Original Article

Efficacy of Pleural Brush Cytology in the Diagnosis of Pleural Diseases

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Abstract

Background: The accurate diagnosis of pleural effusion remains a challenging clinical problem. Medical thoracoscopy has an established role in achieving the etiology of pleural effusion. Pleural biopsies provide us with best results, but if cytological results can be shown to give concordant results, therapy can be instituted early. **Aim:** The aim was to study the efficacy of pleural brush in diagnosing pleural diseases. **Study Design:** This is a prospective study. **Patients and Methods:** The study was done between December 2015 and June 2017 in all patients of undiagnosed exudative effusions who were taken for thoracoscopy. Both pleural biopsy and pleural brushings were obtained in each patient. **Results:** We present the data of 45 patients. The mean age was 59.68 years. Nodule was the most common finding on thoracoscopic examination. Pleural brush cytology was positive in 26 patients with malignancy, 13 for infection and 6 were inadequate. However, forceps biopsy was positive in 42 cases out of 45 (93.3%) in detecting malignancy and infectious diseases. **Conclusion:** Pleural brush cytology can help in increasing the diagnostic yield. It can also be used to commence early treatment of the patient.

Keywords: Pleural biopsies, pleural brush, pleural effusion, thoracoscopy

Introduction

The accurate diagnosis of pleural effusion remains a challenging clinical problem because even after thoracentesis and closed pleural biopsy, 15%–20% of pleural effusions still remain undiagnosed.[1] In order to get a pleural biopsy for the diagnosis of undiagnosed pleural effusion, several techniques are used such as percutaneous needle pleural biopsy, computed tomography (CT)-guided pleural biopsy, medical thoracoscopy, video-assisted thoracoscopy, and open thoracotomy. Medical thoracoscopy can be used to describe the diagnostic and therapeutic exploration of the pleural space. Medical thoracoscopy has an established role in diagnosing the etiology of pleural effusion. Although thoracoscopic-guided pleural biopsy provides good yield, it has a limitation of delayed results by 5–7 days.

Pleural brushings can be obtained using bronchoscopy brush through the working channel of rigid thoracoscope. The hypothesis was that results of cytology will be available earlier and if these results are concordant with pleural biopsy, early institution of therapy may be facilitated.

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Patients and Methods

The study was approved by the Institutional Ethics Committee. This prospective study was done from December 2015 to June 2017. The study participants comprised of consecutive patients in whom the etiology of pleural effusion remained undiagnosed despite routine investigations of pleural fluid such as cell count, adenosine deaminase, lactate dehydrogenase, sugar, protein, cytology, and polymerase chain reaction. Patients with excess rib crowding, bleeding diathesis, hemodynamic instability, and arrhythmias were not included in this study.

Medical thoracoscopy was performed through a single puncture technique using a rigid thoracoscope. The procedure was done with complete aseptic precaution under local anesthesia, conscious sedation, and potent analgesia. The patients were placed in the lateral decubitus position

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with the affected side nondependent. The patients' vitals were monitored continuously. Supplemental oxygen was administered to them.

Pleural brush specimens were obtained from suspected pleural lesions in parietal pleura, visceral pleura, or near vascular structure. The brushing was done by scratching the suspected areas up and down multiple times and at least four samples were taken per patient. Similarly, 4–6 forceps biopsies were taken per patient from parietal pleural lesions. The procedure was followed by the placement of a 28–32 F standard chest tube.

A chest radiograph was obtained postprocedure. Forceps biopsy and pleural brush specimens were sent for histopathological and cytological examination.

Results

A total of 45 patients were recruited during the study period, of whom 33 were male and 12 were female. Eighteen patients were smokers, 14 were ex-smokers, and the rest were nonsmokers. During thoracoscopy, pleural abnormalities were observed as shown in Table 1. The pleural abnormalities observed during thoracoscopy were nodules [Figures 1 and 2], adhesions [Figure 3] and both [Figure 4]. Twenty-nine patients had right-sided pleural effusion and 16 had left-sided pleural effusion.

Patients were distributed on the basis of thoracoscopic-guided pleural brush cytology and histopathology report as shown in Figure 5. We broadly classified our patients on the basis of reports into three groups – malignancy, infectious disease, and indeterminate. A majority of patients were in the malignancy group. The most common malignancy was adenocarcinoma and the least common was metastatic clear cell and ductal cell carcinomas. The adenocarcinoma was diagnosed by cytology in 21 patients and by biopsy in 20 patients. The second group was of infectious disease comprising of acute necrotizing inflammation and chronic granulomatous inflammation. The third group consisted of patients with indeterminate results. Cytology and biopsy showed indeterminate reports in six and three patients, respectively.

The sensitivity, specificity, and positive and negative predictive values of pleural brush cytology were calculated in malignancy and infectious disease patients as shown in Table 2.

