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The role of medical thoracoscopy in the diagnosis of exudative lymphocytic pleural effusions: an observational study

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Abstract

Diagnosis of pleural effusion remains challenging despite extensive microbiological and radiological investigations. Pleural histopathological examination (HPE) is often needed to ascertain the etiology. Medical thoracoscopy (MT) is surpassing the other modalities of pleural biopsy on account of its high diagnostic yield. We aim to estimate the yield of MT in undiagnosed exudative lymphocytic pleural effusion and also intend to correlate gross thoracoscopy findings with HPE results. This retrospective observational study was conducted in a tertiary respiratory care center. Medical records of undiagnosed exudative lymphocytic predominant pleural effusion patients who underwent MT during the study period of 24 months were retrieved from the Medical Records Department. The clinico-demographic profile, radiological images, gross thoracoscopy findings, HPE reports, and post-procedure complications were recorded and analyzed using analysis of variance and chi-square test. The study comprised 62 patients with a mean age of 52 years at presentation. HPE of MT-guided biopsy confirmed tuberculosis in 22 (35.3%), malignancy in 18 (29%) cases, and 22 (35.5%) cases had chronic nonspecific inflammation. The most commonly observed MT finding in malignancy was pleural nodules (14.70%), followed by thickened pleura (10.50%) and growth (2.10%). In tuberculosis, the most common MT finding was adhesions in all, followed by nodules (5.28%). We also diagnosed a case of pleural amoebiasis and ependymoma, which are rare. Macroscopic findings had a significant correlation with the final histopathologic diagnosis, with a diagnostic yield of 66.1%. Gross thoracoscopic findings correlate well with the histopathological diagnosis of pleural effusion etiology, with a correlation coefficient of 0.73. Pleural nodules were the most common finding in malignancy, while adhesions were common in benign pathology like tuberculosis. A good diagnostic yield underscores the utility of MT in undiagnosed exudative lymphocytic pleural effusions.

Key words: medical thoracoscopy, pleural biopsy, undiagnosed pleural effusion, pleural amoebiasis, pleural ependymoma.

Introduction

Pleural effusion, an entity characterized by the accumulation of fluid in the pleural cavity is one of the most common respiratory diseases encountered by Pulmonologists. Pleural effusion accounts for around 25% of the total respiratory diseases presenting to the hospital. Preliminary step in the evaluation of pleural effusion is to categorize effusion into exudative and transudative effusion based on the biochemical reports of pleural fluid analysis. Despite pleural fluid analysis and radiological investigations around 25% of pleural effusion cases remain undiagnosed which require pleural biopsy for establishing a diagnosis [1]. Closed pleural biopsy techniques, CT or Ultrasound guided biopsy or thoracoscopic guided biopsy are the various modalities for pleural biopsy. Closed biopsy has overall poor sensitivity in the diagnosis and around 10-27% of cases may still remain inconclusive after closed pleural biopsy [2]. Radiological image guided biopsy though has good overall sensitivity (around 87%) demands expertise and is expensive, thus may not be feasible at all centers. Medical thoracoscopy (MT) is a minimally invasive procedure which can be performed under mild-moderate sedation and local anesthesia. Direct visualization of the target biopsy site enhances its positive diagnostic rate. The positive diagnostic rate of medical thoracoscopy as per available literature in the diagnosis of malignancy and tuberculosis is around 91%-95% and 93%-100% respectively [3]. Medical thoracoscopy is replacing closed biopsy on account of its high sensitivity and favourable safety profile. Our study is planned to assess the yield of MT in undiagnosed exudative lymphocytic pleural effusion and to correlate the gross thoracoscopic findings with HPE findings in various etiologies and to enumerate the post thoracoscopy complications.

