DOI: 10.7860/JCDR/2014/7476.4310

Original Article

Internal Medicine Section

Medical Thoracoscopy vs Closed Pleural Biopsy in Pleural Effusions: A Randomized Controlled Study

NITHYA HARIDAS[1], SURAJ K.P.[2], RAJAGOPAL T.P.[3], JAMES P.T.[4], RAVINDRAN CHETAMBATH[5]

ABSTRACT

Background: Pleural effusion is a common diagnostic dilemma for the pulmonologist. A histological diagnosis would many a time steer the way to an accurate diagnosis of the aetiologies of pleural effusions. This study has compared two methods for obtaining histological specimens in cases of undiagnosed pleural effusions.

Aim: To compare the efficacy of closed pleural biopsy with Abrahm's needle and medical thoracoscopic biopsy in the diagnosis of undiagnosed exudative pleural effusions at a tertiary care setting.

Study Design: Randomized controlled study.

Study Period: November 2008–October 2010.

Methodology: All patients who were admitted with pleural effusions underwent a clinical workup for pleural effusions. Light's criterion was used to differentiate between exudative and transudative pleural effusions. Those patients with exudative pleural effusions, who did not have a specific diagnosis, were included in the study. Fifty eight patients were included in the study and they were randomized into 2 Groups of 29 patients each. One group was subjected to medical thoracoscopic pleural biopsy and the other to closed pleural biopsy with Abrahm's needle. Demographic, clinical and biochemical characteristics, diagnostic yields and the complications among the two groups were compared.

Result: Medical thoracoscopy has a diagnostic yield of 86.2% with complication rate of 10.3% compared to 62.1% and 17.2% respectively in closed pleural biopsy group.

Conclusion: Medical thoracoscopic pleural biopsy had a better diagnostic yield with a lower complication rate as compared to closed pleural biopsy with Abrahm's needle.

Keywords: Abrahm 's needle, Malignancy, Tuberculosis

INTRODUCTION

Pleural disease remains common, affecting over 3000 people per million populations each year. It therefore presents a significant contribution to the workload of respiratory physicians [1]. Pleural effusion is a common complication of systemic and localized disease. Most common causes of pleural effusions in India are tuberculosis, pneumonia, malignancies, congestive heart failure, renal failure, connective tissue disorders and pulmonary embolism. To find out the cause of pleural effusion, thoracocentesis, biochemical and microbiological analyses of pleural fluid are usually employed. They broadly differentiate exudates from transudates and provide the diagnostic evidence for par pneumonic effusions. However, this initial analysis has low sensitivity to detect tuberculosis and malignancies, the two most important causes of pleural effusions in India.

The diagnostic yield of thoracocentesis alone varies from approximately 25-75% [2-4] for pleural fluid cultures in tuberculosis and generally from 40-87% for malignancies [5-7]. Pleural biopsies provide diagnostic evidences for both tuberculosis and malignancies.

AIM OF THE STUDY

To compare the efficacy of Closed pleural biopsy and Medical Thoracoscopic pleural biopsy in the diagnosis of undiagnosed exudative pleural effusions in a tertiary care setting.

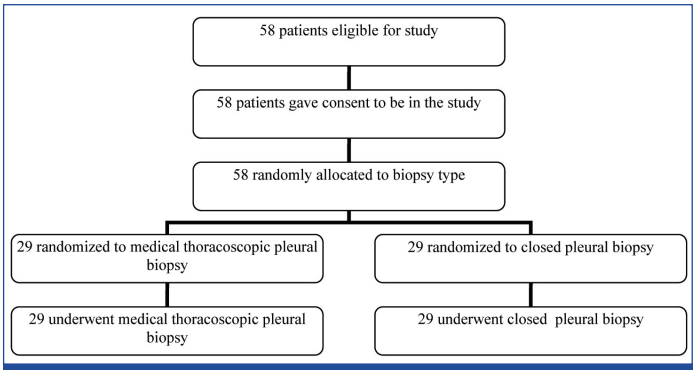
METHODOLOGY

This was a prospective, randomized, controlled clinical study which was done to compare the efficacies of closed pleural biopsy and Medical Thoracoscopic pleural biopsy in patients who were admitted to the institution with exudative pleural effusions, as was evidenced by thoracentesis. Patients who were aged >18 years, who were admitted to the institution during November 2008 to October 2010 with exudative pleural effusions, were included in the study. Patients with significant comorbidities like Coronary artery disease, Uncontrolled Diabetes mellitus, Uncontrolled Systemic hypertension, and features of malignancy, like lymph node enlargement, metastasis were excluded from the study.

