Pleural empyema is an important entity in thoracic surgery with poor prognosis unless treated properly. It can cause sepsis and other complications which may increase morbidity and mortality. The treatment of choices in pleural empyema are thoracentesis, intercostal tube or pleural catheter drainage, video-assisted thoracic surgery (VATS) and open surgery (1, 2). Tube drainage often fails if the empyema is loculated with fibrinous adhesions, hence surgical treatment becomes necessary. Enzymatic debridement using intrapleural instillation of streptokinase is a minimally invasive option for loculated empyema and an alternative approach to surgery.

Herein we report two patients with multiloculated pleural empyema in which we performed intrapleural streptokinase with favourable outcome.

**Case Reports**

Case 1. 16 year-old boy who had undergone left posterolateral thoracotomy and lower lobectomy with the diagnosis of bronchiectasis four months previously. The patient was admitted to our clinic with cough and high fever.

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<td>Significant morbidity and mortality result from ineffective evacuation of pleural empyema. Standard treatment for pleural empyema includes; pleural drainage, and the use of antibiotics. This conventional treatment may not be effective for fibrin deposition and loculated empyema. Intrapleural streptokinase is an effective adjunct in the management of pleural empyema, and an alternative treatment of choice for surgery. In this article, we present two cases, which we performed intrapleural streptokinase with the diagnosis of multiloculated pleural empyema.</td>
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**Key Words:** Intrapleural Streptokinase, Pleural Empyema

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**Anahtar Kelimeler:** Intraplevral Streptokinaz, Plevral Ampiyem
complaints. On physical examination, no sounds were audible in the left lower zone of the thorax. Laboratory data revealed elevated levels of white blood cell count: 18,000/mL. A chest roentgenogram showed a blunt left sinus. Computed tomography of the chest showed multiloculated empyema pus in the left hemithorax. Thoracentesis confirmed the diagnosis of empyema and the culture was positive for Streptococcus pneumonia.

Case 2. 35 year-old man who had undergone left posterolateral thoracotomy and lower lobectomy with lingular resection for bronchiectasis ten days previously. On physical examination, no sounds were audible in the left lower zone of the thorax. Laboratory data showed elevated levels of white blood cell count as 17,000/mL. A chest roentgenogram showed a blunt left sinus (Fig. 1-a). Computed tomography scan of chest showed empyema pus in the left hemithorax (Fig. 1-b). Thoracentesis revealed a purulent pleural fluid, and the culture was positive for Staphylococcus aureus.

Both patients received systemic and specific antibiotic therapy during ten days (Case 1; Levofoxacin 1 gr/day, Case 2; Teikoplanin 2 gr/day). An intercostal catheter (Pleurorcan; Braun, Germany) was inserted into the pleural space in both patients. The catheters were flushed with saline solution (250 ml) in every 12 h. Streptokinase (Streptase; Farmatek, Istanbul, Turkey) 250,000 IU/day in 50 ml saline solution were instilled into the pleural cavity, and the catheter was clamped for 4 hours. Both patients received this regimen for 2 days (Total dose 500,000 IU). Patients venous blood for prothrombin time (international normalized ration [INR]), activated partial thoromboplastin time (aPTT), fibrinogen (FIB) were measured before and after streptokinase therapy. The results were within the normal limits in both patients. Catheters were removed when the drainage declined to below 50 ml daily, and the radiological re-expansion of the underlying lung was seen on follow-up chest X-rays (Fig. 2). The mean hospitalization duration of the patients was 2.5 days. The patients remain well mean 14 and
11 months, respectively, following the intrapleural streptokinase therapy.

**Discussion**

Pleural empyema is an infection of the pleural space that can cause thoracic sepsis and other complications. It has been known since the times of Hippocrates (3). Pleural empyema may develop in up to 44% of patients with parapneumonia, and 10% of patients in the postoperative period following pulmonary resection (1). Para pneumonic empyema can be caused by two mechanisms: obstruction of pulmonary lymphatics by inflammatory debris, which contaminates the pleural fluid by lymphatic transport of organisms from the focus of infection in the lungs, and direct extension of the pneumonic process into the pleural space. The second most common group are patients who have undergone operations on the lungs, mediastinum or esophagus.

The importance of adequate drainage of the pleural space was recognized in ancient times (3). The first line treatments of pleural empyema are adequate pleural drainage and systemic antibiotics. Empyema includes three phases, namely those are exudative, fibrinopurulent and chronic. Pleural drainage should be performed in the early phase because the development of pleural infection is a progressive process in which free-flowing exudative effusions can be transformed into a multiloculated empyema (4). Tube drainage inevitably fails if the fluid is loculated with fibrinous adhesions, thus a surgical intervention is needed. However, morbidity and mortality rates are greater in open surgical approaches (5, 6). Minimally invasive techniques such as VATS have been replaced with conventional surgical approaches recently (7). Despite the minimal invasiveness of VATS, it requires general anesthesia. However, the use of intrapleural streptokinase management can be established with local anesthesia. Thus, as being a less invasive procedure, the use of fibrinolytic agents such as streptokinase and urokinase may be the initial step and an alternative choice with minimal morbidity and mortality in the management of multiloculated empyema (8-10).

The recommended dose of streptokinase is 250,000-1,500,000 units in 100 ml of 0.9% saline; for urokinase the dose 100,000 units in 100 ml of 0.9% saline. We showed that a limited dose of 500,000 units of streptokinase daily is efficient in the management (11). Similarly, Davies et al. reported high success rate (85%) with a limited dose of streptokinase in their series (10).

Streptokinase is administered with small-bore catheter and the patients can be mobile. This concern is presumably because of a theoretical risk of hemorrhage activated by local or systemic fibrinolysis. Intrapleural streptokinase has been shown not to activate systemic fibrinolysis in patients with empyema (1). Similarly, no differences in the laboratory tests were observed with respect to PT, aPTT, FIB between after and before intrapleural streptokinase therapy in our patients. Postinstillation fever, chest pain and specific IgG antistreptokinase antibodies occasionally may occur following streptokinase therapy (11). We did not experience any of the above complications in our cases. Likewise, Davies et al. and Taylor et al. reported no complications in their series (1, 9). Streptokinase was well tolerated in all patients as in the presented cases.

Intrapleural streptokinase therapy is an effective and safe adjunct in the management of complicated empyema and may reduce the need for surgery.
REFERENCES


