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Resrch Article

MEDICAL THORACOSCOPY AN AID TO DIAGNOSIS OF UNDIAGNOSED EXUDATIVE PLEURAL EFFUSION IN A TERTIARY CARE HOSPITAL OF ODISHA

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A R T I C L E I N F O

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A B S T R A C T

Introduction: Medical thoracoscopy is a minimally invasive procedure, that allows complete visualization of the pleural space using a combination of viewing and working instruments and enables various diagnostic and therapeutic procedures, i.e. pleural biopsy, pleurodesis, etc.

Aims & Objective: Role of medical thoracoscopy in diagnosis of undiagnosed exudative pleural effusions.

Material & Methods: It is a prospective study conducted in Department of Pulmonary Medicine, SCB Medical College Cuttack, Odisha from January 2017 to July 2018. After detailed clinical evaluation, radiological investigations, pleural fluid analysis; medical thoracoscopy was donetaking all into account, with written informed consent on 123 consecutive cases of undiagnosed exudative pleural effusion .

Observation: Majority of cases (42.2%) were >60 years with male: female of 2.4:1. Hemorrhagic effusion accounted for 58.6%. ADA level was <40U/L in 109 (88.6%) cases and >40U/L in 14(11.4%) cases. Most common CT thorax finding was Lung mass in 28.5%, followed by pleural nodules in 16.3% of cases. Thoracoscopic findings were multiple pleural nodule(82%) followed by septations (35%) and hyperemia (16%). Malignancy was found in 61 cases (50%) followed by granulomatous lesion suggestive of tuberculosis in 19 cases (15.4%). Major histopathological cell type was adenocarcinoma (49.6%). Chest pain (20.3%) was most common complication followed by oxygen desaturation (8%) and parietal oedema (8%). Sensitivity and specificity of thoracoscopy in malignancy was 86% and 100% respectively and in tubercular pleural effusion was 89% and 97% respectively.

Conclusion: Medical thoracoscopy is a safe, simple, and valuable tool in the diagnosis of undiagnosed exudative pleural effusion with minimal complications.

INTRODUCTION

Jacobaeus, a Swedish physician in early 1910's first used the technique of thoracoscopy by introducing a cystoscope in to the pleural space to lyse adhesion of pleura, who is also regarded as the "father of thoracocopy"[1]. Subsequently video assisted thoracoscope and medical thoracoscopy came into use. For adefinitive etiological diagnosis in pleural effusions which remain undiagnosed after diagnostic thoracentesis, pleuralbiopsy is usually required for diagnostic evaluation[2]. The accurate diagnosis of pleural effusion is challenging because even after thoracocentesis and/or closed pleural biopsy, 25‑40% of pleural effusion remains undiagnosed[3]. Medical thoracoscopy is a minimally invasive procedure, that allows complete visualization of the pleural space using a combination of viewing and working instruments and enables various diagnostic and therapeutic procedures.. The usefulness of thoracoscopy has also been extended in the evaluation of pneumothorax and empyema; in taking diagnostic biopsies from lung, diaphragm, mediastinum, and pericardium; for staging of lung cancers and malignant mesothelioma. Therapeutic procedures like pleurodesisand adhesiolysis may be done in preventing the recurrence of the pleural effusion and palliation of dyspnea[1].

Aims & Objective: The aim of our study was to evaluate the role of medical thoracoscopy in the diagnosis of undiagnosed exudative pleural effusions.

MATERIALS & METHODS

It is a prospective and interventional study conducted in Department of Pulmonary Medicine, SCB Medical College Cuttack, Odisha from January 2017 to July 2018.Detailed history, clinical examination, routine investigations, chest X-ray PA & Lateral view, USG of thorax, thoracocentesis and

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pleural fluid analysis(Cytological, Biochemical, gram stain, culture and sensitivity) done in each case. Pleural fluid CBNAAT and cytological study (two pleural fluid samples) were done in all cases. CECT/HRCT thorax and bronchoscopy and guided biopsy (CT and/or bronchoscopy) done in appropriate cases. Taking all into account, after written informed consent and cardiological clearance 123 consecutive cases of undiagnosed exudative pleural effusion (Light's criteria) were subjected to Medical Thoracoscopy (Rigid Carl Storz Thoracoscope) under local anaesthesia and conscious sedation .

