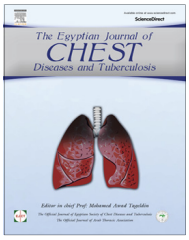
Egyptian Journal of Chest Diseases and Tuberculosis (2015) 64, 601–605

HOSTED BY

The Egyptian Society of Chest Diseases and Tuberculosis

Egyptian Journal of Chest Diseases and Tuberculosis

www.elsevier.com/locate/ejcdt
www.sciencedirect.com



ORIGINAL ARTICLE

Role of thoracoscopic pleural lavage and brush in undiagnosed exudative pleural effusion

Mohamed A. Zamzam [a], Ahmed A. Khames [a], Samy S. El-Dahdouh [a], Hala S. El-Rebey [b], Hanaa A. Eid [a,*]

[a] *Department of Chest Diseases & Tuberculosis, Faculty of Medicine, Menoufia University, Menoufia, Egypt*
[b] *Department of Pathology, Faculty of Medicine, Menoufia University, Menoufia, Egypt*

Received 26 April 2015; accepted 3 May 2015
Available online 23 May 2015

KEYWORDS

Pleural effusion;
Thoracoscope;
Pleural brush;
Pleural lavage

Abstract *Background:* The accurate diagnosis of pleural effusion remains a challenging problem even after thoracentesis and closed pleural biopsy. Medical thoracoscopy has been established to have a greater diagnostic yield in the diagnosis of exudative pleural effusion. Forceps biopsy, pleural brush and lavage could be used through medical thoracoscopy to obtain pleural specimens.

Objective: The aim of this study is to evaluate the role of thoracoscopic pleural lavage and brush in undiagnosed exudative pleural effusion.

Patients and methods: This prospective study was carried out on 25 patients having undiagnosed exudative pleural effusion. All patients submitted to medical thoracoscopy, where forceps biopsy, pleural brush and pleural lavage specimens were taken for all patients and sent for histopathological and cytological examination.

Results: Combined thoracoscopic pleural specimens were diagnostic in 24 patients (96%), and all of them were malignant. Forceps biopsy was positive in 23 patients (92%), while pleural brush and pleural lavage were positive in 18 patients (72%) and 15 patients (60%) respectively. Pleural brush was the only diagnostic modality in one patient. Minimal complications were recorded.

Conclusion: Combined thoracoscopic pleural specimens (forceps biopsy, brush and lavage) increase the diagnostic yield of medical thoracoscopy for patients with undiagnosed exudative pleural effusion than separate them. Thoracoscopic pleural brushing is a safe diagnostic technique as it can brush certain dangerous areas of the pleura. Pleural lavage is more diagnostic than the initial thoracentesis.

* Corresponding author.

Peer review under responsibility of The Egyptian Society of Chest Diseases and Tuberculosis.

http://dx.doi.org/10.1016/j.ejcdt.2015.05.001

Introduction

The accurate diagnosis of pleural effusion remains a challenging clinical problem because even after thoracentesis and closed pleural biopsy 15–20% of pleural effusion still remains undiagnosed [1].

In order to get a pleural biopsy for the diagnosis of undiagnosed pleural effusion, several techniques were used such as percutaneous needle pleural biopsy, CT guided pleural biopsy, medical thoracoscopy, video assisted thoracoscopy and open thoracotomy [2,3].

The term medical thoracoscopy can be used to describe the diagnostic and therapeutic exploration of the pleural space carried out by the pulmonary physician, in the endoscopy unit, mostly under local anesthesia with or without conscious sedation, unlike video-assisted thoracoscopic surgery (VATS) which is conducted under general anesthesia with single lung ventilation [4]. With thoracoscopy, one can visualize the entire visceral and parietal pleura and take pleural biopsy from suspicious sites under vision. A larger pleural biopsy specimen taken under direct vision allows greater diagnostic yield up to 90% [5,6].

