



## TO STUDY THE DIAGNOSTIC YIELD OF PLEUROSCOPY IN UNDIAGNOSED PLEURAL EFFUSIONS

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### ABSTRACT

**Background and objectives:** Pleuroscopy is a minimally invasive procedure useful in patients with undiagnosed exudative pleural effusion. The objective of the present study is to evaluate the role of pleuroscopy in undiagnosed pleural effusions.

**Methods:** This was a prospective observational study conducted at the Department of Respiratory Medicine, Sunshine Hospitals, Hyderabad. The Study period was for 1 year from December 2018 to November 2019.

**Results:** A total of 34 patients underwent Pleuroscopy for Undiagnosed exudative pleural effusions. The age group of the patients ranged from 15-84 years and the mean age was 55.2 years. Males were 26 (76.7%) and 8(23.5%) were females. Majority of patients were Non-smokers 58.82% (20/34). 22 patients (64.7%) were found to have Right sided pleural effusion and 12(35.2%) patients showed effusion on left side. On gross examination of pleural fluid, 18(52.94%) patients had Hemorrhagic effusion, 16(47.06%) patients had straw coloured effusion. Majority of the patients had Pleural effusion with Mediastinal shift 22(64.7%) on imaging, Pleuraleffusion with Mediastinal Lymphadenopathy in 3(8.8%) patients, Pleural effusion with Pleural Nodular enhancement seen in 5(14.7%) patients and 4(11.7%) patients had miscellaneous finding of which 3 patients had Hydro-Pneumothorax and 1 patient with Right sided effusion with left upper lobe Nodular lesion. On Pleuroscopic examination, Multiple variable Pleural Nodules were seen in 15(44.12%) patients, Fibrinous adhesions were seen in 7(20.59%) patients, Sago grain nodules in 9(26.47%) patients, Hyperemic pleura in 1(2.94%) patient, Pleural plaques were noted in 1(2.94%) patient and Mass lesions over parietal pleura noted in 1(2.94%) patients. On Pleuroscopic tissue biopsy for GeneXpert MTB/Rif, MTB was not detected in GeneXpert in 28(82.35%) patients, MTB detected and Rif Resistance detected in 1(2.94%) patient and MTB was detected and Rif Resistance was not detected in 5(14.7%) with low MTB detection in 2(5.88%) and medium MTB detection in 3(8.82%) patients. Thoracoscopic Pleural biopsy on Histopathological examination revealed an overall diagnostic yield of 88.24%. We were able to diagnose 30 of 34 patients of whom 16 (47.05%) patients were diagnosed as Pulmonary Adenocarcinoma, 10 patients (29.41%) showed Granulomatous inflammation consistent with Tuberculosis, 3(8.82%) patients showed chronic inflammation, 1(2.94%) patient (with past history of Left Carcinoma Breast) showed metastatic deposits and 4(11.76%) patients had no definitive diagnosis (Inconclusive), The overall diagnostic yield of Pleuroscopy conducted at our center was 88.24% (30/34 patients).

**Conclusion:** Pleuroscopy has a good diagnostic yield in patients with undiagnosed exudative pleural effusions and is a safe procedure as well.

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### INTRODUCTION

Pleural effusion is a fluid collection that arises as a result of either excessive production or impaired pleural fluid absorption. Pleural effusion is a clinical condition with a variety of causes accounting for about 4% of patients in routine clinical practice(1). Even after thoracentesis and/or closed pleural biopsy, 25-40% of pleural effusions remain undiagnosed, making correct diagnosis difficult(2,3). Thoracoscopy is the procedure in which an endoscope is passed through the chest wall for direct inspection of the pleura. It was primarily utilised in the twentieth century to

treat pulmonary tuberculosis and tubercular pleural adhesions(4). Undiagnosed pleural effusion is the commonest indication of pleuroscopy. It is useful tool to obtain biopsies from parietal pleura under direct vision. Therapeutic interventions like pleurodesis and adhesiolysis can also be performed in cases of recurrent pleural effusions and to relieve dyspnea in malignant effusions (5). The aim of the study was to evaluate diagnostic yield of pleuroscopy in patients with undiagnosed pleural effusions.