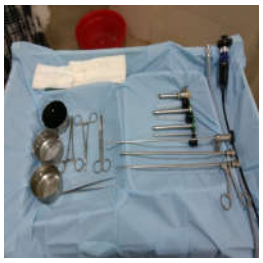
Inclusion Criteria: All cases of undiagnosed exudative pleural effusion were included in the study. Definition of undiagnosed pleural effusion was considered as the failure to achieve an etiologic diagnosis by initial pleural fluid microscopic and biochemical analysis including protein, sugar, lactate dehydrogenase, Gram stain, acid fast *bacilli* (AFB) smear and culture, pleural fluid adenosine deaminase (ADA) levels, and at least two pleural fluid cytologies negative for malignant cells or other definite causes[1].

***Exclusion Criteria*:** Patients withSevere COPD with respiratory insufficiency (hypoxemia and hypercapnia), Ultrasonography of Thorax showing extensive adhesions, Bleeding diathesis and Unstable cardiac status were excluded from the study.

Procedure: Patient was positioned in lateral decubitus position with affected hemithorax facing upwards and normal lung in dependant position with the arm raised above the head. Local anesthesia (2% lignocaine) with conscious sedation (injection midazolam) was used. Skin incision of 2cm over 6^{th} /7^{th}ics was given between anterior and mid axillary line.

Dissection of subcutaneous tissue and intercostal muscles, followed by insertion of trochar with cannula was done. Telescope was inserted and thoracoscopic visualization with 5-6 biopsy samples from parietal pleural lesions were performed. Parietal pleural biopsy sample was studied for histopathology and tested for CBNAAT. After the thoracoscopic procedure, Intercostal chest tube of 28f was inserted and water seal drainage was connected. Suturing and dressing of intercostal drainage site was done. Patients were put under close observation post thoracoscopy, any complication was reported and dealt with. A final diagnosis was then made in light of the biopsy findings regarding both histopathological and microbiological examinations.

THORACOSCOPIC SUITE



REQUISITES

Hopkins II telescope 30 degree(4mm)
Telescope canulla (6mm)
Optical biopsy forceps
Trochar(6mm, 11 mm) with cannula
Telecam camera head
Suction catheter
Sterile Talc powder
ICDT with water seal drainage bag
Mersilk with curve cutting needle
Povidine iodine solution,rectified spirit

Observation

Majority of cases (42.2%) were greater than 60 years with male: female ratio of 2.4:1. More than 50% of cases had presented to the hospital with symptoms duration of more than 30 days. Majority of the pleural effusion were hemorrhagic accounting for 58.6% of cases. Most of the effusions were moderate (44.7%) followed by massive(41.5%) and encysted(13.8%). In 22% of cases, there was parenchymal lesions along with effusion. ADA level was less than 40U/L in 109 (88.6%) cases and greater than 40U/L in 14(11.4%) cases. Most common CT thorax finding was lung mass in 28.5% of cases followed by pleural nodules in 16.3% of cases. Bronchoscopic finding was extrinsic compression in 33 cases and endobronchial growth in 10 cases (n=60). Most common thoracoscopic finding was multiple pleural nodule (82%) followed by septations (35%) and hyperemia(16%). Out of 123 cases, who had undergone thoracoscopy malignancy was found in 61 cases (50%) followed by granulomatous lesion suggestive of tuberculosis in 19 cases (15.4%). Major histopathological cell type was adenocarcinoma (65.7%) among the malignant pleural effusions. Malignancy was diagnosed in 8 cases of ADA $\geq$ 40U/L and tuberculosis was diagnosed in 13 cases with ADA < 40 U/L. Most common complication was chest pain(20.3%)followed by oxygen desaturation (8%) and parietal oedema (8%),which were managed conservatively. Sensitivity and specificity of thoracoscopy in malignancy was 86% and 100% respectively. Whereas in tubercular pleural effusion sensitivity was 89% and specificity was 97%.

