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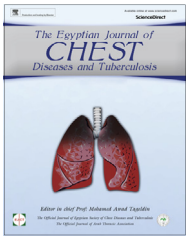

ORIGINAL ARTICLE

Diagnostic yield of medical thoracoscopy in diagnosis of exudative pleural effusion: One year prospective study

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KEYWORDS

Undiagnosed exudative pleural effusion;
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Abstract *Background:* Differential diagnosis of pleural disease is often a lengthy process fraught with pitfalls. Contrary to thoracocentesis and closed pleural biopsy, thoracoscopy permits biopsy with direct visualization. Medical thoracoscopy increases the diagnostic yield in patients with pleural disease when thoracocentesis and closed pleural biopsy are non diagnostic.

Aim of the work: This study investigated diagnostic yield of medical thoracoscopy for undiagnosed exudative pleural effusions over one year period.

Patient and Methods: This study included 117 patients with undiagnosed exudative pleural effusions. All patients were subjected to written informed consent, full history taking, clinical examination, plain chest X-ray, CT chest and tuberculin skin test. Diagnostic pleural aspiration was done with pleural fluid chemical and cytological analysis. Patients with unhelpful pleural fluid analysis underwent medical thoracoscopy.

Results: Regarding thoracoscopic pleural biopsy histopathology, out of 117 patients, 55 were diagnosed as malignant pleural mesothelioma, 26 diagnosed as metastatic adenocarcinoma, 1 diagnosed as spindle cell carcinoma, 5 diagnosed as lymphoma, 5 diagnosed as tuberculosis, 1 diagnosed

Abbreviations: VATS, video-assisted thoracic surgery; P–A, posterior–anterior view; CT, computed tomography; LDH, Lactate dehydrogenase; ADA, Adenosine deaminase; AFB, Acid fast bacilli; ECG, electrocardiogram; SD, standard deviation; P-value, probability value; SPSS, statistical package for the social science; MPM, malignant pleural mesothelioma; SLE, systemic lupus erythromatosis; T.B., tuberculosis; N.S., non-significant; Sig., significant.

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as SLE, 2 diagnosed as sarcoidosis, 6 diagnosed as empyema and 16 diagnosed as chronic non specific pleurisy. There was a statistically significant difference between the histopathological subgroups as regards mean value of age and smoking prevalence but there was no statistically significant difference as regards sex. Regarding pleural fluid cytological analysis, 5 cases were positive for malignant cells and 7 cases showed atypical mesothelial cells. Overall complication rate after medical thoracoscopy was low with no reported mortality or major complications.

Conclusion: Medical Thoracoscopy is a valuable diagnostic tool for undiagnosed exudative pleural effusion. It is a simple and safe procedure with low complication rate.

Introduction

Medical thoracoscopy was first introduced in 1866 by S. Gordon who observed the thoracic cavity with a binocular instrument in a case of purulent effusion. Gordon was followed by Hans Jacobaeus, a Swedish internist in 1910 [1].

Between 1915 and 1955 thoracoscopy was almost exclusively used therapeutically in the pneumothorax treatment of tuberculosis. In the early 1960s, thoracoscopy was used, mainly by pulmonologists in Europe, on a much broader basis for the diagnosis of many pleuropulmonary diseases [2].

Due to technical improvements, thoracoscopy was rediscovered by thoracic surgeons at the beginning of this decade, and renamed "surgical" thoracoscopy, better known as video-assisted thoracic surgery (VATS), requiring general anesthesia with selective end-bronchial intubation, disposable equipment, and at least three points of entry [3,4].

Medical thoracoscopy is a minimally invasive procedure performed by the pulmonologists in an endoscopy suite. It is much less invasive requiring only local anesthesia with conscious sedation and only one or two points of entry. It also allows for basic diagnostic (undiagnosed pleural fluid or pleural thickening) and therapeutic procedures (pleurodesis) to be performed safely and distinct from video-assisted thoracoscopic surgery, an invasive procedure that uses sophisticated access platform and multiple ports for separate viewing and working instruments [5].

The present study investigated the diagnostic yield of medical thoracoscopy for undiagnosed exudative pleural effusions over one year period and tried to find out its complication rate.

