

The evolving role of medical thoracoscopy on therapeutic management of pleural disease

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Purpose of review

The use of medical thoracoscopy (MT) has gained widespread acceptance for the diagnosis and management of pleural disease. It is less invasive compared to video-assisted thoracoscopic surgery (VATS), can be performed in the endoscopy suite and in patients who are unfit to undergo general anaesthesia. It is safe, with high diagnostic yield, and enables pulmonologists to intervene therapeutically.

Recent findings

There have been several developments in this field, particularly for malignant pleural effusions (MPE). Specifically, we discuss further techniques that can be employed during MT to distinguish between benign and malignant pleural disease. There is also potential for combined thoracoscopic talc poudrage (TPP) and indwelling pleural catheter (IPC) insertion to shorten hospital stay.

Summary

Beyond MPE, we discuss the role of MT in patients with pneumothorax and pleural infection. We discuss the advantages and disadvantages of MT over traditional practices in a variety of conditions – diagnosis of exudative pleural effusions, prevention of recurrent MPE and pneumothoraces as well as treatment of pleural infections, so as to better aid physicians in selecting the optimum procedure for patients.

Keywords

pleural effusions, pleuroscopy, pneumothorax, thoracoscopy

INTRODUCTION

Thoracoscopy otherwise known as pleuroscopy or local anaesthetic thoracoscopy, is a minimally invasive endoscopic procedure. Its use was first described by Jacobaeus in 1910 [1]. It is performed in spontaneously breathing patients under moderate sedation with local anaesthesia (Fig. 1). It is less-invasive compared to VATS and thus may be performed in patients whose co-morbidities place them at high general anaesthetic risk.

Medical thoracoscopy (MT) has a favourable safety profile with a low rate of major complications and mortality [2[▪]] (Table 1). It is widely employed in the diagnosis of pleural effusions, especially when initial fluid analysis is nondiagnostic [3], and has a pooled sensitivity of 97% [4]. MT can also be offered upfront if an exudative effusion is suspected. The use of ultrasonography for assessing pleural effusions has become common practice, and the newly published DUETS score [5[▪]] can effectively differentiate between transudates and exudates, which may eliminate the need for initial pleural fluid analysis. Therapeutically, MT is used to perform talc pleurodesis to prevent recurrence of pleural effusion

or pneumothorax and to break down thin adhesions in pleural infections.

MALIGNANT PLEURAL EFFUSIONS

Malignant pleural effusions (MPE) represent 22% of all pleural effusions [6[▪]]. Initial pleural fluid analysis is often unrevealing – cytology is positive only in 62% of patients with MPE [7], and in <20% of patients with malignant mesothelioma [8]. Repeated sampling only increases diagnostic sensitivity to at most 90% [9] and may result in delays. Prethoracoscopy

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KEY POINTS

- Medical thoracoscopy is a minimally invasive procedure that is both diagnostic and therapeutic.
- It is less invasive than video assisted thoracic surgery and can be considered in a variety of conditions such as malignant pleural effusion, pneumothoraces and pleural infections, especially in patients with significant co-morbidities.
- It has a high diagnostic yield in the diagnosis of malignant pleural effusion.
- Exciting developments in the field include that of combined thoracoscopic talc pleurodesis and indwelling pleural catheter insertion.

computed tomography scanning of the chest has a sensitivity of only 68% [10]. In contrast, the diagnostic yield of thoracoscopy for MPE and mesothelioma exceeds 90% [2,4,11,12,13,14], and is higher than that of closed pleural biopsy [15] – as one is able to directly visualize and target areas of pleural abnormality (Fig. 2). In addition, MT is able to biopsy pleural lesions which may not be amenable to closed pleural biopsy (Fig. 3). To improve diagnostic efficacy

Table 1. Complications of medical thoracoscopy

Major complications

- Hemorrhage
- Port site tumour growth
- Bronchopleural fistula
- Postoperative air leak
- Pneumonia and empyema

