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Understanding The Acute Interventions for Complicated Pleural Effusions

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Abstract

Pleural effusion affects approximately 1.5 million individuals in the U.S. annually. A significant subset of these cases evolves into complicated parapneumonic effusions due to bacterial infections, intense inflammation, or other causal factors, presenting considerable diagnostic and therapeutic challenges. If untreated, the condition's sequential progression can culminate in restrictive respiratory dysfunction. This review examines the diverse interventions available for diagnosing and treating complicated pleural effusions. The therapeutic spectrum ranges from minimally invasive procedures such as thoracentesis and Intrapleural Enzymatic/Fibrinolytic Therapy (IPET) to surgical interventions, including Video-assisted Thoracoscopic Surgery (VATS) for pleurodesis and pleurectomy/decortication, and open pleurectomy/decortication. Notably, the combined use of agents in IPET presents a significant advancement, especially for patients unsuitable for surgery. Furthermore, VATS emerges as a promising, less invasive surgical alternative, and the role of pleurectomy/decortication in managing malignant mesothelioma becomes more pronounced, offering advantages over other surgical modalities. The diagnostic and therapeutic landscape for complicated pleural effusions is vast and continues to evolve, with an increasing emphasis on minimizing invasiveness and optimizing patient outcomes. As clinical approaches diversify and improve, ensuring patient-centric care becomes paramount. The future of this domain rests on refining current practices and further investigating newer interventions to elevate patient outcomes.

Keywords: Pleural Effusion; Parapneumonic Effusion; Thoracentesis; Video-assisted; Pleurectomy

Abbreviations: VATS: Video-assisted Thoracoscopic Surgery; IPET: Intrapleural Enzymatic/Fibrinolytic Therapy; LDH: Lactate Dehydrogenase; CT: Computed Tomography; EPP: Extrapleural Pneumonectomy; TPA: Tissue Plasminogen Activator; DNase: Deoxyribonuclease; rTPA: Recombinant Tissue Plasminogen Activator; P/D: Pleurectomy/Decortication; MIST: Multicenter Intrapleural Sepsis Trial

Introduction

Pleural effusion, characterized by the accumulation of fluid between the parietal and visceral pleura within the pleural cavity [1], can become a complex condition when infected by bacteria or other microorganisms, leading to a complicated parapneumonic effusion with positive Gram stain or significant inflammation [2,3]. As the most prevalent among all pleural diseases, pleural effusion affects approximately 1.5 million patients annually in the United States, with parapneumonic effusion developing in about 20% to 40% of hospitalized pneumonia patients, accounting for nearly 1 million cases yearly [1,2]. The progression of parapneumonic effusion encompasses distinct stages: the exudative stage, marked by fluid accumulation in the pleural space; the fibrinopurulent stage, characterized by the deposition of fibrin clots and fibrin membranes within the pleural cavity; and the organizing stage, during which fibroblasts transform fibrin membranes into a thick, nonelastic pleural peel, leading to trapped lung and restrictive respiratory dysfunction [2].

Clinical presentation of parapneumonic pleural effusion includes chest pain, cough, fever, and systemic manifestations. Physical examination often reveals signs of volume gain, reduced tactile vocal fremitus, dullness on percussion, shifting dullness, and diminished or absent breath sounds [1,2,4]. Chest radiographs play a crucial role in confirming the presence of an effusion. At the same time, further analysis of pleural fluid involves a battery of commonly performed tests, including measurement of fluid pH, protein, albumin, LDH (lactate dehydrogenase), glucose, triglycerides, cell count differential, gram stain, culture, and cytology [1,4]. The management of parapneumonic pleural effusion may encompass various approaches, such as therapeutic thoracentesis, intrapleural enzymatic/fibrinolytic therapy, video-assisted thoracoscopic surgery, or open surgery. This narrative review aims to provide an informative overview of the current concepts related to the early diagnosis and multidisciplinary management of parapneumonic pleural effusion, emphasizing the significance of timely and comprehensive care for affected patients.

