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DIAGNOSTIC UTILITY OF MEDICAL THORACOSCOPY IN UNDIAGNOSED EXUDATIVE PLEURAL EFFUSION AT A TERTIARY CARE HOSPITAL

Respiratory Medicine

Dr. Gangadhar Mallu — Professor Respiratory Medicine M N R Medical college, Sanga Reddy, Telangana State, Hyderabad, India.

Dr. Prashanthy Reddy — Fellow, Respiratory medicine, Yashoda Hospital, Telangana State, Hyderabad, India.

Dr. Shastri. Lakshmi Sindhuri — Resident M N R Medical College, Sangareddy, TS, India.

Raghavendra Rao M V* — Professor, and Vice-President, in World Academy of Medical Sciences, Netherlands (Europe). *Corresponding Author

ABSTRACT

Medical thoracoscopy is considered a relevant diagnostic device for undiagnosed exudative pleural effusion cases. It offers a scarcely interfering to directly visualize the pleural space and obtain tissue samples for accurate diagnosis, especially when other methods like pleural fluid analysis are inconclusive; it is often recommended when the cause of a significant pleural effusion remains unclear, particularly if malignancy is suspected. One of the most common indications for pleuroscopy is undiagnosed pleural effusion, which comprises about 25% of all cases of pleural effusions, which remain undiagnosed despite primary tests. **Background:** Medical thoracoscopy (MT) is an extremely valuable tool in the diagnosis of exudative pleural effusions which remain undiagnosed even after thoracentesis because it allows obtaining pleural biopsy under direct vision. **Methods:** This study is a descriptive observational study done on 45 patients with undiagnosed exudative pleural effusion (inconclusive after repeated pleural fluid analysis) who underwent medical thoracoscopy and direct pleural biopsy. The study was done at a tertiary care hospital in India over 2 years. **Results:** Among the 45 patients in the study, the clinical, laboratory and the radiological findings could not predict the accurate histological diagnosis with certainty. MT was safe and had an excellent procedural yield (93.3%) in our study. Malignancy and Tuberculosis were the leading histological diagnoses (37.7% each). 8 patients (17.78%) were diagnosed to have nonspecific pleuritis, one (2.22%) patient had empyema and 4.44% (2/45) were inconclusive. **Conclusions:** Medical thoracoscopy is an extremely useful and safe diagnostic tool with excellent diagnostic accuracy in obtaining a conclusive histologic diagnosis of exudative pleural effusion of unknown etiology.

KEYWORDS

Medical thoracoscopy, Pleural biopsy, Exudative pleural effusion, Malignancy, Tuberculosis.

INTRODUCTION

Medical Thoracoscopy (MT is a valuable diagnostic procedure in the diagnosis of exudative pleural effusion that remains undiagnosed after laboratory and imaging studies. [1].

MT is performed as a daycare procedure which can be performed under local anesthesia or conscious sedation, using a rigid or semi - rigid thoracoscope. [2].

MT is less invasive and less expensive and is most used for pleural fluid drainage, pleural biopsy, and pleurodesis. (3)

MT is typically performed when multiple attempts at thoracentesis have failed to achieve a diagnosis in patients with an exudative pleural effusion of unclear etiology [4].

Pleuroscopy is associated with a small probability of major complications (1.95%) , and mortality is very rare, similar to the risks of transbronchial biopsy (0.22–0.66%) and mediastinoscopy (0.17%) (5)

The diagnostic yield of MT ranges from 93%-97% which is significantly higher when compared to the closed needle biopsy [6].

With “success” defined as conclusive diagnosis, researchers in Thailand reported the use of pleuroscopy in 86 patients with a success rate of 95.2%; researchers in Hong Kong reported a success rate in 20 patients with 70% success rate; and researchers in India reported a success rate of 74.5% (7,8).