Minor complications

- Wound infection
- Subcutaneous emphysema
- Postoperative fever

in cases where only pleural inflammation is seen, autofluorescence can be employed [16,17]. Confocal laser endomicroscopy can also be utilized to differentiate between malignant and benign pleural fibrosis in malignant mesothelioma [18]. Loss of BAP-1 staining and Methylthioadenosine phosphorylase testing on pleural tissue immunohistochemistry can further aid in differentiating mesothelioma from reactive mesothelial proliferation [19]. In other malignancies, thoracoscopy also allows for tissue samples to be obtained for molecular profiling [20], a key advantage in the era of targeted therapy.

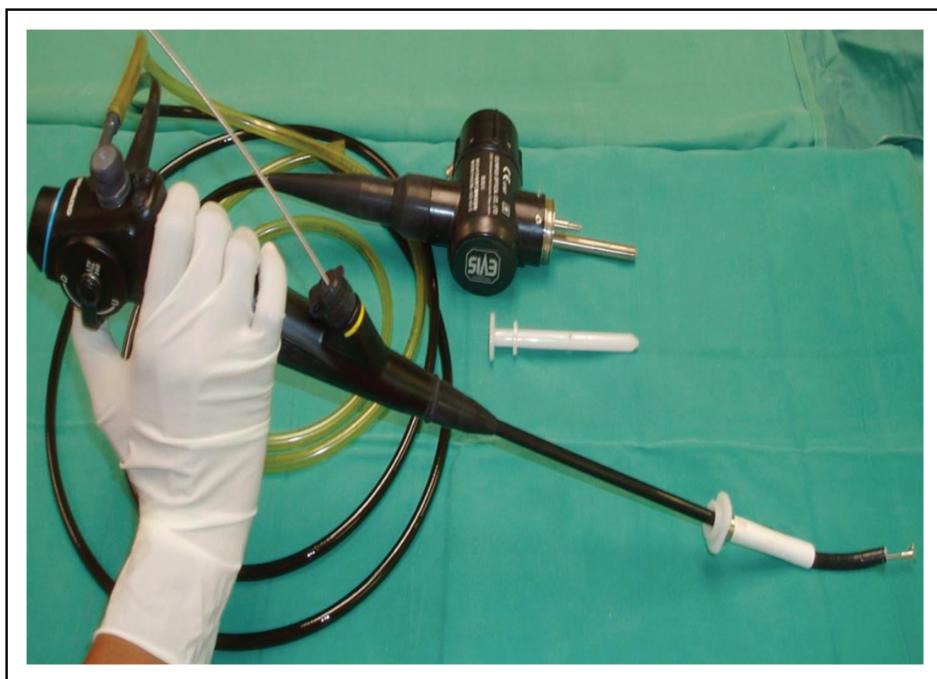


FIGURE 1. Procedural technique for flex-rigid thoracoscope. The thoracoscope is inserted through a trocar after a small chest wall incision is made. This allows for direct inspection of the pleural space, biopsy of pleural lesions, and therapeutic interventions such as fluid drainage, adhesiolysis and pleurodesis to be performed. Both flex-rigid and rigid thoracoscopes can be utilized, the former offering advantages in terms of manoeuvrability as well as compatibility with existing processors and light sources. Source: Lee P, Colt HG. Pleuroscopy in 2013. Clin Chest Med. 2013;34:81–91.

