

Original Research Article

Medical thoracoscopy in evaluation of undiagnosed pleural effusion

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ABSTRACT

Background: Medical thoracoscopy or pleuroscopy, in recent past has received lot of interest for diagnostic as well as therapeutic purposes. In the evaluation of undiagnosed pleural effusion, it has become a key diagnostic modality as it is a cost effective and safe procedure. The aim of present study was to assess the diagnostic yield of medical thoracoscopy in patients with undiagnosed exudative pleural effusion.

Methods: This prospective study was conducted at government chest diseases hospital Srinagar between December 2016 to June 2018. One hundred and twenty-five (125) patients who fulfilled inclusion criteria were included in this study. Thoracoscopy was done using rigid thoracoscope under local anesthesia. Thoracoscopic and histopathological data of enrolled patients was collected prospectively and analysed.

Results: Patients enrolled in the study were in the age range of 17 to 82 years and consisted of 80 males and 45 females. Most common thoracoscopic finding was multiple variable sized nodules (53.6%) followed by sago grain infiltration (15.2%). Malignancy was the most common histopathological diagnosis (60.8%) with metastatic adenocarcinoma being the most common histopathological diagnosis (50%). The overall diagnostic yield of thoracoscopy was 90.4%.

Conclusions: Medical thoracoscopy is a safe procedure with excellent diagnostic yield for evaluation of undiagnosed pleural effusion with minimal complication rates.

Keywords: Medical thoracoscopy, Malignancy, Pleural effusion, Tuberculosis

INTRODUCTION

Medical thoracoscopy, also referred to as pleuroscopy, is a minimally invasive procedure involving endoscopic evaluation of the pleural space.

The first thoracoscopy was performed using a cystoscope in 1866 by FR Cruise in Ireland. HC Jacobeus, a Swedish

internist, was the first to perform thoracoscopy in 1910, as a diagnostic procedure for exudative pleuritis.¹ The concept of medical thoracoscopy is simplification of video assisted thoracoscopic surgery as it allows basic diagnostic as well as therapeutic procedures to be performed safely as a day care procedure in conscious sedation under local anesthesia.¹⁻³ With the availability of better instrumentation and simpler sedation protocols,

medical thoracoscopy has received renewed interest among pulmonary physicians in the recent past.³

The major indication for medical thoracoscopy is evaluation of exudative pleural effusions which remain undiagnosed after pleural fluid analysis. Usually in all pleural effusions, cytological and biochemical analysis is needed to establish diagnosis. Blind pleural biopsies may help in additional cases but low yield and complications like bleeding and pneumothorax are common. In around 20% cases, etiology remains unclear even after extensive diagnostic work up. In the context of these undiagnostic pleural effusions, thoracoscopy is an essential modality.

Both rigid and semi rigid thoroscopes remain valuable in the evaluation and management of pleural disease but majority of centers use a rigid thoracoscope as this allows excellent visualization and inspection of thoracic cavity and permits adequate sized biopsies to be obtained.⁴

METHODS

The study was a prospective, non-randomized study conducted at Govt chest diseases hospital Srinagar from December 2016 to July 2018 on usefulness of medical thoracoscopy in undiagnosed pleural effusions. Patients with undiagnosed pleural effusion despite repeated biochemical and cytological analysis of pleural fluid were enrolled in this study. After detailed history and examination, necessary laboratory hematological and radiological investigations were done and thoracoscopy was performed in all eligible patients after taking informed consent. The study was approved by the local ethical committee. The inclusion and exclusion criteria for the study are.

Inclusion criteria

- Exudative pleural effusion as per Lights criteria
- ADA levels less than 70 IU/l
- Pleural fluid cytology negative for malignant cells
- No endobronchial growth on assessment with FOB
- Lymphocyte predominant pleural fluid
- Surgically fit for thoracoscopy
- No known underlying lung disease causing pleural effusion like tuberculosis or malignancy
- Patient willing to give consent for thoracoscopy.

Exclusion criteria

- Transudative pleural effusion as per Lights criteria
- Pleural fluid ADA levels greater than 70 IU/l
- Pleural fluid cytology positive for malignancy
- Known primary malignancy
- Smear positive pulmonary tuberculosis patients
- Endobronchial growth on assessment with FOB
- Pregnant female patients
- Surgically unfit patients

- Patients with recent history of myocardial infarction, or cardiac arrhythmias
- Patients with hemodynamic instability
- Patients with excessive rib crowding and extremely narrow intercostal space
- Intractable cough or severe dyspnea
- Bleeding diathesis.

