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Original Research

To Evaluate The Additional Diagnositic Role Of Thoracoscopic Pleural Lavage And Brush In Undiagnosed Exudative Pleural Effusion

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ABSTRACT

Introduction : Even after thoracentesis and closed pleural biopsies, properly diagnosing pleural effusion is still a challenging task. It has been demonstrated that medical thoracoscopy has a higher diagnostic yield for diagnosing exudative pleural effusion. Pleural specimens could be obtained via medical thoracoscopy using forceps biopsy, pleural brush, and lavage. The present study was done to evaluate the diagnostic role of thoracoscopic pleural lavage and pleural brush in addition to thoracoscopic pleural biopsy in undiagnosed exudative pleural effusion.

Material and methods: This prospective, observational, cross sectional, single centred study was conducted at department of pulmonary and critical care medicine, KGMU, Lucknow from December 2022 to October 2023 among patients with undiagnosed exudative pleural effusion attending the outpatient department and admitted indoor. All patients underwent medical thoracoscope procedure, where forceps pleural biopsy, pleural brush and pleural lavage specimens were taken and sent for histopathological cytological & microbiological examination. Total 64 patients enrolled. Data were collected and analyzed by SPSS.

Results: Out of 64 patients, 47 were males and 17 were females, mean age of the patients was 58.5 ± 6.7 years. Diagnostic yield of pleural brush, pleural lavage and pleural biopsy was 71.8% , 61% and 91% respectively. Sensitivity of forceps biopsy of 96.8% compared with the pleural brush and Pleural lavage of 76% and 63.5% respectively. Accuracy of Forceps biopsy of 97% compared with Pleural brush and Pleural lavage of 75% and 63% respectively. Specificity of forceps biopsy, pleural brush and pleural lavage of 100%.

Conclusion: For patients with an undiagnosed exudative pleural effusion, combined thoracoscopic pleural specimens (forceps biopsy, brush, and lavage) offer a higher diagnostic yield during medical thoracoscopy than do isolated specimens.

Keywords : brush, chest, lavage, pleural effusion, thoracoscopy

INTRODUCTION

Even after thoracentesis and closed pleural biopsies, 15-20% of pleural effusions remain undetected, making correct detection of pleural effusion a challenging clinical problem [1]. A number of procedures, including percutaneous needle pleural biopsy, CT guided pleural biopsy, medical thoracoscopy, video assisted thoracoscopy, and open thoracotomy, were employed to obtain a pleural sample for the identification of an undetected pleural effusion [2, 3]. By using direct visual guidance, medical thoracoscopy (MT) enables the imaging of the pleural cavity and the biopsy of specific pleural lesions. In the same sitting, therapeutic procedures such as chemical pleurodesis can also be carried out.[4] Using rigid or semi-rigid thoracoscopes, it is a minimally invasive and somewhat safe operation that can be carried out under local anesthesia and/or conscious sedation.[5] It has been demonstrated that MT had a greater diagnostic yield in cases of unexplained exudative pleural effusion (PF), ranging from 86.2% to 100%.[6-9]

The most popular tool for obtaining thoracoscopic specimens from suspected pleural lesions is the forceps biopsy; however, the procedure may cause bleeding, which could prevent further biopsy, and the decision to take a biopsy could be challenging, particularly if the targeted lesions are on the visceral pleura or close to a vascular structure. However, pleural brushes could be employed to safely collect pleural specimens from suspicious locations in the

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parietal or visceral pleura or close to the vascular system during medical thoracoscopy [3,10]. Compared to cytologic analysis of the fluid obtained at thoracentesis, pleural lavage, which is performed by injecting normal saline into the pleural space and aspirating at the time of thoracoscopy, would yield a higher diagnostic yield and could supplement thoracoscopic biopsy with additional diagnostic information. One of the following could account for this finding: Compared to many of the cells in the pleural fluid, the cells in the lavage are younger and have not undergone degeneration. Cells that otherwise would not have detached could be loosen by the lavage process. Tumor cells may seed in the subserous layer or on the mesothelial surface when a malignant tumor spreads to the pleura. While there are many tumor cells in the pleural fluid in the former scenario, few malignant cells are exfoliated into the pleural cavity in the later, and lavage may result in the recovery of malignant cells.The tumor may have been visible during parietal and visceral pleural biopsies, which would have allowed cancerous cells to leak into the lavage fluid [11]. Hence the present study was done to diagnose the role of additional thoracoscopic pleural lavage and pleural brush in undiagnosed exudative pleural effusion.

MATERIAL & METHODS: This was prospective study conducted in department of pulmonary and critical care medicine, KGMU, Lucknow from December 2022 to October 2023.

Inclusion Criteria

- Patients Having Undiagnosed Exudative Pleural Effusion (failure to achieve an etiologic diagnosis by initial pleural fluid microbiological , biochemical analysis and at least 3 pleural fluid cytology negative for malignant cells or other definite causes)Admitted In The PCCM Department.
- Patients Of Either Sex Aged Above ≥ 18years Of Age.