Subjects

Among the patients of pleural effusion who sought medical advice at the Chest Department, Kasr Alainy Hospital during the period from January 2012 to December 2012, a total of 117 cases were selected.

The selected patients had exudative pleural effusion with negative or unsuccessful pleural fluid analysis. Patients with transudative pleural effusion were excluded.

Methods

All included patients were subjected to written informed consent, detailed history taking, full clinical examination, routine chemical and hematological blood analysis including liver and kidney functions tests, complete blood count, coagulation profile, plain chest X-ray (P–A and lateral view), CT chest and tuberculin skin test. Also diagnostic pleural aspiration was done and the pleural fluid was analyzed for sugar, protein, Lactate dehydrogenase (LDH), Adenosine deaminase (ADA), gram stain, Acid fast bacilli (AFB) smear, culture and cytological analysis. Patients with unhelpful results of pleural fluid analysis underwent medical thoracoscopy and pleural biopsy.

Medical thoracoscopy

Equipment

Rigid thoracoscope with a cold light source was used using a KARL-STORZ rigid thoracoscope (Fig. 1).

Technique

All cases were performed using local anesthesia (Lidocaine 2%) and analgesia using pethidine 100 mg (50 mg was given by intramuscular injection & 50 mg was given by intravenous injection). Lidocaine 2% was used for local anesthesia of the skin, subcutaneous tissues, and periosteum of ribs. The needle was advanced carefully over the superior aspect of the rib, first aspirating and then injecting small amounts of the lidocaine while slowly advancing toward the pleura, till the pleural fluid was drained.

Patient's vital signs and oxygen saturation by means of pulse oximetry were monitored. The patient is positioned in the lateral decubitus position, with the normal lung in the dependent position and the affected side up with the arm rose above the head. The puncture site is usually in the mid-axillary zone between the fourth and sixth intercostal spaces.

The single port entry technique for thoracoscopy was used in all cases. 1–2 cm skin incision was made with a scalpel, which was followed by blunt dissection of intercostal muscles until reduction of resistance is felt and the parietal pleura is reached. Then the rigid trocar which is 8 mm in inner diameter was introduced through the chest wall slowly and carefully. The inner part of the trocar was then withdrawn and the thoracoscope was introduced inside the trocar.

The procedure included the following phases: (1) Careful aspiration of the pleural fluid; (2) Dissection of adhesions preventing proper inspection of the pleural space; (3) Inspection of the pleural space using a direct viewing telescope; and (4) Multiple biopsy samples (usually 5–8) were obtained under direct vision from any abnormal areas in the parietal or visceral pleura with the biopsy forceps.

After obtaining satisfactory biopsy specimens, the thoracoscope was removed followed by the trocar and chest tube (28-32F) connected to under water seal was introduced in the same

Figure 1 Medical thoracoscope set.

place. A post-procedure chest X-ray was done. All the thoracoscopic pleural biopsy specimens were sent for histopathological analysis. The chest tube was removed as soon as the lung is clinically and radiologically re-expanded with minimal amount of pleural fluid drainage (< 100 cc/24 h) [6].

Statistical analysis

Data were statistically described in terms of mean (standard deviation (± SD), median and range, or frequencies (number of cases) and percentages when appropriate. Comparison of numerical variables between the study groups was done using one way analysis of variance (ANOVA) test with posthoc multiple 2-group comparisons in normal data and Kruskal Wallis test with posthoc multiple 2-group comparisons in non-normal data. For comparing categorical data, Chi square (χ^2) test was performed. Exact test was used instead when the expected frequency is less than 5. P values less than 0.05 were considered statistically significant. All statistical calculations were done using computer program SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.

Results

The present study included 117 patients who underwent medical thoracoscopy for undiagnosed exudative pleural effusion. They were selected from the Chest Department inpatients, Kasr Alainy Hospital during the period from January 2012 to December 2012.

On the basis of the histopathological results of the thoracoscopic pleural biopsy among the study population, out of 117 patients, 55 patients were diagnosed as malignant pleural mesothelioma (47.01%), 26 patients were diagnosed as metastatic adenocarcinoma (22.22%), 1 patient was diagnosed as spindle cell carcinoma (0.85%), 5 patients were diagnosed as lymphoma (4.27%), 5 patients were diagnosed as tuberculous pleurisy (4.27%), 1 patient was diagnosed as systemic lupus erythromatosis (0.85%), 2 patients were diagnosed as sarcoidosis (1.71%), 6 patients were diagnosed as septic empyema (5.13%) and the remaining 16 patients were diagnosed as chronic non specific pleurisy (13.68%) (Table 1).

