Original Article

Medical Thoracoscopy: A Useful Diagnostic Tool for Undiagnosed Pleural Effusion

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Abstract

Objective. We aimed to assess the role of medical thoracoscopy in patients with undiagnosed pleural effusion.

Methods. Patiens presenting with pleural effusion underwent three pleural aspirations. Patients in whom pleural fluid analysis was inconclusive underwent closed pleural biopsy for diagnostic confirmation. Patients in whom closed pleural biopsy was incolcusive underwent medical thoracoscopy using a rigid thoracoscope with a viewing angle of zero degrees was done under local anaesthesia and sedation with the patient lying in lateral decubitus position with the affected side up. Biopsy specimens from parietal pleura were obtained under direct vision and were sent for histopathological examination.

Results. Of the 128 patients with pleural effusion who were studied, pleural fluid examination established the diagnosis in 81 (malignancy 33, tuberculosis 33, pyogenic 14 and fungal 1); 47 patients underwent closed pleural biopsy and a diagnosis was made in 28 patients (malignancy 24, tuberculosis 4). The remaining 19 patients underwent medical thoracoscopy and pleural biopsy and the aetiological diagnosis could be confirmed in 13 of the 19 patients (69%) (adenocarcinoma 10, poorly differentiated carcinoma 2 and mesothelioma 1).

Conclusion. Medical thoracoscopy is a useful tool for the diagnosis of pleural diseases. The procedure is safe with minimal complications. **[Indian J Chest Dis Allied Sci 2014;56:217-220]**

Key words: Closed pleural biopsy, Medical thoracoscopy, Pleural disease, Pleural effusion.

Introduction

Thoracoscopy is the insertion of an endoscope through the chest wall to enable a physician to visualise the inside of the chest cavity.[1] Medical thoracoscopy is being increasingly used by chest physicians worldwide due to technical advancements and better instrumentation as well as manner of this procedure that is done as a day care procedure. It is a minimally invasive procedure done in a spontaneously breathing patient that allows one to perform limited diagnostic and therapeutic procedures. The main indication for medical thoracoscopy is in the diagnosis and treatment of undiagnosed exudative pleural effusions. Medical thoracoscopy has also proved to be useful in the management of empyema. Contrary to thoracentesis and percutaneous closed pleural biopsy, thoracoscopy permits large biopsy under direct visualisation that increases the diagnostic yield. Despite better instrumentation and simpler sedation protocols, this procedure has not gained wider acceptability and popularity, this is probably due to the lack of proper exposure and facility for its training and learning as well as initial hitch in switching to minimally invasive procedure which remained under the hands of surgeons. The present study describes the initial experience from a tertiary care referral centre assessing the usefulness of medical thoracoscopy in patients of undiagnosed pleural effusion.

Material and Methods

This prospective study was carried out at a teaching hospital in the Department of Pulmonary Medicine, King George's Medical University, Lucknow, Uttar Pradesh. During the study period of one year from July 2009 to July 2010, 128 patients with pleural effusion were studied. Informed consent for participation in the study was obtained from all of them. Detailed history was obtained from all the patients, a thorough clinical examination was carried out and all patients were subjected to laboratory investigations as per a pre-designed proforma. Laboratory testing that was carried out included haematological profile, blood sugar, liver function and renal function tests, coagulation profile and viral markers (human immunodeficiency virus Australia antigens (HbsAg) and hepatitis-C viral antigen), chest radiograph (postero-anterior view), computed tomography (CT) and ultrasonography of thorax. Diagnostic thoracentesis was done and repeated up to a maximum of three times, if needed.