With MT, in addition to diagnostic parietal pleural biopsies, large volume therapeutic drainage of the pleural effusion and definitive intervention for fluid control such as administration of talc poudrage for pleurodesis or insertion of an indwelling pleural catheter (IPC) may also be performed concurrently. This allows for a 'one stop' approach to evaluation and management of symptomatic pleural effusions (9,10)

Its similarity with a flexible bronchoscope also enables easy adaptation for respiratory physicians. With rigid thoracoscopy, larger pleural biopsy specimens can be obtained, but whether this results in increased diagnostic yield is unclear, with conflicting reports from randomised trials comparing both techniques (11)

Closed pleural biopsy by Cope or Abrams needle has a poor overall sensitivity of just 38%,which was higher in tubercular pleurisy up to 80% due to diffuse involvement of pleura while it was lesser in malignancy due to patchy involvement (12)

CT- or ultrasound-guided cutting needle pleural biopsy is useful in diagnosing malignancy when pleural-based soft tissue masses are identified. In a randomized trial, CT-guided biopsy had a sensitivity of 87% in patients with suspected malignant effusions (13)

The diagnostic yield of USG-guided pleural biopsy was comparable to CT-guided Tru-Cut biopsies (14)

MT is a safer procedure with minor complications including minor bleeding, prolonged air leak, surgical emphysema, and local infection with an overall incidence rate of <1% [15].

MATERIALS AND METHODS

This study is a prospective observational study that is conducted at a tertiary care hospital in India over 2 years. Ethics review committee approval was taken, and written informed consent was obtained from all the patients who were included in the study. All the patients with undiagnosed exudative pleural effusion (inconclusive after repeated pleural fluid analysis) who presented to the Department of Pulmonology at our hospital were included in the study. The exclusion criteria included bleeding diathesis or decreased platelet count (<50,000/mm3), occluded pleural cavity, refractory cough, poorly controlled cardiac arrhythmias, hemodynamic instability, respiratory failure, poor functional status/ inability of the patient to lie in lateral decubitus position for about an hour. The study group consisted of patients with undiagnosed exudative pleural effusion who meet the criteria as above. All the anti-platelet and anticoagulant medications were held at least 4-5 days before the thoracoscopy. Pre-operative workup included routine chest radiograph and as needed ultrasound chest and CT scan of chest in assessing the hemithorax of interest. Arterial blood gas and spirometry were also performed as part of evaluation to determine the respiratorystatus.

Complete blood count with differential, Prothrombin time/INR, 12 lead EKG and 2DEchocardiogram were done. Patients' allergies were recorded with particular attention to anesthetic agents. Thoracoscopy is performed with 2% lidocaine as local anesthetic and for conscious sedation we used combination of IV fentanyl plus midazolam for analgesia, sedation, and amnesia. Propofol is used in place of midazolam in a few cases. In this study, a single port technique is used for the thoracoscopy. Patients are placed in the lateral decubitus position after preparation and sterile draping. A 10 mm (about 0.39 in) incision is made above superior rib margin in mid axillary line, simple dissection is performed, and blunt tip trocar and cannula are then introduced carefully to avoid lung injury. After careful visualization of the entire pleural cavity with thoracoscope, multiple biopsy bits were taken at multiple abnormal sites. The obtained specimens were sent for histopathological study. Hemostasis was secured and a chest tube was inserted for removal of any air and fluid at the completion of the thoracoscopic procedure. Patients were closely monitored for 6 hours after the procedure. A follow up chest radiograph was performed. The chest tube was removed after full expansion of the lung and drain <50ml/day. The collected data was tabulated and analyzed.