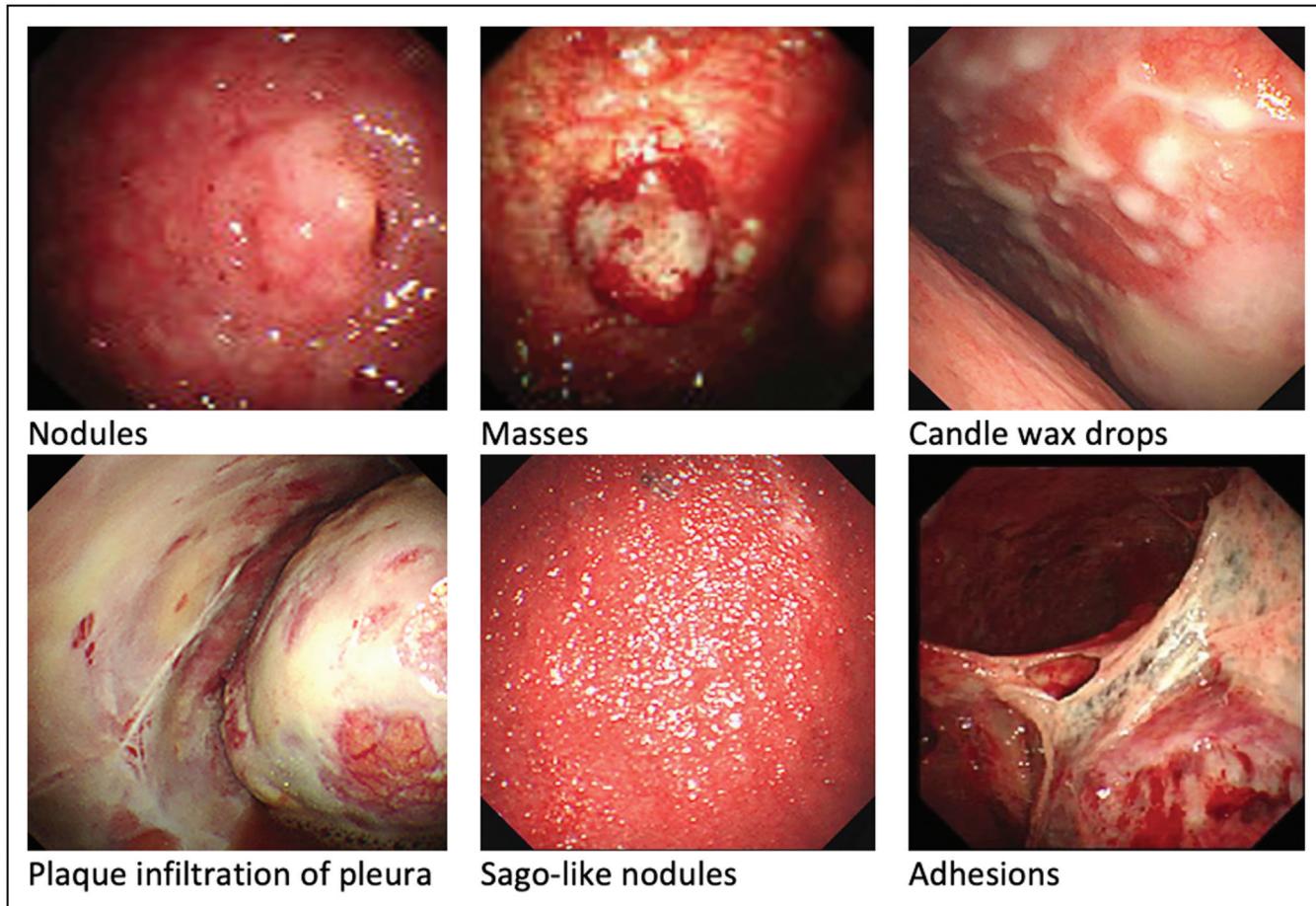


FIGURE 2. Examples of pleural abnormalities.