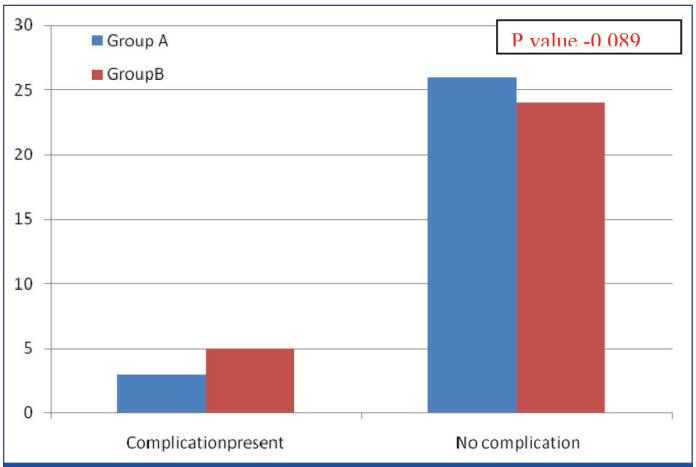
Before their inclusion, all patients had undergone clinical work-ups for pleural effusions, including chest radiograph, sputum smears for acid fast bacilli, and thoracocentesis with biochemical, cytological and microbiological evaluations of the aspirated fluid. After thoracocentesis, Light's criteria were used to differentiate between exudative and transudative pleural effusions. Pleural fluid was considered as an exudate if one or more of the following criteria were met

1. Pleural fluid protein/serum protein - >0.5
2. Pleural fluid LDH/serum LDH - >0.63
3. Pleural fluid LDH more than two-thirds of the upper limit of normal serum LDH.

Those patients with exudative pleural effusions who did not have the establishment of specific diagnoses were included in the study after getting their informed consents. The enrolled patients were then randomized into two groups, Group A and Group B. Randomization was done by a simple randomization method by using computer generated random numbers. The randomization diagram-trial profiles of patients in the study have been shown in [Table/Fig-1]. Group A was subjected to Medical Thoracoscopic pleural biopsy. Rigid thoracoscopy was done in the lateral position. Thoracoscopy was employed as a "medical" procedure with a single incision. After giving local anaesthesia with 2% lidocaine and sedation with midazolam, a small caliber trocar (14F) was



[Table/Fig-1]: Randomization trial profile of the patients



[Table/Fig-2]: Comparison of Complication rate

introduced into the intercostal space after incising the chest wall, in order to produce a pneumothorax. A larger flexible trocar (10 mm) was then introduced after enlarging the channel. Suction was then applied to remove the pleural fluid. A rigid thoracoscope of 7 mm diameter was inserted into the pleural cavity. Adhesions, when they were present, were lysed by using biopsy forceps or cautery. The thoracoscope was connected to a video camera and the lesions were viewed on a computer screen. Biopsies were taken from abnormal lesions. An intercostal drain was inserted post procedure.

Group B was subjected to closed pleural biopsy with Abrahm's needle. All closed pleural biopsies were performed in a standardized fashion. After giving local anaesthesia at a suitable location at the dorso-lateral thoracic wall, with the patient in sitting position, pleural fluid was sampled via Abrahm's needle and three to six biopsy specimens were taken with an inward motion of the closed biopsy punch.

The clinical profiles, diagnostic yields obtained on histopathology, complications and durations of hospital stay of the 2 Groups were compared and conclusions were drawn.

Sample size which was needed for this study was estimated at a minimum of 19 patients in each arm, with a power of 90% and an alpha error of 5%. However, we extended the number of patients to upto 29 for both arms, in case some patients were excluded in the course of the study. The primary end point of this study was the determination of diagnostic yields and complication rates of both invasive methods in the diagnosis of pleural diseases. The hospital stay associated with these procedures was the secondary outcome. Statistical analysis was done by using SPSS software, version 16. Pearson Chi-square test was used for qualitative variables. Unpaired student t-test was used for quantitative variables. p-value of <0.05 was considered to be statistically significant

This study was approved by the Institutional Ethics committee on 13/11/2008.

