Benign and Malignant Pleural Effusions

36

Thomas Schneider

Introduction

A wide range of diseases may involve the pleura and pleural space; therefore, pleural effusions are common in the practice of thoracic surgery. Although the management of pleural effusions seems simple, their diagnosis often presents a challenge. Historically, thoracoscopy was the customary approach; today, video-assisted thoracoscopic surgery (VATS) procedures are widely practiced to diagnose and treat pleural diseases. Patients who may have undergone nondiagnostic, noninvasive evaluation in the past should now be offered a VATS procedure to avoid repeated thoracenteses or pleural biopsies.

The most common cause of transudative effusion, based on protein and lactate dehydrogenase levels in pleural fluid, is congestive heart failure. Malignancy, infection, and pulmonary emboli are the most common causes of exudative pleural effusion. In specific clinical situations, other biochemical tests (eg, amylase, triglyceride, pH, glucose) may be helpful. Transudative pleural effusions are managed by treating the underlying disease and usually resolve after it has been controlled. Additive intervention (mostly pleurodesis) occasionally may be required if the underlying medical problem is refractory to maximal medical treatment. Some exudative effusions (those caused by nonbacterial infections, gastrointestinal diseases, drugs, malignancy highly responsive to chemotherapy) resolve after specific therapy. However, exudative pleural effusion is the most common indication for diagnostic VATS procedures in malignant and nonmalignant diseases (Antunes et al. 2003).

The goal of the diagnostic approach in exudative effusions is to sample representative tissue probes from the pleura or other structures possibly affected by the underlying disease. The video-assisted approach facilitates inspection of the whole pleural surface as well as the mediastinal face and diaphragmatic recesses; pulmonary wedge resections may be performed concurrently.

The goal of the therapeutic approach, mostly in malignant diseases, is to prevent a repeated manifestation of the pleural effusion. The most common practice today is instillation of sclerosing agents into the pleural cavity to induce an intense chemical pleuritis resulting in pleurodesis, with a reported success rate of 90 % or greater for talc poudrage by VATS. Patients who are not candidates for general anesthesia may be offered instillation of a sclerosant (talc, doxycycline, bleomycin, silver nitrate) via chest tube. In patients with primary tumors of the lung or breast, talc poudrage by VATS seems superior to talc slurry via tube thoracostomy; in other malignancies, the two approaches obtain similar results (Dresler et al. 2005).

Although patients with trapped lung are not candidates for pleurodesis, many experience relief from dyspnea after evacuation of the pleural fluid. Currently, intermittent drainage via an indwelling pleural catheter is the most accepted approach for patients with symptomatic effusion in the presence of a trapped lung. The patient or a caregiver drains the pleural fluid periodically by connecting the tubing to a disposable vacuum container, resulting in a definitive improvement in pulmonary function. However, in up to 58 % of patients, spontaneous pleurodesis may be achieved and the catheter may be removed again (Putnam et al. 2000).

VATS pleurectomy may be considered in select patients with tumors located mainly on the parietal pleural surface or who are not candidates for a simple approach such as talc pleurodesis. Historically, the mortality rate of the thoracotomy approach was up to 18 %; VATS pleurectomy was reported to be associated with a much lower risk. Like pleurodesis, pleurectomy likely will not affect the course of the underlying disease (Waller et al. 1995).

T. Schneider
Department of Thoracic Surgery,
St. Vincentius Kliniken,
Südendstr. 32, 76137 Karlsruhe, Germany
e-mail: thomas.schneider@vincentius-ka.de

H.C. Dienemann et al. (eds.), *Chest Surgery*, Springer Surgery Atlas Series,
DOI 10.1007/978-3-642-12044-2_36,

Figure 36.1

(**a**) The patient undergoes general anesthesia and double-lumen intubation and is placed in a stretched lateral decubitus position, secured by a side-positioned cushion and elevated arm support. Bronchoscopy is performed if endobronchial lesions are suspected with symptoms such as hemoptysis and atelectasis; moreover, it is necessary to exclude endobronchial obstruction before attempting pleurodesis when the lung remains collapsed after thoracentesis. Surgical disinfection and sterile covering are extended from the axillary region down to the distal costal arch and from the mammary line backward to the vertebral column. A spacious sterile covering facilitates targeted localization of the surgical incisions in case of a loculated pleural effusion. Lung ventilation is terminated on the side of the operation. The first surgical incision is directed into the present pleural effusion to evacuate it and to obtain sufficient space for an initial exploration of the pleural surfaces. This incision is always made bluntly; digital intrathoracic exploration is performed to detect and release adhesions around the port site before the camera is inserted. (**b**) Further incisions are placed under video-optical control and are located at the furthest distance, either cranial in the third intercostal space if the first incision was located below the fifth intercostal space or into the diaphragmatic recesses if the initial approach was above the fifth intercostal space. For a diagnostic approach, two incisions usually are adequate; if a pulmonary wedge resection is required, a third incision may be appropriate