Exclusion Criteria:

- Patient Less Than ≥18 Years Of Age.
- Transudative pleural effusion
- patients with excess rib crowding, patients with bleeding diathesis, hemodynamic instability, and arrhythmias were not included in this study.
- Patients who did not signed consent form.

Ethical permission was taken from institutional review board before commencement of study. Patients were asked to sign an informed consent form after explaining them the complete procedure of study. The patients were selected on the basis of following inclusion and exclusion criteria. Total 64 eligible patients were enrolled.

Consecutive sampling was done . Sample size was estimated by using the formula

$$n=C \quad \frac{\quad + \quad +2}{d^2 d}$$

Where

C=7.8 at 95% Confidence & 80% power

P1=92.5%=0.925

q1= (1-P1)=0.075

P2=44.5%=0.445; q2=(1-P2)= 0.555; d=P1-P2=0.925-0.555=0.370

n=63.60 =64

All patients underwent detail relevant history, clinical examination and routine biochemical investigations. All patient underwent medical thoracoscopy by using rigial thoracoscope. Under conscious sedation, Midaz 1-5 mg analgesia, and local anesthetic fentanyl 50-200ug, the procedures were performed with utmost aseptic precaution. With the affected side facing upward, patients were positioned in the lateral decubitus position. The patients received ongoing monitoring. They were provided with more oxygen. A little skin incision was made in the fifth or sixth intercostal gap of the mid-axillary line following the administration of local anesthetic. After making a skin incision, a 10-mm blunt trocar with a cannula is inserted into the thoracic cavity. Following the removal of the trocar and suctioning of all fluid, the thoracoscope was inserted into the pleural cavity and the parietal and visceral pleura were inspected one after the other.First, a pleural brush was employed, and then a forceps biopsy.Pleural brush was taken from suspected lesions in the parietal, visceral, or next to the vascular structures. Several times over, the suspected locations were scratched, and each patient had at least four samples obtained. Each patient had six to ten forceps biopsies from parietal pleural lesions. After removing the telescope, 300 mL of normal saline was injected to do pleural lavage. After the procedure, a conventional 28–36F chest tube was implanted. After the surgery, a radiograph of the chest was taken. Specimens from pleural lavage, pleural brush, and forceps biopsy were sent for cytological and histological analysis & microbial examination. The data collected were entered and analyzed using IBM SPSS Statistics 25.0 and presented as mean±SD and frequency (percentage).

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RESULTS:

The mean age of the patients was 58.5 ± 6.7 years, 47 males and 17 females. 57% were smokers. 57.8% had comorbidity. 52.5% patients only left side affected, 42.5% had right sided effected and 5% had both sides effected. In pleural fluid the mean protein was 4.96±0.83, ADA was 40.5±11.1 and LDH was 476, as shown in table 1.

Table 1: Demographic and clinical data of patients

Variables	Mean±SD/N(%)
Age (years)	58.5 ± 6.7
Males	47 (73.4)
Females	17 (26.5)
Smoker	35 (55)
Co-morbidities	
Diabetes	12 (18.46)
Hypertension	19 (29.23)
Both	6 (9.23)
Side effected- Left	34 (52.5)
Right	27 (42.5)
Both	3 (5)
Pleural fluid findings - Protein	4.96±0.83
ADA	40.5±11.1
LDH	476 (145-2314)

Most of the detected lesions were nodules on parietal and visceral pleura in 30 patients, nodules on the parietal pleura in 22 patients, nodules on the visceral pleura in 2 patient, adhesions and loculations in 4 patients. Congested pleura in 4 patients and no lesions in 2 patient as shown in table 2.

Table 2: Thoracoscopic findings

Findings	Frequency (%)
Nodules on parietal and visceral pleura	30 (46.8)
Nodules on parietal pleura	22 (34.3)
Nodules on visceral pleura	2 (3.1)
Adhesions loculations	4 (6.2)
Congested pleura	4 (6.2)
No lesion	2 (3.1)

The examination of specimens obtained by the thoracoscopic pleural brush was diagnostic in 46 out of 64 cases (71.8%) Pleural lavage was positive in 39 (61%) patients while pleural biopsy forceps showed pathology in 58 (91%) patients as shown in table 3.

Table 3: Diagnostic yield

Procedure	Diagnostic yield
Biopsy	58 (91)
Brush	46 (71.8)
Lavage	39 (61)

Results of thoracoscope pleural specimens were adenocarcinoma in 34 patients, malignant mesothelioma in 12 patients, Undifferentiated neoplasm in 10 patients (one of them diagnosed only with pleural brush), non-Hodgkin lymphoma in 6 patient, no pathology recorded in 2 patients as shown in table 4.

Table 4: Results of HPE diagnostics

Results of specimen	Frequency (%), N=64
Adenocarcinoma	34 (53.1)
Malignant mesothelioma	12 (18.7)
Undifferentiated neoplasm	10 (15.6)
Non Hodgkin lymphoma	6 (9.3)

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No pathology	2 (3.1)

Sensitivity of forceps biopsy of 96.8% compared with the pleural brush and Pleural lavage of 76% and 63.5% respectively. Accuracy of Forceps biopsy of 97% compared with Pleural brush and Pleural lavage of 75% and 63% respectively. Specificity of forceps biopsy, pleural brush and pleural lavage of 100% as shown in table 5.