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The pleural fluid was subjected to testing for cell count, sugar, protein, adenosine deaminase (ADA), cytopathology, Gram's stain, acid-fast bacilli (AFB) smear and culture. Closed pleural biopsy was done with Cope's pleural biopsy needle if repeated pleural fluid aspiration and analysis failed to establish the diagnosis. Patients in whom the pleural effusion remained undiagnosed even after closed pleural biopsy were subjected to medical thoracoscopy. Patients less than 12 years of age, pregnant and lactating mothers, patients with blood coagulation disorders, patients having co-morbid conditions like coronary artery disease, cerebrovascular disease, chronic liver disease and chronic kidney disease, patients with poor lung function, patients having excessive rib crowding, patients with intractable cough and patients not willing to give consent for thoracoscopy were excluded.

Medical thoracoscopy was performed with a rigid thoracoscope which includes trocar and canula with valve, rigid endoscope with viewing angle of zero degrees and biopsy forceps. Patients were kept fasting for six hours before the procedure. An intravenous canula was secured in the upper limb on the opposite side of thoracoscopy. Patient was placed in lateral decubitus position with the affected side up and the arms of the patient placed above the head to prevent the arms from interfering in the procedure. A finger probe was attached to monitor the pulse rate and the arterial oxygen saturation of the patient. The procedure was done in local anaesthesia under conscious sedation. Patient was sedated with midazolam (0.05 mg/kg body weight). Intravenous analgesic (e.g., tramadol, 5 mg) was administered in some patients. The lateral chest wall was cleaned with povidone iodine and chloroform spirit. Skin, subcutaneous tissue, intercostal muscle and parietal pleura were infiltrated with 10mL to 15mL of 2% lignocaine. Midazolam and intravenous analgesics were repeated to achieve adequate sedation and analgesia.

A skin incision of about 1.5cm was made in the 4th or 5th intercostal space in mid-axillary line to create a single port for entry into the pleural space. Subcutaneous tissue and intercostal muscles were bluntly dissected. A 10mm diameter cannula with trocar was inserted into the pleural cavity. Trocar was then removed and rigid endoscope was inserted through the cannula. Pleural fluid was suctioned through the cannula until the pleural surfaces were clearly visible. The thoracoscope was rotated within the pleural cavity to visualise the costal, diaphragmatic and the visceral pleura. Dense fibrin strands were cut with cutting forceps. An adequate biopsy of the parietal pleura was taken from an abnormal and infiltrated area on the parietal pleura by means of the biopsy forceps. After the biopsy was taken, the cannula and the rigid endoscope were removed and a chest tube (26 F to 32 F) was inserted. The chest tube was connected to an underwater seal. The chest drain was removed once the lung expanded, the broncho-pleural fistula sealed off and/or the secretion from the chest drain reduced to less than 50mL in 24 hours.

Results

Of the 128 patients with pleural effusion who were studied, pleural fluid examination established the diagnosis in 81 (malignancy 33, tuberculosis (TB) 33, pyogenic 14 and fungal 1) (Table 1); 47 patients underwent closed pleural biopsy and a diagnosis could be made in 28 of them (malignancy 24, TB 4). The remaining 19 patients (16 males) underwent medical thoracoscopy and pleural biopsy. Their mean age was 47±17.3 years; 15 patients were 45 years of age or older. In 14 patients the pleural effusion was haemorrhagic while 5 patients had a straw-coloured pleural effusion. Pleural fluid ADA levels were less than 40 IU/L in all the 19 patients.

Medical thoracoscopy and pleural biopsy was done in remaining 19 patients. Gross appearance of the pleura on medical thoracoscopy is shown in the figure. A diagnosis could be established in 13 of the 19 patients by medical thoracoscopy and pleural biopsy (Table 2). In eight patients the primary malignancy was in the lung and in one patient the primary malignancy was in the breast; in three patients the site of primary malignancy was unknown.

Overall, combining the yield of thoracentesis and pleural fluid analysis; closed pleural biopsy and medical thoracoscopy and pleural biopsy, aetiological diagnosis could be confirmed in 122 of the 128 (95%) patients presenting with exudative pleural effusion.

