

# The Outcome of Medical Thoracoscopy in Patients with Unexplained Exudative Pleural Effusion

Sharath Chandra KS<sup>1</sup>, Chandramouli M Thimmaiah<sup>2</sup>, Giridhar B Hosmane<sup>3</sup>

Received on: 17 October 2022; Accepted on: 16 February 2023; Published on: 30 June 2023

## ABSTRACT

**Background:** Exudative pleural effusion of unknown etiology is a diagnostic perplexity. Medical thoracoscopy (MT) is a less invasive procedure and has a high diagnostic utility in these patients.

**Objectives:** The study goal was to analyze the value of MT in patients with exudative pleural effusion of unknown cause.

**Materials and methods:** The cross-sectional observational study included clinical data of patients with unexplained pleural effusion of exudative type who had undergone MT at a tertiary care center between July 2019 and June 2022.

**Results:** The diagnostic MT was performed on 28 patients with exudative pleural effusion, which diagnostic thoracentesis could not explain. The diagnostic yield was 96.42%. The mean age was  $52.9 \pm 13.5$  (range 25–75) years, and 17 (60.7%) were males. Malignancy was diagnosed in 60.70% (17/28) of patients, tuberculosis in 28.60% (8/28) of patients, and nonspecific pleuritis/fibrosis in 10.70% (3/28) of patients. Out of 17 patients with malignancy, metastatic adenocarcinoma was detected in 70.58% (12/17) of patients, malignant mesothelioma in 17.64% (3/17) of patients, and poorly differentiated in 11.76% (2/17) of patients. No major complications were observed and only three patients had minor complications.

**Conclusion:** Medical thoracoscopy (MT) is a minimally invasive, risk-free, and effective tool for the diagnosis of unexplained exudative pleural effusion with added therapeutic advantages with high diagnostic yield and minimal complication rate.

**Keywords:** Malignancy, Nodules, Pleural effusion, Rigid thoracoscopy, Tuberculosis.

*Indian Journal of Respiratory Care* (2023); 10.5005/jp-journals-11010-1031

## INTRODUCTION

Medical thoracoscopy (MT) or pleuroscopy has both diagnostic and therapeutic advantages, where the endoscope is passed through the chest wall for direct visualization of the pleura. Francis Richard Cruise and Samuel Gordon first visualized the pleural cavity in a girl with chronic empyema by using a cystoscope. Hans Christian Jacobaeus developed it in 1910 and published the first thoracoscopy case series in 1921. Between 1920 and 1950, thoracoscopy was used mainly to treat tuberculosis, lyse the pleural adhesions, and create a pneumothorax as part of collapse therapy for tuberculosis. After the advent of anti-tubercular drugs, thoracoscopy has been changed to diagnose several chest diseases, namely pleural effusions, lung malignancy with pleural metastasis, primary pleural malignancies, and recurrent, complicated pneumothorax. MT has several therapeutic indications, including drainage of complicated parapneumonic effusion, pleurodesis, and foreign body removal.<sup>1</sup>

Pleural effusion is common in clinical practice. The first question to be addressed in pleural effusion is whether it is exudative or transudative effusion; this can be achieved by diagnostic thoracentesis and pleural fluid analysis for measuring protein and lactate dehydrogenase (LDH) levels. After the differentiation, if the effusion is, further exudative evaluation includes pleural fluid adenosine deaminase (ADA) levels, total cell count, differential count, cytopathology studies, bacterial culture, and GeneXpert for mycobacterium tuberculosis (MTB). However, in some patients, the diagnosis of exudative lymphocytic effusion poses a diagnostic dilemma for pulmonologists. In such patients, the next step should be MT.

<sup>1-3</sup>Department of Pulmonary Medicine, KS Hegde Medical Academy (KSHEMA), Nitte (Deemed to be University), Mangaluru, Karnataka, India

**Corresponding Author:** Chandramouli M Thimmaiah, Department of Pulmonary Medicine, KS Hegde Medical Academy (KSHEMA), Nitte (Deemed to be University), Mangaluru, Karnataka, India, Phone: +91 9632551141, e-mail: mouli.aims@gmail.com

**How to cite this article:** KS SC, Thimmaiah CM, Hosmane GB. The Outcome of Medical Thoracoscopy in Patients with Unexplained Exudative Pleural Effusion. *Indian J Respir Care* 2023;12(2):109–112.