Table 1 Pleural Fluid ADA Levels In Undiagnosed Pleural Effusion

ADA Level (U/L)	No of Cases	% Age
< 40	109	88.6
≥ 40	14	11.4
TOTAL	123	100

ADA Level Was Less Than 40 U/L in 109 (88.6%) and More Than 40 U/L IN 14(11.4%) cases.

Table 2 CT Thorax Findings (N=42)

CECT Findings	No of Cases	% age
Lung Mass	35	71.1
Mediastinal Mass	3	2.4
Pleural Nodule	20	16.3
Pleural Thikening	9	7.3
Lung nodule	6	4.9

Most Common CT Finding Was Lung Mass Followed By Pleural Nodules

Table 3 Bronchoscopic Findings (N=60)

Bronchoscopic Finding	No of Cases
Extrinsic compression	33
Endo-bronchial growth	10
Carinal widening	3
Normal	14

Table 4 Thoracoscopic Findings (N=123)

Thoracoscopic Finding	No of Cases	% Age
Pleural Nodule	101	82
Hyperemia	20	16.2
Septation	43	35
Plaque	3	2.4
Normal	3	2.4

Most Common Thoracoscopic Finding Was Pleural Nodule Followed By Septation and Hyperemia

Table 5 Overall Histopathological Findings

Histopathological Finding	No of Cases	% Age
Malignancy	61	50
Granulomatous (tuberculosis)	19	15.3
Fungal (aspergillosis)	02	1.6
Inflammatory	15	12.2
Nonspecific	18	14.5
Lost to follow up	08	6.4
Total	123	100

Out of 123 Undiagnosed Pleural Effusion Underwent Thoracoscopy, 50% Showed Malignancy

Table 6 Histopathological Cell Types of Malignant Effusion (N=61)

Types of Malignancy	No of Cases	% Age
Adenocarcinoma	40	65.7
Squamous Cell CA	09	14.8
Mesothelioma	06	9.8
Spindle cell sarcoma	01	1.6
Synovial cell sarcoma	01	1.6
Nonhodgkins lymphoma	01	1.6
Malignancy not otherwise Specified	03	4.9
Total	61	100

Out of Total Malignant Effusions, Major Histopathological Cell Type Was Adenocarcinoma (65.7%).

Table 7 Pleural Malignancy and Metastases (N=61)

Origin of malignancy	No of cases	% Age
Primary Pleura	7	11.5
Mesothelioma	6	9.8
Synovial Sarcoma	1	1.6
Secondary From Lung	49	80.32
Secondaries From Outside	5	8.2
Lung	1	1.6
CA Breast	1	1.6
Cystosarcoma Breast	1	1.6
CA Cervix	1	1.6
CA Ovary	1	1.6
Nhl		
Total	61	100

Table 8 Correlation of ADA with Histopathological Findings

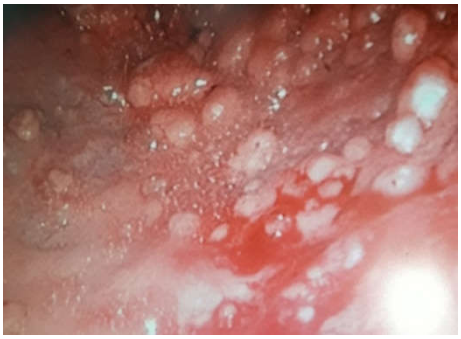
Pleural Fluid ADA (U/L)	Histopathology	
	Malignancy(N=61)	Tubercular (N=19)
< 40	53	13
≥ 40	8	6

Malignancy was Confirmed in 8 Cases Having pleural fluid ADA ≥ 40 U/L and tuberculosis was Diagnosed IN 13 cases, where Ada level was Less Than 40 U/L.