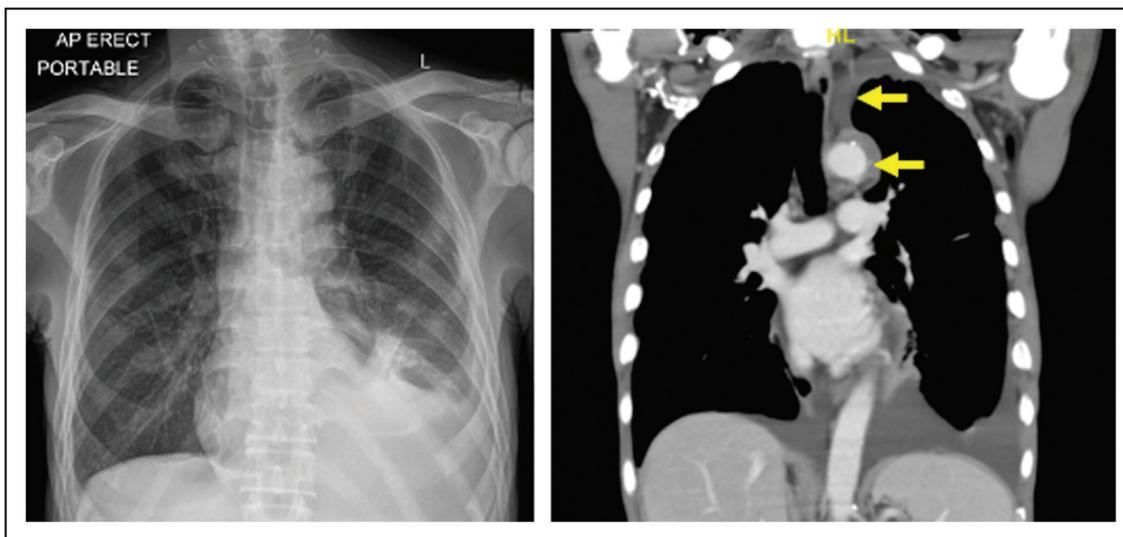


FIGURE 3. Unilateral pleural effusion with mediastinal pleural thickening. Example of a patient with unilateral exudative pleural effusion and mediastinal pleural thickening on computed tomography scan of the chest. This was not amenable to image-guided percutaneous pleural biopsy. MT was pivotal in clinching the diagnosis.

In our experience, a flex-rigid thoracoscope using flexible forceps should suffice in most cases, unless there is suspicion of malignant mesothelioma or if the pleura is fibrous and impenetrable. In such cases, either a cryoprobe or the rigid 5-mm optical forceps may be favoured. When successful biopsies are obtained, there is no significant difference in diagnostic yield between semi-rigid versus rigid thoracoscopy [21,22]. Cryoprobe biopsy has been safely employed to achieve larger and deeper biopsies [23], including malignant mesothelioma [24,25]. However, it has not been shown to significantly improve diagnostic yield [26,27].

Options for recurrent malignant pleural effusions include that of talc slurry via chest tube, thoracoscopic talc poudrage and indwelling pleural catheter (IPC) insertion [28[▪]]. For successful talc pleurodesis, the underlying lung must re-expand for pleural apposition. With thoracoscopic talc poudrage (TTP), breakdown of intrapleural loculations can be performed and real-time expansion of the lung observed prior to talc administration. TTP has a high efficacy in achieving pleurodesis with success rates between 80% and 90% [29,30]. Although talc slurry via chest tube can achieve similar success [6[▪]], MT allows for talc to be administered upfront during the initial diagnostic procedure. It also allows for identification of a nonexpandable lung. Presence of a thick fibrous peel, multiple adhesions and failure of lung expansion intra-procedure would signify a trapped lung for which an IPC can be inserted instead. Several authors have recently described the combined procedure of TTP followed by IPC insertion, overcoming the problem of lengthy hospital stay associated with the former and lower pleurodesis rates with the latter. Most patients could be discharged on the same day, with high success rates at 6 months [31,32]. A large RCT (TACTIC) set to compare MT and talc poudrage with MT, talc poudrage and IPC insertion has recently finished recruiting in the UK and will report in November 2024.