**Source of support:** Nil

**Conflict of interest:** None

The most standard indication for MT is a pleural effusion that is unexplained by diagnostic thoracentesis. It is considered to be a minimally invasive procedure with a high diagnostic yield in unexplained exudative pleural effusion. MT has two types, namely rigid and semirigid thoracoscopy. In semirigid thoracoscopy, the obtained samples are small compared to rigid thoracoscopy. However, the quality of samples is adequate; the diagnostic accuracy is comparable with that of rigid thoracoscopy in the analysis of pleural effusion.<sup>2</sup> The complications of MT include pneumonia, hemorrhage, empyema, bronchopleural fistula, postoperative pneumothorax, pneumomediastinum, surgical emphysema, atrial fibrillation, and hemodynamic instability during the procedure.

## MATERIALS AND METHODS

The current retrospective cross-sectional observational study included clinical data of patients who had undergone MT following an inconclusive diagnostic thoracentesis at a tertiary care hospital in the period between July 2019 and June 2022. Unexplained exudative pleural effusion, which refers to exudative, lymphocytic effusion where ADA, cytology, bacterial culture, and GeneXpert MTB results not contributing to the diagnosis. Institutional Ethics Committee approval was taken before conducting the study.

The clinical data of the study cohort included detailed clinical history, general physical and systemic examination, and relevant blood investigations, including complete blood count, blood sugar, bleeding parameters such as bleeding time, clotting time, and prothrombin time, and liver function tests, renal function tests, radiologic studies including plain chest radiography, ultrasound thorax, and contrast-enhanced computed tomography thorax. Diagnostic thoracentesis and results of pleural fluid analysis including protein, glucose, LDH, and ADA levels, total cell count, differential count, and cytology for malignant cells, and GeneXpert for MTB, and findings of the thoracoscopic examination of the pleural space which was carried out using single entry site, the Karl Storz 10-mm rigid thoracoscope under conscious sedation after obtaining written informed consent and results of the histopathological study, immunohistochemistry, and GeneXpert MTB which were done on obtained biopsy specimens in a National Accreditation Board for Testing and Calibration Laboratories accredited laboratory were collected.

All the collected data were analyzed using IBM Statistical Package for the Social Sciences 23 statistics and exhibited as mean  $\pm$  standard deviation (SD) and frequency expressed in percentage. The association between gross thoracoscopy findings was measured using a Chi-squared test.

## RESULT

Between July 2019 and June 2022, 28 MTs were performed in patients with exudative pleural effusion, which could not be explained by diagnostic thoracentesis, and satisfactory biopsy specimens were procured for histopathological and microbiological studies. The mean age of the patients was 52.9 years (SD  $\pm$  13.5), 17 (60.7%) were males, and 11 (39.3) were females. The patient's ages ranged between 25 and 75 years. More patients belonged to the age group of 40–60 years. Most patients were nonsmokers, and 32.1% (9/28) of patients were chronic smokers. Comorbidities such as obstructive airway diseases, hypertension, diabetes mellitus, and hypothyroidism were present in 46.4% (13/28) of patients. The demographic characteristics of patients who had undergone diagnostic thoracoscopy were presented in (Table 1).

Unilateral pleural effusion was found in 96.4 % (27/28) of patients, right and left-sided effusion was seen in 60.7% and 35.7% of patients, respectively, and only one patient had bilateral effusion. Thoracoscopy findings such as nodules were found in 67.9 % (19/28) of patients, adhesions in 21.4% (6/28) of patients, and pleural thickening in 10.7% (3/28) of patients (Table 2).

In our study, the diagnosis of malignancy was established in 17 (60.7%) patients, tuberculosis in 8 (28.6%) patients, and nonspecific pleuritis/fibrosis in 3 patients (10.7%), among which one patient was eventually diagnosed with synovial sarcoma on ultrasound-guided biopsy (Table 3).

Among malignancies, metastatic adenocarcinoma was the commonest type which was found in 70.58% (12/17) of patients, and malignant mesothelioma was diagnosed in 17.64% (3/17) of patients, and poorly differentiated carcinoma in 11.76 % (2/17) of patients.