Thoracoscopy was done under local anesthesia with rigid thoracoscope. Prior to the procedure, patients were kept fasting for about 6 hours. After gaining proper intravenous access, patients were made to lie in lateral decubitus position with affected side facing upwards. Throughout the procedure vital parameters like electrocardiogram, blood pressure and oxygenation were continuously monitored. The port of site was selected with ultrasonic guidance usually between 5th-6th intercostal space in midaxillary line.

The skin, subcutaneous tissue, intercostal muscles and parietal pleura were anaesthetized with 10 ml of 2% lignocaine. Intravenous tramadol and midazolam were also given in some patients to increase comfort without compromising respiration. Around 1-2 cm long incision was given at desired site and blunt dissection of subcutaneous tissue and intercostals muscle was done to reach pleural cavity. Trocar was introduced and pleural fluid was aspirated. Rigid thoracoscope was introduced and thorough examination of pleural cavity and pleura was done.

Mostly 5-6 biopsies were taken from parietal pleura at the involved site. If no gross abnormalities were present at parietal pleura, multiple biopsies were taken from different sites. A lateral lift and peel technique were used to take pleural biopsies. Adhesions wherever present were broken gently by biopsy forceps. After taking biopsies pleural cavity was properly examined for active bleed. Chest tube size 28 F to 32 F was introduced through trocar site and connected with under water seal followed by proper suturing of the wound.

RESULTS

The total number of patients included in the study was 125. Out of these 125 patients 80 (64%) were males and 45 (36%) were females, with an age range of 17 to 82 years. Maximum number of patients (23.2%) was in the age group of 61-70 years followed by 20% each in the age group of 51-60 and 71-80 years. Lowest number of patients was in the age group of 81-90 years (Table 1).

The most common gross thoracoscopic visual findings were multiple variable sized nodules in 67 patients (53.6%), followed by sago granular appearance in 19 patients (15.2%), adhesions in 14 patients (11.2%), mass lesion in 9 patients (7.2%), diffuse pleural thickening in 6 patients (4.8%), single nodule in 4 patients (3.2%), ulcerative lesion in 3 patients (2.4%), apparently healthy

smooth pleura in 2 patients (1.6%) and hyperemic pleura in 1 patient (0.8%) (Table 2).

Table 1: Age and gender distribution of the study population.

Age group	Males	Females	Total
15-20	3	1	4 (3.2%)
21-30	6	3	9 (7.2%)
31-40	9	5	14 (11.2%)
41-50	10	6	16 (12.8%)
51-60	16	9	25 (20%)
61-70	18	11	29 (23.2%)
71-80	16	9	25 (20%)
81-90	2	1	3 (2.4%)
Total	80	45	125

Table 2: Gross thoracoscopic findings in the study population.

Thoracoscopic findings	Total	%
Multiple variable pleural nodules	67	53.6
Single nodule	4	3.2
Sago grain appearance	19	15.2
Hyperemic pleura	1	0.8
Ulcerative lesion	3	2.4
Mass lesion	9	7.2
Diffuse pleural thickening	6	4.8
Smooth apparently healthy pleura	2	1.6
Adhesions	14	11.2
Total	125	100

Table 5: Distribution of the diagnosed patients in the studied group in relation to the thoracoscopic findings.

Findings	Malignant	Nonmalignant	Inconclusive	Nonspecific	Total
Multiple variable pleural nodules	56 (83.58%)	7 (10.45%)	-	4 (5.97%)	67
Single nodule	2 (50%)	1 (25%)	1 (25%)	-	4
Sago grain appearance	-	19 (100%)	-	-	19
Mass lesion	9 (100%)	-	-	-	9
Diffuse pleural thickening	5 (83.33%)	-	-	1 (16.67%)	6
Smooth apparently healthy pleura	-	-	1 (50%)	1 (50%)	2
Adhesions	1 (7.14%)	9 (64.28%)	2 (14.29%)	2 (14.28)	14
Hyperemic pleura	-	1 (100%)	-	-	1
Ulcerative lesion	3 (100)	-	-	-	3
Total	76	37	4	8	125

Out of the 76 malignant effusions, metastatic adenocarcinoma was the most common cause of effusion in 38 (50%) patients followed by mesothelioma in 28 (36.84%) patients. In 7 (9.21%) patients squamous cell carcinoma was the cause of effusion and small cell carcinoma in 2 patients. Non-Hodgkin's lymphoma was the cause of effusion in 1 of the patients (Table 4). Among the malignant effusion group, multiple variable

Table 3: Distribution of study population in various diagnostic groups depending upon histopathological findings.