Forceps biopsy is the commonest used instrument to obtain thoracoscopic specimens from suspected pleural lesions; however its procedures may be associated with bleeding that hinders further biopsy, additionally the decision to take biopsy could be difficult especially when the targeted lesions are on the visceral pleura or near the vascular structure. On the other hand pleural brush could be used to obtain pleural specimens through medical thoracoscopy from suspected areas either in parietal, visceral pleura or near the vascular structure safely [3,7].

The use of pleural lavage performed by injecting normal saline to pleural space and aspirated at the time of thoracoscopy would provide a higher diagnostic yield than the cytologic analysis of the fluid obtained at thoracentesis and could provide additional diagnostic information to thoracoscopic biopsy. This finding could be explained by one of the following: (1) the cells in the lavage are fresher and have not undergone degeneration as have many cells in the pleural fluid. (2) The lavage procedure could dislodge cells that would not have been detached otherwise. When a malignant tumor metastasizes to the pleura, tumor cells can be seeded over the mesothelial surface or in the subserous layer. In the former situation, tumor cells are abundant in the pleural fluid, but in the latter, few malignant cells are exfoliated into the pleural cavity, and lavage could lead to the recovery of malignant cells. (3) Biopsies of the parietal and visceral pleura could have exposed the tumor and allowed malignant cells to be shed into the lavage fluid [8].

Materials and methods

This prospective study was carried out on 25 patients having undiagnosed exudative pleural effusion (after pleural aspiration and Abrams pleural biopsy were negative) admitted in the Chest Department, Menoufia University Hospital in the period between November 2013 and December 2014. Patients with excess rib crowding, patients with bleeding diathesis, hemodynamic instability, and arrhythmias were not included in this study. All patients submitted for medical thoracoscopy, where forceps biopsy, pleural brush and pleural lavage specimens were taken from all patients. Medical thoracoscopy was performed through a single puncture technique using a rigid thoracoscope (tekno rigid thoracoscope, made in Germany). The procedures were done with complete aseptic precaution under local anesthesia, conscious sedation and potent analgesia. Patients were placed in the lateral decubitus position with the affected side upward. The patients were monitored continuously. Supplemental oxygen was given to them. After local anesthesia, a small skin incision was made in the mid-axillary line either in the fifth or sixth inter-costal space. The skin incision is followed by the introduction of a 10-mm blunt trocar with a cannula into the thoracic cavity. After the trocar was removed, all fluid was suctioned, and then the thoracoscope was introduced into the pleural cavity, where the parietal and visceral pleura were successively inspected. Pleural brush was used first followed by forceps biopsy. Pleural brush was obtained from suspected pleural lesions either 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 4 samples were taken per patient. Between 6 and 10 forceps biopsies were taken per patient from parietal pleural lesions. The telescope was then removed, and pleural lavage was performed by injecting 300 mL of normal saline. The procedure was followed by the placement of a 28–36F standard chest tube. A chest radiograph was obtained post procedure. Forceps biopsy, pleural brush and pleural lavage specimens were sent for histopathological and cytological examination.

Results

This study was carried out on 25 patients having undiagnosed exudative pleural effusion who underwent medical thoracoscopy in our endoscopy unit for the purpose of reaching the final diagnosis. The characteristics of these patients included the following. The mean age of the patients was 57.5 ± 6.6 years with a range of 32–72 years, 16 males and 9 females. 56% were smokers. Most of the detected lesions were nodules on parietal and visceral pleura in 14 patients, nodules on the parietal pleura in 5 patients, nodules on the visceral pleura in one patient, adhesions and loculations in 2 patients. Congested pleura in 2 patients and no lesions in one patient (Table 1).

The examination of specimens obtained by the thoracoscopic pleural brush was diagnostic in 18 out of 25 cases (72%) Pleural lavage was positive in 15 patients out of 25 cases (60%) while pleural biopsy forceps showed pathology in 23 out of 25 patients (92%) (Table 2) Collectively, the thoracoscopic pleural specimens showed pathology in 24 out of 25 patients

Table 1 Findings detected by medical thoracoscopy.