Nodules were the more frequently noticed finding in the gross thoracoscopic examination found in nineteen patients. Out of 19 patients with nodules, 84.21% (16/19) were diagnosed as malignant, while 15.79% (3/19) were nonmalignant. The second common finding in the gross thoracoscopic examination was adhesions found in six patients, all of whom were nonmalignant. The association between the gross thoracoscopic findings was measured with the chi-squared test and showed a value of 14.613<sup>a</sup> with a *p*-value of 0.001 which is <0.05; hence the findings are statistically significant (Table 4 and Fig. 1).

No mortality or major complications were related to the procedure. A few minor complications occurred in three patients, including minor bleeding in two patients (7.14%) and mild fever in one patient (3.57%).

## DISCUSSION

In clinical practice, patients frequently present with pleural effusion. The diagnosis of pleural effusion can be made by biochemistry, microbiological and cytological analysis of pleural fluid. However, in some patients, pleural effusion, which was unexplained by diagnostic thoracentesis, poses a diagnostic challenge for pulmonologists. The etiologies such as malignancy

**Table 1:** Demographic characteristics of patients with pleural effusion

Variable	Subgroup	Number of patients (n = 28), n (%)
Age	21–40 yrs	6 (21.4)
	41–60 yrs	13 (46.4)
	>60 yrs	9 (32.1)
Sex	Male	17 (60.7)
	Female	11 (39.3)
Smoking status	Smoker	9 (32.1)
	Nonsmoker	19 (67.9)
Comorbidities	Yes	13 (46.4)
	Nil	25 (53.6)

**Table 2:** Laterality of pleural effusion and gross thoracoscopic findings in the study groups

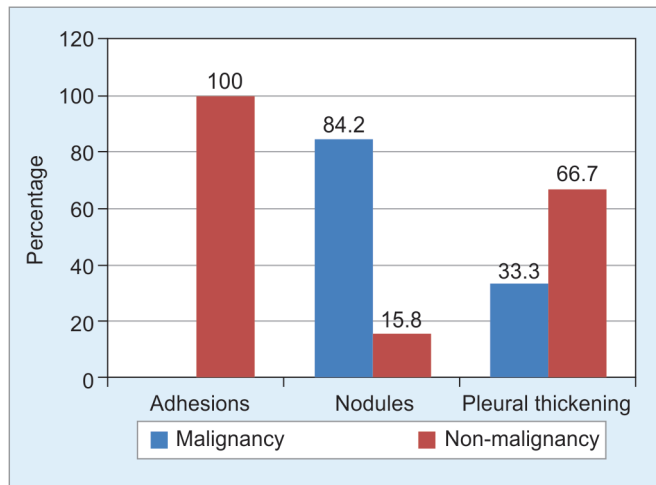
Variable	Subgroup	Number of patients (n = 28), n (%)
Laterality	B/L	1 (3.6)
	Left	10 (35.7)
	Right	17 (60.7)
Thoracoscopic findings	Nodules	19 (67.9)
	Adhesions	6 (21.4)
	Pleural thickening	3 (10.7)

**Table 3:** The histopathological diagnosis of patients, which was established by thoracoscopic pleural biopsy

Diagnosis	Number of patients (n = 28)	Percent
Malignancy	17	60.7
Tuberculosis	8	28.6
Nonspecific inflammation	3	10.7

**Table 4:** Distribution of histopathological diagnosis with the thoracoscopic findings

	MT findings			Total
	Adhesions	Nodules	Pleural thickening	
Malignancy	0	16	1	17
	0.0%	84.2%	33.3%	60.7%
Non-malignancy	6	3	2	11
	100.0%	15.8%	66.7%	39.3%
Total	6	19	3	28
	100.0%	100.0%	100.0%	100.0%



**Fig. 1:** Distribution of histopathological diagnosis with the thoracoscopic findings

and tuberculosis are the more frequent diagnoses established in these patients using MT.<sup>3</sup> We hand out an analysis based on clinical data of patients with unexplained pleural effusion, which was collected over 3 years. During the study period, a noticeable decrease in the number of MTs was witnessed due to the coronavirus disease pandemic.

The objective of this study was to estimate the contribution of MT in the diagnosis of undiagnosed exudative pleural effusion. Our analysis included consecutive MTs with diagnostic intent without any selection.