Discussion

Pleural effusions can be caused by innumerable causes. Application of Light's criteria is helpful in differentiating between transudative and exudative effusions. Achieving a definitive diagnosis in exudative pleural effusions has always been a difficult task for the pulmonologist. "Undiagnosed" pleural effusions are those where no definitive diagnosis is possible on routine investigations on pleural fluid. Nearly 15%–20% of patients with pleural effusion remain undiagnosed even after thoracentesis and pleural fluid analysis for biochemistry, microbiology, and cytology, and a closed pleural biopsy.[1]

Table 1: Pleural abnormalities observed during thoracoscopy

Pleural abnormalities	Number of patients
Nodules [Figures 1 and 2]	28
Adhesion [Figure 3]	7
Tumor	2
Nodules + adhesions [Figure 4]	5
Normal	3

Table 2: Sensitivity, specificity, and positive and negative predictive values of pleural brush cytology calculated in malignancy and infectious disease patients

	Malignancy (%)	Infectious diseases (%)
Sensitivity	65.13	100
Specificity	73.68	93.75
Positive predictive value	81.48	86.67
Negative predictive value	77.78	100

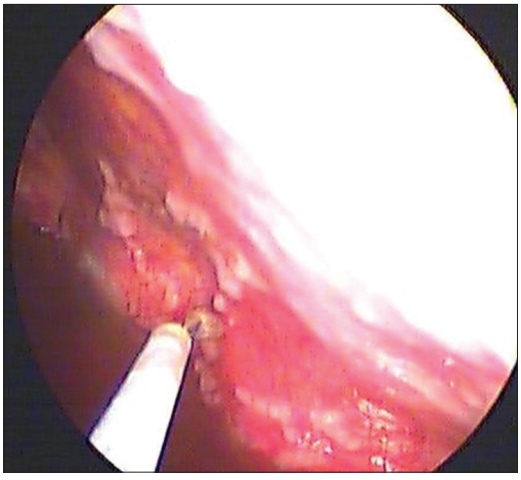

Figure 1: Brush samplings on nodule in parietal pleura

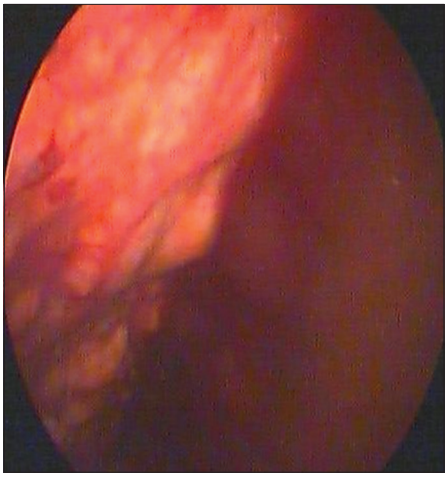

Figure 2: Multiple nodules at the parietal pleura

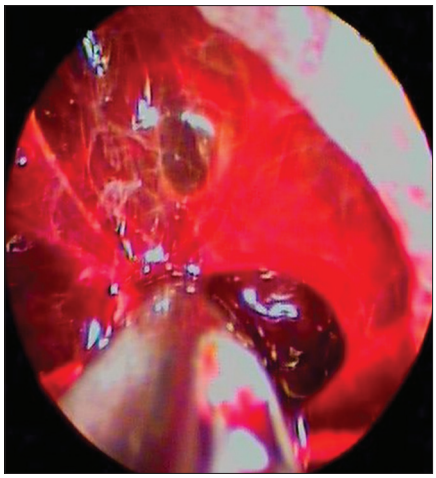

Figure 3: Dense adhesions at the parietal pleura which are being broken by the help of biopsy forceps

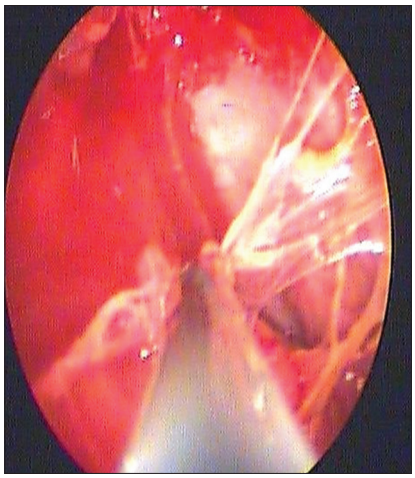

Figure 4: Dense adhesions at the parietal pleura which are being broken by the help of biopsy forceps

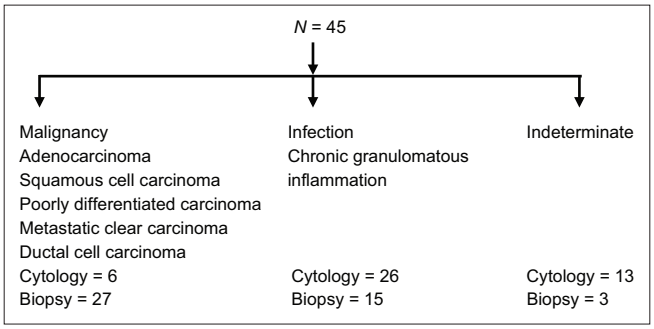

Figure 5: Distributions of patients as per thoracoscopy-guided pleural brush (cytology) and biopsy reports