Epidemiology, Etiology & Pathophysiology

The mortality rate from thoracic empyema remains high, ranging between 6%-24%. Pleural infection develops in 65,000 patients annually in the United States and the United Kingdom. A significant proportion of pleural space infection complicates community or hospital-acquired pneumonia. However, a proportion of pleural space infection results from iatrogenic causes; it is also known that pleural infection may develop without pneumonia, so-called primary empyema [5,6]. A significant proportion of pleural space infection presents as complications in the community or hospital-acquired pneumonia. Other causes include penetrating chest trauma, thoracic surgery, and esophageal rupture. Independent risk factors for empyema development include age under 60 years old, poor oral hygiene, disorders with a predisposition to aspiration (seizure, alcoholism, central nervous system disease), IV drug misuse, diabetes, cardiovascular disease, liver cirrhosis, other immunocompromised states (HIV infection, malignancy) [7,8].

A three-stage classification of parapneumonic effusion (exudative, fibrinopurulent, and organizing) was proposed in 1962. Early observations suggested that it took 2 to 3 weeks for the early exudate to become purulent [6]. However, the time to progress from one stage to another is highly variable [7-9]. Exudative stage initial bacterial infection causes an acute inflammatory response between the pulmonary parenchyma and visceral pleural. Proinflammatory cytokines cause increased capillary permeability leading to an influx of neutrophil-rich fluid into the pleural space. This exudative fluid is usually free-flowing. Fibrinopurulent and loculated is the second stage. Without appropriate treatment, the effusion can become complicated via the deposition of fibrin clots and membranes, resulting in isolated fluid collections in the pleural space [6-9]. At this stage, bacteriology usually becomes positive, and the effusion warrants antimicrobials and drainage. The last stage is chronic organizational if not drained; fibroblasts merge to form a thick pleural peel between the visceral and parietal pleura. This peel can ultimately encase the underlying lung parenchyma and complicate the clinical course by inhibiting adequate gas exchange, trapped lung, or chronic forms of empyema [9,10].

Clinical Presentation & Diagnostic Approach

The clinical presentation of complicated pleural effusions can vary widely and often depends on the underlying etiology and the extent of pleural involvement. Patients may present with symptoms such as dyspnea, pleuritic chest pain, cough, fever, and general malaise [11-14]. On physical examination, decreased breath sounds, dullness to percussion, and decreased tactile fremitus may be observed over the affected area. In large or loculated effusions, there may be signs of respiratory distress, such as increased respiratory rate, use of accessory muscles, and cyanosis [11-15]. The diagnostic approach involves a thorough medical history, physical examination, and imaging studies. Chest X-ray is often the initial imaging modality, which may reveal pleural effusion and thickening. Computed tomography (CT) scan provides more detailed information and can help identify loculated effusions, pleural masses, or signs of infection [13,14]. Thoracentesis is a crucial diagnostic procedure, allowing for pleural fluid analysis.

Laboratory analysis of pleural fluid includes evaluation of cell count, protein, lactate dehydrogenase (LDH), glucose, pH, and cytology. An elevated white blood cell count, low glucose, elevated LDH, or positive cytology may indicate infection or malignancy. If infection is suspected, pleural fluid culture and Gram stain should be performed. In some cases, further imaging studies like ultrasound or pleural biopsy may be necessary to establish the underlying cause [11-13]. The management of pleural effusions is largely based on the underlying cause. Based on fluid chemistry, pleural effusions are broadly categorized as transudates or exudates. This classification helps guide further evaluation to determine the underlying etiology. Acute interventions for complicated pleural effusions depend on the specific etiology. Therapeutic thoracentesis can be performed for symptomatic relief and diagnostic purposes. Drainage of large effusions may require the placement of a chest tube to facilitate fluid removal and lung re-expansion [13-15].