PNEUMOTHORAX

Treatment options for pneumothorax include that of talc slurry via chest tube, pleurectomy with bullectomy by thoracotomy or VATS, or TTP by MT. Both the British thoracic society (BTS) and European Respiratory society (ERS) now advocate for conservative management for primary spontaneous pneumothorax (PSP) if the patient is minimally symptomatic, regardless of size [6[▪],33[▪]]. The BTS guidelines recommend surgery if a patient experiences a second ipsilateral pneumothorax, first contralateral pneumothorax, synchronous bilateral spontaneous pneumothorax or persistent air leak [6[▪]]. Both guidelines recommend

surgical intervention early for initial treatment in patients who prioritize recurrence prevention.

Instillation of sclerosing agents through a chest tube has a lower success rate and is generally reserved for patients are at high risk for surgery [34]. VATS is preferred over thoracotomy [35,36]. Similar efficacy has been demonstrated between apical pleurectomy versus pleurodesis [37], and it is unclear if bullectomy prevents pneumothorax recurrence [38,39].

MT is safe and effective in patients with pneumothorax [40–42]. It can be performed in patients with advanced lung disease with an acceptable safety profile and a success rate of 95% [43[▪]]. Typically, talc poudrage is performed [44]. While coagulation of blebs and bullae is possible [45,46], caution should be taken and surgery for such patients should be considered first. In PSP, administration of TTP had a lower recurrence rate compared to chest drain insertion alone (5 versus 34%) [47]. TTP has a low overall recurrence rate of 2.41% [48].

Nonetheless, since a greater range of surgical interventions can be undertaken during VATS, MT is often reserved for patients with secondary pneumothorax who are unfit for surgery, but direct head-on comparison with bedside talc slurry pleurodesis remains lacking.

PLEURAL INFECTIONS

MT has been utilized in the management of both tuberculous (TB) and nontuberculous pleural infections.

Tuberculous pleural effusions

The classical finding of TB pleuritis on thoracoscopy is that of 'sago-like' nodules (Fig. 2).

Pleural fluid acid fast bacilli (AFB) smear and culture have a poor sensitivity in the diagnosis of TB [49]. Adenosine deaminase has high sensitivity [50], but its predictive value is affected by disease prevalence and false positives can occur in malignancy. The diagnostic yield of closed pleural biopsy averages 60–80% [51]. MT has a sensitivity beyond 90% in diagnosing TB effusions [52]. It allows for adhesiolysis in loculated effusions allowing better drainage [53]. Thoracoscopic biopsies are better able to obtain positive AFB cultures over closed pleural biopsy [54], providing additional information on drug susceptibility especially in countries where multidrug resistant TB is common.

Complicated parapneumonic effusions and empyema

MT facilitates drainage of infected pleural fluid via breakdown of septations and accurate chest tube

placement. It however does not offer significant benefit in obtaining microbiology for empyema [55]. MT has a high success rate of 85% in the treatment of complicated parapneumonic effusion and empyema [56], increased when adjuvant intra-pleural fibrinolysis is administered.

Large prospective trials have not demonstrated the benefit of MT over tube thoracostomy (with or without intrapleural fibrinolytics) [57,58]. A study of 32 patients found that the median length of stay was 2 days shorter in patients who underwent MT versus intra-pleural fibrinolysis. There was no significant difference in treatment failure, mortality or complications [59]. Further research is needed to define the role of MT, especially when intra-pleural fibrinolysis is used widely with great success following the MIST2 trial [60].

If MT is performed, it should be done early in the disease course, when fibrinopurulent septations are still thin [56,61]. It should be undertaken by an experienced operator as navigation of the infected pleural space is challenging due to viscous fluid and multiple adhesions. For late stage pleural infection with a thick pleural peel and complex loculations [62], a surgical opinion is still preferred.

CONCLUSION

MT is a procedure with a myriad of applications and offers pulmonologists a window into the pleural space. It allows for physicians to not only make a diagnosis, but intervene therapeutically at the same time. It is less-invasive compared to surgery and is a good intermediate option for patients with severe co-morbidities.

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Conflicts of interest

Rocket Med Plc provides free drainage kits for patients in clinical trials of malignant pleural effusions that YCGL lead.

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