A total of 28 patients had undergone MT. Out of 28 patients, 17 were men, and 11 were women, with a mean age of 52.9 ± 13.5 years. The overall diagnostic yield was 96.42%. This finding echoes the results of other studies such as Munavvar et al., Wang et al., Dhooria et al., Mohamed et al., and Prabhu et al.<sup>4-8</sup> We have included both malignant and nonmalignant conditions in the analysis of diagnostic yield. However, one of the patients who was diagnosed to have nonspecific pleuritis/fibrosis on histological analysis of MT was later, after 3 months came, with a large pleural mass lesion and diagnosed as synovial sarcoma on ultrasound-guided biopsy, and the rest of the patients with nonspecific pleuritis remained benign even after the 6 months of regular follow-up.

Directly visualizing the pleural surfaces is advantageous in arriving at a diagnosis. In our study, variable-sized nodules were seen in 19 patients, and adhesions in six patients. Compared with histology reports, 84.2% of patients with nodules had malignancy, and non-malignancy conditions were diagnosed in 100% of patients

with adhesions. These findings were peering the results of studies conducted by Prabhu et al. and Laila et al.<sup>8,9</sup>

In our study, malignancy was diagnosed in most of the patients (60.7%, 17/28), with metastatic adenocarcinoma (70.58%, 12/17) being the most common; these findings were comparable to the results obtained by Patil et al. and Hansen et al. published respectively in 2016 and 1998.<sup>10,11</sup> The second common diagnosis among malignancies was malignant pleural mesothelioma (MPM) found in 17.64% (3/17) of patients. This is less compared to the results obtained by Valsecchi et al. and Ahmed et al.<sup>12,13</sup> this could be due to the low incidence of MPM in India as compared to other countries such as Europe, Australia, and New Zealand<sup>14</sup> and none of our patients in this study had a history of any occupational exposure.

In the current study, the second most prevalent diagnosis was tuberculosis found in eight patients (28.6%). This is comparable with the results of other Indian studies were done by Mootha et al. and Sud et al.<sup>15,16</sup> Still, this finding is in contrast to the results of Valsecchi et al., where tuberculosis was found in only 6% of patients (n = 2,474). This is probably due to the high incidence of tuberculosis in India. In this study, right-side pleural effusion was seen in 17 patients (60.7%), left-sided effusion in 10 patients (35.7%), and only one patient (3.6%) had bilateral effusion. These findings followed the results of Kiani et al. and Shrestha et al.<sup>17,18</sup>

Major complications of MT include persistent air leak, major bleeding, empyema, pneumonia, port site tumor growth, and extensive surgical emphysema. Minor complications are mild fever, minor bleeding, operative skin infection, atrial fibrillation, and temporary air leaks.<sup>19</sup> In this study, minor complications were observed in three patients (10.71%), which echoes the results obtained by Ahmed et al. and Nour et al., where minor complications were observed in 10 and 16.5% of patients.<sup>20</sup>

## CONCLUSION

Medical thoracoscopy (MT) is a minimally invasive, risk-free, and effective tool for the diagnosis of unexplained exudative pleural effusion with added therapeutic advantages with high diagnostic yield and minimal complication rate.

## REFERENCES

- Narasimhan RL, Sehgal IS, Dhooria S, et al. Removal of intrapleural foreign body by medical thoracoscopy: report of two cases and a systematic review of the literature. *J Bronchology Interv Pulmonol* 2017;24(3):244–249. DOI: 10.1097/LBR.0000000000000275
- Rozman A, Camlek L, Marc-Malovrh M, et al. Rigid versus semi-rigid thoracoscopy for the diagnosis of pleural disease: a randomized pilot study. *Respirology* 2013;18(4):704–710. DOI: 10.1111/resp.12066
- Light RW. The undiagnosed pleural effusion. *Clin Chest Med* 2006;27(2):309–319. DOI: 10.1016/j.ccm.2005.12.002
- Munavvar M, Khan MA, Edwards J, et al. The autoclavable semirigid thoracoscope: the way forward in pleural disease? *Eur Respir J* 2007;29(3):571–574. DOI: 10.1183/09031936.00101706
- Wang Z, Tong ZH, Li HJ, et al. Semi-rigid thoracoscopy for undiagnosed exudative pleural effusions: a comparative study. *Chin Med J (Engl)* 2008;121(15):1384–1389. DOI: 10.1097/00029330-200808010-00010
- Dhooria S, Singh N, Aggarwal AN, et al. A randomized trial comparing the diagnostic yield of rigid and semirigid thoracoscopy in undiagnosed pleural effusions. *Respir Care* 2014;59(5):756–764. DOI: 10.4187/respcare.02738.
- Mohamed SA, Shaban MM. Diagnostic yield of medical thoracoscopy in diagnosis of exudative pleural effusion: one year prospective study. *Egypt J Chest Dis Tuberc* 2014;63(4):897–905. DOI: 10.1016/j.ejcdt.2014.06.007