The 16 patients who were diagnosed as chronic non specific pleurisy were observed closely for another one year to follow up the course of the disease in these patients. It was found that 4 patients developed MPM while the remaining 12 patients followed a benign course. So the diagnostic yield of medical thoracoscopy in this study was considered 96.6% because diagnosis was obtained in 113 out of 117 patients of the study population & only 4 (3.41%) patients were failed to be diagnosed by medical thoracoscopy.

In the present study, thoracoscopic findings included (Figs. 2 and 3): (a) big pleural masses in 23 patients (22 were mesothelioma and 1 case was metastatic adenocarcinoma); (b) multiple variable sized nodules in 67 patients (18 were mesothelioma, 25 were metastatic adenocarcinoma, 2 cases were sarcoidosis, 5 cases were tuberculous pleurisy, 5 cases were lymphoma, 11 were chronic non specific pleurisy); (c) septic pyogenic membranes with extensive adhesions in 7 patients (6 were septic empyema and 1 case was chronic non specific pleurisy); (d) diffuse pleural thickening in 17 patients (14 were mesothelioma, 2

Table 1 Histopathological results of thoracoscopic pleural biopsy among the study population.

Histopathological results of thoracoscopic pleural biopsy		
Histopathological subgroups	Count	% within histopathological results of thoracoscopic pleural biopsy
Malignant pleural mesothelioma	55	47.01
Metastatic adenocarcinoma	26	22.22
Spindle cell carcinoma	1	0.85
Lymphoma	5	4.27
Tuberculous pleurisy	5	4.27
SLE	1	0.85
Sarcoidosis	2	1.71
Septic empyema	6	5.13
Chronic non specific pleurisy	16	13.68
Total	117	100

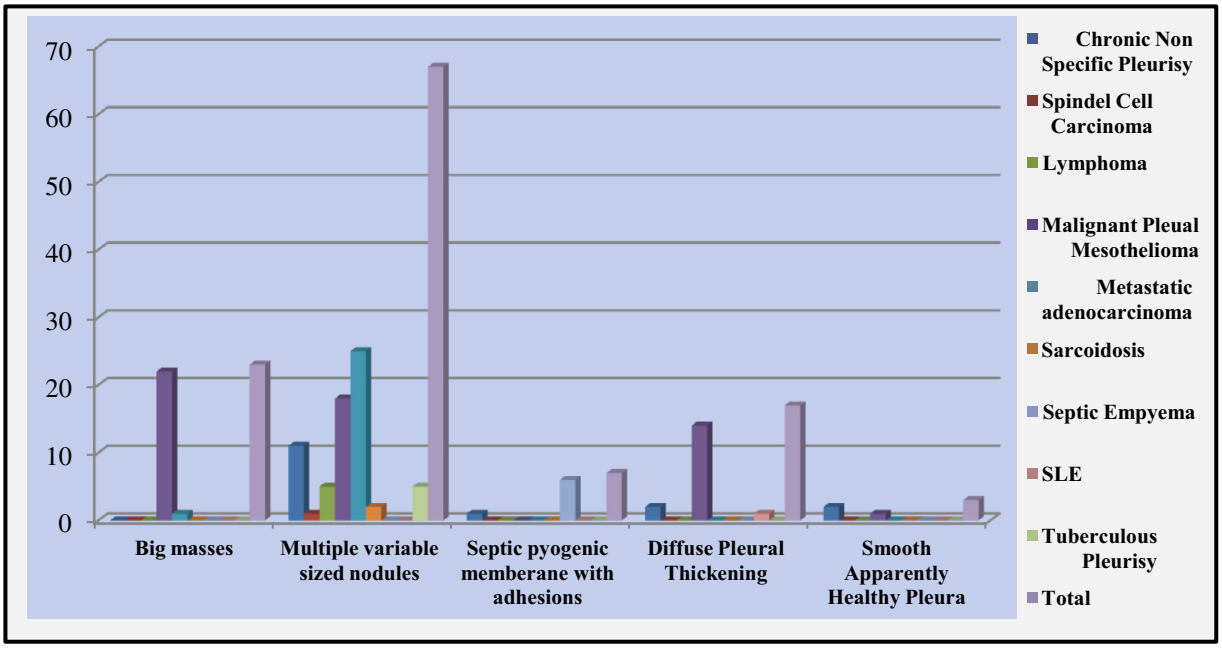

Figure 2 Main Thoracoscopic Findings.