Materials and Methods

This descriptive retrospective study was conducted in a tertiary respiratory care center between March 2022 to march 2024 after obtaining approval and clearance from the Institutional Ethics Committee, SDS Tuberculosis Research Centre & Rajiv Gandhi Institute of Chest Diseases as per the document no. SDS/PG/01/2023-24 dated 21/2/2024 .All cases aged above 18 years who underwent MT for undiagnosed exudative lymphocytic pleural effusion (described as exudate as per Light's criteria but cytological, microbiological and biochemical tests failed to yield a diagnosis) during our study period were included and cases with incomplete data were excluded .Data of the 62 cases fulfilling our inclusion criteria were retrieved from the Medical Records Department of our hospital. The details were recorded in a pre-formatted case proforma. Detailed clinical history including socio- demographic data, symptomatology, comorbidities, significant medical surgical illness in the past, drug intake if any, etc. were recorded. All the required laboratory hematological and radiological investigations, pleural fluid analysis including microscopic and biochemical analysis reports (sugar, protein, gram

stain, ZN stain and culture, adenosine deaminase (ADA) level and pleural fluid cytology) were collected and recorded. MT procedure details and gross thoracoscopic findings were noted. Post procedure complications and Histopathological examination (HPE) reports were documented.

Procedure details

Informed written consent was obtained from all cases prior to the procedure. Patients were premeditated with midazolam 1mg and fentanyl 50 mg just prior to the procedure. Patients were positioned on the contralateral lateral decubitus, after site marking under USG guidance ipsilateral hemi thorax was cleaned and draped. Injection lignocaine was instilled to the skin subcutaneous tissue, muscle and parietal pleura and fluid presence was reconfirmed. After systemic exploration of the pleura and pleural cavity using artery forceps, trocar was inserted to the pleural cavity, MT was directed through the trocar, lung, costal, diaphragmatic Pleura were visualized thoroughly. Biopsies were taken from the abnormal sites with alligator jaw forceps and sent for histopathological analysis and microbiological investigations including CBNAAT for mycobacterium Tuberculosis. Intercostal drainage tube (ICD) was fixed in situ post procedure. Patients were monitored for procedure related complications.
Thoracoscope used: Evis Exera Pleuravideoscope Olympus LTF Type 160

Statistical analysis

All the data collected were entered in Micro Soft Excel spread sheet and data analysis was done. The data collected were analysed statistically using descriptive statistics in terms of mean, standard deviation, (± SD), median and range or frequencies (number of cases), percentages, tables, graphs wherever applicable. Stratified analysis was performed wherever necessary using 95% confidence Interval. Chi-square test and ANOVA were used to analyse correlations in the data obtained. P value of <0.05 was considered significant.

Results

The study comprised of 62 patients of undiagnosed exudative lymphocyte predominant pleural effusion who underwent medical thoracoscopy. There were 49(79%) males, 13(21%) females with a mean age of 52 years. The histopathological diagnosis from MT showed tuberculosis in 22(35.5%) patients, malignancy in 18(29%) and chronic nonspecific inflammation in 22(35.5%) patients. Confirmed etiological diagnosis after thoracoscopy was obtained in 41 of 62 (66.1%) patients. In our study, there was a significant difference in the average age, gender, and past medical history across different groups. Average age of patients with Malignancy was more than the average age of those with tuberculosis and chronic inflammation which was

statistically significant. Additionally, we observed that males had more chronic inflammation and tubercular effusion, while females had more malignant pleural effusion. Comorbidities were noted in 25(40.32%) patients of which systemic hypertension was the commonest. Comorbidities had no impact on the etiological diagnosis. Mean duration of presenting complaints was 4 weeks. Breathlessness was the commonest presenting complaint in 52(83.8%.) patients followed by cough in 38 (61.3%) and chest pain in 26 (41.9%). History of alcohol intake or smoking had no significant influence on the etiological diagnosis. Previous history of Tuberculosis or a past history of malignancy had a statistically significant influence on being diagnosed with tuberculosis or malignancy as the cause for current pleural effusion. Baseline socio demographic characteristics of all the cases are enumerated in Table 1.

Radiologically, on CECT thorax pleural effusion was the only radiological abnormality in 42 patient (67.7%). Loculations were the commonly observed findings along with effusion in 40 patients (64.5), pleural nodules and mass were observed in 11patients (17.7%) each. Pleural thickening and loculations were more often noted in tubercular effusion (72.7%) while pleural nodules and parenchymal mass lesions were frequent (77.7%) in malignant effusion (Table 2). Diagnostic thoracocentesis was suggestive of exudative lymphocytic predominant with low ADA level below 40 units/L in all our cases.