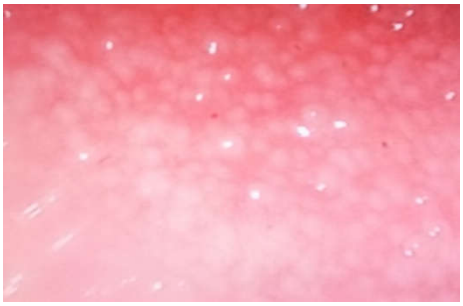
Table 9 Complications of Thoracoscopy

Complication	No of Cases	% Age
Chest Pain	25	20.3
Oxygen Desaturation (<90% By Pulse Oxymetry)	10	8.0
Infection	6	4.8
Bleeding	4	3.3
RE-Expansion Odema	1	0.8
Subcutaneous Emphysema	8	6.5
Parietal Odema	10	8.0

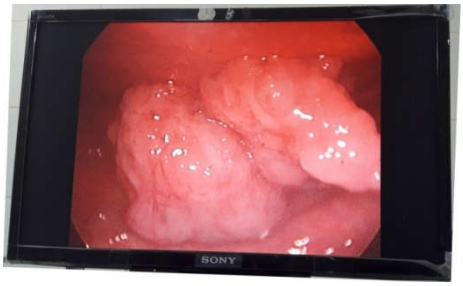
Most Common Complication Was Chest Pain Followed By Oxygen Desaturation And Parietal Odema.



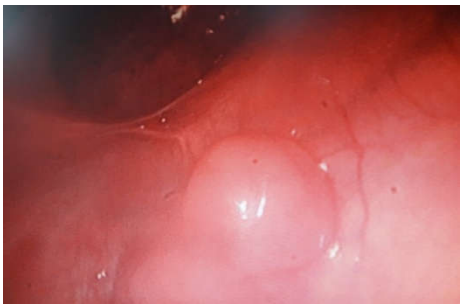
Parietal pleural nodules in Malignancy



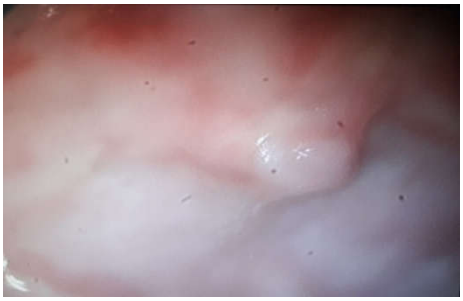
Sago grain appearance of parietal pleura in Tuberculosis



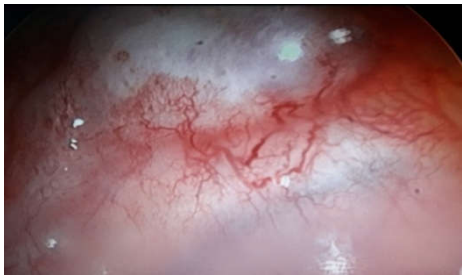
Parietal pleural based mass



Parietal pleural nodule with septation



Pleural nodules in a case of Mesothelioma



Pleural nodule with surrounding Neo-vascularisation

DISCUSSION

Main indication for thoracoscopy in this study was recurrent exudative pleural effusion, whose etiology remained unexplained after initial and repeated cytobiochemical analysis of pleural fluid. In this context, we needed pleural biopsy for histological confirmation. Since percutaneous blind needle pleural biopsy is having low sensitivity[3], we chose thoracoscopy as it provides a positive diagnosis in a high proportion of pleural effusions in whom the diagnosis had not been achieved by conventional investigations. The major advantage of thoracoscopy is that it gives an opportunity to perform biopsy on suspicious looking pleural lesions and nodules on the surface of the lung under direct vision. It is also possible to get good views in loculated pleural effusions because of the ability to break down the loculi, with biopsy forceps. In addition, it is possible to carry out chemical pleurodesis at the same time[5].