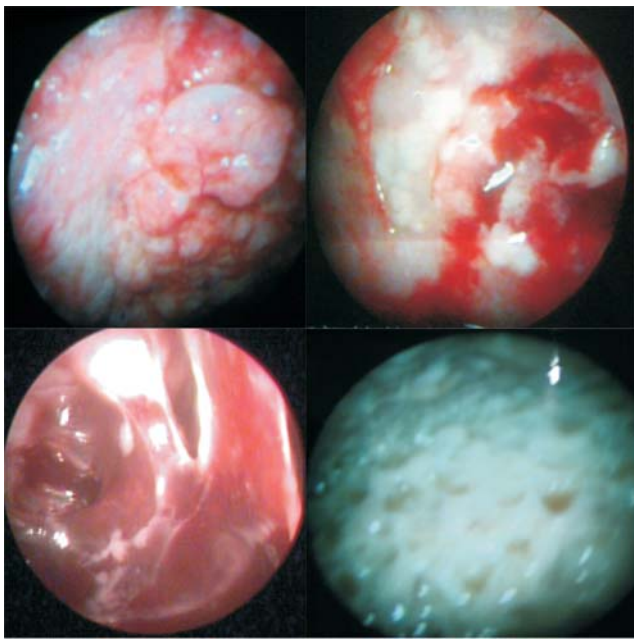

Figure. Gross appearance of the parietal pleura on medical thoracoscopy showing (a) nodular appearance; (b) plaque; (c) fibrin strands; and (d) adhesions.

Table 1. Clinical profile of patients with pleural fluid diagnosed by thoracentesis and pleural fluid analysis (n=81)

Characteristics	Diagnosis			
	Malignant No. (%)	Tuberculosis No. (%)	Pyogenic No. (%)	Fungal No.
Age (years) distribution				
>45	26 (78.8)	10 (30.3)	6 (42.9)	1
<45	7 (21.2)	23 (69.7)	8 (57.1)	0
Gender distribution				
Male	24 (72.7)	20 (60.6)	12 (85.7)	1
Female	9 (27.3)	13 (39.4)	2 (14.3)	0
Smoking status				
Yes	20 (60.7)	15 (45.5)	6 (42.9)	0
No	13(39.3)	18 (54.5)	8 (57.1)	1
Side of pleural effusion				
Right	22 (66.7)	6 (18.2)	4 (28.6)	1
Left	9 (27.2)	23 (69.7)	10 (71.4)	0
Bilateral	2 (6.1)	4 (12.1)	0 (0)	0
Appearance of pleural fluid				
Haemorrhagic	30 (90.9)	5 (15.2)	0 (0)	0
Straw coloured	3 (9.1)	16 (48.5)	2 (14.3)	0
Turbid	0 (0)	12 (36.3)	12 (85.7)	1
Nature of fluid				
Exudate	33 (100%)	33 (100)	14 (100)	1
Transudate	0 (0)	0 (0)	0 (0)	0
Pleural fluid total leucocyte count (TLC)				
>1000 / mm^3	18 (54.5)	13 (39.4)	2 (14.3)	0
<1000 / mm^3	15 (45.5)	20 (60.6)	12 (85.7)	1
Pleural fluid differential leucocyte count (DLC)				
Neutrophilic predominant	29 (87.9)	6 (18.2)	11 (78.6)	0
Lymphocytic predominant	4 (12.1)	27 (81.8)	3 (21.4)	1
Pleural fluid AFB staining				
Positive	0 (0)	12 (36.4)	0 (0)	0
Negative	0 (0)	21 (63.6)	0 (0)	0
Pleural fluid cytology				
Positive for malignant cells	14 (42.4)	0 (0)	0 (0)	0
Negative for malignant cells	19 (57.6)	0 (0)	0 (0)	0
Pleural fluid Gram staining				
Positive	0 (0)	0 (0)	8 (57.1)	0
Negative	0 (0)	0 (0)	6 (42.9)	0
Pleural fluid fungal staining				
Positive	0 (0)	0 (0)	0 (0)	1
Negative	0 (0)	0 (0)	0 (0)	0
Pleural fluid ADA (IU/L)				
>40	8 (24.2)	27 (81.8)	3 (21.4)	0
<40 IU / L	25 (75.8)	6 (18.2)	11 (78.6)	1
Total	**33 (40.7)**	**33 (40.7)**	**14 (17.4)**	**1 (1.2)**