On performing MT, we observed Adhesions in 48(77.4%), Nodules in 19(30.6%), growth in 2(3.2%) and grossly normal pleura in 6(9.6%). HPE of MT guided biopsy confirmed malignancy in 18 cases (29%). Among these Adenocarcinoma was observed in 13 cases and 2 were poorly differentiated carcinoma, 1 was mesothelioma,1was metastatic squamous cell carcinoma and 1 rare case of pleural ependymoma. Nonspecific chronic inflammation was reported in 22 cases (35.5%) and 1case of chronic inflammation was diagnosed as pleural amoebiasis on microscopy. Biopsy sample was positive for M.tuberculosis by GeneXpert in 4 of 22 (18.18%) patients with HPE confirmed tuberculosis and all were Rifampicin sensitive. Most commonly observed MT finding in Malignancy was nodules in14(77.8%) followed by adhesions with thickened pleura in10 (55.6%) and growth in 2 patients (11.1%). In Tuberculosis, most common MT finding was adhesions in all the 22 patients followed by nodules in 5(22.7%) patients. Those with chronic inflammation had adhesions in 16(72.7%) and grossly normal pleura in almost 6(27.3%) patients (Table 3). Pleural amoebiasis had thick septation and whitish slough covering the entire pleura and pleural ependymoma had multiple papilloid growth in the parietal pleura. The gross thoracoscopic findings had significant correlation (correlation coefficient 0.73) with the final histopathological diagnosis.

Post procedure complications were reported in 14 (22.5%) patients but none major. Chills was observed in 9 (14.5%), chest pain in 3 (4.8%), fever and breathlessness in 1 patient (1.61%)

each (Table 4). Mean duration of post procedure intercostal tube placement was 2 days in our study group.

Discussion

Establishing the cause of exudative pleural effusion in the context of inconclusive pleural fluid analysis requires pleural sampling via invasive procedures. Even closed pleural biopsies fail to reach right diagnosis in up to 40% of exudative effusion [4]. Medical thoracoscopy has replaced the conventional pleural biopsy in many centres. In the present study we obtained histopathological abnormal pleural findings in all the 62 patients but a final etiological diagnosis was obtained in only 41 of 62 patients. Thus, our study reports 66.1% diagnostic yield of medical thoracoscopy in undiagnosed exudative lymphocyte predominant pleural effusion. Various factors are known to influence the yield of Medical thoracoscopy like method of sampling, inadequate sampling, pathological techniques, presence of dense adhesion masquerading the pathological sites etc.

The yield in our study is slightly lesser than available literature of more than 90% positive diagnostic rate [5,6]. Few of these studies with >90% yield included all cases of exudative pleural effusions and not only those with lymphocytic effusions like ours. The diagnostic yield of thoracoscopy in exudative lymphocytic pleural effusions done by Law et al and Mootha et al. was 78.57% and 74.28% respectively [7,8]. An Indian study with patients of inconclusive pleural effusion who underwent flex-rigid thoracoscopy, biopsy was positive in 12 of the 18 patients (66.7%) which was similar to our study [9]. The discrepancy in yield may also be secondary to non-consideration of chronic inflammation which constitutes 35.5% of HPE diagnosis as a final etiological diagnosis in yield calculation in our study unlike few other studies. Nonspecific chronic inflammation can suggest the occurrence of a sampling error or genuine benign pleural disease. However, our study was limited by the inability to perform advanced molecular or immunohistochemical analyses on samples of chronic inflammation and by the lack of long-term follow-up for these patients. In a study on long term outcome of patients with nonspecific pleurisy on MT, most of them were found to be benign etiology (23/31 patients, 74.2%). Specific histopathological changes in the pleura are not expected in cases of pulmonary embolism, heart failure or treated parapneumonic effusion. Even in the case of tuberculous effusion, the reaction occurring in the pleura may cause effusion in the absence of granulomatous inflammation [10]. Although the diagnosis of most nonspecific pleurisy (NSP) is a benign disease, malignant disease is also a possibility, especially in patients with nodules or plaques following MT and the recurrence of pleural effusion. Another update on the long-term outcome of patients with NSP at MT, of the 154 patients diagnosed with NSP with available follow-up data,19 patients were subsequently diagnosed

with pleural malignancy, including lung cancer and malignant pleural mesothelioma, which were most common. The more difficult disease to diagnose is pleural mesothelioma because the lesion is difficult to access using MT [11].