In this study, we present the data of 123 patients who underwent thoracoscopy for undiagnosed pleural effusions. The overall diagnostic yield of thoracoscopic pleural biopsy in the study was 97/123(78.9%). Mootha *et al*.[5] from India reported yield of 74.3% in 35 patients. Patil CB *et al*.[1] had reported an yield of 85.3% among 129 patients. ArdaKiani *et al*.[6] from Iran reported an diagnostic yield of 87% taking 300 patients. Though at the end of our study 6 patients were lost to follow up, this study is comparable to above studies.

Pleural malignancies (either primary or secondary) being the most common histological diagnosis that was encountered in this study (*n* = 61; 50%), is comparable with the similar studies done in this field.M de Groot *et al*.[7] reported malignancy in 50% cases and Mootha *et al*.[5] reported 48.6% malignancy of their study population.

Metastatic adenocarcinoma lung was being the most frequent primary lung carcinoma (65.7%) which is almost similar to theone reported by Patil CB *et al*[1]. In our study, squamous cell carcinoma was the diagnosis in 9 patients, other less common carcinomas like malignant mesothelioma were diagnosed in 6 patients.

Pleural TB was present in 19 cases (15.3%) on histopathology. This study is comparable to the study of M de Groot *et al*.[7], where tuberculosis was diagnosed in 18% cases. Out of 19 cases of tubercular pleural effusion, ADA level was less than 40U/L in around one-third cases (n=6). Therefore pleural effusions cannot be designated as TB, solely based on the ADA values. Presence of either parenchymal lesion suggestive of TB or a histological confirmation is necessary before putting them on antitubercular treatment[1].

Other less common non-malignant conditions were inflammatory effusions (*n* =15), which is consistent with the finding of the study by Abd El Rehim *et al*[10]. and 2 cases of fungal etiology. 18 cases out of 123 cases (14.5%) had non-specific histopathological findings, 8 cases lost to follow up (6.4%) and the diagnosis remained unclear. This findings can be compared with the study of Abhishek Agarwal *et al*[9]and Patil CB *et al*[1].

Findings observed during pleural visualization included pleural nodule (n=101), hyperaemia (n=20), septation (n=43) and pleural plaques (n=3), which is compared with the study population conducted by Natusamy L *et al*[2].

Complication rate in our study was low. There were no major complications and procedure related mortality was nil. Most common minor complications were chest pain, which was seen in 25 cases during the procedure and was managed conservatively in the ward. Other minor complications observered were oxygen desturation (8%), parietal oedema (8%), infection (4.8%), bleeding (3.3%). These are at par with the study of Abd El Rehim *et al*[10].

CONCLUSION

Medical thoracoscopy is a safe, simple, and valuable tool in the diagnosis of undiagnosed exudative pleural effusion with minimal complications. High ADA is an important biochemical parameter favouring the diagnosis of tubercular etiology. But in our study, 13 cases having ADA < 40 U/L was diagnosed as tuberculosis histopathologically. 8 cases having ADA > 40 U/L confirmed to be malignant by histopathology. Thus there is a discordance between ADA levels and histopathology in17.10% (21 out of 123 cases) in our study. Thoracoscopic guided biopsy of parietal pleura is always superior to closed pleural biopsy. Thoracoscopic biopsy tissue CBNAAT established etiological diagnosis quickly in pleural effusions due to tuberculosis. It allows direct visualisation of parietal pleura and lung surface. Biopsy sample is large for histopathological and immuno-histochemistry studies, which helps in further management. The sensitivity and specificity by thoracoscopic guided pleural biopsy in malignant effusion was 86% and 100% respectively, where as in pleural effusion of tubercular etiology, it was 89% and 97% respectively. So, thoracoscopy is a most important diagnostic procedure in undiagnosed cases of exudative pleural effusions.

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