CASE REPORT

Clagett open-window thoracostomy revisited in empyema necessitans secondary to pulmonary tuberculosis – A case report

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SUMMARY

This report details the case of a 47-year-old male who developed empyema necessitans, a rare complication where a pleural infection extends into the chest wall, secondary to chronic pulmonary tuberculosis. The patient initially presented in 2020 and was managed with anti-tuberculous therapy but declined surgical intervention. Two years later, he returned with recurrent empyema thoracis and a trapped lung. Despite chest tube drainage and targeted antibiotics for a superimposed Pseudomonas aeruginosa infection, his condition did not resolve. Consequently, he underwent a Clagett open-window thoracostomy. This surgical procedure, which involves creating an opening into the chest cavity for drainage and packing, revealed extensive pleural fibrosis that prevented lung re-expansion. The Clagett window facilitated effective infection control and promoted the growth of healthy granulation tissue, leading to a favorable outcome. This case underscores the enduring relevance of the Clagett thoracostomy as a vital surgical option for complex and refractory chronic empyema, especially in the context of extensive tuberculous fibrosis.

INTRODUCTION

Empyema necessitans is an uncommon but serious complication of pleural infection, in which purulent material dissects through the parietal pleura into the chest wall and surrounding soft tissues.[1] It has been described for centuries but remains most frequently associated with tuberculosis, particularly in regions where the disease is endemic. Chronic tuberculous empyema presents a formidable therapeutic challenge because of the dense fibrous peel that encases the lung and prevents re-expansion, leaving a persistent cavity that sustains infection despite antibiotics or drainage.[1,3]

Surgical intervention is often required when medical treatment fails. Among the available approaches, the open window thoracostomy first described by Clagett and Geraci in 1963 has stood the test of time.[2] The procedure involves removal of rib segments and creation of a marsupialized opening into the pleural cavity to allow continuous drainage, reduce the bacterial burden, and encourage the gradual filling of the space with granulation tissue.

Over the decades, several series have confirmed the value of this technique for chronic empyema, especially in cases where the lung is destroyed or irreversibly trapped.[4,5,6] More recently, the use of vacuum assisted closure therapy has been introduced as an adjunct, accelerating granulation and shortening the time to closure.[7,8] Even in the modern era of minimally invasive surgery and intrapleural fibrinolytics, open window thoracostomy continues to provide dependable outcomes in selected patients with advanced disease.[9,10]

The present case report describes a patient with tuberculous empyema complicated by empyema necessitans, successfully managed with a Clagett open window thoracostomy. This case highlights the ongoing importance of a procedure that, although introduced more than half a century ago, remains highly relevant in contemporary thoracic surgery.

CASE PRESENTATION

A 47-year-old male was first diagnosed with right-sided empyema thoracis secondary to pulmonary tuberculosis in September 2020. At that time, a chest tube was inserted, and surgical decortication was recommended. However, the patient declined the operation and opted for medical management. He completed a one-year course of anti-tuberculous therapy (ATT) in August 2021 but was subsequently lost to follow-up.

In July 2023, he presented to the emergency department with a two-week history of dyspnoea, productive cough, and haemoptysis. A chest X-ray revealed a massive right-sided pleural effusion. A chest tube was inserted, and the drained pus grew Pseudomonas aeruginosa on culture. The patient was started on intravenous antibiotics based on sensitivity testing and referred to the cardiothoracic surgery service for further management.

Investigations

The admission chest X-ray showed a large, opacified right hemithorax with a contralateral tracheal shift, consistent with a massive pleural effusion and no underlying lung aeration (Figure 1-A). A contrast-enhanced computed tomography (CECT) scan of the thorax confirmed a large, right-sided fluid collection with markedly thickened parietal pleura. The scan also revealed a direct extension of the collection into the subcutaneous tissue between the 9th and 10th ribs posteriorly, establishing the diagnosis of empyema necessitans (Figure 2-A). The axial view clearly demonstrated the chronic trapped right lung, encapsulated by a thick visceral peel (Figure 2-B).