Thoracoscopy can be performed using a rigid or semi-rigid thoracoscope. We used a semi-rigid thoracoscope and not rigid one as in some previous studies with high diagnostic yield. Generally, larger biopsy specimens are obtained via rigid thoracoscopy which may influence the yield obtained [5,12]. A RCT comparing the two techniques by Dhooria *et al.*, found that the diagnostic yield of biopsies obtained was almost similar (100% with rigid *vs.* 94.3% with semi-rigid), but when they conducted intention-to-treat analysis including cases where a successful biopsy was not obtained, rigid thoracoscopy had a significantly higher yield compared to semi-rigid (100% *vs.* 73.3%, P=0.02) [13]. Thus, the instrument used and the technique also plays a significant role in obtaining positive yield. Adhesions were the predominant gross thoracoscopy findings found in 77.4% of all cases and 72.7% of those with chronic nonspecific inflammation. The presence of dense adhesions may impair the ease of mobility and restrict access to the pathological site. Also, all patients in our study were treated elsewhere and later referred to us which might have obscured the actual diagnosis. Especially, 8 of 22 patients (36.4%) with chronic nonspecific inflammation on HPE were on empirical ATT prior to thoracoscopic procedure which could lead to absence of specific findings on MT, non-specific histopathological finding and hence lower diagnostic yield.

The most common etiology of pleural effusion worldwide is malignancy, however regional discrepancies to this are noted especially in high tuberculosis burden countries. In India tuberculosis represents the top cause of pleural effusion [14]. Pleural fluid ADA has been widely used to diagnose tuberculosis in resource limited settings. Though pleural fluid ADA has good sensitivity of 86% in the diagnosis of tuberculosis, false positive results reported in the literature is around 1.7% [14,15]. Moreover, many tubercular pleural effusions will have lower levels of ADA than the accepted cut offs. In a study by Kim et al on tubercular pleural effusion, 18.8% of their study population had low ADA levels [16]. Decreased ADA levels in tubercular pleural effusion are linked with advanced age, active smoking, multiorgan dysfunction, and critical illness [16]. These observations foreground tissue diagnosis for apt diagnosis. In the present study tuberculosis remains the common histopathology diagnosis and all those cases had lower ADA levels. The second common cause was chronic inflammation, followed by malignancy. Malignancy and tuberculosis were the commonest histopathological diagnosis in several studies of which malignant effusion tops the diagnosis. Adenocarcinoma was the commonest histopathological type of malignancy diagnosed which is similar to other studies [17,18]. It is notable that the present study reports one pleural amoebiasis, which is

reported to occur in 7-20% cases of hepatic amoebiasis [19]. Also, pleural ependymoma is a rare cause of metastatic pleural effusion that we have encountered.

Amongst 62 cases, the majority were found to be in the age group of 33 to 70 years which is a similar observation as observed in a study by Swarnakar et al [20]. Age has significant impact on the etiology of the pleural effusion. Malignant effusion was more in advanced age group in our study. Males were more preponderant to the development of pleural effusion in our study. Majority of females undergoing MT were diagnosed with malignancy which explains adenocarcinoma being the commonest histopathological type in our study. Neither comorbidities nor smoking history influenced the diagnosis in our study in similarity to the observations done by Chen RL et al [6]. Previous history of Tuberculosis or a past history of malignancy had a statistically significant influence on being diagnosed with tuberculosis or malignancy as the cause for current pleural effusion.14.5% (9) of the patients gave previous history of being diagnosed with tuberculosis of which 27.6% were diagnosed as tuberculous pleural effusion on MT.

Most of the patients who were enrolled in this study had breathlessness followed by cough and chest pain as presenting complaints which is comparable with other studies [21-23] in which breathlessness is the most common presenting symptom in 86.3%, 75.4%, and 67.4% patients, respectively followed by cough.

Radiologically, on CECT pleural thickening and loculations were more often noted in tubercular effusion (72.7%) while pleural nodules and parenchymal mass lesions were frequent (77.7%) in malignant effusion. Even majority of patients with a previous history of tuberculosis had a typical presentation of moderate to large pleural effusion with pleural thickening, loculations with underlying consolidation/collapse while a few had associated pleural nodules.