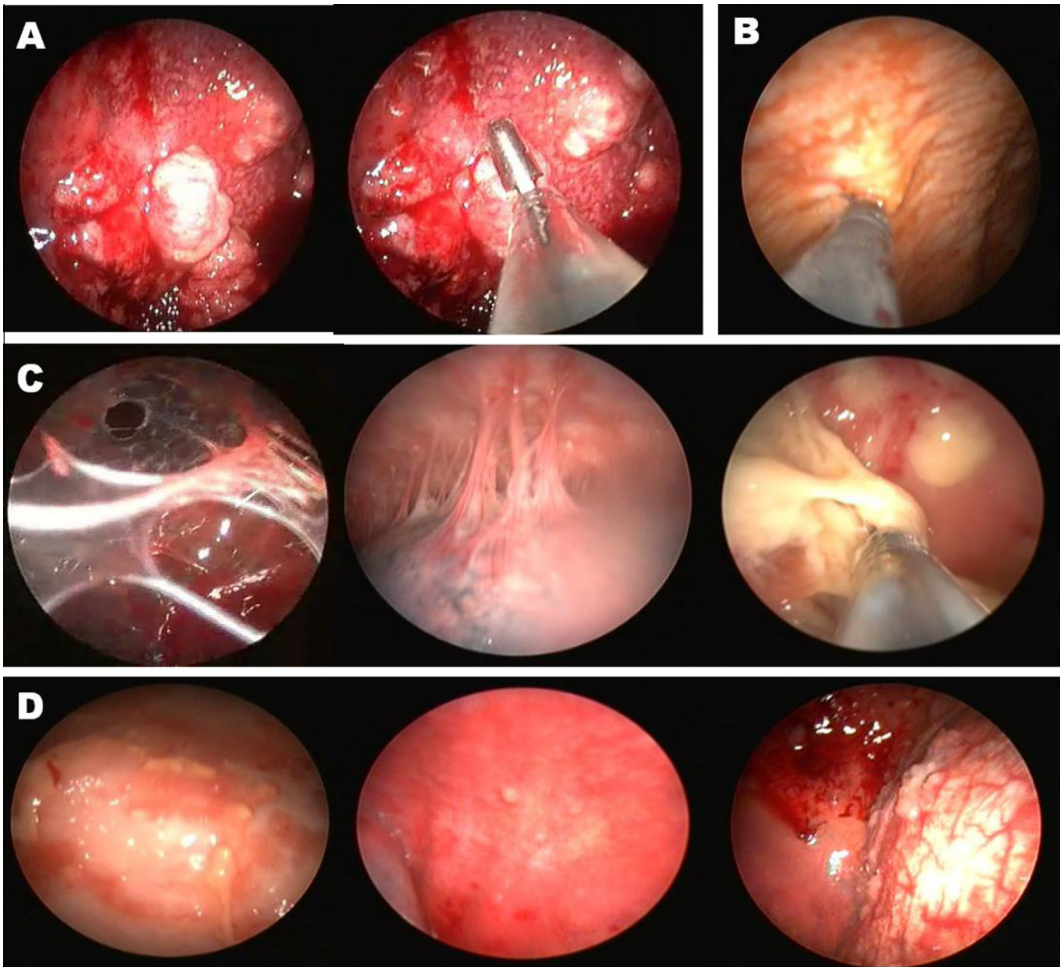

Figure 3 Thoracoscopic pictures of some pleural abnormalities: (A) Big pleural masses in cases of MPM. (B) Diffuse thickening of the costal pleura mainly in cases of MPM. (C) Different forms of adhesions mainly in cases of empyema. (D) Multiple variable sized pleural nodules mainly in cases of tuberculosis, metastatic adenocarcinoma and MPM.

were chronic non specific pleurisy and 1 case was SLE); and (e) smooth apparently healthy pleura in 3 patients (1 case was mesothelioma and 2 cases were chronic non specific pleurisy).