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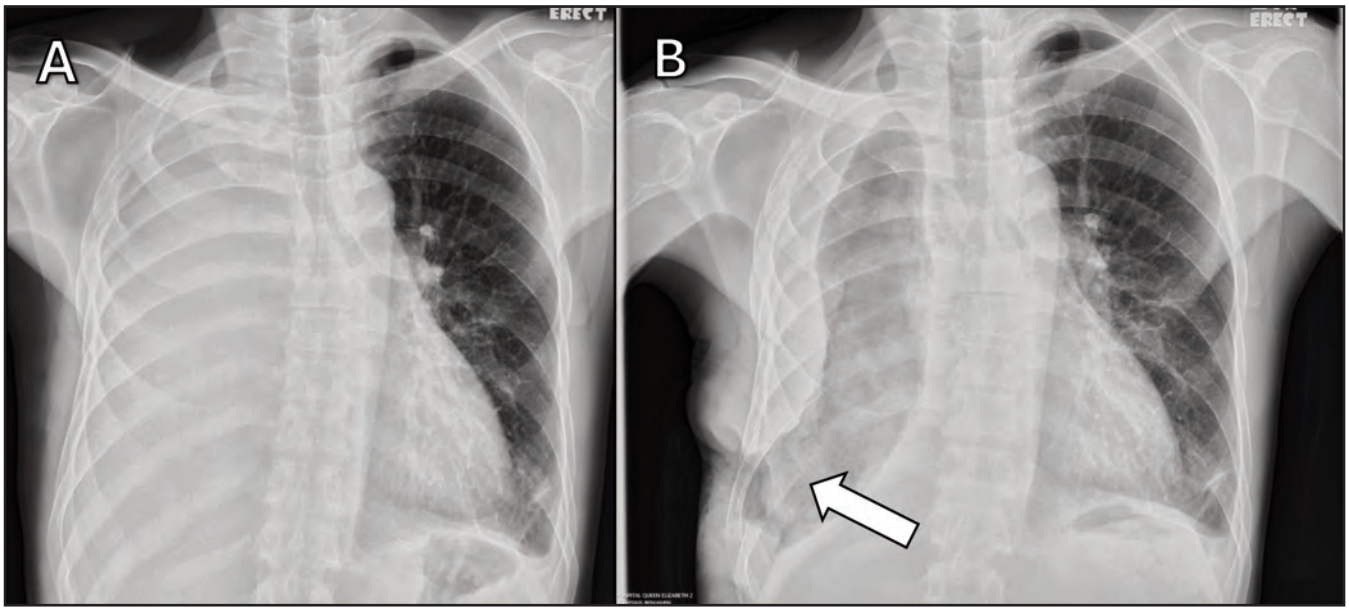

Fig. 1: A. Chest x-ray showed total opacity of right lung with no lung aeration before operation. B. Chest x-ray showed no more effusion over right lung cavity after right Clagett open-window thoracostomy and arrow showed the rib resected during operation