In cases of empyema, a more aggressive approach may be necessary, such as video-assisted thoracoscopic surgery (VATS) or open thoracotomy with decortication. Antibiotics are initiated promptly in cases of infection, and appropriate broad-spectrum coverage should be considered until the causative organism is identified. In some instances, pleurodesis may be performed to prevent fluid re-accumulation and manage recurrent pleural effusions. In conclusion, the clinical presentation of

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complicated pleural effusions can be diverse, with prominent respiratory symptoms [12-15]. A comprehensive diagnostic approach, including imaging studies, pleural fluid analysis, and possibly biopsy, aids in determining the underlying cause. Acute interventions depend on the specific etiology and may involve therapeutic thoracentesis, chest tube placement, surgical interventions, and appropriate antimicrobial therapy [15].

Therapeutic Thoracentesis & Thoracocentesis

Indications

The indications for thoracentesis are relatively broad, including diagnostic and therapeutic clinical management. Thoracentesis should be performed diagnostically whenever the excessive fluid is of unknown etiology. It can be performed therapeutically when the fluid volume is causing significant clinical symptoms. Typically, diagnostic thoracentesis is a small volume (single 20cc to 30cc syringe). Unless the etiology is evident, a first-time thoracentesis should have a diagnostic sample collected for laboratory and pathology analysis. Typically, therapeutic thoracentesis is a large volume (multiple liters of fluid). A small sample of a large volume thoracentesis should be sent for analysis when the etiology of the fluid is unknown, or there is a question of a change in the etiology (e.g., new infection, decompensated chronic condition). If the fluid volume is anticipated to reaccumulate quickly, a drain is often left in place to collect this fluid. This often is seen in trauma (e.g., hemothorax), cancer (e.g., malignant effusion), post-operatively (e.g., cardiothoracic post-operative healing/inflammatory conditions), and end-stage metabolic conditions with the systemic excessive colloid leak (e.g., cirrhosis or malabsorption syndromes). A fluid collection that is believed to be infected should be drained to eliminate the source of infection and/or reservoirs of the infection [16,17].

Contraindications

There are no absolute contraindications. Relative contraindications include any condition that prohibits safe patient positioning, uncontrollable coagulation deficits through medications/iatrogenic or intrinsic, or conditions in which the potential procedure complication outweighs the benefits [17].

Technique or treatment

The preferred site for the procedure is on the affected side in either the midaxillary line if the procedure is being performed in the supine position or the posterior mid-scapular line if the procedure is being performed in the upright or seated position. Bedside ultrasound should be used to identify an appropriate location for the procedure. Placing the patient in the upright seated position and using bedside ultrasound can aid in identifying fluid pockets in patients with lower fluid volumes. Prep and drape the patient in a sterile fashion. Cleanse the skin with an antiseptic solution. Administer local anesthesia to the skin (25-gauge needle to make a wheal at the skin's surface) and soft tissue. After administering the local anesthetic, use a more significant 20- or 22-gauge needle to infiltrate the tissue around the rib, marching the needle tip just above the rib margin. Insert the needle or catheter attached to a syringe or the prepackaged catheter directly perpendicular to the skin.

If using a catheter kit, it may be helpful to make a small nick in the skin using an 11-blade scalpel to smoothly advance the catheter through the skin and soft tissue. Apply negative pressure to the syringe during needle or catheter insertion until a loss of resistance is felt and a steady fluid flow is obtained. This is paramount to detect unwanted entry into a vessel or other structure. Advance the catheter over the needle into the thoracic cavity. After you collect sufficient fluid in the syringe for fluid analysis, either remove the needle (if performing a diagnostic tap) or connect the collecting tubing to either the needle or the catheter's stopcock. Drain larger volumes of fluid into a plastic drainage bag using gravity feed or serial syringe draw with a three-way stop-cock. After draining the desired amount of fluid, remove the catheter and hold pressure to stop bleeding from the insertion site [18].