Pleural biopsy istopathology	Number	Percentage
Granulomatous inflammation consistant with tuberculosis	37	29.6%
Chronic nonspecific pleuritis	8	6.4%
Malignant effusion	76	60.8%
Inconclusive	4	3.2%
Total	125	100%

The nature of pleural effusion was malignant in 76 (60.8%) of patients and non-malignant in 45 patients. The histopathology report was inclusive in 4 patients. Among the patients with non-malignant effusion, granulomatous infection consistent with tuberculosis was most common finding in 37 (29.6%) patients and chronic nonspecific pleuritis in 8 (6.4%) patients. In 4 patients thoracoscopy was inconclusive (Table 3).

Table 4: Frequency of different type of malignant lesions among the study patients.

Type of malignancy	Number	% total malignancy
Metastatic adenocarcinoma	38	50%
Mesothelioma	28	36.84%
Squamous cell carcinoma	7	9.21%
Small cell carcinoma	2	2.63%
Non-Hodgkin's lymphoma	1	1.31%
Total	76	100%

pleural nodules were the most common gross thoracoscopic finding in 56(83.58%) patients, followed by mass like lesion, ulcerative lesion and single nodule.

In the non-malignant group, sago grain appearance was the most common gross thoracoscopic finding and was highly specific of tuberculous effusion. The other gross thoracoscopic findings in case of non-malignant effusion

were adhesions, single nodule, hyperemic mucosa and in few cases multiple soft nodules (Table 5).

Table 6: Diagnostic yield of medical thoracoscopy in present study.

Patients	Total	Percentage (%)
Diagnosed	113	90.4
Undiagnosed	12	9.6
Total	125	100

Out of 125 patients 113 were diagnosed. As 8 patients with nonspecific pleuritis need close follow up for prolonged period, they were put in non diagnosed group along with 4 patients with inconclusive biopsy report (total 12) so the overall diagnostic efficacy was 90.4% (Table 6).

In the present study, there was no reported mortality and no observed major complications only 8 patients had minor complications like prolonged air leak (2 patients), subcutaneous emphysema (3 patients) wound infection (2 patients) and empyema (1 patient).

DISCUSSION

Main indication of thoracoscopy in this study was unexplained pleural effusions after thorough cytological and biochemical analysis. As percutaneous blind needle biopsy is having low sensitivity, thoracoscopy is a better option.⁵ Overall cost effectiveness of thoracoscopy is better in view of its better yield and lesser duration of hospital stay.⁶ Direct visualization of pleural surface during medical thoracoscopy is a major advantage, which may help to suspect a diagnosis and permit targeted biopsy from abnormal pleural region under direct vision. Besides adhesionolysis can be done in loculated effusions.

In present study the overall diagnostic yield was 90.4% similar results were experienced in multiple studies across the globe. Hansen et al, were able to achieve diagnosis in 90.4% in a study comprising of 147 patients.⁷ Patel CB et al, reported a diagnostic yield of 85.3% in 129 patients.⁸ Dhanya TS et al, reported diagnostic sensitivity of 90.4% in 147 patients.⁹ Tscheikuna J et al, reported diagnostic yield of 95% in 35 patients.¹⁰ Prabhu and Narasimhan et al, reported diagnostic yield of 97% in 68 patients while Menzies R et al, reported diagnostic yield in 96% in a study involving 102 patients.^{11,12} Harris RJ et al, in a retrospective study involving 182 patients reported diagnostic yield in 85.71% of patients.¹³ In 51 patients Lee P et al, reported diagnostic yield of 96% in 51 patients.¹⁴ Rozman A et al, reported diagnostic accuracy of thoracoscopy as 91.5% in their study involving 125 patients.¹⁵ A retrospective analysis of 2380 patients with unexplained pleural effusion from China was done by Jiang SJ et al.¹⁶ The diagnostic positive rate of medical thoracoscopy was 96.8% in this study.¹⁶ In a study by