	No (25)	%
No lesions	1	4.0
Nodules on parietal pleura	5	20.0
Nodules on visceral pleura	1	4.0
Adhesions and loculations	2	8.0
Congested pleura	2	8.0
Nodules on parietal and visceral pleura	14	56.0

Table 2 Results of the diagnostic procedures in the studied cases.

Parameter	Biopsy		Brush		Lavage	
	No	%	No	%	No	%
Positive findings	23	92.0	18	72.0	15	60.0
Negative findings	2	8.0	7	28.0	10	40.0

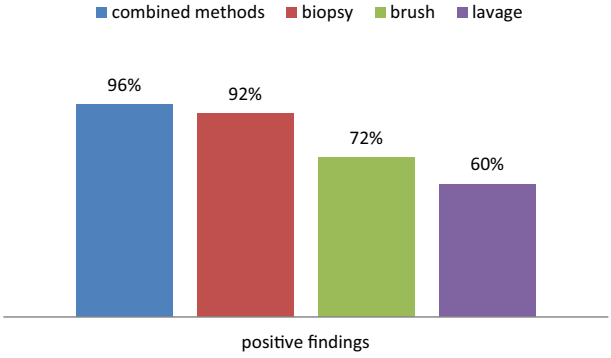


Fig. 1 Comparison of diagnostic yields between the three procedures.

Table 3 Results of thoracoscopic pleural specimens with forceps biopsy, pleural brush and lavage.

Parameter	No (25)	%
Adenocarcinoma	12	48.0
Mesothelioma	5	20.0
Undifferentiated neoplasm	6	24.0
Non-Hodgkin lymphoma	1	4.0
Pathology not detected	1	4.0

(96%) as the pleural brush was the only diagnostic modality in one patient not diagnosed by forceps or lavage Fig. 1.

Results of thoracoscope pleural specimens were adenocarcinoma in 12 patients, malignant mesothelioma in 5 patients, Undifferentiated neoplasm in 6 patients (one of them diagnosed only with pleural brush), non-Hodgkin lymphoma in one patient, no pathology recorded in one patient (Table 3).

Sensitivity of forceps biopsy of 95.8% compared with the pleural brush and Pleural lavage of 75% and 62.5% respectively. Accuracy of Forceps biopsy of 96% compared with Pleural brush and Pleural lavage of 76% and 64% respectively. Specificity of forceps biopsy, pleural brush and pleural lavage of 100% (Table 4).

Table 4 Sensitivity, specificity and accuracy of forceps biopsy, pleural brush and lavage.

	Sensitivity	Specificity	Accuracy	PPV*	NPV**
Biopsy	95.8	100	96	100	50
Brush	75	100	76	100	14.3
Lavage	62.5	100	64	100	10

* Positive predictive value (PPV).
** Negative predictive value (NPV).

Table 5 Comparison between complications of the three procedures.

	Forceps		Brush		Lavage	
	No	%	No	%	No	%
No complications	20	80.0	23	92.0	25	100.0
Chest pain	3	12.0	2	8.0	0	0.0
Bleeding	2	8.0	0	0.0	0	0.0

Minimal complications were recorded with pleural brush with only mild chest pain in two patients. However forceps biopsy is more painful than brushing. Chest pain was seen in three patients and bleeding in two patients. No complications were recorded with pleural lavage (Table 5).

Discussion

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]. In this study, we have presented the data of 25 patients with undiagnosed exudative pleural effusion who underwent thoracoscopy. The yield of combined thoracoscopic pleural specimens was 96% in 24/25 patients. Elameen [9] had reached a specific diagnosis in 24 patients out of 26 ones with a diagnostic accuracy of 92.3%. Tscheikuna [10] described their experience from Thailand where thoracoscopy was diagnostic in 95% of 34 patients. However Kendall [11] reported a yield of thoracoscopic pleural biopsy to be 83% in their study which included 48 patients (See Fig. 2).