The presence of grossly abnormal thoracoscopy findings will increase the probability of histopathologic diagnosis. Knowledge of macroscopic findings will guide physicians about the nature of the disease they are dealing with. The most common gross thoracoscopic finding in our study is adhesions over the pleural surface in 48(61%) followed by nodules in 19(35%) and growth in 2 (6%) contrarily to several studies which reported more nodules than adhesion [24,25]. This disparity is due to the higher number of tuberculosis and chronic inflammation cases than malignancy in our study. In Tuberculosis, the most common MT finding that we noted were adhesions between visceral and parietal pleura and were present in 22 cases (71%) which is similar to the observations made by Chen RL et al [6]. Most common thoracoscopic finding we observed in malignancy was pleural nodule, followed by adhesions and growth. Among the patients with chronic nonspecific inflammation in our study, majority had adhesions (67%) followed by normal pleura (33%) which are comparable with similar studies

[6,26]. We observed significant correlation between macroscopic findings and the histopathological diagnosis. In our study 14 out of 18 (77%) pleural nodules turned out to be malignant. Yousef A.E.R.I. et al reported nodules in 27(75%) of their study population of which 22(81.48%) were malignant [27]. In a study by Arif M et al, they reported nodules in 23 cases of their study population and majority (82.6%) were malignant [25]. Other common thoracoscopic findings reported in the literature are adhesions and pleural thickening. 79.16% (38/48) of patients with adhesions on macroscopy turned out to be benign in our study. In a study by Prabhu et al 96% of pleural adhesions turned out to be benign [23]. A study by Helala et all reported that all their cases with gross adhesions on MT were of benign etiology [28]. In the study by Chen RL et al 77% (48) had adhesions of which 80% were benign and 20% had malignant pathology [6]. We observed pleural growth only in 2 cases which turned out to be malignant. Thus, the presence of pleural nodules or growth would increase the possibility of malignancy while benign etiologies are usually associated with adhesions, pleural thickening and irregularities.

Though medical thoracoscopy is a relatively safe procedure a very few minor complications like persistent air leak, chest pain, subcutaneous emphysema are reported to occur. We report complications in only 22.6% (14 cases) of which chills were the frequent (14.5%) followed by chest pain in 2 cases (3.2%). Complications after thoracoscopy reported in the reference studies were 20%, 3.70%, and 4.41% of patients, respectively [11,23,29]. Subcutaneous emphysema and pneumothorax were the reported post procedure complications by Kapadia V et al in their study [24]. Marwah et al reported fever as the most common complication in their study [30]. Mean duration of ICD in our study was 2 days post procedure, whereas Ranganatha et al reported median duration for ICD removal post procedure of 4 days and often more prolonged in parapneumonic effusions [31].

Limitations

Our study is a single centre study with a small sample size and hence the results cannot be generalised. The retrospective and observational nature of the study might have introduced patient selection bias due to referral pattern, prior treatment and missing data. Thoracoscopy was performed by different pulmonologists with varied skill and experience that might have affected the yield. Advanced molecular or immunohistochemical analysis was not done on chronic inflammation samples which could have influenced the diagnosis. Most cases were referred at a later stage of disease which might also have influenced the yield.

Conclusions

Medical thoracoscopy (MT) has a very high diagnostic yield in undiagnosed exudative lymphocytic pleural effusions with negligible complications. Presence of pleural nodules would increase the probability of malignancy while adhesions, pleural thickening favour benign pathologies.

References

1. Shaheen MMAM, Shaaban AY, Mahmoud MI, et al. The diagnostic role of thoracoscope in undiagnosed pleural effusion: rigid versus flexible. Egyptian J Chest Dis Tuberc 2014;63:635-42.

2. Soni A, Bansal V, Goel A. The role of thoracoscopy in diagnosis and treatment of pleural disease. WJOLS 2012;2005:4-15.

3. Rahman NM, Ali NJ, Brown G, et al. Local anaesthetic thoracoscopy: British Thoracic Society Pleural Disease Guideline 2010. Thorax 2010;65:54-60.

4. Barreiro TJ, Katzman PJ. Malignant mesothelioma: a case presentation and review. J Am Osteopath Assoc 2006;106:699-704.