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**MATERIALS AND METHODS**

This was a prospective observational study performed at the Department of Respiratory Medicine, Sunshine Hospitals, Hyderabad. The Study lasted one year, from December 2018 to November 2019. Permission from the ethical and scientific committee was obtained and written informed consent was taken from the study patients. Inclusion criteria was age more than 12 years, exudative pleural effusion (as per Lights criteria), pleural fluid cytology was negative for malignant cells, lymphocytic predominant effusions and Adenosine Deaminase (ADA) levels < 60 U/L. Hemodynamically unstable patients and patients with bleeding diathesis were excluded from the study.

Detailed proforma was filled for all enrolled patients that included:

- Detailed clinical history and examination
- Investigations include Hemogram, liver function tests and renal function tests and prothrombin time(PT), activated partial thromoplastin time(aPTT), International normalized ratio(INR) and Viral screening for HIV, HBsAg and HCV
- Chest X-ray and computed tomography of the chest(CT Chest)
- Diagnostic Thoracentesis
- Pleural fluid aspiration was done under Ultrasound guidance and fluid was sent for Biochemistry (Glucose, Protein, Lactate Dehydrogenase (LDH), ADA and Albumin), Bacteriological (acid fast bacilli stain, Gram stain, culture and sensitivity, Fungal stain) and Cell count, Differential count and cytological examination for malignant cells.
- Pleuroscopic examination of the pleural space and biopsy sampling was done using a rigid thoracoscope through same trocar.
- Duration of Intercostal tube drain and complications.

**Procedure:** Patients were kept fasting for at-least 6 hours prior to the procedure. Procedure was performed in operation theatre on a spontaneously breathing patients and it was performed by trained pulmonologists. Conscious sedation was given (using midazolam and fentanyl). Vital parameters (heart rate, blood pressure, oxygen saturation and electrocardiogram) were monitored during the procedure and oxygen supplementation was given via face mask. Subjects were positioned inlateral decubitus position with pleural effusion side facing upwards. Ultrasound chest screening was done in all patients, pleural effusion was localized and site marked for trocar insertion and level of diaphragm was marked. Site of entry was single, either in fifth or sixth intercostal space. The site was infiltrated with local anesthesia 2% lignocaine and 1–3 cm sized incision was given and the subcutaneous tissue and muscles were dissected bluntly to reach the pleural cavity, then a trocar with cannula was inserted, pleural fluid was removed and systemic inspection of the parietal, visceral and diaphragmatic pleura was done by Pleuroscope (Olympus Semi-Rigid). Biopsies in our study were performed using rigid pleuroscope and 2–4 biopsies from abnormal lesions were taken. A 24-28 French intercostal drainage tube was placed post procedure and connected to under water seal. Chest X-rays were obtained 4 hours after the procedure. The inter costal tube was removed once pleural fluid drain was < 50 ml/day for 24 hours.

Data analysis was done by statistical package for social sciences (SPSS) Version 16.0. The descriptive analysis was carried out. Quantitative variables were given as mean ± SD, while categorical variables were presented as frequency (percent).

**RESULTS**

A total of 34 patients underwent Pleuroscopy for Undiagnosed exudative pleural effusions. The age of patients ranged from 15-84 years and the mean age of presentation was 55.2. The majority of the patients were males 26(76.7%) and 8(23.5%) were females. Majority of patients were Non-smokers 58.82% (20/34). 64.7%of the patients were found to pleural effusion on right side and 35.2% of the patients had effusion on left side.

On In our study on gross examination of pleural fluid, 18(52.94%) patients had Hemorrhagic effusion, 16(47.06%) patients had straw coloured effusion.

**Table 1** Pleural Fluid - Gross Examination

Pleural fluid	No. of Cases	Percentage
Straw coloured	16	47.06
Hemorrhagic	18	52.94
Total	34	100

Diagnostic thoracentesis revealed pleural fluid Protein mean [SD] of 4.56g/dl[0.56], mean Glucose [SD] of 78.23[24.8], mean ADA values [SD] of 28.32[11.84] and mean cell count[SD] of 1021.6[632.1].Cytological examination of the pleural fluid was inconclusive in the study patients. Direct Smear for AFB, Grams stain, fungal stains were negative and pyogenic cultures were sterile in all the patients.