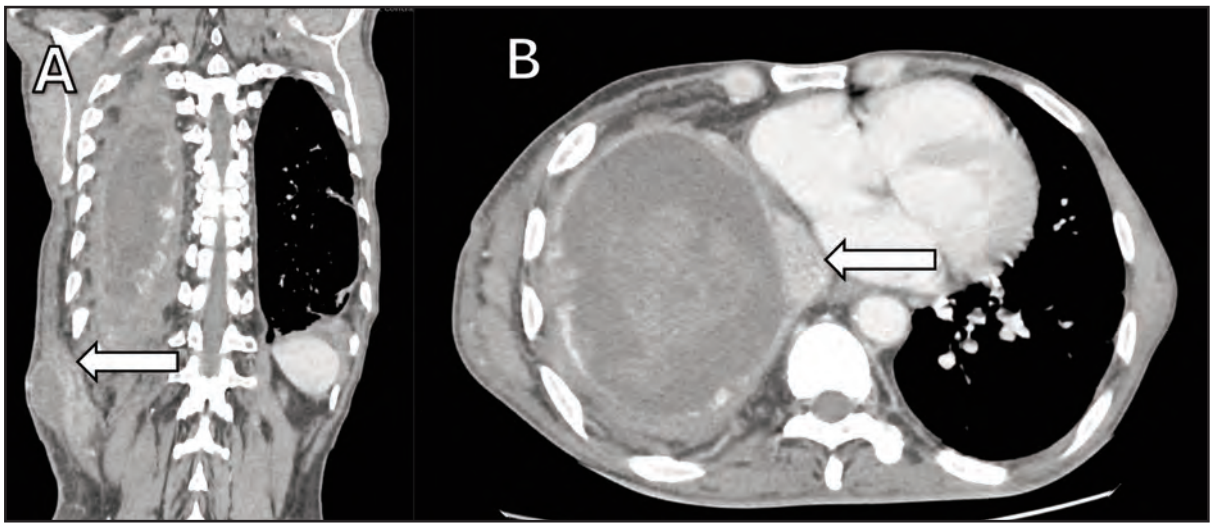

Fig. 2: A. Contrast-enhanced CT (coronal view) showed right empyema thoracis with thick parietal cortex and extension to the subcutaneous tissue between 9th and 10th ribs (arrow). B. Contrast-enhanced CT (axial view) showed right empyema thoracis with chronic trapped lung (arrow)

Management

The initial surgical intervention consisted of an incision and drainage of the chest wall abscess at its most fluctuant point. A cruciate incision was made over the right posterior 9th and 10th intercostal spaces, releasing approximately 2500 mL of frank pus. Cultures again grew Pseudomonas aeruginosa, and the patient was treated with a six-week course of intravenous antibiotics.

Following this, daily dressings were performed through the incision site to the pleural cavity, but the opening began to narrow, compromising adequate drainage. A decision was therefore made to perform formal right-sided Clagett open window thoracostomy.

Intraoperatively, a preliminary video-assisted thoracoscopic surgery (VATS) was performed to assess the pleural space. This revealed a cavity almost entirely lined by a thick, fibrous cortex, with no identifiable viable lung tissue. Multiple sites of slow, oozing haemorrhage were noted from the raw surfaces. To create the window, an incision was made at the most dependent part of the right thoracic cavity, and segments of two lower ribs were resected. The skin edges were then sutured down to the parietal pleura with a non-absorbable monofilament suture, creating a marsupialized opening and covering the sharp, cut rib edges. The cavity was thoroughly irrigated with antiseptic solution.

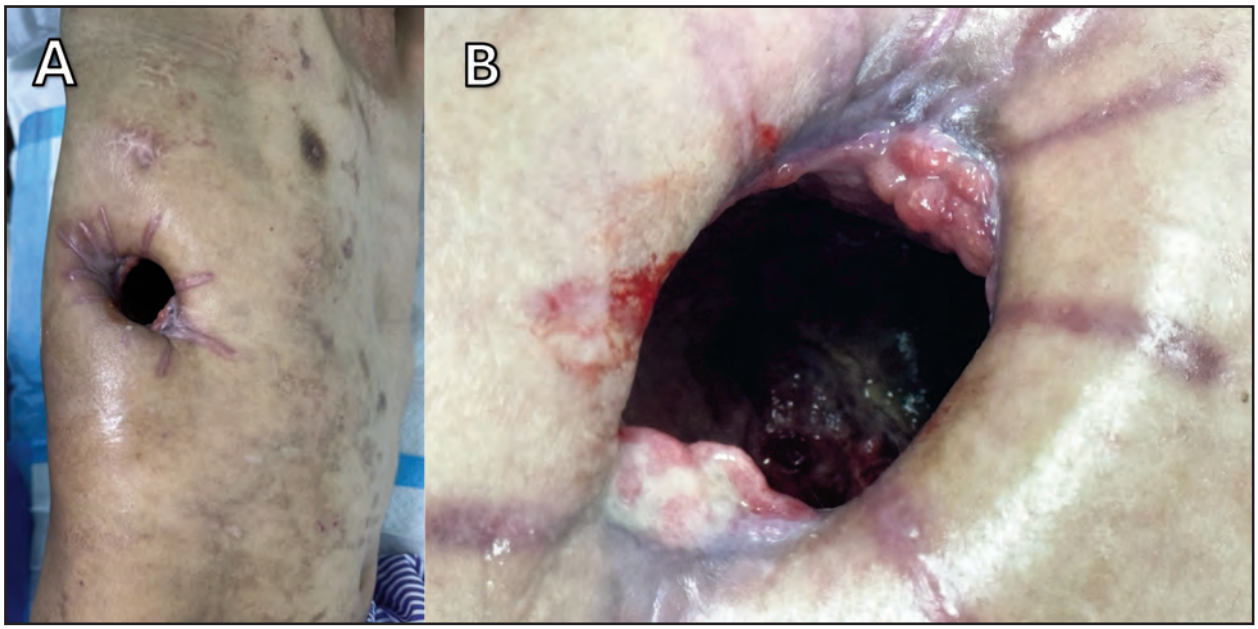

Fig. 3: A. Right Clagett open-window thoracostomy after the edges healed and covered with skin. B. Close-up picture of the right Clagett open-window thoracostomy wound