Figure 36.1

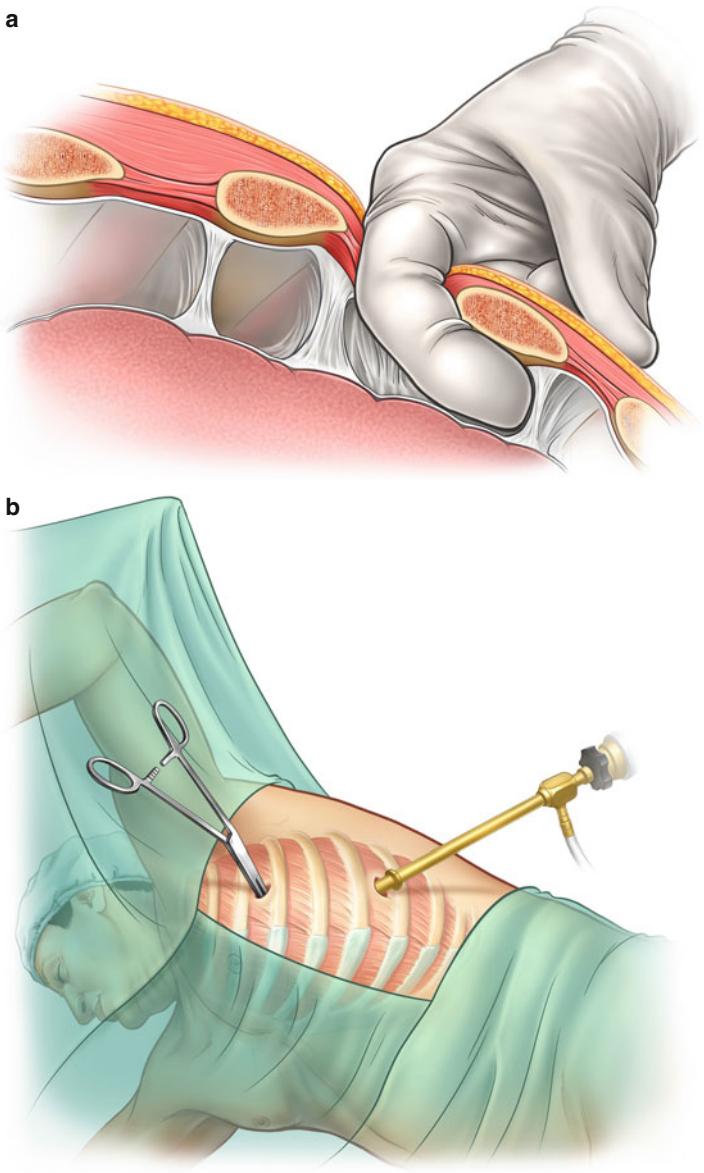


Figure 36.2

Gross inspection of the thoracic cavity reveals pleural adhesions, and the space for surgical intervention may be defined. The lung is mobilized and adhesions are dissolved by lung grasping forceps; a decortication may be done to achieve complete lung reexpansion. Subsequently, a complete video-optical investigation of the pleural surface (including the parietal and visceral pleura as well as the mediastinal and pericardial face and diaphragmatic surface, including the diaphragmatic recesses) is performed. The pleural surfaces (parietal and visceral) are examined for tumor growth, abnormal vascular inclusions, or thickening of the pleural layers. In cases of generalized pleural disease, up to three biopsy samples of the parietal pleura are extracted from different representative areas. If there is localized tumor growth, targeted biopsy samples are taken from the affected area. The extracted pleural specimens should include all layers of the parietal pleura to enable confident histopathologic diagnosis, including potential immunohistochemistry. If pleural mesothelioma is suspected and the patient is a candidate for extrapleural pneumonectomy (EPP) or complete parietal and visceral pleurectomy, tissue specimens should be taken from the diaphragm so as not to aggravate the extrapleural dissection during EPP or pleurectomy. Tissue specimens of the visceral pleura may be obtained best by pulmonary wedge resection. In cases of pleural asbestosis, tissue specimens should not be taken from the middle of a pleural plaque but from a border of the pleural plaques and should include the adjoining parietal pleura