Table 2. Histopathological diagnosis in patients who had undergone medical thoracoscopy and pleural biopsy (n=19)

Histopathological Diagnosis	Number
Adenocarcinoma	10
Poorly differentiated carcinoma (anaplastic carcinoma)	02
Malignant mesothelioma	01
Chronic inflammatory pathology	03
Non-specific	03

Two patients had developed empyema following the procedure in our study. None of the patients died. The mean duration of hospital stay was 14.5±0.5 days.

Discussion

Undiagnosed pleural effusion is a frequently encountered problem in clinical practice. It is essential to determine the aetiology of undiagnosed pleural effusion so as to treat the condition appropriately. The incidence of undiagnosed pleural effusion in our study was 14.8%. This figure is comparable with observations recorded in where undiagnosed pleural effusion was observed in 8%-25% of cases.[2-4] In the present study, medical thoracoscopy and pleural biopsy confirmed the diagnosis in 13 of the 19 (69%) patients who underwent this procedure in the present study. In a study from Thailand[5] (n=86), the diagnostic yield of medical thoracoscopy and pleural biopsy was 95.2% while a yiled of 91% was reported in other study[4] (n=100). In another study,[3] the yield of medical thoracoscopy has been observed to be 95% for malignant pleural effusion and 99% for tuberculosis pleural effusion. In a retrospective study[6] that examined the diagnostic yield of thoracoscopy in 147 patients, 136 of whom had pleural effusion which was negative on cytology and microbiology on 3 occasions, the diagnostic yield was reported to be 90.4%. In another prospective study[7] of thoracoscopy in 102 patients, 86 of whom had undiagnosed pleural effusion after thoracocentesis and "blind" pleural biopsy, the diagnostic yield for malignancy was observed to be 96%. Published observations suggest that the procedure is safe with minimal complications.[8] The diagnostic yield with medical thoracoscopy increases even in those cases where there are no significant pleural abnormalities visible on chest CT.[9]

In the present study, 19 patients underwent medical thoracoscopy for the diagnosis of undiagnosed pleural effusions. Malignant pleural effusion was the aetiological diagnosis in 13 of the 19 (69%) patients in whom histopathology was conclusive. In other studies of undiagnosed pleural effusion, malignancy was the most frequent aetiological cause observed in 50%[10], 54%[11], 69%[12], and 83%[13]. Adenocarcinoma is the most common sub-type reported in undiagnosed pleural effusions. In our study, 10 of the 13 patients with a conclusive histopathology were diagnosed to have adenocarcinoma. Similar observations were reported in other studies.[6,14]

The diagnostic yield observed in the present study (13 of the 19 patients, 69%) was lower. The mean duration of hospital stay in our study (14.5±0.5 days) was similar to the duration of 14.1 days reported in one study[2], but was longer than the duration of 9.1 days[5], 6.7 days (range 1-25 days)[10], and 48 hours[13], reported in other studies. The lower diagnostic yield and longer hospital stay could be due to the fact that the procedure of medical thoracoscopy was initiated for the first time through this study at our Institute and these results could reflect the learning curve for the pulmonologists. Further, six of our patients had chronic inflammatory and non-specific histopathological findings and the diagnosis remained unclear. These patients were started on empirical anti-tuberculosis treatment and four of them responded well to the therapy suggesting TB as the aetiological cause in these patients. Our observations suggest that medical thoracoscopy is a useful tool for the diagnosis of pleural diseases.

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