Gao B et al, comprising of 215 patients with undiagnosed exudative pleural effusion the diagnosis rate was 88.4%.¹⁷

Malignancy was the most common histological diagnosis (76, 60.8%) in present study. Similar to present study, the reported malignancy rate was 59% by Hucker et al, 55.8% by Dhanya et al, 62% by Hansen et al, 56.6% by Patel et al.^{6,8,9,18,19} In contrast, Prabhu et al, reported malignancy in only 35.3% of their study patients.¹¹

Among the malignancies in our study, metastatic adenocarcinoma was the most common malignancy (50%) followed by mesothelioma (36.84%), squamous cell carcinoma (9.21%), small cell carcinoma (2.63%) and non-Hodgkin's lymphoma (1.31%). These results were contradictory to those from the study by Helala et al, in which metastatic adenocarcinoma was found in 35.6% and malignant mesothelioma was found in 53.6% of patients.²⁰ Adenocarcinoma was also the most commonly reported malignancy in multiple studies; 62.5% by Prabhu et al, 76.9% by Agarwal et al.^{19,21} In another study by Sodhi et al, metastatic adenocarcinoma was found in 30.3% patients while malignant mesothelioma was also found in 30.3% of patients.²²

Granulomatous inflammation consistent with tuberculosis was found in 29.6% patients. Prabhu et al, reported tuberculosis as final diagnosis in 23.53% of patients.¹¹ Similarly, Wang et al, reported tuberculosis as final diagnosis in 22% of patients, Helala et al, reported a definitive diagnosis of tuberculosis in 22.5% of patients 20 while Jiang et al, reported tuberculosis pleurisy in 21.6% of patients.^{16,22,23}

Among thoracoscopic findings in present study, multiple variable sized nodules were the commonest lesions found in 53.6% patients followed by sago grain appearance in 15.2% patients. Malignancy was the final diagnosis in 83.58% of patients with multiple nodules whereas tuberculosis was final diagnosis in all (100%) of the patients with sago grain infiltration in our study.

All (100%) patients with mass lesions had malignancy as final diagnosis, while malignancy was the final diagnosis in 83.6% of patients who had pleural thickening. Majority of adhesions were non-malignant (64.28%). All (100%) patients with ulcerative lesions on thoracoscopy had malignancy as final diagnosis.

Prabhu et al, reported nodules in 48.53% patients and sago grain appearance in 11.76% of patients. 70% of patients in their study with nodules had malignancy as final diagnosis and similar to our study all the patients with sago granular appearance had tuberculosis as final diagnosis.¹¹

Similar to present study, in a study by Elshamly MM et al, of 44 patients multiple pleural nodules were found in 54.54% of patients. Pleural masses were found in 13.6% of patients, pleural thickening in 18.18% of patients.

While as pleural loculations with adhesions were found in 6.81% of patients.²⁴

In another study by Sabah et al, multiple nodules were the most common thoracoscopic finding (57.26%); other findings consisted of pleural masses (19.66%), adhesions (5.12%), diffuse pleural thickening (14.53%) and apparently healthy smooth pleura (2.56%).²⁵

In the study by Helala et al, all (100%) of the patients with adhesions had non-malignant lesion. Similarly, in the study by Prabhu et al, majority (96%) of the patients with adhesions had non malignant lesion.^{11,20}

In the present study there was no mortality and no major complications were observed. Minor complications were seen in 8 (6.4%) patients. The minor complications observed in our study were 2 (1.6%) had prolonged air leak in 2 (1.6%), had subcutaneous emphysema in 3 (2.4%), wound infection in 2 (1.6%) and empyema in 1(0.8%). Similar to our study, Prabhu et al, reported subcutaneous emphysema in 4.4% and prolonged air leak in 0.8% of patients.¹¹ While Sabha et al, reported prolonged air leak in 0.85%, subcutaneous emphysema in 1.7%, wound infection in 0.85% and empyema in 1.71% of patients.²⁵ Both studies also reported no major complication or mortality.

CONCLUSION

The results of present study suggest medical thoracoscopy should be considered in patients with undiagnosed pleural effusion as it facilitates targeted biopsy under direct visualization. It has a high diagnostic yield and almost negligible mortality and morbidity rates.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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