Figure 36.3

Controlled equilateral intraoperative ventilation confirms the dilatability of the lung and whether pleurodesis may be promising. If the lung is completely dilatable, 4 g of sterile talc is sprayed onto the pleural surfaces: the parietal and visceral pleura, mediastinal and pericardial face, diaphragma, and diaphragmatic recesses. At the end of this procedure, all surfaces are evenly covered with a thin layer of talc. Prior to talc insufflation, the pleural effusion has to be evacuated completely so the talc is not washed out. A chest tube is introduced, and controlled ventilation inflates the lung to contact the parietal and the visceral pleura. Postoperatively, the chest tube is connected to a continuous suction source for 24–48 h; the tube may be removed after radiologic proof of lung expansion at a regressive amount of pleural fluid below 150 mL/d

Figure 36.2

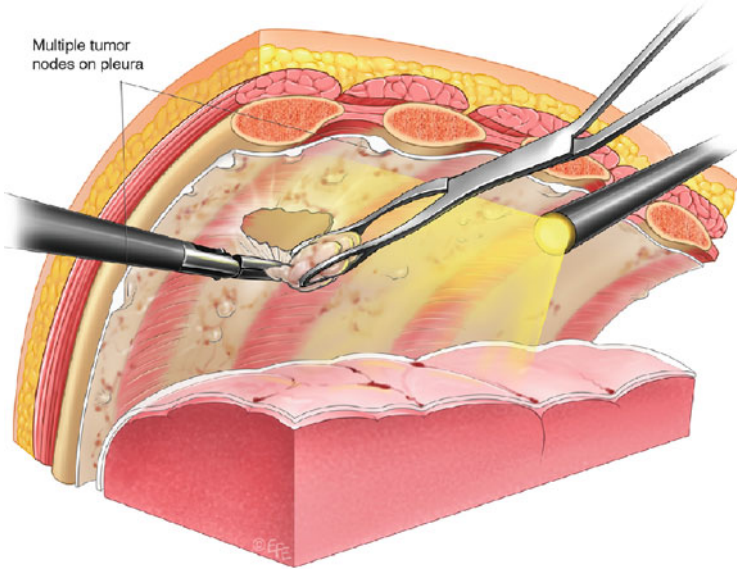


Figure 36.3

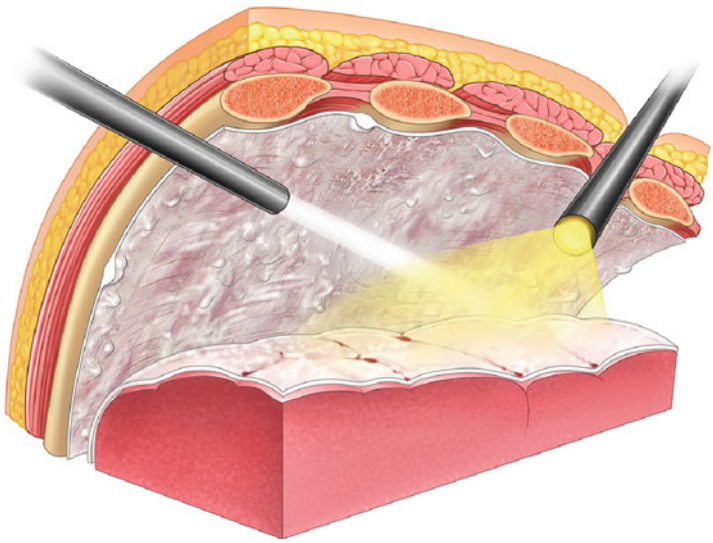


Figure 36.4

For patients in whom a trapped lung (ie, pleural surfaces—parietal and visceral—do not come into contact under controlled ventilation of the lung) is found intraoperatively, the instillation of sclerosing agents is not promising. In this situation, accelerated controlled ventilation, as well as prolonged continuous suction via chest tube, is precarious because the lung's expansion may lacerate the scarred visceral pleural surface, resulting in chronic fistulation and pleural empyema. On the other hand, many patients experience relief of dyspnea when the effusion is evacuated. The implantation of an indwelling pleural catheter (Pleurx Pleural Catheter; CareFusion, San Diego, CA) enables intermittent drainage of pleural fluid and may result in partial reexpansion of the lung