In this study malignant pleural effusion was found to be the only cause of exudative undiagnosed pleural effusion. In 24 out of 25 patients we did not find any case of TB similar to Kendall [11] who report that all his diagnosed cases were malignant pleural effusion and did not find any case of TB in their study of 48 patients. While El halfwy [12] could diagnose 19 patients with malignant pleural effusion and 3 cases with tuberculous pleural effusion out of 30 cases undergoing thoracoscopy for undiagnosed pleural effusions. Shaaban [3] diagnosed 20 cases with malignant pleural effusion and two

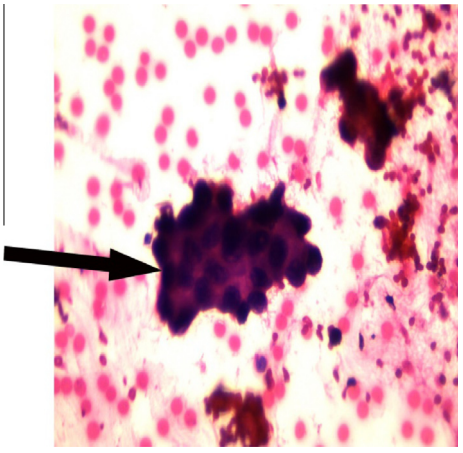


Fig. 2 Pleural lavage cytology demonstrating clusters of malignant cells (H&E × 400).

cases with tuberculous pleural effusion out of 28 patients (See Fig. 3).

In this study pleural metastasis is the most common cause of malignant pleural effusions. Metastatic adenocarcinoma could be diagnosed in 12 patients and non-Hodgkin lymphoma in one patient out of 24 cases had malignant pleural effusion, whereas mesothelioma could be diagnosed in five cases. Undifferentiated malignant neoplasm was seen in 6 patients, These findings are in concordance with the findings of Shaaban [3] who found that metastatic adenocarcinoma could be diagnosed in 15 patients and three cases of mesothelioma out of 20 cases proved finally to have malignant lesions. El halfway [12] found that 13 cases had metastatic adenocarcinoma to the pleura and 6 had mesothelioma out of the 19 patients that had malignant pleural effusion, while Mootha [13] diagnosed 16 cases with pleural metastasis and only one case of mesothelioma of the 17 malignant cases.

In this study forceps biopsy was positive in 23 out of 25patients (92%) while Shaaban [3] found that forceps biopsy was positive in 22 out of 28 patients (78.6%). Khaled [14] found that forceps biopsy was positive in 12 of 16 cases (75%). However Ali [2] found that the diagnostic accuracy of thoracoscopic forceps biopsy was 100%.

In this study pleural brush was positive in 18 out of 25 patients (72%). Pleural brush was the only diagnostic modality in one patient in whom no nodules were seen over the parietal pleura while many nodular lesions over the visceral pleura. The use of both forceps biopsy and pleural brush to take thoracoscopic specimens could augment the final positive thoracoscopic yield to be 96% instead of 92% (for forceps biopsy alone) or 72% (for pleural brush alone), however, Shaaban [3] found that pleural brush was positive in 17 out of 28 patients (60.7%) and it was the only diagnostic modality in four patients. Both forceps biopsy and pleural brush to take thoracoscopic specimens 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). Ali [2] found 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 malignant pleural effusion.

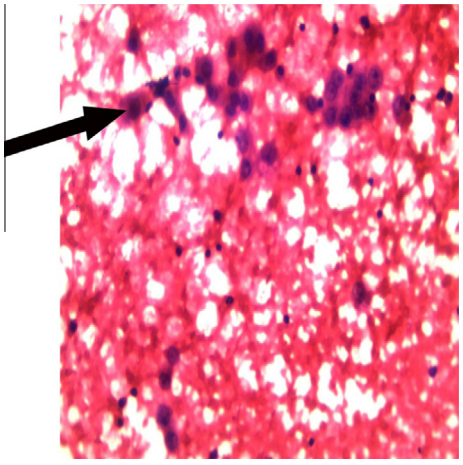


Fig. 3 Pleural brush cytology demonstrating clusters of malignant cells with attempts for aciner formation (H&E × 400).