Clinical significance

Thoracentesis may relieve pressure from fluid on the lungs treating symptoms such as pain and shortness of breath. Evaluation of the fluid removal may determine the underlying cause of excess fluid in the pleural space [16,17].

Complications

Complications include bleeding, pain, and infection at the needle entry point. If the approach is too high in the intercostal space, damage to the coastal vasculature and nerve injury is possible. If too much fluid is removed or if the fluid is removed too rapidly (e.g., using negative pressure chambers), re-expansion (aka post-expansion) pulmonary edema may occur. Removal of significant fluid volumes may also induce vasovagal physiology. If the procedural needle/catheter is passed through diseased tissue before entering the chest cavity, that process can be extended into the chest space. For example, passing the needle through a thoracic or pleural tumor can seed the thoracic cavity, or passing the needle through a chest wall abscess or otherwise infected tissue can result in empyema. If the insertion site is too low, splenic and hepatic puncture can occur. Except for localized pain from the actual procedure, pneumothorax is the most common complication reported in 12-30% of cases.

Pre and post-chest radiographs are appropriate routine practice. Rare cases of retained intrapleural or intrathoracic catheter fragments have been reported. This is typically only seen when a catheter over trocar technique is used. To aid in repositioning, the catheter is advanced back over the trochar resulting in tear and failure of the catheter integrity [16-19]. Documenting the presence and location of lung sliding before the procedure is essential. (Best examined with a greater than

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5 MHz vascular probe). The disappearance of lung sliding or B-lines suggests the interval development of a pneumothorax. Indications of chest tube placement to manage the pneumothorax following thoracentesis are 1. large pneumothorax, 2. progressive, 3. symptomatic pneumothorax. The occurrence of pneumothorax in mechanically ventilated patients should be managed with chest tube placement [16-19].

Intrapleural Enzymatic/Fibrinolytic Therapy

Apart from antibiotics, surgery is an effective treatment for separating fibrous formation and potentiating fluid drainage. However, because of the mortality, it is still a controversial approach, especially for patients with comorbidities. Intrapleural fibrinolysis, on the other hand, has increasingly gained interest from physicians by activating plasmin to lyse fibrinous septations and turning back the balance between fibrin activators and inhibitors. Fibrinolytic therapy, including streptokinase, urokinase, alteplase, recombinant tissue plasminogen activator (TPA), and Deoxyribonuclease (DNase), is intended to improve drainage and reduce the need for invasive interventions and therefore likely decrease mortality. Patients diagnosed with complicated pleural effusion or empyema, who are also unsuitable for operative management, are indicated with rTRPA and DNase [20].

Although First Multicenter Intrapleural Sepsis Trial (MIST-1) conducted in infected pleural effusion shows that there was no difference between Intrapleural fibrinolytic agents (Streptokinase) and placebo in improving outcomes, in MIST-2, combined treatment with TPA and DNase increased drainage of infected fluid compared with placebo, TPA alone and DNase alone. More specifically, in a total of 193 patients randomized with (1) double placebo, (2) TPA plus placebo, (3) DNase plus placebo, and (4) TPA plus DNase, the TPA/DNase group resulted in a significant reduction in Chest Radiography, lower referral rate for surgery and shorter on average hospital stays than the three remaining groups [21,22].

In a cohort study in Loculated pleural effusion by Saleh Abu-Daff et al. [23] all patients with pleural effusions that showed no response to 24-hour drainage, including emphysema, complicated parapneumonic effusions (CPE), and haemothorax or malignant effusions were given Streptokinase or TPA. The procedure's success was based on clinical + radiological improvement without further requirements. At the same time, the failure to resolve loculated pleural effusion or a complication necessitating resuscitation was defined as failure outcomes. In a total of 227 cases, 72% (163/227) patients had emphysema or CPE, and the overall success rate was 80% (181/227) in which empyema and CPE patients had a success rate of 85% (138/163). Streptokinase therapy had a success rate of 73,1%, while patients receiving t-PA had a success rate of 81,2% which was not statistically different [21]. Saleh Abu-Daff et al. also demonstrated that the major complication was bleeding, which occurred in 15 patients, 8 of whom needed blood transfusion for at least 1 unit of packed red blood cells, and 3 required emergency thoracotomies to control bleeding.