Figure 36.5

The indwelling pleural catheter may be placed by a single-use introduction set via a J-tip guidewire and peel-away introducer according to the manufacturer's instructions. In the VATS setting, we prefer an open approach. An additional inferior cutaneous incision at the lateral distal costal arch is performed as a counterincision. After subcutaneous tunneling, the pleural catheter is passed backward through the inferior incision and via subcutaneous tunneling into the VATS incision until a polyester cuff is situated within the subcutaneous tract about 1 cm beyond the inferior incision. The cuff serves to decrease bacterial dislocation and anchor the catheter in position. Subsequently, the fenestrated silicone catheter is placed via the VATS incision into the lower pleural space. Multiple fenestrations ensure sufficient drainage of recurrent effusion. An additional chest tube is not required. The indwelling pleural catheter may be connected with a moderate continuous suction source at 5 mm Hg. The patient can drain the pleural fluid him- or herself by connecting the tube to a disposable vacuum container

Figure 36.4

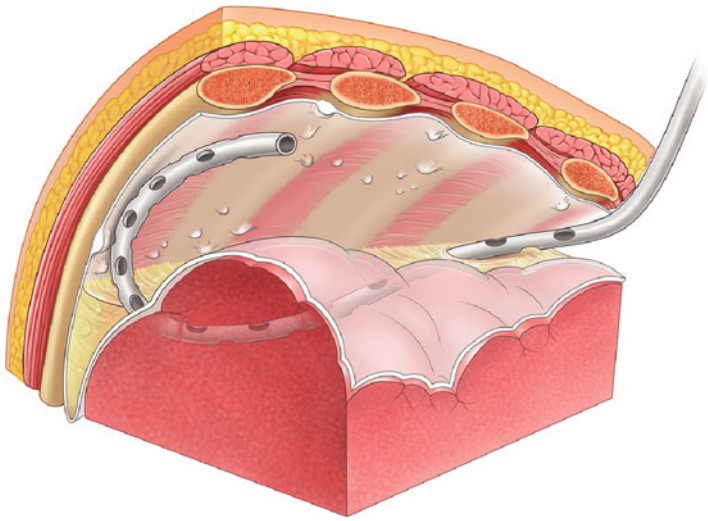


Figure 36.5

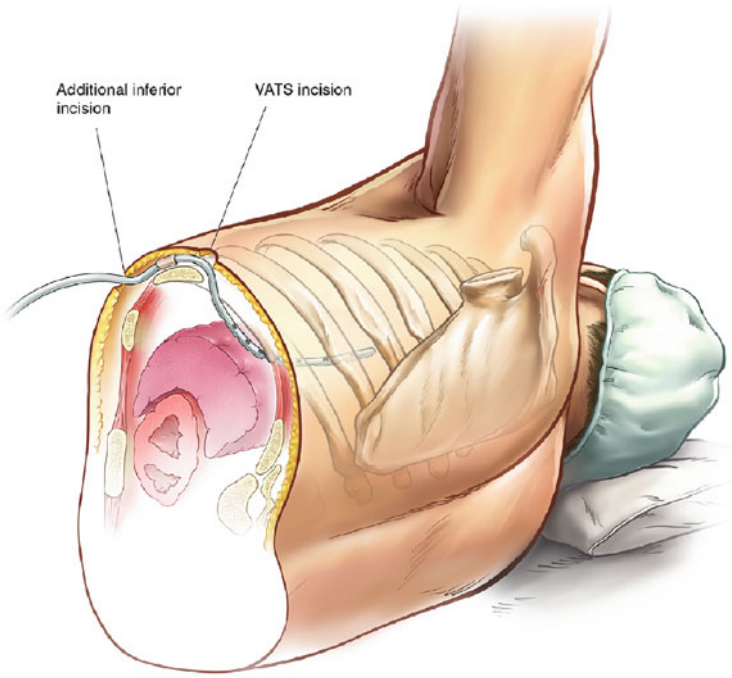
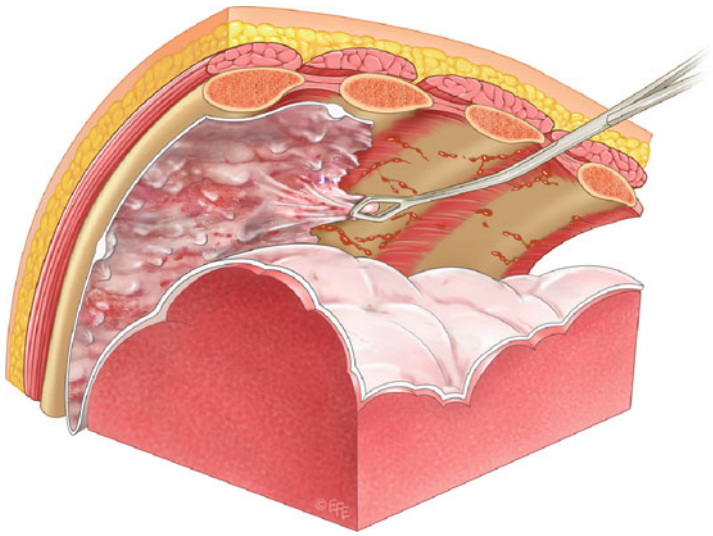


