has been replaced by thoracoscopic biopsy but not easily available in resource-limited setups. **Objective:** The objective of this study was to analyze the diagnostic yield and safety of closed needle pleural biopsy in exudative pleural effusion and assessment of patients' characteristics with the yield of pleural biopsy. **Design:** This was a cross-sectional study. **Settings:** This study was conducted at Institute of Respiratory Diseases, SMS Medical College, Jaipur, a tertiary care center of West India. **Patients and Methods:** A total of 250 cases of pleural effusion were evaluated with complete pleural fluid biochemical, microbiological, and cytological examination. Out of these 250 patients, 59 were excluded from the study as the diagnosis could be established on initial pleural fluid examination. The remaining (191) patients were considered for closed pleural biopsy with Abrams pleural biopsy needle. **Main Outcome Measures:** The main outcome measure was diagnostic yield in the form of confirming diagnosis. **Results:** Out of the 191 patients with exudative lymphocytic pleural effusion, 123 (64.40%) were diagnosed on the first pleural biopsy. Among the remaining 68 patients, 22 patients had repeat pleural biopsy with a diagnostic yield of 59.9%. The overall pleural biopsy could establish the diagnosis in 136 (71.20%) patients with pleural effusion. The most common diagnosis on pleural biopsy was malignancy followed by tuberculosis. **Conclusions:** Closed pleural biopsy provides diagnostic yield nearly comparative to thoracoscopy in properly selected patients of pleural effusions. In view of good yield, low cost, easy availability, and very low complication rate, it should be used routinely in all cases of undiagnosed exudative lymphocytic pleural effusion. **Limitations:** There was no comparison with a similar group undergoing thoracoscopic pleural biopsy.

Key words: Closed pleural biopsy, malignant pleural effusion, thoracoscopic pleural biopsy, tubercular pleural effusion

INTRODUCTION

Pleural effusion is one of the most commonly encountered clinical conditions in day-to-day pulmonary practice. In spite of good history, thorough clinico-radiological, and laboratory investigations of aspirated fluid, it is not possible to establish the diagnosis in all the cases. Many of the patients often receive treatment empirically without any confirmatory diagnostic documentation.

Before the availability of thoracoscopy, closed pleural biopsy was used as a standard practice to diagnose such patients, and the diagnostic efficacy of pleural biopsy in such situation has been reported between 60% and 80%.[1-4] With the easy

Address for correspondence: Dr. Rajendra Prasad Takhar, Quarter No 1/4, Medical College Campus, Kota, Rajasthan, India. E-mail: drrajtakhar@gmail.com

Cite this article as: Rajawat GS, Batra S, Takhar RP, Rathi L, Bhandari C, Gupta ML. Diagnostic yield and safety of closed needle pleural biopsy in exudative pleural effusion. Avicenna J Med 2017;7:121-4.

availability of thoracoscopy, currently, the thoracoscopic biopsy is recommended in patients with undiagnosed pleural effusion replacing the closed pleural biopsy.[5] It is true that thoracoscopy has better yield than pleural biopsy, but such recommendation is not tenable in resource-limited settings like our country because of scarce infrastructure and available expertise for thoracoscopy.

Few previous studies have shown that the diagnostic yield of closed pleural biopsy can be improved by repeating the procedure.[6,7] Therefore, we planned this study to know the combined yield of the first and, if required, a repeat pleural biopsy in undiagnosed exudative pleural effusion and factors associated with diagnostic yield.