Other minor adverse effects were mentioned and easily manageable, including pain (19/227) which required analgesic requirement, shortness of breath in (8/227) patients who needed to be increased oxygen requirement, and fever (9/227), which required antipyretics [23]. When it comes to contraindications of intrapleural fibrinolysis, it is stated in MIST-2 that all patients who had a known sensitivity to DNase or TPA, a history of coincidental stroke, major bleeding or trauma, 5-day post-operation of major surgeries, or previous pneumonectomy were excluded from their study. These criteria can be a reference source to consider contraindication factors for patients before this procedure. Moreover, patients under 18 years or pregnant or lactating are also inappropriate for this therapy [23].

Video-assisted Thoracoscopic Surgery (VATS): Pleurodesis

Video-assisted thoracic surgery (VATS) for pleurodesis is a minimally invasive surgical procedure for managing recurrent pleural effusion or pneumothorax. Pleurodesis is a medical intervention aimed at creating adhesions between the two layers of the pleura (the lining of the lungs) to prevent the recurrence of fluid or air accumulation in the pleural space. During the VATS procedure, the patient is placed under general anesthesia, and small incisions (usually 0.5 to 1.5cm) are made in the chest wall. A thoracoscope, a tiny camera attached to a thin, flexible tube, is inserted through one of the incisions, providing the surgeon with a visual image of the pleural cavity on a video monitor. Through other incisions, surgical instruments are introduced to perform pleurodesis. The surgeon can use agents like talc, doxycycline, bleomycin, or other sclerosing agents to create inflammation and adhesions between the pleural layers, promoting the lung's adherence to the chest wall [24].

The most common indication for pleurodesis is a malignant pleural effusion, typically refractory. Other indications for pleurodesis are recurrent pneumothorax and recurrent pleural effusions. While there are many management options for treating these pleural diseases, the decision to proceed with pleurodesis should be carefully undertaken after discussion with the patient and reviewing expectations from the procedure. Medical pleurodesis is a preferred approach for patients [25]. Indications for mechanical pleurodesis are similar to chemical pleurodesis, with the added benefit of treating the underlying cause if present during the same procedure. For example, the simultaneous inspection and resection of subpleural blebs and bullae could be the source of recurrent pneumothorax [26].

In recent years, there has been a growing tendency to treat patients with pneumothorax using video-assisted thoracoscopic surgery (VATS) to achieve resection of the bullae or blebs and achieve pleurodesis, either through local abrasion of the parietal

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pleura or localized apical pleurodesis. However, this procedure is expensive and requires general anesthesia and (usually) double-lumen tracheal intubation. Also, the recurrence rate varies wildly, depending on the identification and subsequent ablation of blebs, according to Naunheim et al. The use of VATS or conventional thoracoscopy and pleurodesis, or thoracotomy, is dependent upon several factors, and there is no precise technique of choice. VATS would be recommendable in young patients with recurrent pneumothorax, combined with some technique to induce pleural symphysis (usually mechanical pleural abrasion or apical talc pleurodesis) [24,27].

VATS pleurodesis showed a quantitative advantage, and it may be concluded that the average hospitalization when applying the VATS pleurodesis was shorter. Abouzgheib et al. mentioned in their retrospective study that the average duration of hospitalization was 9 days after VATS pleurodesis. Likewise, Fortin et al. mentioned that the hospitalization period was 4-7 days for VATS pleurodesis. Troter et al. and Mitrofan et al. mentioned that the hospitalization period for VATS pleurodesis with talc was 7-10 days [28].