Figure 36.6

Parietal pleurectomy may be performed only if the visceral pleura is not heavily involved in the malignant process, allowing full reexpansion of the lung. This is confirmed by intraoperative re-ventilation under vision. The tumor-infiltrated parietal pleura is stripped from the thoracic wall by blunt dissection with a curved atraumatic forceps. The dissection starts at a VATS incision in the plane between the endothoracic fascia and the parietal pleura. The tumor-infiltrated pleura is dissected bluntly away from the chest wall. The plane is developed in a cephalad direction toward the apex; the subclavian vessels have to be identified carefully to avoid traction injury to these structures. Downward pleurectomy is performed into the diaphragmatic recesses, sparing only the diaphragmatic surface and central mediastinal pleura. A fair amount of blood loss will result from the blunt dissection; therefore, careful control of hemostasis by electric coagulation or compression by swabs is mandatory to prevent postoperative hemorrhage. Two chest tubes are placed: one to the apex and the other to the base of the pleural cavity; these tubes are connected to a continuous suction source at 30 mm Hg each. The chest tubes will be removed at a regressive amount of pleural fluid below 150 mL/d

Figure 36.6



Conclusion

In patients presenting with a pleural effusion, the likely cause should be evaluated initially by a thorough clinical investigation. Unique pleuracentesis and biochemical analysis of the pleural fluid will determine whether the effusion is transudative or exudative. Transudative and benign exudative effusions are managed by treating the underlying disease.

In patients with malignant pleural effusion, the treatment depends on whether the lung can expand after fluid evacuation. If the lung expands fully, the effusion may be managed by sclerosis; talc poudrage by VATS is most effective (Dresler et al. 2005). If the lung is trapped, intermittent drainage via a chronic indwelling pleural catheter is the most accepted approach today. However, the patient's prognosis and clinical condition also must be considered. For talc pleurodesis, the reported rate of respiratory complications is as high as 14 %, representing the most frequent causes of treatment-related death (2–3 %). As a palliative approach, the treatment of malignant pleural effusion must be safe and effective, with the least amount of invasiveness and the shortest possible hospital stay. VATS requiring general anesthesia and single-lung ventilation is not sustainable in patients presenting with a malignant pleural effusion who are in poor clinical condition and have a limited life expectancy. For these patients, implantation of a chronic indwelling catheter under local anesthesia is a suitable alternative as an outpatient procedure and should cause minimal morbidity or mortality (Putnam et al. 2000).

If there is an intraoperative finding of a partially trapped lung during VATS, as well as limited tumor on the visceral surface, talc pleurodesis also may be combined with a chronic indwelling catheter. An incremental expansion of the entrapped parts of the lung may be achieved in many patients, and the catheter may then be removed (Putnam et al. 2000).

The surgeon must consider each patient's condition and prognosis when deciding whether to perform a pleurectomy. Certainly, the morbidity and mortality of thoracotomy are not acceptable. Although the VATS approach seems much less invasive, its use in pleurectomy was not widespread until recently. In only a few patients with very little tumor can pleurectomy influence the course of the underlying disease. Actually, pleurectomy is best reserved for patients with breast cancer and malignant pleural mesothelioma; randomized studies comparing VATS pleurodesis to VATS pleurectomy did not exist until now (Waller et al. 1995).

References

Antunes G, Neville E, Duffy J, Ali N (2003) BTS guidelines for the management of malignant pleural effusions. Thorax 58(Suppl 2):ii29–ii38

Dresler CM, Olak J, Herndon JE 2nd, Richards WG, Scalzetti E, Fleishman SB, Kernstine KH, Demmy T, Jablons DM, Kohman L et al (2005) Phase III intergroup study of talc poudrage vs talc slurry sclerosis for malignant pleural effusion. Chest 127:909–915

Putnam JB Jr, Walsh GL, Swisher SG, Roth JA, Suell DM, Vaporciyan AA, Smythe WR, Merriman KW, DeFord LL (2000) Outpatient management of malignant pleural effusion by a chronic indwelling pleural catheter. Ann Thorac Surg 69:369–375

Waller DA, Morritt GN, Forty J (1995) Video-assisted thoracoscopic pleurectomy in the management of malignant pleural effusion. Chest 107:1454–1456