**Table 2** Diagnostic Thoracentesis

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
PF Protein(g/dl)	34	3.5	5.7	4.5647	0.56024
PF Glucose(mg/dl)	34	18	145	78.235	24.89379
PF ADA	34	4.9	52	28.321	11.84426
PF Cell Count	34	110	2340	1021.60	632.1877
Duration of ICD(Days)	34	1	15	3.4118	2.29779
AGE	34	15	84	55.2059	19.9450
Valid N (listwise)	34				

On CECT chest, majority of the patients had Pleural effusion with Mediastinal shift 22(64.7%), Pleural effusion with Mediastinal Lymphadenopathy was seen in 3(8.8%) patients, Pleural effusion with Pleural Nodular enhancement was seen in 5(14.7%) patients and 4 (11.7%) patients had miscellaneous finding of which 3 patients had Hydro-Pneumothorax and 1 patient with Right sided effusion with left upper lobe Nodular lesion.

**Table 3** CECT Chest Findings

CT Chest	No. of Cases	Percentage
PE with MEDIASTINAL LYMPHADENOPATHY	3	8.82
PE WITH MEDIASTINAL SHIFT	22	64.71
PE WITH PLEURAL NODULES	5	14.71
MISCELLANEOUS	4	11.76
TOTAL	34	100

On Pleuroscopic examination, Multiple variable Pleural Nodules were seen in 15(44.12%) patients, Fibrinous adhesions were seen in 7(20.59%) patients, Sago grain nodules were visualized in 9(26.47%) patients, one patient showed hyperemic pleura, Pleural plaques were noted in 1(2.94%)

patient and Mass lesions over parietal pleura noted in 1(2.94%) patents.

**Table 4** Pleuroscopic Findings on Examination of Pleural cavity

PLEUROSCOPIC FINDING	No. of Cases	Percentage
Multiple variable Nodules	15	44.12%
Adhesions	7	20.59%
Sago Grain Nodules	9	26.47%
Hyperemia	1	2.94
Plaques	1	2.94
Mass lesions over parietal pleura	1	2.94%
Total	34	100

Pleuroscopic tissue was subjected to GeneX pert-MTB/Rif test, MTB was not detected in 28(82.35%) patients. MTB was detected and Rif Resistance was detected in one patient and MTB was detected and Rif Resistance was not detected in 5(14.7%) patients.

**Table 5** Tissue Biopsy for Gene Xpert MTB/Rif

Tissue GeneXpert MTB/Rif	No. of Cases	Percentage	
Tissue GeneXpert MTB detected & Rifampicin resistance detected	1	2.94	
Tissue GeneXpert MTB not detected	28	82.35	
Tissue GeneXpert MTB detected & Rifampicin resistance not detected	Low	2	5.88
	Medium	3	8.82
	High	0	0.00
Total	34	100	

Thoracoscopic Pleural biopsy on Histopathological examination revealed an overall diagnostic yield of 88.24%. We were able to diagnose 30 of 34 patients of whom 16(47.05%) patients showed Pulmonary Adenocarcinoma, 10(29.41%) showed Granulomatous inflammation consistent with Tuberculosis, 4(11.76%) patients had no definitive diagnosis (Inconclusive), 3(8.82%) patients showed chronic inflammation, 1(2.94%) patient (with past history of Left Carcinoma Breast) showed metastatic deposits.

**Table 6** Tissue Histopathological Examination

TISSUE HPE	No. of Cases	Percentage
Granulomatous Inflammation	10	29.41
Pulmonary Adeno carcinoma	16	47.05
Chronic Inflammation	3	8.82
Inconclusive	4	11.76
Metastasis	1	2.94
Total	34	100

Of the 34 patients in the study group, 30(88.23%) patients had no complications, 3(8.82%) patients had surgical emphysema and 1(2.94%) patient had prolonged air leak. Mean duration of ICD in our study was 3.4 days and Median duration was 3 days. Duration of ICD in our study was 3 to 4 days in majority of patients 22/34(64.7%). 1 patient had >6 days of ICD which was subsequently diagnosed as Malignant Mesothelioma by Open Decortication. No major complications were seen in our study. The overall diagnostic yield of Pleuroscopy conducted at our centre was 88.24% (30/34 patients).