Video-assisted Thoracoscopic Surgery (VATS): Pleurectomy/Decortication

VATS pleurectomy is performed under general anesthesia, single-lung ventilation, and double-lumen endotracheal ventilation with the patient in a lateral decubitus position. The incision is made in the 5th intercostal space at the anterior axillary line, approximately 4cm long. An incision for the camera trocar is occasionally made in the 7th intercostal space at the midaxillary line for approximately 1cm. The parietal pleura is separated using scissors, with the pleura on the diaphragm left intact. After resection, electrocautery is used to achieve homeostasis, and a 28-Fr chest tube is inserted and connected to a water seal system for drainage post-procedure [29]. One of the main indications for VATS Pleurectomy is primary spontaneous pneumothorax and recurrent spontaneous pneumothorax [30,31]. VATS permits the entire lung's observation, identifying blebs and bullae and resecting these diseased areas [32]. Another upcoming indication for this procedure is palliative pleurectomy for malignant mesothelioma [31].

The long-term prognosis is excellent, with low recurrent rates for primary and secondary spontaneous pneumothorax with VATS procedures [33]. A study done by Nathan et al. concluded that there was a 2.5% recurrence among 39 patients following total thoracoscopic pleurectomy [34]. Another study by Leo et al. showed the recurrence rate difference between VATS-limited pleurectomy among 54 patients and wide pleurectomy and open pleurectomy in 36 patients. The recurrence rates were 4% and 0%, respectively [35]. VATS procedures generally have been found to have a low incidence of complications. The most common complication of a pleurectomy is dense adhesions in the chest cavity [29]. A rare complication is the formation of neopleura, leading to recurrence. Pleurectomy can also damage the sympathetic chain at the T2-T4 level, which can cause palmar anhidrosis and compensatory contralateral hyperhidrosis [36].

Open Surgery

Pleurectomy/decortication (P/D) surgery is a two-part procedure. Pleurectomy involves opening the chest cavity and removing the pleural lining around the lung and other cancerous tissues. The decortication then removes any visible tumor masses from the surface of the lung and the rest of the chest area. Pleurectomy/decortication can extend survival and significantly increase the quality of life for eligible patients, especially when it's part of a multimodal treatment approach that includes chemotherapy, radiation therapy, immunotherapy, or other emerging treatment options [37]. The chest cavity is entered extrapleurally. A deliberate dissection is performed, mobilizing the pleura from the chest wall. A self-retaining Finochietto retractor is used to spread the ribs slowly to avoid fracturing the ribs. Blunt hand dissection is performed in the extrapleural plane between the parietal pleura and endo thoracic fascia to take down the parietal pleura intact. We place multiple sponge packs to help tamponade and limit blood loss. Moving systematically and organized throughout the chest to limit blood loss is paramount.

Once the parietal pleura are mobilized, the dissection is continued removing the mediastinal pleura. All mediastinal structures are carefully preserved. The superior vena cava, azygous trachea, left on the right side. The right main bronchus vein and esophagus are carefully protected, and on the left side, the esophagus, aorta, and vagus nerve, including the recurrent nerves, should be preserved. The phrenic nerves are identified and preserved whenever possible when the diaphragm is not resected. It es also essential to appreciate the location of the internal mammary vessels, which can inadvertently be injured and be a source of significant blood loss. If they are involved in a tumor, proper control of the vessels should be achieved and divided [38]. If the tumor involves the diaphragm, partial or complete resection is performed. Whenever possible, the peritoneal membrane is preserved.

Although every effort is made not to enter the peritoneum, this is often very difficult due to the thin nature of the diaphragm at the central tendon, and sometimes the tumor involves near the total thickness of the diaphragm [38]. With the parietal pleurectomy now complete, the decortication and resection of the visceral pleura are performed. The anesthesia team is made aware of this transition as this requires a change in ventilation management. A second ventilator is connected to the affected side, and the lung is inflated with room air at high tidal volumes (8-10 L/min). A ten-blade scalpel cuts vertically through the tumor and past the visceral pleura. This is perhaps the most crucial step, as the visceral pleura must be appropriately identified and removed. The tumor, visceral pleura, and parietal pleura are then stripped off the lung using a combination of blunt and sharp dissection.