5. Haridas N, KP S, TP R, et al. Medical thoracoscopy vs closed pleural biopsy in pleural effusions: a randomized controlled study. J Clin Diagn Res 2014;8:MC01-4.

6. Chen RL, Zhang YQ, Wang J, et al. Diagnostic value of medical thoracoscopy for undiagnosed pleural effusions. Exp Ther Med 2018;16:4590-4

7. Law WL, Chan J, Lee S, et al. Pleuroscopy: our initial experience in Hong Kong. Hong Kong Med J 2008;14:178-84.

8. Mootha VK, Agarwal R, Singh N, et al. Medical thoracoscopy for undiagnosed pleural effusions: experience from a tertiary care hospital in North India. Indian J Chest Dis Allied Sci 2011;53:21-4.

9. Thangakunam B, Christopher DJ, James P, Gupta R. Semi-rigid thoracoscopy: initial experience from a tertiary care hospital. Indian J Chest Dis Allied Sci 2010;52:25-7.

10. Yang Y, Wu YB, Wang Z, et al. Long-term outcome of patients with nonspecific pleurisy at medical thoracoscopy. Respir Med 2017;124:1-5.

11. Yu YX, Yang Y, Wu YB, et al. An update of the long-term outcome of patients with nonspecific pleurisy at medical thoracoscopy. BMC Pulm Med 2021;21:226.

12. Khan MA, Ambalavanan S, Thomson D, et al. A comparison of the diagnostic yield of rigid and semirigid thoracoscopes. J Bronchology Interv Pulmonol 2012;19:98-101.

13. Dhooria S, Singh N, Aggarwal AN, et al. A randomized trial comparing the diagnostic yield of rigid and semirigid thoracoscopy in undiagnosed pleural effusions. Respir Care 2014;59:756-64.

14. Pathak H, Pandey S, Dave L, et al. To correlate clinical and biochemical profile of pleural effusion: a retrospective study in tertiary care centre of central India. Indian J Tuberc 2024;71:405-9.

15. Castro DJ, Nuevo GD, Pérez-Rodríguez E, Light RW. Diagnostic value of adenosine deaminase in nontuberculous lymphocytic pleural effusions. Eur Respir J 2003;21:220-4.

16. Kim SB, Shin B, Lee JH, et al. Pleural fluid ADA activity in tuberculous pleurisy can be low in elderly, critically ill patients with multi-organ failure. BMC Pulm Med 2020;20:13.

17. Gioia M, Arancibia RL. A review of medical thoracoscopy and its role in management of malignant pleural effusion. J Respir 2024;4:35-49.

18. Shrestha BK, Adhikari S, Thakur BK, et al. Medical thoracoscopy for undiagnosed exudative pleural effusion: experience from two tertiary care hospitals of Nepal. JNMA J Nepal Med Assoc 2020;58:158-64.

19. Zakaria A, Al-Share B, Al Asad K. Primary pulmonary amebiasis complicated with multicystic empyema. Case Rep Pulmonol 2016:2016:8709347.

20. Swarnakar, Rajesh, Vaghani B, Dhoble C. Gr upSM to study the diagnostic yield of medical thoracoscopy in patients with pleural effusion of undetermined etiology. 2017.

21. Prabhu VG, Narasimhan R. The role of pleuroscopy in undiagnosed exudative pleural effusion. Lung India 2012;29:128-30.

22. Soe Z, Aung Z, Darli Tun K. A clinical study on malignant pleural effusion. Int J Collab Res Intern Med Public Health 2012;4:761-79.

23. Patil CB, Dixit R, Gupta R, et al. Thoracoscopic evaluation of 129 cases having undiagnosed exudative pleural effusions. Lung India 2016;33:502-6.

24. Kapadia V, Jindal S, Patel P, Tripathi S. A study of role of medical thoracoscopy in undiagnosed pleural effusion. J Assoc Physicians India 2023;71:11-2.

25. Arif M, Bhargava R, Shameem M, et al. Diagnostic yield of medical thoracoscopy in undiagnosed exudative pleural effusion- a tertiary centre experience from Aligarh Muslim University, Uttar Pradesh, India. J Clin Diagn Res 2020;14:OC16-20.