RESULTS

A total of 58 patients were included in the study. They were divided into two Groups A and B with 29 patients in each. Group A was subjected to medical Thoracoscopy and Group B was subjected to closed pleural Biopsy. 62.1% of the patients in Group A and 58.6% of the patients in Group B belonged to the 30-60 years age group. Mean age was 56.14 years in Group A and 56.04 in Group B. In Group A, there were 72.4 % males and 27.6% females, whereas in Group B, there were 55.4% males and 44.8% females. There was no difference in the study population in terms of age (t = 0.032, df = 56, sig (2-tailed) = 0.975) and sex(χ^2 = 0.072, df = 1, p = 0.788) COPD was the most common co-morbidity. It was present in 31% of the patients. The mean smoking score was 12.9 pack years in Group A and it was 13.2 pack years in Group B.

There was no significant difference between the two groups in the blood investigations. 60.1 % of the patients had right sided pleural effusion. 56.9% of the patients had moderate effusions. The two groups were comparable in the amounts of effusions. 53.4% of the patients had a straw coloured pleural fluid on thoracentesis. The two groups were similar in their pleural fluid characteristics. The mean ADA was 32.23 IU/ml in the medical thoracoscopy group and it was 30.48 IU/ml in the closed pleural biopsy group. 81% of the patients had lymphocyte predominant pleural fluids.

The diagnostic yield was 86.2% in Group A as compared to 62.1% in Group B with a statistically significant difference with a p-value of 0.036. Complication rates have been compared in [Table/Fig-2,3]. Hospital stay was longer in Group A [Table/Fig-4,5].

	Hydro-pneumothorax	Prolonged air leak	Hypotension	Surgical emphysema
Group A	0	2	1	0
Group B	4	0	0	1

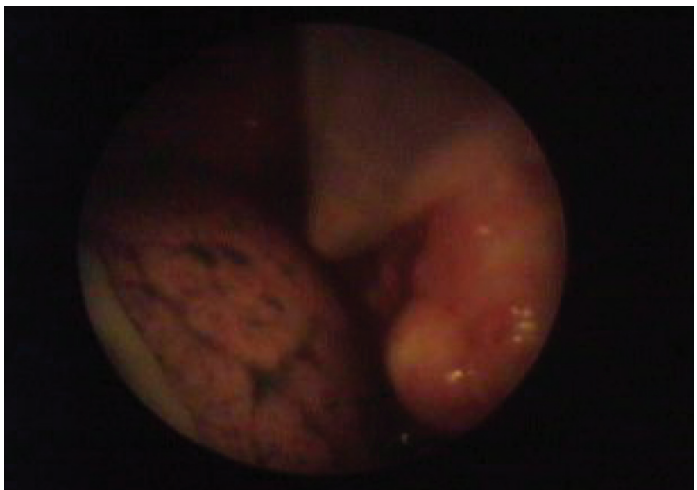
[Table/Fig-3]: Complications

	Group	n	Mean	Standard deviation
Total hospital stay	A	29	19.93	5.59
	B	29	10.34	4.80
Post procedure hospital stay	A	29	12.45	5.61
	B	29	4.45	2.71

[Table/Fig-4]: Hospital stay

	T	df	Sig (2-tailed)
Total hospital stay	7.010	56	0.00
Post procedure hospital stay	6.696	56	0.00

[Table/Fig-5]: t-test for equality of means-hospital stay



[Table/Fig-6]: Thoracoscopic appearance in case of Ca Breast- post MRM- post chemotherapy – presenting with massive pleural effusion

	Diagnostic yield		complication		Hospital stay	
	Medical thoracoscopy	Closed pleural biopsy	Medical thoracoscopy	Closed pleural biopsy	Medical thoracoscopy	Closed pleural biopsy
Diacon et al., [8]	100%	67%				
Walz et al., [9]	98%	80%				
Loddenkemper et al., [10]	95%	44%				
Metintas et al., [11]			40.3%	22.5%		
Hansen et al., [12]			3%			
Mungall et al., [13]				10.9%		
de Groot et al., [14]					6.7days	
François-Xavier Blanc et al., [15]					14.1±1.1 days	
Present study	86.2%	62.1%	10.3%	17.2%	19.93days	10.45days

[Table/Fig-7]: Comparison with similar studies

DISCUSSION

The present study was a randomized, controlled study which compared the diagnostic yields and complication rates of closed pleural biopsy and medical thoracoscopic pleural biopsy in undiagnosed exudative pleural effusions [Table/Fig-6].