Table.1: Baseline Demographic And Clinical Characteristics Of The Study Population

Characteristics		N (Percentage)
Median age (y)		51 (Range 12-75)
Gender	Male	28 (62.22%)
	Female	17 (37.78%)
Symptoms	Cough	33 (73.33%)
	Expectoration	10 (22.22%)
	Shortness of breath	35 (77.78%)
	Chest pain	26 (57.78%)
	Fever	26 (57.78%)
	Loss of appetite	14 (31.11%)
	Weight loss	13 (28.89%)
Smoking history	Smokers	21 (46.67%)
	Non-smokers	24 (53.33%)
X-ray findings	Right-sided pleural effusion	26 (57.78%)
	Left-sided pleural effusion	18 (40%)
	Bilateral pleural effusion	1 (2.22%)
Ultrasound chest	Simple effusion	24 (53.33%)
	Loculated effusion	21 (46.67%)
Pleural fluid cytology	Lymphocytic predominant	32 (71.11%)
	Neutrophil predominant	9 (20%)
	Mixed	4 (8.89%)
Gross appearance of pleural fluid	Hemorrhagic	9 (20%)
	Non-hemorrhagic	36 (80%)
Provisional etiology	Infective	30 (66.66%)
	Malignant	15 (33.33%)

RESULTS

In our study, MT was done on 45 patients who had undiagnosed exudative pleural effusion (inconclusive after repeated pleural fluid analysis). The age of the patients ranged from 17-75 years with a median age of 51 years. The highest number of patients were from the age group 61-70 years. 28 (62.2%) were males and 17 (37.8%) were females in this study. Out of total 45 patients, 26 (57.78%) patients had complaints of fever, 33 (73.33%) had cough, 10 (22.22%) had expectoration, 35 (77.78%) had dyspnea, 26 (57.78%) had complaints of chest pain, 14 (31.11%) had associated anorexia and 13 (28.89%) patients had weight loss. Out of 45 patients, 21 (46.67%) patients were smokers, and 24 (53.33%) patients were non-smokers. A total of 43 patients (95.56%) had abnormal findings and 2 patients (4.44%) had normal thoracoscopic findings. Among them 3 patients (6.67%) showed diffuse pleural thickening, 1 patient (2.22%) had mass lesion over costal pleura, 13 patients (28.89%) showed multiple septations with or without adhesions, 6 patients (13.33%) had sago grain appearance, 20 (44.44%) had multiple variable sized pleural nodules. Of these, 14 (93.33%) patients were diagnosed with malignancy among 15 patients having malignancy as provisional diagnosis. 3 patients were diagnosed with malignancy among 30 patients having infective etiology as provisional diagnosis. So, a total of 17 patients were finally diagnosed with malignancy. One patient was finally diagnosed with infective etiology (tuberculosis) among 15 patients having malignancy as provisional diagnosis. 16 patients were diagnosed to have tuberculosis among 30 patients having infective etiology as provisional diagnosis. So, a total of 17 patients were finally diagnosed with tuberculosis. Out of 30 patients with provisional diagnosis of infective etiology, one patient was finally diagnosed with empyema, 8 were diagnosed with non-specific pleuritis and 2 were inconclusive. The diagnostic yield of our study is 95.56% (43/45 patients). Malignancy was diagnosed in 17 (37.78%) patients, 17 (37.78%) patients were diagnosed with Tuberculosis (TB), 8 (17.78%) patients had non-specific pleuritis and one (2.22%) patient had empyema. Out of 17 malignant cases diagnosed 11 (64.7%) patients were diagnosed as Adenocarcinoma, 2(11.76%) patients were diagnosed Squamous cell carcinoma, 2 (11.76%) patients were diagnosed Mesothelioma, one (5.88%) patient was diagnosed round cell tumor, and one (5.88%) patient was diagnosed Non-Hodgkins Lymphoma.