26. Rawat J, Kumar A, Mrigpuri P, et al. Role of single port rigid thoracoscopy in undiagnosed pleural effusion. Tuberc Respir Dis 2024;87:194-9.

27. Yousef AERI, Morsi AF, El-Shabrawy M, El Shahaat HA. The role of medical thoracoscopy in the diagnosis of exudative pleural effusion at the Chest Department of Zagazig University Hospitals. Egypt J Bronchol 2016;10:225-31.

28. Helala LA, El-Assal GM, Farghally AA, El Rady MMA. Diagnostic yield of medical thoracoscopy in cases of undiagnosed pleural effusion in Kobri El-Kobba Military Hospital. Egyptian J Chest Dis Tuberc 2014;63:629-34.

29. Wang Z, Tong ZH, Li HJ, et al. Semi-rigid thoracoscopy for undiagnosed exudative pleural effusions: a comparative study. Chin Med J 2008;121:1384-9.

30. Marwah V, Bhattacharyya D, Mohamed Ali F, et al. Diagnostic utility of medical thoracoscopy in undiagnosed exudative pleural effusions. Med J Dr DY Patil University 2020;13:525-8.

31. Ranganatha R, Tousheed SZ, MuraliMohan BV, et al. Role of medical thoracoscopy in the treatment of complicated parapneumonic effusions. Lung India 2021;38:149-53.

Table 1. Baseline socio demographic characteristics of the study population

Variables		Tuberculosis (n=22)	Malignancy (n=18)	Chronic inflammation (n=22)	Total (n=60)	p-value tuberculosis vs. malignancy	p-value malignancy vs. chronic inflammation	p-value tuberculosis vs. chronic inflammation
Age		51.5±13.2	65.6±9.2	56.3±17.7	57.3±15.0	0.0005	0.0511	0.3137
Gender	**Male**	18(81.8)	8(44.4)	17(77.3)	43(69.4)	0.013	0.032	0.708
	Female	4(18.2)	10(55.6)	5(22.7)	19(30.6)			
Comorbidity		8(36.4)	7(38.9)	11(50.0)	26(41.9)	0.869	0.482	0.361
Smoking History		9(40.9)	7(38.9)	7(31.8)	23(37.1)	0.896	0.641	0.531
Alcohol history		11(50.0)	10(55.6)	8(36.4)	29(46.8)	0.726	0.949	0.361
Past h/o TB		6(27.3)	0(0.0)	3(13.6))	9(14.5)	0.024	0.235	0.295
Past h/o Malignancy		0(0.0)	7(38.9)	0(0.0)	7(11.3)	0.001	0.001	1.000

*P value of <0.05 is considered significant. Thus, there is significant difference in the average age, gender, and past medical history in different groups

Table 2. Radiological findings (CECT THORAX) of the study population

Features on CT thorax	TB (n=22)		Malignancy (n=18)		Chronic inflammation (n=22)	
	N	**%**	**N**	**%**	**N**	**%**
Effusion only	1	4.6	1	5.6	4	18.2
Effusion + septations	16	72.7	2	11.1	15	68.2
Effusion + pleural nodules	5	22.7	8	44.4	0	0
Effusion + mass	0	0	6	33.3	0	0
Effusion+ septations+ pleural thickening	0	0	1	5.6	3	13.6

Table 3. Correlation of thoracoscopic findings and histopathological diagnosis among 3 groups i.e. tuberculosis, malignancy and chronic inflammation.

MT Findings	Tuberculosis (n=22)	Malignancy (n=18)	Chronic inflammation (n=22)	p-value
Nodules	5(22.7)	14(77.8)	0(0.0)	<.0001
Adhesions	22(100.0)	10(55.6)	16(72.7)	0.003
Growth	0(0.0)	2(11.1)	0(0.0)	0.0801

*P value of <0.05 is considered significant. A statistically significant correlation coefficient 0.73 was observed between the gross thoracoscopy findings and the histopathological results suggesting a strong association between them.

Table 4. Complications after thoracoscopy observed in our study population

Complications after procedure	Number	%
Nil	48	77.4
Chills	9	14.5
Chest pain	2	3.2
Fever	1	1.6
Breathlessness	1	1.6