The age of the study population ranged from 21 to 77 years old with a mean value of 52.03 and ±SD 13.81. There was a statistically significant difference as regards the mean value of the age among the histopathological subgroups of the study population with *P*-value of 0.000. The significant difference was between the two histopathological subgroups with the lowest mean value of age (lymphoma and septic empyema) and the three histopathological subgroups with the highest mean value of age (MPM, metastatic adenocarcinoma and chronic non specific pleurisy) (Table 2).

The present study included 62 female patients with a percent of 53% and 55 male patients with a percent of 47%. There was no statistically significant difference between the different histopathological subgroups of the study population as regards sex distribution (Table 3).

There was a statistically significant difference between the different histopathological subgroups of the study population as regards smoking prevalence. There was higher percentage of smokers in relation to non smokers in the malignant subgroups including MPM, metastatic adenocarcinoma and lymphoma (Table 4).

As regards the chemical analysis of the pleural fluid, there was a statistically significant difference between the histopathological subgroups of the study population as regards the mean values of LDH, glucose and ADA. As regards the mean value of LDH and glucose, the significant difference was between the subgroup of septic empyema and subgroups of chronic non specific pleurisy, lymphoma, MPM and metastatic adenocarcinoma. As regards the mean value of ADA the significant difference was between tuberculous pleurisy subgroup and subgroups of MPM, metastatic adenocarcinoma, chronic non specific pleurisy and septic empyema (Table 5).

On the basis of pleural fluid cytological analysis, 5 cases only were positive for malignant cells and then proved to be MPM by thoracoscopic pleural biopsy and only 7 cases showed atypical mesothelial cell and then proved to be MPM (6 cases) and tuberculous pleurisy (1 case). The remaining 105 cases showed exudative effusion with no evidence of malignant cells (Table 6).

In the present study, there was no reported mortality and no observed major complications. Only 6 patients had minor complications like prolonged air leak (1 patient), subcutaneous emphysema (2 patients), wound infection (1 patient) and empyema (2 patients).

Table 2 Mean age of the histopathological subgroups of the study population.

Histopathological subgroups	Count	Mean age ± SD
Malignant pleural mesothelioma	55	54.71 ± 12.38
Metastatic adenocarcinoma	26	56.04 ± 13.66
Spindle cell carcinoma	1	34.00
Lymphoma	5	31.00 ± 14.16
Tuberculous pleurisy	5	49.00 ± 11.31
SLE	1	43.00
Sarcoidosis	2	40.50 ± 4.95
Septic empyema	6	31.83 ± 9.37
Chronic non specific pleurisy	16	54.56 ± 8.49
Total	117	52.03 ± 13.81
	P-value = 0.000*	
Statistical significance		Significant

* *P*-value < 0.05 means statistically significant.

Discussion

Even after extensive diagnostic evaluation of a patient with pleural effusion, the etiology often remains unclear. Pleural fluid studies and blind pleural biopsy have their own limitations. It is in this context that pleuroscopy or thoracoscopy becomes an important investigation so that the pleural surface can be visualized and representative sample can easily be picked. The concept of medical thoracoscopy is a simplification of VATS, as it is done under conscious sedation through a single port by chest physicians [7].

The 2000 American Thoracic Society statement on management of malignant pleural effusions stated that indications for

Table 3 Sex distribution among histopathological subgroups of the study population.

		Histopathological Subgroups									
		Chronic non specific pleurisy	Spindle cell carcinoma	Lymphoma	MPM	Metastatic adenocarcinoma	Sarcoidosis	Septic empyema	SLE	T.B. pleurisy	Total
Female	Count	9	1	2	29	17	1	0	1	2	62
	% within histopathology subgroup	56.3	100	40.0	52.7	65.4	50.0	0.0	100.0	40.0	53.0
Male	Count	7	0	3	26	9	1	6	0	3	55
	within histopathology subgroup	43.8	0.0	60.0	47.3	34.6	50.0	100.0	0.0	60.0	47.0
Total	Count	16	1	5	55	26	2	6	1	5	117
	% within histopathology subgroup	100	100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
					P-value = 0.208						
Statistical significance						Not significant					

performing thoracoscopy include ''the evaluation of exudative effusions of unknown cause'', among others, and that in cases of undiagnosed exudative effusions with a high clinical suspicion for malignancy, some clinicians may proceed directly to thoracoscopy if the facilities for medical thoracoscopy are available [8,9].