**DISCUSSION**

In our study 22(64.7%) patients had pleural effusion on the right side and 12(35.2%) patients were found to have left sided

effusion. A study done by Nattusamy *et al*(6) found majority of effusions(52.08%) were right sided and left sided pleural effusions were seen in 47.92% of the patients. In a study conducted by Rui-lin Chen *et al*(7)46.5% of patients showed right sided effusion and left sided pleural effusion was seen in 41.8% patients.

On gross appearance of pleural fluid in our study, 18(52.94%) patients had Hemorrhagic effusion, 16(47.06%) patients had straw colored effusion. In a study conducted by Nattusamy *et al* (6) found straw colored 25(52.08%), hemorrhagic 21(43.75%). Appearance of Pleuralfluid was blood stained in 306(36.7%) patients and 62.7% it was yellow in a study conducted by Xiao-Juan Wang *et al* (8).

In our study, On Gross examination, Multiple variable Pleural Nodules were seen in 15(44.12%) patients, Fibrinous adhesions were seen in 7(20.59%) patients, sago grain nodules were noted in 9(26.47%) patients, Hyperemic pleura was seen in 1(2.94%) patient, Pleural plaques were noted in 1(2.94%) patient and Mass lesions over parietal pleura were noted in 1(2.94%) patents. In a study conducted by Prabhu and Narasimhan *et al*(9) who performed pleuroscopy in 68 patients, Nodules were found in 48.52% of patients, 38.23% had adhesions and 11.76% had sago grain appearance. Helala *et al*(10) conducted a study and found Nodules in 28 patients (70%), sago grain nodules in 12.5% patients, adhesions in 3(7.5%) and mass was found in1(2.5%) patients.

Of the 34 patients in our study, MTB was not detected in GeneXpert in 28(82.35%) patients. One patient was found to have detected MTB and also Rifampicin resistance in pleural tissue. MTB was detected and Rif Resistance was not detected in 5(14.7%) patients, among which MTB was low in 2(5.88%) and medium in 3(8.82%) patients.

A retrospective study was done by DJ Christopher *et al* (11) of the 60 Histopathological diagnosis of TB patients, the yields of the Gene Xpertagainst histopathology on thoracoscopic biopsy sample was 45%.

Of the 34 patients in our study, 16(47.05%) patients showed Primary Pulmonary Adenocarcinoma, 10(29.41%) showed Granulomatous inflammation, in 4(11.76%) patients it was Inconclusive, 3(8.82%) patients showed chronic inflammation, 1(2.94%) patient (with past history of Left Carcinoma Breast) showed metastatic deposits. Of the 4 patients with inconclusive diagnosis, 1 was subsequently diagnosed as malignant melanoma by thoracotomy and decortication. In a study conducted by Ramakanthdixit *et al*(12) 73/129(56.5%) had HPE diagnosis of Malignancy, of which Adenocarcinoma lung seen in 27/73(37%). Tuberculosis was seen in 31/129(24%) patients.

Histopathological findings in a study by KurshidAhmeddar *et al* (13) showed that 29.6% of the patients were found to have Granulomatous inflammation consistent with tuberculosis, malignant effusions were seen in 76/125(60.8%) patients, 6.4% of the patients in our study had nonspecific chronic pleuritis and diagnosis was inconclusive in 3.2% of the patients.

The overall diagnostic yield of Pleuroscopyin our study was 88.24% (30/34 patients). The higher diagnostic yield in our study could be due to usage of rigid thoracoscope for biopsy sampling. In a study conducted by Kurshid Ahmed Dar *et al*(13) diagnostic yield of thoracoscopy was 90.4% which is

comparable to our study. Diagnostic yield in our study was comparable to other studies conducted globally.

## CONCLUSION

Pleuroscopy is a promising minimally invasive procedure in the diagnosis of undiagnosed pleural effusion. This procedure can be performed easily and safely with high diagnostic yield and fewer complications. Combined usage of semirigid and rigid pleuroscope may increase the diagnostic yield in such undiagnosed pleural effusions.

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