



## Case report

## Successful treatment of late onset empyema after extrapleural pneumonectomy: A case report

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## ABSTRACT

Treatment of post-extrapleural pneumonectomy empyema (PEPPE) is more difficult than that for post-pneumonectomy empyema for two reasons: first, a large infectious dead space remains after extrapleural pneumonectomy (EPP); and second, defects of the pericardium and diaphragm are reconstructed with artificial materials, which ideally should be removed for treatment of infection. Here, we report the case of a 56-year-old male with PEPPE that occurred long after EPP for mesothelioma. The patient was treated successfully by minimally invasive procedures of irrigation, instillation of urokinase and antibiotics, and surgical debridement without peeling off artificial materials.

### 1. Introduction

Post-pneumonectomy empyema (PPE) is difficult to treat [1]. Use of intrathoracic muscle flaps combined with a Clagett procedure or omentum flap, and thoracoplasty have been described as treatments of PPE [2,3], but it is often difficult to control infection, even with such treatment. Post-extrapleural pneumonectomy empyema (PEPPE) is even more difficult to treat because the thoracic cavity after extrapleural pneumonectomy (EPP) is too large to be collapsed. In PEPPE, loss of almost all parietal pleura may also be associated with an additional disadvantage of loss of vascularization and the self-defense mechanism of the pleura. In addition to classic therapies for PPE, a less invasive procedure using vacuum-assisted devices has recently been reported [4], and this minimally invasive approach might be an alternative treatment option for PEPPE. Here, we report the case of a 56-year-old male with late onset PEPPE who was treated successfully using minimally invasive procedures.

### 2. Case report

A 56-year-old man who worked at a construction company had been exposed to asbestos for 3–4 years in his twenties during building or demolition of foundations. He was hospitalized for bilateral spontaneous pneumothorax. A right mesothelioma was diagnosed from a pleural specimen taken during a bullectomy. The patient underwent trimodal therapy of chemotherapy with cisplatin plus pemetrexed, followed by EPP and radiation. Eighteen months after EPP, he

complained of right chest pain and high fever. Chest CT showed that the right thoracic cavity was filled with a fluid of homogeneous density (Fig. 1). Onset of PEPPE was confirmed by thoracocentesis. Tube drainage and intravenous administration of 4.5 g of tazobactam/piperacillin (TAZ/PIPC) every 8 hours were immediately started. An air leak was not observed. Beta-lactamase was positive and coagulase negative staphylococcus was cultured from the pleural fluid; therefore, TAZ/PIPC was changed to 3.0 g of sulbactam/ampicillin (SBT/ABPC) every 6 hours on hospital day 7.

There were no signs of a bronchial fistula, which allowed irrigation of the thoracic cavity with normal saline through the double-lumen drainage tube every day. Normal saline (2000 mL) was instilled via a bypass-line of the chest tube and drained 3 hours later. A total of 60,000 units of urokinase were instilled into the thoracic cavity on days 17 and 22. After instillation of urokinase the drainage fluid became clearer day by day. A thoracoscopic observation was performed using a 5-mm, 30°-angled rigid scope via the chest tube insertion port in the seventh intercostal space at the mid-axillary line under local anesthesia on day 25. This showed that many fibrin nets remained in the thoracic cavity and that the artificial mesh used for reconstruction of the pericardium and diaphragm was covered with yellow pus. Instillation of urokinase was repeated on days 26 and 29. Due to the residual pus, thoracoscopic debridement of the whole cavity under general anesthesia was performed on day 37, using a 5-mm, 30°-angled rigid scope with three 5.5-mm ports in the fourth intercostal space at the anterior axillary line, and in the seventh intercostal space at the post-axillary line and the mid-axillary line. Naruke Type Thoraco Cotton (Kenmedico, Saitama,

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**Abbreviations:**

PPE	post pneumonectomy empyema
PEPPE	post extrapleural pneumonectomy empyema
EPP	extrapleural pneumonectomy
TAZ/PIPC	Tazobactam/Piperacillin
SBT/ABPC	Sulbactam/Ampicillin
UK	urokinase

Japan) was used to scrape off the residual pus without peeling off the mesh. Instillation of 3 g of cefazolin into the thoracic cavity during the irrigation was started after surgery. Postoperative drainage fluid then became clearer. No residual bacteria were found on day 48. The chest tube was taken out on day 58 and the patient was discharged on the next day.

Two months later, there were no signs of relapse of empyema in a blood test and chest CT. However, another two months later, the patient died of acute respiratory distress syndrome caused by viral pneumonia. An autopsy revealed that the right thoracic cavity was aseptically. The bronchial stump reinforced with an intercostal muscle flap at EPP was completely covered with hypertrophic connective tissue (Fig. 2). There was no recurrence of right-sided mesothelioma, but left-sided



**Fig. 1.** Chest CT on admission, at 18 months after EPP. The right thoracic space was filled with homogenous fluid and the bronchial stump was separated from the space by thick fibrous tissue.



**Fig. 2.** Autopsy 26 months after EPP, at 4 months after treatment of late onset empyema. Late onset empyema was cured. The bronchial stump was widely covered with hypertrophic connective tissue without a fistula.

mesothelioma that was not apparent on chest CT was found at autopsy.

**3. Discussion**

Minimally invasive sequential procedures of irrigation, instillation of urokinase and antibiotics, and debridement without peeling off mesh were performed to treat late onset PEPPE. In a case of early onset PEPPE, immediate dissection and replacement of mesh has been recommended [1]. In contrast, little is known about late onset PEPPE.

The treatment of late onset empyema should be individualized based on each patients' background. We selected conservative treatment for the following reasons. First, there was no evidence of a bronchial fistula, and the bronchial stump was completely reinforced with an intercostal muscle, which allowed irrigation and debridement of the thoracic cavity. Second, there was little chance to peel off and replace the mesh covering the pericardium and diaphragm because tight adhesion between the mesh and organs had occurred in the long period after EPP. In fact, autopsy revealed that the adhesion was too tight to peel off. Therefore, a radical procedure such as thoracoplasty of the whole hemithorax would have caused a profound deterioration in quality of life. Unfortunately, we could not examine the outcome of the conservative treatment over a longer period, but we do recommend this modality for patients with poor performance status or end-stage disease.

**4. Conclusions**

In this case of late onset PEPPE, we believe that a gradual decrease in the amount of bacteria through sequential procedures led to a cure of empyema. Reinforcement of a bronchial stump with the intercostal muscle in EPP prevents formation of a bronchial fistula and enables treatment with non-invasive procedures in a case of late onset PEPPE.

**Declaration of interest**

The authors declare that they have no competing interests.

**Informed consent**

The family of this patient provided informed consent for the publication of this report and any accompanying images.

**Authors' contributions**

SN drafted the manuscript. KC (director of thoracic surgery) helped with finalizing the manuscript and gave the final approval of the article. ST and KO participated in the article revision. All authors have read and approved the final manuscript.

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