8. Prabhu VG, Narasimhan R. The role of pleuroscopy in undiagnosed exudative pleural effusion. *Lung India* 2012;29(2):128–130. DOI: 10.4103/0970-2113.95304.
9. Helala LA, El-Assal GM, Farghally AA, et al. Diagnostic yield of medical thoracoscopy in cases of undiagnosed pleural effusion in Kobri El-Kobba Military Hospital. *Egypt J Chest Dis Tuberc* 2014;63(3):629–634. DOI: 10.1016/j.ejcdt.2014.04.002
10. Patil CB, Dixit R, Gupta R, et al. Thoracoscopic evaluation of 129 cases having undiagnosed exudative pleural effusions. *Lung India* 2016;33(5):502–506. DOI: 10.4103/0970-2113.188969
11. Hansen M, Faurschou P, Clementsen P. Medical thoracoscopy, results and complications in 146 patients: a retrospective study. *Respir Med* 1998;92(2):228–232. DOI: 10.1016/s0954-6111(98)90100-7
12. Valsecchi A, Arondi S, Marchetti G. Medical thoracoscopy: analysis on diagnostic yield through 30 years of experience. *Ann Thorac Med* 2016;11(3):177–182. DOI: 10.4103/1817-1737.185755
13. Ahmed MM, Abdel Halim HA, Aziz ET, et al. Outcomes and complications of medical thoracoscopy in undiagnosed exudative pleural effusion. *Egypt J Bronchol* 2016;10(2):93–99. DOI: 10.4103/1687-8426.184367
14. Hui M, Uppin SG, Bhaskar K, et al. Malignant mesothelioma: a histomorphological and immunohistochemical study of 24 cases from a tertiary care hospital in Southern India. *Indian J Cancer* 2018;55(2):190–195. DOI: 10.4103/ijc.IJC\_584\_17
15. Mootha VK, Agarwal R, Singh N, et al. Medical thoracoscopy for undiagnosed pleural effusions: experience from a tertiary care hospital in north India. *Indian J Chest Dis Allied Sci* 2011;53(1):21–24. DOI: 10.5005/ijcdas-53-1-21
16. Sud R, Mujeeb VR, Tilak T, et al. The diagnostic dilemma of an exudative pleural effusion and the emerging role of thoracoscopic pleural biopsy in these patients: a study from South India. *Ann Med Res Pract* 2022;3:2. DOI: 10.25259/ANMRP\_24\_2021
17. Kiani A, Abedini A, Karimi M, et al. Diagnostic yield of medical thoracoscopy in undiagnosed pleural effusion. *Tanaffos* 2015;14(4):227–231. PMID: 27114723
18. Shrestha BK, Adhikari S, Thakur BK, et al. Medical thoracoscopy for undiagnosed exudative pleural effusion: experience from two tertiary care hospitals of Nepal. *JNMA J Nepal Med Assoc* 2020;58(223):158–164. DOI: 10.31729/jnma.4873
19. Rahman NM, Ali NJ, Brown G, et al. British Thoracic Society pleural disease guideline group. Local anaesthetic thoracoscopy: British Thoracic Society pleural disease guideline 2010. *Thorax* 2010;65(2):54–60. DOI: 10.1136/thx.2010.137018
20. Nour Moursi Ahmed S, Saka H, Mohammadien HA, et al. Safety and complications of medical thoracoscopy. *Adv Med* 2016;2016:3794791. DOI: 10.1155/2016/3794791