Several studies suggested that medical thoracoscopy increases the diagnostic yield in patients with benign and malignant pleural disease when thoracocentesis is non diagnostic [10,11].

The following is a one year prospective study of the diagnostic yield of medical thoracoscopy, carried out on 117 patients with undiagnosed exudative pleural effusions, in the Chest Department, Faculty of Medicine, Cairo University during the period from January 2012 to December 2012. Also the present study tried to find out the complication rate associated with medical thoracoscopy.

In the present study, the histopathological results of thoracoscopic pleural biopsy among the study population, revealed MPM in 47.01% (55 patients), metastatic adenocarcinoma in 22.22% (26 patients), spindle cell carcinoma in 0.85% (1 patient), lymphoma in 4.27% (5 patients), tuberculous pleurisy in 4.27% (5 patients), SLE in 0.85% (1 patient), sarcoidosis in 1.71% (2 patients), septic empyema in 5.13% (6 patients) and chronic non specific pleurisy was diagnosed in 13.68% (16 patients).

By comparing the results of the present study to other several studies which evaluated the diagnostic role of medical thoracoscopy in pleural effusion, it was found that the present study disagreed with the study performed by Jiang et al. [12] who showed pleural metastases in 37.8%, primary pleural mesothelioma in only 18.4%, tuberculous pleurisy in 21.6%, non specific inflammation in 9.5% & empyema in 8.0%.

Again the present study disagreed with Wang et al. [13] who found that out of 27 patients who underwent medical thoracoscopy, 15 patients had malignancy among them, 12 patients had metastatic carcinoma, 2 patients only mesothelioma and 1 patient has non-Hodgkin's lymphoma. Also they found tuberculous pleurisy in 22% (6 patients), nonspecific inflammation in 7% (2 patients), septic empyema in 4% (1 patient) and normal pleura in 4% (1 patient). Only 2 (7%) patients could not get definite diagnosis. Diagnostic efficiency of medical thoracoscopy in this study was 93%.

In the present study, the 16 patients who were diagnosed as chronic non specific pleurisy were observed closely for another one year to follow up the course of the disease in these patients. It was found that 4 patients developed malignancy (MPM) while the remaining 12 patients followed a benign course. So the diagnostic yield of medical thoracoscopy in this study was considered 96.6% because diagnosis was obtained in 113 out of 117 patients of the study population & only 4 (3.41%) patients were failed to be diagnosed by medical thoracoscopy.

Other previous studies [14,15] showed that even after thoracoscopy, around 10% of effusions remain undiagnosed. The reasons for this false-negative thoracoscopy include insufficient and non-representative biopsies that depend largely on the experience of the thoracoscopic [16] and the presence of adhesions that prevent access to neoplastic tissues which often are a consequence of repeated therapeutic thoracentesis [17].

Also the present study agreed with Venekamp et al. [18] who retrospectively studied the natural evolution of 75 patients between 1992 and 2002 who underwent diagnostic thoracoscopy and in whom the histopathological diagnosis of non-specific pleuritis was made. They tried to evaluate whether the histological diagnosis of non-specific pleuritis corresponds with the clinical diagnosis of ''idiopathic pleuritis'' and they found that 8.3% of these 75 patients developed a malignancy during the follow up period. In the remaining patients (91.7%), the clinical evolution followed a benign course.

The direct visualization of the pleural surface during medical thoracoscopy is a major advantage which may help to suspect a diagnosis and permit targeted biopsy from the abnormal pleural regions with direct vision. In the present study, thoracoscopic findings included the presence of big pleural masses in 23 patients (mainly in cases of mesothelioma), multiple variable sized nodules in 67 patients (the largest nodules were in metastatic adenocarcinoma and mesothelioma while the smallest one or the sago grain appearance was in all cases of tuberculous pleurisy and sarcoidosis), septic pyogenic membranes with extensive adhesions in 7 patients (mainly septic empyema), diffuse pleural thickening in 17 patients (mainly mesothelioma followed by chronic non specific pleurisy) and smooth apparently healthy pleura in 3 patients.