Diagnostic yield, complication rate and hospital stay in the present study were compared with those of previous studies, as has been shown in [Table/Fig-7].

The diagnostic yield of thoracoscopy was slightly less as compared to that seen in other similar studies [Table/Fig-7]. This may be due to complexity of cases which were referred to a teritiary care teaching institute. The yield of closed pleural biopsy was comparable to that seen in a study done by Diacon et al., [8] and it was better than that seen in study done by Loddenkemper et al., [10]. The complication rates of both procedures were lower than those seen in the study done by Metintas et al., [11].

The mean hospital stay in this study was longer than that which was usually reported. However, thoracoscopy was not the reason for hospital admissions in several cases (most of the patients were admitted for pleural effusions without prior thoracocentesis). Hospital protocol was to perform pleurodesis in cases with histological evidences of malignancy when the drain decreased to less than 100 ml/day. Hence, pleurodesis was performed in 17 of the 29 patients who were subjected to medical thoracoscopy, which increased the mean duration of drainage and the mean length of the hospital stay.

This study proved that Medical thoracoscopy had a better diagnostic yield and a lower complication rate as compared to closed pleural biopsy in the diagnosis of undiagnosed exudative pleural effusions. The relatively low yield of closed pleural biopsy which was seen was caused by several factors, including minimal and non uniform pleural involvement in early disease, especially diaphragmatic and visceral pleura. These limitations can be overcome by medical thoracoscopy, wherein the biopsy is taken under direct vision from the site of the abnormality. As compared to surgical thoracoscopy (which is commonly known as video-assisted thoracic surgery [VATS]); medical thoracoscopy has the advantage of being performed under local anaesthesia and with conscious sedation, in an endoscopy suite. Thus, it is considerably less invasive and less expensive. The technique is technically simpler, resembling a chest tube insertion on using a trocar. In addition to its high diagnostic yield, thoracoscopy can be used for therapeutic procedures, such as breakage of adhesions and talc poudrage pleurodesis.

The British Thoracic Society (BTS) recommends either thoracoscopy or image-guided biopsy (using CT or ultrasound) as the next line of investigation in the event of a non diagnostic, blind pleural aspirate [16]. A CT-guided biopsy is safe, and sensitive [17] but a pleural fluid drainage or pleurodesis cannot be done in the same sitting. BTS recommends thoracoscopy in cases in which non diagnostic image-guided biopsies are done . This study has highlighted these recommendations.

Medical Thoracoscopy therefore, has an irrefutable role in the management of exudative pleural effusions and it should be the next investigation after the initial pleural fluid study in cases of undiagnosed exudative pleural effusions.

CONCLUSION

Medical thoracoscopy has a diagnostic yield of 86.2% with a complication rate of 10.3% as compared to a diagnostic yield of 62.1% and a complication rate of 17.2% respectively in closed pleural biopsy group. Hence, medical thoracoscopy is a better diagnostic tool in the hands of pulmonologists in cases of undiagnosed exudative pleural effusions.

REFERENCES

[1] Ingrid Du Rand, Nick Maskell. Introduction and Methods. British Thoracic Society – Pleural Disease Guideline 2010. (Available online at: http://www.brit-thoracic.org.uk/clinical-information/pleural-disease.aspx) (accessed on 19 april 2013)

[2] Baumann MH, Nolan R, Petrini M, Lee YC, Light RW, Schneider E. Pleural tuberculosis in the United States: Incidence and drug resistance. *Chest*. 2007; 131:1125-32.