Table.2: Correlation Of Thoracoscopic Findings With Pleural Biopsy Finding

Thoracos copic Findings	Pleural Biopsy Findings									Total
	Nonspe cific pleuritis	Aden o carcin oma	Squa mous cell carcin oma	Mes othel ioma	Roun d cell tumor	Non- Hodg kins Lymp homa	Tuber culosis	Emp yem a	Incon clusive	
Diffuse Pleural thickening	1 (33.33%)	0	0	0	0	0	1 (33.33%)	0	1 (33.33%)	3 (100%)
Mass lesion seen over costal Pleura	0	1 (100%)	0	0	0	0	0	0	0	1 (100%)
Sago grain appearan ce	0	0	0	0	0	0	6 (100%)	0	0	6 (100%)
Multiple septation s with or without adhesions	3 (23.1%)	0	0	0	0	0	8 (61.5%)	1 (7.7%)	1 (7.7%)	13 (100%)
Multiple variable sized nodules	2 (10%)	10 (50%)	2 (10%)	2 (10%)	1 (5%)	1 (5%)	2 (10%)	0	0	20 (100%)
Normal Pleura	2 (100%)	0	0	0	0	0	0	0	0	2 (100%)
Total	8 (17.8%)	11 (24.4%)	2 (4.4%)	2 (4.4%)	1 (2.2%)	1 (2.2%)	17 (37.8%)	1 (2.2%)	2 (4.4%)	45 (100%)

Table.3: Correlation Of Type Of Pleural Effusion With Pleural Biopsy Findings

Type Of Pleural Effusion	Pleural Biopsy					Total	P Value
	Nonspecific pleuritis	Malign ancy	Empyema	TB	Inconclusive		
Hemorrhagic	0	8(88.8%)	0	1(11.11%)	0	9(100%)	0.013
Non-Hemorrhagic	8 (22.22%)	9 (25%)	1(2.77%)	16(44.44%)	2(5.55%)	36(100%)	
Total	8(17.77%)	17(37.77%)	1(2.22%)	17(37.77%)	2(4.44%)	45(100%)	

DISCUSSION

Pleural effusion is a quite common clinical entity encountered in our clinical practice, that can be caused by benign or malignant etiologies. If the findings of pleural fluid analysis are inconclusive, additional procedure is required to obtain pleural biopsy for histopathology. 25-40% of pleuraleffusions remain undiagnosed even after thoracocentesis and closed pleural biopsy [13,16]. MT is a simple procedure which allows for excellent direct visualization and aids in taking large biopsies which would increase the diagnostic yield significantly. In addition, it allows for the complete removal of pleural fluid without any additional complications like re-expansion pulmonary edema which is more common following closed thoracocentesis when more than 1.5L of pleural fluid is removed in single sitting. Re-expansion pulmonary edema following thoracoscopy does not occur because of some air entry via the trocar while removing the pleural fluid during the procedure.

We did not find any statistically significant observations on age sex relationship in this study. 80% of patients with nodules were eventually proven to be malignant, while only 20% were non-malignant and this difference was statistically very significant. All the patients with multiple septations (with or without adhesions) were nonmalignant. All patients (100%) with sago grain appearance were diagnosed with Tuberculosis (TB). All patients (100%) with diffuse pleural thickening were nonmalignant and all patients (100%) with mass lesion over costal pleura were malignant. Similar observations were seen in other studies [6,9].

In our study, 88.88% patients with hemorrhagic pleural effusion were diagnosed as malignant whereas in non-hemorrhagic pleural effusion 44.44% patients were diagnosed TB and 25% patients were malignant. There were no major complications during this study. The post thoracoscopic complications in the studied group occurred in 3 patients (6.66%). Prolonged air leak (>7 days) was seen in one patient (2.22%), postoperative pain in 2 patients (4.44%). There were no complications in 42 patients (93.33%). Procedure related mortality was zero.

The diagnostic yield of our study is 95.56% which is comparable to other studies like Prabhu and Narasimhan et al [6] where the diagnostic yield was 97%, Huang et al [7] where the diagnostic yield was 93.6%, Tscheikuna et al [8] where the yield was 95.2%, Helala et al [9] where the diagnostic yield was 95%, Lee P et al [10] where the yield was 96%, and Wang et al [17] where the yield was 93%.

CONCLUSION

With this experience from our study, we suggest that medical thoracoscopy should be the next modality of evaluation and standard of care in all patients with undiagnosed exudative pleural effusion in view of its simplicity, high diagnostic yield, and low complication rate. It should be made widely available, and more pulmonologists, especially in developing countries, should be trained in performing this simple but valuable procedure.

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