Prabhu and Narasimhan [19] studied 68 patients and found nodules in 33 patients, adhesion in 26 patients and 8 patients had sago grain appearance. When they compared these findings with the final histopathological diagnosis, they reported that 70% of patients who had nodules had malignant lesions and 96% of patients who had adhesions had chronic or subacute inflammation (non malignant lesion) and 100% of patients who had sago grain appearance had tuberculosis.

Thoracocentesis was routinely performed to all patients in this study to obtain pleural fluid samples for biochemical (including total protein, LDH, glucose and ADA) and cytological analyses. Regarding chemical analysis of the pleural fluid, there was a statistically significant difference between the histopathological subgroups of the study population in the mean values of LDH, glucose and ADA.

In this study, it was found that the mean value of glucose level was significantly lower in the septic empyema subgroup when compared to chronic non specific pleurisy, lymphoma, MPM and metastatic adenocarcinoma subgroups. Similarly, Colice et al. [20] found that a pleural fluid glucose concentration less than 60 mg/dl can be used to identify complicated para-pneumonic effusions.

However, the mean value of LDH was significantly higher in septic empyema cases when compared to chronic non specific pleurisy, lymphoma, MPM and metastatic adenocarcinoma subgroups. This agreed with Porcel et al. [21], who found very high levels of pleural fluid LDH in patients with complicated para-pneumonic pleural effusion.

Pleural fluid ADA can be a useful marker for diagnosis of tuberculosis. Its sensitivity varies from 78% to 99% and its specificity from 85% to 97% [22]. In the present study, the mean value of ADA (38.8 IU/L) was significantly higher in cases of tuberculous pleurisy when compared to those of MPM, metastatic adenocarcinoma, chronic non specific pleurisy and septic empyema histopathological subgroups. This was in agreement with Verma et al. [23] (>36 IU/L), Niwa et al. [24] (>38 IU/L) and Rodriquiz [25] (>37 IU/L) who found higher levels of ADA in cases of tuberculous pleural effusion.

Table 4 Smoking prevalence among histopathological subgroups of the study population.

		Histopathological subgroups									
		Chronic non specific pleurisy	Spindle cell carcinoma	Lymphoma	MPM	Metastatic adenocarcinoma	Sarcoidosis	Septic empyema	SLE	T.B. pleurisy	Total
Smokers	Count	10	1	5	34	19	2	0	1	3	75
	% within histopathology Subgroup	62.5	100	100.0	61.8	73.1	100.0	0.0	100.0	60.0	64.1
Non smokers	Count	6	0	0	21	7	0	6	0	2	42
	% within histopathology subgroup	37.5	0.0	0.0	38.2	26.9	0.0	100.0	0.0	40.0	35.9
Total	Count	16	1	5	55	26	2	6	1	5	117
	% within histopathology subgroup	100	100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
					P-value = 0.032*						
Statistical significance						Significant					

* *P*-value < 0.05 means statistically significant.

Table 5 Chemical analysis of the pleural fluid among the histopathological subgroups of the study population.

Histopathological Subgroups	Protein (g/dL) (Mean ± SD)	LDH (IU/L) (Mean ± SD)	Glucose (mg/dL) (Mean ± SD)	ADA (IU/L) (Mean ± SD)
Malignant pleural mesothelioma (*N* = 55)	5.02 ± 1.30	728.56 ± 474.87	82.84 ± 28.55	17.99 ± 9.51
Metastatic adenocarcinoma (*N* = 26)	4.61 ± 0.78	627.15 ± 483.82	98.58 ± 29.68	19.42 ± 9.34
Spindle cell carcinoma (*N* = 1)	2.90	844.00	83.00	10.00
Lymphoma (*N* = 5)	4.02 ± 1.01	557.20 ± 358.47	107.80 ± 77.31	17.60 ± 9.86
Tuberculous pleurisy (*N* = 5)	5.22 ± 0.52	675.80 ± 511.29	68.80 ± 13.03	38.80 ± 25.43
SLE (*N* = 1)	4.90	252.00	93.00	15.00
Sarcoidosis (*N* = 2)	4.55 ± 0.64	314.50 ± 91.22	70.00 ± 14.14	38.00 ± 24.04
Septic empyema (*N* = 6)	4.42 ± 0.63	2077.33 ± 2975.05	42.83 ± 23.79	13.83 ± 5.19
Chronic non specific pleurisy (*N* = 16)	4.86 ± 1.35	616.88 ± 466.94	80.06 ± 24.19	19.69 ± 15.33
Total (*N* = 117)	4.81 ± 1.15	740.18 ± 826.46	84.24 ± 32.55	19.45 ± 12.20
P-value	0.336	0.018*	0.010*	0.007*
Statistical significance	N.S.	Sig.	Sig.	Sig.