[3] Chen ML, Yu WC, Lam CW, Au KM, Kong FY, Chan AY. Diagnostic value of pleural fluid adenosine deaminase activity in tuberculous pleurisy. *Clin Chim Acta*. 2004;341:101-7.

[4] Baumann MH. Closed needle biopsy of the pleura is a valuable diagnostic procedure.Pro: Closed needle biopsy. *JOBIP*. 1998;5:327-31.

[5] Sallach SM, Sallach JA, Vasquez E, Schultz L, Kvale P. Volume of pleural fluid required for diagnosis of pleural malignancy. *Chest*.2002;122:1913-7.

[6] Light RW. Pleural diseases. *Dis Mon*. 1992;38:266-331.

[7] Prakash UBS, Reiman HM. Comparison of needle biopsy with cytologic analysis for the evaluation of pleural effusion: analysis of 414 cases. *Mayo Clin Proc*. 1985; 60:158-64.

[8] Diacon AH, Van de Wal BW, Wyser C. Diagnostic tools in tuberculous pleurisy: a direct comparative study. *Eur Respir J*. 2003;22:589-91.

[9] Walzl G, Wyser C, Smedema J, Corbett C, van de Wal B. Comparing the diagnostic yield of Abrams needle pleural biopsy and thoracoscopy. *Am J Respir Crit Care Med*. 1996;153 A460.

[10] Loddenkemper R, Grosser H, Gabler A, Mai J, Preussler H, Brandt HJ. Prospective evaluation of biopsy methods in the diagnosis of malignant pleural effusions. Intrapatient comparison between pleural fluid cytology, blind needle biopsy and thoracoscopy. *Am Rev Respir Dis.* 1983;127 (Suppl. 4):114.

[11] Metintas Muzaffer, Guntulu AK, Emine Dundar, Huseyin Yildirim, Ragip Ozkan, Emel Kurt, et al. Medical Thoracoscopy vs. CT Scan-Guided Abrams Pleural Needle Biopsy for Diagnosis of Patients With Pleural Effusions A Randomized, Controlled Trial. *Chest*. 2010;137;1362-68.

[12] Hansen M, Faurschou P, Clementsen P. Medical thoracoscopy, results and complications in 146 patients: a retrospective study. *Respir Med*. 1998;92: 228-32.

[13] Mungall IP. Multiple pleural biopsy with the Abrams needle. Thorax. 1980;35(8): 600-2.

[14] de Groot M, Walther G. Thoracoscopy in undiagnosed pleural effusions. *S Afr Med J*. 1998;88:706-11.

[15] François-Xavier Blanc, Kinan Atassi, Jean Bignon, Bruno Housset. Diagnostic Value of Medical Thoracoscopy in Pleural Disease:A 6-Year Retrospective Study. *Chest*. 2002;121;1677-83.

[16] Maskell NA, Butland RJA, on behalf of the British Thoracic Society Pleural Disease Group. BTS guidelines for theinvestigation of a unilateral pleural effusion in adults. *Thorax.* 2003; 58: Suppl. II, ii8–ii17.

[17] Maskell NA, Gleeson FV, Davies RJO. Standard pleural biopsy versus CT-guided cutting-needle biopsy for diagnosis of malignant disease in pleural effusions: a randomized controlled trial. *Lancet*. 2003; 361: 1326–30.

PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Pulmonary Medicine, AIMS, Ponekara, Kochi, Kerala, India.
2. Additional Professor Department of Pulmonary Medicine, Institute of Chest Diseases, Government Medical College, Kozhikode, Kerala, India.
3. Professor, Department of Pulmonary Medicine, Institute of Chest Diseases, Government Medical College, Kozhikode, Kerala, India.
4. Professor & HOD, Department of Pulmonary Medicine, Institute of Chest Diseases, Government Medical College, Kozhikode, Kerala, India.
5. Principal, Government Medical College, Kozhikode, Kerala, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Nithya Haridas,
Assistant Professor, Department of Pulmonary Medicine, AIMS, Ponekara, Kochi, Kerala-682041, India.
Phone: 9447414081, E-mail: nithyaharidas@aims.amrita.edu

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Aug 26, 2013**
Date of Peer Review: **Jan 17, 2014**
Date of Acceptance: **Mar 12, 2014**
Date of Publishing: **May 15, 2014**