PATIENTS AND METHODS

This was a yearlong cross-sectional study conducted at Institute of Respiratory Diseases, SMS Medical College, Jaipur (India). The study protocol was approved by the Research and Review Board of SMS Medical College, Jaipur. Two hundred and fifty patients of pleural effusion were evaluated. After giving full explanation regarding the study, written informed consent was obtained from the patients. The entire study participants were evaluated in detail with history taking, physical and radiological examinations, and routine investigations. When examinations and investigations indicated a clear cause of effusion, no further workup was done (e.g., patients presented with bilateral effusion in a clinical setting strongly suggestive of transudates were not enrolled in our study [unless there were atypical features or they fail to respond to therapy]). If no clear cause of pleural effusion was found, a diagnostic thoracocentesis was done, and aspirated fluid was evaluated for cell count, biochemistry, acid-fast bacilli smear, and cytopathology for malignant cells. When these investigations of pleural fluid failed to establish the diagnosis, it was labeled as undiagnosed pleural effusion, and patients were subjected to pleural biopsy with Abrams pleural biopsy needle. The Abrams needle was inserted after making a small scalpel incision in the properly anesthetized skin and subcutaneous tissue under all aseptic precautions. Once the tip of the needle is thought to be in the pleural space, the inner stylet was removed, and the biopsy needle is then slowly withdrawn with constant aspiration until it hooks onto the pleura. The outer trocar is held firmly with one hand while the inner cannula is rotated into the closed position with the other hand to cut off a small piece of parietal pleura.

Exclusion criteria for pleural biopsy were age <12 years, noncooperative and/or moribund patient, pleural fluid thickness <3 cm on ultrasonography at the infrascapular border, patients with bleeding diathesis, transudative effusion, empyema[8]/neutrophilic effusion, and local skin infection. Those patients who had negative first pleural biopsy were asked to undergo repeat pleural biopsy. After taking consent, repeat pleural biopsy was done by similar procedure.

Study design

This was a tertiary care hospital-based, cross-sectional study. Assuming sensitivity of diagnosis at level one and two, which is around 70%, the sample size was calculated at a level of 0.05 and study power of 80%, thus minimal sample size obtained was 172 patients of pleural effusion. Hence, finally, we decided to include 250 patients of pleural effusion in our study.

Patients' demographic characteristics are shown in Table 1.

RESULTS

Out of the total 250 patients, 59 were excluded from the study as the diagnosis could be established before closed pleural biopsy [Table 2].

The remaining (191) patients were considered as having undiagnosed pleural effusion on initial evaluation and were subjected to closed pleural biopsy. To obtain four

Table 1: Patients' demographic characteristics

Patients and characteristics	Total	Male	Female
Number	191	138	53
Mean age±SD	52.12±16.42	50.60±17.72	55.13±15.56
Smoker			
Yes/no	97/94	86/52	11/42
Side of effusion			
Unilateral/bilateral	177/14	126/12	51/2
Color of effusion			
Straw/hemorrhagic	124/67	94/44	30/23
Extent of effusion			
Mild/moderate/massive	10/132/49	10/98/30	0/34/19
Position of mediastinum			
Central/opposite/ipsilateral	109/76/6	81/52/5	28/24/1

SD: Standard deviation

Table 2: Etiology of effusion established on initial workup

Etiological diagnosis established	Number of patients
Sputum positive for AFB smear	5
Pleural fluid positive for AFB smear	6
Cytology positive for malignant cells	9
Chylothorax	2
Transudative effusion	18
Parapneumonic effusion	11
Empyema	8
Total patients	59

AFB: Acid-fast bacilli

satisfactory pleural biopsy samples, the average number of needle passes was 4.52 per patient. The first pleural biopsy yielded pleural tissue in 186 (97.38%) patients. The yield of the first pleural biopsy was 64.40%. In spite of pleural tissue obtained on biopsy procedure, diagnosis could not be established in 63 patients on histopathological examination, while pleural biopsy failed to provide pleural tissue in 5/191 (2.62%) patients. Sixty-eight patients had negative first pleural biopsy, out of which 22 patients could be subjected for repeat pleural biopsy (35 patients did not give consent, 7 lost to follow-up, and 4 had partial resolution of pleural effusion). Out of 22 patients who had repeat pleural biopsy, 13 had definitive histopathological diagnosis. The yield of repeat pleural biopsy was 13/22 (59.09%). Hence, after repeat pleural biopsy, combined yield of closed pleural biopsy was 136/191 (71.20%). Out of the total 191 patients who underwent closed pleural biopsy, 63 patients were diagnosed as having tuberculosis (TB), 71 patients as metastatic carcinoma, and 2 patients as Non-Hodgkin's lymphoma [Table 3]. In those 68 nondiagnostic pleural biopsy reports, one patient's report showed eosinophilic infiltration of the pleural tissue. Moreover, with the help of this, this patient was finally diagnosed as a case of Churg-Strauss syndrome (rare disease).