* *P*-value < 0.05 means statistically significant.

In this study, pleural fluid cytological analysis revealed that only 5 cases were positive for malignant cells and then proved by thoracoscopic pleural biopsy to be MPM and only 7 cases showed atypical mesothelial cell and then proved to be MPM (6 cases) and tuberculous pleurisy (1 case). The remaining 105 cases showed exudative effusion with no evidence of malignant cells. On the other hand previous studies [17,26] showed that cytological investigations of the pleural fluid can reveal malignancy in approximately 50–60% of the cases of malignant pleural disease.

Pleural fluid cytological analysis is critical in any patient who had suspected malignancy or an exudative effusion of unknown origin [27]. Several factors influence the diagnostic potential of pleural fluid cytology. The sensitivity of the pleural fluid depends primarily upon the free-floating malignant cells. These malignant cells have to be morphologically well preserved with enough intact cytological features to be first diagnostic of malignancy and hopefully also diagnostic of a specific malignant cell type [16]. These features, however, may not be present, either with a malignancy that does not shed off malignant cells into the pleural fluid or a malignancy that is largely necrotic and releases cells that are non-diagnostic [16].

Medical thoracoscopy is a safe and easy procedure in trained hands. Procedure related mortality is rare (0.24%, which is comparable to that of bronchoscopic biopsy) in experienced hands [28]. Loddenkemper [2] reported that the most serious, but rare complication is severe hemorrhage caused by trauma to the blood vessel. Other reported complications are empyema, prolonged air leakage, subcutaneous emphysema, post procedure fever, wound infection, cardiac arrhythmias, hypotension and seeding of the chest wall from mesothelioma [29]. Overall, the side effects of medical thoracoscopy appear to be few and it is extremely safe.

In the present study, there are no reported mortality and no observed major complications, only 6 patients (5%) had minor

Table 6 Pattern of pleural fluid cytology among histopathological subgroups of the study population.

		Histopathological subgroups									
		Chronic non specific pleurisy	Spindle cell carcinoma	Lymphoma	MPM	Metastatic adenocarcinoma	Sarcoidosis	Septic empyema	SLE	T.B. pleurisy	Total
Atypical mesothelial cells	Count	0	0	0	6	0	0	0	0	1	7
	% within histopathology subgroup	0.0	0.0	0.0	10.9	0.0	0.0	0.0	0.0	20.0	6.0
Positive for malignant cells	Count	0	0	0	5	0	0	0	0	0	5
	within histopathology subgroup	0.0	0.0	0.0	47.3	0.0	0.0	0.0	0.0	0.0	4.3
No malignant cells	Count	16	1	5	44	26	2	6	1	4	105
	% within histopathology subgroup	100.0	100.0	100.0	80.0	100.0	100.0	100.0	100.0	80.0	11.1
Total	Count	16	1	5	55	26	2	6	1	5	117
	% within histopathology subgroup	100	100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Statistical significance					*P*-value = 0.582						

complications like prolonged air leak (1 patient), subcutaneous emphysema (2 patients), wound infection (1 patient) and empyema (2 patients).

Similarly, Mootha et al. [30] reported that out of 35 thoracoscopic procedures, 2 cases (5.2%) developed empyema with no other complications. Also Prabhu and Narasimhan [19] found that out of 68 patients who underwent medical thoracoscopy, there were no major complications, only 4 patients had minor complications like subcutaneous emphysema (3 patients) and prolonged air leak (1 patient).

In conclusion, medical thoracoscopy is a valuable tool in the diagnosis of undiagnosed pleural effusion. It is a simple and safe method with a high diagnostic yield and lower complication rates. Due to its higher diagnostic yield the future of it is very bright.

Conflict of interest

None.

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