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Many techniques are used to achieve this, including suction dissection, ultrasound, or plasma, in order to lift the tumor layer off the lung. Air leaks can be large and are expected during this portion of the procedure. Packing with wet gauze or lap pads is helpful to reduce the air leak and encourage the formation of a coagulum on the surface of the lung. Due to the tedious nature of this dissection, it is essential to continue in a patient, systematic and organized fashion. The dissection is continued in the fissures removing the visceral pleura on both sides towards the pulmonary arterial branches. Any lymph nodes encountered in the fissure are removed for histológicas examination [38]. We next perform the mediastinal lymph node dissection. We routinely remove lymph nodes from levels 4,7 and 9. It is not unusual to find internal mammary, costophrenic, or nodes in the posterior intercostal space, which are also removed. We also remove any other nodes that appear abnormal during the dissection. Suppose the patient is a candidate for EPP.

In that case, mediastinal lymph node dissection is conducted earlier with a frozen section after the extrapleural mobilization of the parietal pleura before the final decision. If there is any concern for metastatic disease in any lymph node, we proceed with PD and not EPP in these candidates [38]. Complications that may occur include infection, bleeding air leak, pneumonia, cardiac complications, respiratory failure, and post-operative pain. A pleurectomy has a risk of failure with a mortality rate of around 3.1%. Macroscopic complete surgical resection with curative intent of malignant mesothelioma includes extrapleural pneumonectomy (EPP) and pleurectomy and decortication (P/D).

Various studies have demonstrated decreased short-term mortality with P/D compared to EPP and improved quality of life and safety in the elderly without increased morbidity and mortality. P/D was defined as parietal and visceral pleurectomy to remove all gross tumors without diaphragm or pericardial resection. Extended P/D (EPD) was defined as parietal and visceral pleurectomy to remove all gross tumors with the diaphragm and/or pericardium resection [37,38]. Of the 2 types of surgeries for MPM, pleurectomy/decortication (P/D) is a lung-sparing approach that is less invasive than EPP. However, there is concern regarding local control. Cao and coworkers reported a systematic review and meta-analysis of P/D and EPP for MPM, stating that P/D is performed with lower morbidity and mortality outcomes and comparable long-term survival outcomes to EPP [38,39].

Conclusion

The discussed literature provides a comprehensive overview of various aspects of pleural effusion and its management, mainly focusing on parapneumonic effusion. Pleural effusion, characterized by fluid accumulation between the pleural layers, can become complex when infected by microorganisms, leading to a complicated parapneumonic effusion. This condition affects many patients annually, with clinical presentations involving various respiratory and systemic symptoms. The three-stage classification of parapneumonic effusion (exudative, fibrinopurulent, and organizing) highlights the progression and potential complications of the condition. Diagnostic approaches, including imaging studies, pleural fluid analysis, and sometimes biopsy, aid in identifying the underlying cause and guiding appropriate management strategies.

Therapeutic thoracentesis, intrapleural enzymatic/fibrinolytic therapy, video-assisted thoracoscopic surgery (VATS), and open surgery are discussed as potential interventions for pleural effusion management. Each approach has indications, contraindications, techniques, clinical significance, and potential complications. VATS procedures, including pleurodesis and pleurectomy/decortication, offer minimally invasive surgical options with potential benefits regarding recurrent pleural effusion prevention and improved quality of life. The literature underscores the importance of a multidisciplinary approach and timely intervention for managing parapneumonic pleural effusion. The management choice should consider individual patient factors, the underlying cause of the effusion, and potential benefits and risks associated with each treatment option. Overall, this narrative review provides valuable insights into the current concepts and practices in diagnosing and managing parapneumonic pleural effusion, highlighting the significance of comprehensive care for affected patients.

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