TB and metastatic carcinoma were the two most common and nearly equally distributed etiological diagnoses on the first closed pleural biopsy. However, repeat closed pleural biopsy in those with negative first pleural biopsy showed proportionately more patients with metastatic carcinoma than TB.

DISCUSSION

Closed pleural biopsy has been considered a valuable tool for the diagnosis of exudative pleural effusion. However, after the availability of thoracoscopy, the value of closed pleural biopsy has been downgraded. The BTS guidelines[5] released in the year 2010 recommend that thoracoscopic biopsy should be the next procedure after initial inconclusive diagnostic pleural aspiration in suspicious cases of malignancy, and Abrams needle biopsies are only diagnostically useful in areas with a high incidence of TB. However, in their early guidelines[9] in 2003, they advised thoracoscopic pleural biopsy only after initial negative closed pleural biopsy.

In a country like India, a large number of patients with both TB and malignancy present similarly with pleural effusion. As per the BTS guidelines,[5] half of these patients should be subjected for thoracoscopic pleural biopsy without considering closed pleural biopsy. Considering the number of patients and availability of infrastructure and expertise, there is a large gap between what is recommended and what is really available, not only in our country but also in most of the developing world. In this context, yield of the first pleural biopsy (64.40%) which further improved on repeat pleural biopsy to 71.20% in our study is meaningful. This figure would have gone higher if all patients with the first negative pleural biopsy could have been subjected to repeat pleural biopsy. Our results of repeat pleural biopsy are higher in comparison to the studies by Chakrabarti *et al*.[6] and Basu *et al*.[7] To the best of our knowledge, this is the largest single-center study from India of pleural biopsy and a repeat pleural biopsy if the first attempt was unsuccessful.

The yield of closed pleural biopsy was analyzed with the age, sex, smoking habits, and extent of effusion, color of effusion, duration of disease, and shift of the mediastinum. We did not find any positive association between the yield and the demographic and other characteristics of pleural fluid. However, unilateral effusion was found to be significantly associated with positive yield of pleural biopsy than bilateral pleural effusion ($P < 0.05$). Possible reasons for such variability could be that some of the patients with bilateral effusion might be having systemic disease or long-standing transudative effusion.

The etiology of effusion was correlated with patients' characteristics, and it was found that age above 50 years, smoking background, female gender, and hemorrhagic effusion were significantly associated with malignant etiology. We observed that chances of malignant etiology on pleural biopsy increased in incremental order when patients were having more than one of these factors. Chances of malignant etiology increased from 13.15% to 83.33% when the risk factor increased from 1 to 4 whereas only 1 out of 34 patients, who was below 50 years of age, male gender, never smoker, and with straw color effusion, had malignancy on pleural biopsy.

Table 3: Etiological diagnosis after pleural biopsy procedure

Etiological diagnosis	First pleural biopsy (*n*=191)	Repeat pleural biopsy (*n*=22)	Total patients, *n*=191 (100%)
Tuberculosis	60	3	63 (32.98)
Metastatic carcinoma	61	10	71 (37.17)
Non-Hodgkin lymphoma	2	0	2 (1.04)
Total	123	13	136 (71.20)

Considering the workload of TB and malignant effusion to the institutions, it is difficult to offer pleural biopsy to all those eligible patients, leave aside the option of thoracoscopic pleural biopsy. Therefore, considering the constraints and workload, one can offer the pleural biopsy to these patients (age above 50 years, smoker, female gender, and hemorrhagic effusion) and others can be put on empirical antitubercular treatment. In case of persistence, recurrence of effusion, or other signs favoring malignancy, pleural biopsy to establish the etiological diagnosis can be considered in follow-up.