There are two types of thoracoscopy: rigid thoracoscopy and semi-rigid thoracoscopy (pleuroscopy). Semi-rigid thoracoscopy (pleuroscopy) was first used in 1970[2] and was designed for pulmonologists who were familiar with bronchoscopy instruments. In the past, pulmonologists performed rigid thoracoscopy under local anesthesia. Since the procedure is relatively invasive under local anesthesia and also because of pulmonologist's unfamiliarity with rigid instruments, it was not popular.[3] Rigid thoracoscopy can obtain samples with higher diagnostic value than semi-rigid thoracoscopy (specifically in mesothelioma).[4,5] However, when rigid thoracoscopy is not available, semi-rigid thoracoscopy can yield diagnoses that are comparable in prevalence.

A rigid thoracoscope was used in this study. All the necessary tests were conducted prior to the pleuroscopy procedure, and the patients' physical status was thoroughly assessed.

Pleural brush cytology was positive in 26 patients with malignancy, 13 for infection and 6 were inadequate as shown in Figure 1. However, forceps biopsy was positive in 42 cases out of 45 (93.3%) in detecting malignancy and infectious diseases. These results are comparable with the study done by Mohammad *et al.*[6] where forceps biopsy was positive in 23 out of 25 patients (92%) and the study of Shaaban and Ahmed[7] who found that forceps biopsy was positive in 22 out of 28 patients (78.6%). Khaled and Osama[8] found that forceps biopsy was positive in 12 of 16 cases (75%). Only in the study by Ali,[9] the diagnostic accuracy of thoracoscopic forceps biopsy was found to be 100%.

While observing the results from the brush cytology, we found positivity in 39 cases (86.67%). On comparing brush cytology report with that of pleural biopsy, 80% concordance (36 patients out of 45) was observed, which was highly significant.

Shaaban and Ahmed[7] found that pleural brush was positive in 17 out of 28 patients (60.7%) and it was the only diagnostic modality in four patients. If they considered the usage of both forceps biopsy and pleural brush to take thoracoscopic specimens, it could augment the final positive thoracoscopic yield to be 92.9% instead of 78.6% (for forceps biopsy alone) or 60.7% (for pleural brush alone). These observations were different from those of Ali.[9] They concluded that pleural brushing did not increase the histological results because the diagnostic accuracy of thoracoscopic forceps biopsy was 100%. Pleural brushing was diagnostic in 75% of their malignant pleural effusion cases.

In this study, the procedure of medical thoracoscopy was generally well tolerated by our patients, with no major complications recorded. Minimal complications were recorded with pleural brush procedure. However, forceps thoracoscopic biopsy is more painful than brushing.

Conclusion

Pleural brush cytology as compared to pleural biopsy was found to be more sensitive and specific. Thus, treatment can be initiated after the cytology report without further waiting for biopsy report.

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Conflicts of interest

There are no conflicts of interest.

References

1. Blanc F, Xavier F, Atassi K. Diagnostic value of medical thoracoscopy in pleural disease. Am Coll Chest Phys 2002;121:1677-83.
2. Loddenkemper R, Lee P, Noppen M, Mathur PN. Medical thoracoscopy/pleuroscopy: Step by step. Breathe 2011;8:156-67.
3. Tape TG, Blank LL, Wigton RS. Procedural skills of practicing pulmonologists. A national survey of 1,000 members of the American College of Physicians. Am J Respir Crit Care Med 1995;151:282-7.
4. Davidson AC, George RJ, Sheldon CD, Sinha G, Corrin B, Geddes DM, *et al.* Thoracoscopy: Assessment of a physician service and comparison of a flexible bronchoscope used as a thoracoscope with a rigid thoracoscope. Thorax 1988;43:327-32.
5. Shaheen MM, Shaaban AY, Mahmoud MI, Shaaban AA, Sweed RA. The diagnostic role of thoracoscope in undiagnosed pleural effusion: Rigid versus flexible. Egypt J Chest Dis Tuberc 2014;63:635-42.
6. Mohamed KH, Mobasher AA, Yousef AI, Salah A, Ramadan MA, Emam AK, *et al.* Pleural lavage: A novel diagnostic approach for diagnosing exudative pleural effusion. Lung 2000;178:371-9.
7. Shaaban L, Ahmed Y. Value of thoracoscopic pleural brush in the diagnosis of exudative pleural effusion Egyptian. J Chest Dis Tuberc 2012;61:385-9.
8. Khaled H, Osama A. Usefulness of fiberoptic pleuroscopy and brushing in patients with unknown pleural effusion. Egypt J Chest Dis Tuberc 2013;62:111-4.
9. Ali I. Comparison Between the Diagnostic Yields of Thoracoscopic Brush Pleural Biopsy and Medical Thoracoscopic Forceps Biopsy in Patient with Undiagnosed Pleural Effusion Master Thesis. Alexandria University, Faculty of Medicine; 2011.