Table 5: Sensitivity, specificity and accuracy of pleural brush and lavage in comparison to biopsy

Procedure	Sensitivity	Specificity	Accuracy	PPV	NPV
Biopsy	96.8	100	97	100	51
Brush	76	100	75	100	13.2
Lavage	63.5	100	63	100	12

DISCUSSION: Numerous factors can result in pleural effusions. It is useful to apply Light's criteria in order to distinguish between exudative and transudative effusions. For the pulmonologist, making a conclusive diagnosis in cases of exudative pleural effusions has never been easy. Pleural effusions classified as "undiagnosed" occur when normal studies on pleural fluid are unable to provide a conclusive diagnosis. Even after a closed pleural biopsy, thoracentesis, and pleural fluid analysis for biochemistry, microbiology, and cytology, about 15%–20% of individuals with pleural effusion remain undetected.[1] In the present study 64 patients who had thoracoscopies but had an unidentified exudative pleural effusion were included in our analysis. Forceps biopsy results were positive in 58 out of 64 patients in this study (91%) and in 22 out of 28 patients (78.6%) according to Shaaban [3]. According to Khaled [12], 12 out of 16 cases (or 75%) had positive forceps biopsies. However, Ali [2] discovered that a thoracoscopic forceps biopsy had 100% diagnostic accuracy. In this study, 46 out of 64 patients (71.8%), had positive pleural brush results. In one patient, a pleural brush was the only diagnostic tool used; there were numerous nodular lesions over the visceral pleura but no nodules over the parietal pleura. Although Shaaban [3] found that pleural brush was positive in 17 out of 28 patients (60.7%) and that it was the only diagnostic modality in four patients, the use of both forceps biopsy and pleural brush to take thoracoscopic specimens could increase the final positive thoracoscopic yield to be 96% instead of 91% (for forceps biopsy alone) or 71.8% (for pleural brush alone). Pleural brushing did not improve the histology results, according to Ali [2], because a thoracoscopic forceps biopsy had 100% diagnostic accuracy. 75% of malignant pleural effusions could be diagnosed with pleural brushing.

Pleural lavage during thoracoscopy was found to be positive in 39 out of 64 instances (61%) in this study. This is much higher than the cytological analysis of pleural fluid by thoracentesis findings, which was completely negative. According to Ali [2], 66% of malignant cases had pleural effusions that were drained during thoracoscopy for diagnostic purposes. Thoracentesis was used to obtain preliminary cytological results, which were negative. Mohamed [11] also discovered that the cytologic findings from pleural lavage in malignant pleural effusions had a higher diagnostic yield (84%) than the cytologic findings from thoracentesis in pleural fluid (62%). The only cause of exudative undiagnosed pleural effusion in our study was determined to be malignant pleural effusion. Similar to Kendall [13], who reports that all of his identified cases were malignant pleural effusions and did not identify any cases of TB in their research of 48 patients, we did not detect any cases of TB in 24 out of 25 patients. Out of 30 individuals having thoracoscopy for undetected pleural effusions, El Halfwy [14] was able to diagnose 19 patients with malignant pleural effusion and 3 cases with tuberculous pleural effusion. Out of 28 patients, Shaaban [3] identified 20 cases with malignant pleural effusion and 2 cases with tuberculous pleural effusion. According to this study, the most frequent reason for malignant pleural effusions is pleural metastasis. Results showed adenocarcinoma in 34 patients, malignant mesothelioma in 12 patients, Undifferentiated neoplasm in 10 patients (one of them diagnosed only with pleural brush), non-Hodgkin lymphoma in 6 patient, no pathology recorded in 2 patients, These results are consistent with the findings of Shaaban [3], who discovered that adenocarcinoma with metastases could be identified in 15 patients, and three mesothelioma cases out of 20 ultimately showed evidence of malignant lesions. El halfway [14] discovered that, of the 19 individuals, 6 had mesothelioma and 13 had metastatic adenocarcinoma to the pleura. Patients with pleural effusions that were malignant, whereas Mootha 16 cases of pleural metastases were identified by [15], and only one of the 17 malignant cases was a mesothelioma case.

In this study, our patients typically took the medical thoracoscopy technique well, and no serious problems were noted. There were very few reported problems from the pleural brush operation. But a thoracoscopic forceps biopsy hurts more than a brushing.

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CONCLUSION:

For patients with undetected exudative pleural effusion, combined thoracoscopic pleural specimens (forceps biopsy, brush, and lavage) offer a higher diagnostic yield during medical thoracoscopy compared to individual procedures. Because thoracoscopic pleural brushing can safely remove some problematic portions of the pleura that other diagnostic modalities cannot, it is a safe diagnostic procedure for pleural effusion. Also turn round time of brush cytology is less as the reports took less than 8 hours as compared to histopathology.

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