In our study, four patients developed small pneumothorax and three had pain at biopsy site after closed pleural biopsy. No patient required intercostal drainage tube for pneumothorax. These seven complications (3.28%) were occurred after 213 attempts of closed pleural biopsy (191 attempts for the first pleural biopsy and 22 attempts for repeat pleural biopsy). Viskum and Enk[10] reported complication rates of 7%–8% in a series of 566 thoracoscopy examinations.

The results of our study clearly show that closed pleural biopsy has good diagnostic yield (near comparable to thoracoscopic pleural biopsy) in a selected population. Yield also increased after repeat pleural biopsy, hence considering the yields of repeat pleural biopsy in our study, closed pleural biopsy should also be considered before thoracoscopic pleural biopsy. The relative ease of performance, obvious advantage over open biopsy, and lack of any significant complication should prompt its more frequent use in Indian centers. Provided that adequate training is given, blind pleural biopsy appears to be well tolerated by a population who often have a poor performance status, short life expectancy, and comorbidities. Therefore, the BTS guidelines[5,9] are not perfectly tenable in our setup, and one should not forget the usefulness of the simple procedure which can be performed even in a sick patient on bedside.

CONCLUSIONS

In the diagnostic workup of pleural effusion, closed pleural biopsy provides a high diagnostic yield in the diagnosis of pleural TB and malignancy. Given low cost, easy availability, and low complication rates, closed pleural biopsy should always be considered as an initial diagnostic tool in the workup of exudative pleural effusion. Considering the relative yields of repeat pleural biopsy in our study, closed pleural biopsy should also be considered before thoracoscopic pleural biopsy. A higher diagnostic yield of thoracoscopic pleural biopsy should always be weighted in the context of available resources, expertise, and morbidity of patients.

Acknowledgment

We would like to acknowledge all the support staff involved in the care of patients.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Poe RH, Israel RH, Utell MJ, Hall WJ, Greenblatt DW, Kallay MC. Sensitivity, specificity, and predictive values of closed pleural biopsy. Arch Intern Med 1984;144:325-8.
2. Suri JC, Goel A, Gupta DK, Bhatia A. Role of serial pleural biopsies in the diagnosis of pleural effusions. Indian J Chest Dis Allied Sci 1991;33:63-7.
3. Kettel LJ, Cugell DW. Pleural biopsy. JAMA 1967;200:317-20.
4. Tomlinson JR, Sahn SA. Invasive procedures in the diagnosis of pleural disease. Semin Respir Med 1987;9:30-6.
5. Hooper C, Lee YC, Maskell N; BTS Pleural Guideline Group. Investigation of a unilateral pleural effusion in adults: British Thoracic Society pleural disease guideline 2010. Thorax 2010;65 Suppl 2:ii4-17.
6. Chakrabarti B, Ryland I, Sheard J, Warburton CJ, Earis JE. The role of Abrams percutaneous pleural biopsy in the investigation of exudative pleural effusions. Chest 2006;129:1549-55.
7. Basu A, Chakrabarti I, Ghosh N, Chakraborty S. A clinicopathological study of tuberculous pleural effusion in a tertiary care hospital. Ann Trop Med Public Health 2012;5:168-72.
8. Levine H, Cugell DW. Blunt-end needle biopsy of pleura and rib. Arch Intern Med 1962;109:516-25.
9. Antunes G, Neville E, Duffy J, Ali N; Pleural Diseases Group, Standards of Care Committee, British Thoracic Society. BTS guidelines for the management of malignant pleural effusions. Thorax 2003;58 Suppl 2:ii29-38.
10. Viskum K, Enk B. Complications of thoracoscopy. Poumon Coeur 1981;37:25-8.