Postoperatively, the patient underwent daily dressing changes of the Clagett window. He was continued on oral antibiotics to suppress the infection. Over time, healthy granulation tissue progressively filled the pleural cavity (Figure 3). A follow-up chest X-ray demonstrated the resolution of the fluid-filled cavity, which was being replaced by newly formed tissue (Figure 1-B).

DISCUSSION

Empyema necessitans remains a striking reminder of how chronic pleural infections can evolve if not adequately treated. Although rare in the modern antibiotic era, it is still encountered in tuberculosis-endemic regions, where chronic empyema with a trapped lung poses significant management challenges.[1,3] In these patients, the lung is encased by a rigid fibrous peel that prevents re-expansion, leaving a chronically infected cavity that is resistant to standard measures such as antibiotics and intercostal drainage.

The Clagett open window thoracostomy, first described in 1963, was originally conceived for post-pneumonectomy empyema but has since proved to be a versatile tool for managing chronic, refractory pleural infections of various causes.[2] The enduring value of the procedure lies not in restoring lung function but in reliably controlling sepsis. By providing a marsupialized opening into the pleural cavity, it ensures continuous drainage, prevents accumulation of infected fluid, and allows meticulous wound care. Over time, this facilitates the gradual replacement of the cavity by granulation tissue, effectively transforming a hostile space into one capable of healing.[4,5]

The technical principle of placing the window at the most dependent part of the cavity is central to its success. Gravity aids drainage and reduces the risk of residual loculations that could sustain infection.[4,6] Long-term studies have confirmed that, when performed correctly, open window thoracostomy offers durable infection control with acceptable morbidity5,6. Failure is more likely when the stoma is inadequate in size, when a persistent bronchopleural fistula remains, or when the patient's nutritional status is poor.[6]

The evolution of adjunctive technologies has further refined the management of chronic empyema. Negative pressure wound therapy, commonly applied through vacuum assisted closure (VAC) systems, has been shown to accelerate granulation, reduce bacterial burden, and shrink the cavity more quickly than traditional dressings.[7,8] Although VAC was not available in the present case, its growing use in specialized centers represents a valuable adaptation of the original Clagett principles. Importantly, this case demonstrates that even without such adjuncts, the fundamental technique remains highly effective.

In contemporary thoracic practice, the place of open window thoracostomy must be considered in the broader context of minimally invasive surgery, intrapleural fibrinolytics, and advanced antimicrobial therapy. While these modalities can be effective in early or less complex empyema, refractory case particularly those with a trapped lung continue to demand surgical drainage. Recent outcome studies affirm that open window thoracostomy continues to provide reliable results in such patients.[9] Moreover, once infection is controlled and granulation tissue is established, reconstructive techniques can be employed to restore chest wall integrity and quality of life.[10]

This case illustrates how the principles described by Clagett more than half a century ago remain relevant today. In a patient with long-standing tuberculosis, secondary bacterial infection, and a chronically entrapped lung, the Clagett window offered definitive sepsis control and allowed

progressive healing. For surgeons working in tuberculosis-endemic settings, it is a reminder that time-tested procedures, when applied thoughtfully, continue to have a vital role alongside modern innovations.

CONCLUSION

The Clagett open window thoracostomy remains an indispensable surgical tool for the management of complex, refractory empyema necessitans, especially in cases secondary to pulmonary tuberculosis with extensive fibrosis and a trapped lung. The procedure offers a reliable method for achieving definitive infection control and promoting gradual healing through granulation tissue formation. This case demonstrates that even without modern adjuncts, the fundamental principles of the Clagett window provide a robust and effective solution, affirming its relevance in contemporary thoracic surgical practice.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

PATIENT CONSENT

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

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