In this study pleural lavage during thoracoscopy was positive in 15 out of 25 cases (60%) which is highly greater than that of pleural fluid cytological analysis by thoracentesis findings (all was –ve). Ali [2], found that the diagnostic yields of pleural effusion that was drained during thoracoscopy was 66% in malignant cases. The initial cytological results done by thoracentesis were negative. Mohamed [8] also found that the diagnostic yield of pleural lavage cytologic findings in malignant pleural effusions (84%) was greater than that of pleural fluid done by thoracentesis cytologic findings (62%).

In this study, the procedure of medical thoracoscopy was generally well tolerated by patients with no major complications recorded. Minimal complications were recorded with pleural brush procedure, only mild chest pain was seen in two patients of 8%. However forceps thoracoscopic biopsy is more painful than brushing and causes bleeding in 2 patients. Ali [2] also did not report any complications apart from some pain. No complication was recorded with pleural lavage procedures similar to Ali [2] and Mohamed [8].

Conclusion

Combined thoracoscopic pleural specimens (forceps biopsy, brush and lavage) increase the diagnostic yield of medical thoracoscopy for patients with undiagnosed exudative pleural effusion than each procedure alone. Thoracoscopic pleural brushing is a safe diagnostic technique in pleural effusion as it can brush a certain dangerous areas of the pleura which other diagnostic modalities cannot deal with.

Conflict of interest

Authors have no conflict of interest to declare.

References

[1] F. Blanc, F. Xavier, K. Atassi, Diagnostic value of medical thoracoscopy in pleural disease, Am. Coll. Chest Phys. 121 (2002) 1677–1683.
[2] I. Ali, 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.
[3] L. Shaaban, Y. Ahmed, Value of thoracoscopic pleural brush in the diagnosis of exudative pleural effusion Egyptian, J. Chest Dis. Tuberculosis 61 (2012) 385–389.
[4] R. Casal, G. Eapen, R. Morice, et al, Medical thoracoscopy, Curr. Opin. Pulm. Med. 15 (2009) 313–320.
[5] K. Arapis, R. Caliandro, J.B. Stern, et al, Thoracoscopic palliative treatment of malignant pleural effusions, Surg. Endosc. 20 (2006) 919–923.
[6] R. Loddenkemper, Thoracoscopy: state of the art, Eur. Respir. J. 11 (1998) 213–221.
[7] R. Loddenkemper, H. Grosser, A. Gabler, et al, Prospective evaluation of biopsy methods in diagnosis of malignant pleural effusions: intra patient comparison between pleural fluid cytology, blind needle biopsy and thoracoscopy, Am. Rev. Respir. Dis. 127 (1983) 114.
[8] K. Mohamed, A. Mobasher, Yousef, et al, Pleural lavage: a novel diagnostic approach for diagnosing exudative pleural effusion, Lung 178 (6) (2000) 37.

[9] M. Elameen, K. Khalid, Medical thoracoscopy: a useful minimal invasive procedure, Egypt. J. Chest Dis. Tuberculosis 61 (2012) 159–163.

[10] J. Tscheikuna, S. Silairatana, Sangkeaw, et al, Outcome of medical thoracoscopy, J. Med. Assoc. Thai. 92 (Suppl. 2) (2009) S19–S23.

[11] S. Kendall, A. Bryan, S. Large, et al, Pleural effusions: is thoracoscopy a reliable investigation? A retrospective review, Respir. Med. 86 (1992) 437–440.

[12] A. El halfway, The role of fiberoptic medical thoracoscope in the diagnosis of pleural effusion, MD Thesis, Faculty of Medicine, Cairo University, 2001.

[13] V. Mootha, R. Agarwal, N. Singh, et al, Medical thoracoscopy for undiagnosed pleural effusions: experience from a tertiary care hospital in North India, Ind. J. Chest Dis. Allied Sci. 53 (2011) 21–24, 85–89.

[14] H. Khaled, A. Osama, Usefulness of fiberoptic pleuroscopy and brushing in patients with unknown pleural effusion, Egypt. J. Chest Dis. Tuberculosis 62 (2013) 111–114.