

**Case
Report**

Endobronchial Watanabe Spigot Embolisation in the Treatment of Bronchopleural Fistula due to Tuberculous Empyema in Intensive Care Unit

Levent Dalar, MD, Filiz Kosar, MD, Emel Eryuksel, MD,
Levent Karasulu, MD, and Sedat Altin, MD

Tuberculosis may be complicated with empyema and fistula in patients with cellular immune deficiency.

The case presented was a 39-year-old male patient with diagnosis of rheumatoid arthritis developed hydropneumothorax while taking steroid and immunosuppressive treatment and examination of pleural fluid revealed acid-fast bacilli.

The patient was admitted to the intensive care unit due to respiratory failure and underwent bronchoscopic examination due to air leakage. The right middle lobe was obliterated by using an endobronchial Watanabe Spigot (EWS), and the amount of leakage decreased considerably after the procedure. On day 7, chest tube drainage was removed, and empyema was drained with a Pezzer drain. On day 50, upon the cessation of empyema drainage, spigots were removed with rigid and flexible bronchoscope.

In conclusion, EWS use in the treatment of bronchopleural fistula is an effective, safe and a reversible procedure.

Keywords: bronchopleural fistula, endobronchial therapy, silicone spigot, tuberculous empyema

Introduction

Pneumothorax and empyema are rarely seen complications of tuberculosis. Pleural tuberculosis is mostly seen during the clinical course of primary *Mycobacterium tuberculosis* infections of the lung.¹⁾ Inflammation of the pleura is related to a delayed hypersensitivity reaction to tuberculosis bacilli located near to pleural surface. This is mostly self limited but rarely may lead to a chronic active infection of the pleural space.¹⁻³⁾ Active infection of the pleural space causes erosion of the pleural space and air-

ways by time and may lead to bronchopleural fistula.³⁾ In addition, a large cavity that erodes into pulmonary parenchyma may open into the pleural cavity and may be the main reason of the development and persistence of pleural infection. If the content of the cavity evacuates to the pleural cavity, this may lead to a bronchopleural fistula.

Empyema is rarely seen primary infection with pleural involvement. Empyema is more frequent in late stage of the disease and mostly follows pneumothorax. It is more frequent in debilitated and cellular immune compromised patients.²⁾ It appears with the spread of caseous and cavitated parenchymal infection. Chemotherapy alone is not sufficient due to weak penetration of antituberculosis drugs to empyema cavity.²⁾

With this tuberculosis related pneumothorax and empyema case, we discussed the value of Endobronchial Watanabe Spigot (EWS) use in bronchial embolization.

Interventional Pulmonology Unit, Yedikule Chest Diseases and Thoracic Surgery Teaching Hospital, Istanbul, Turkey

Received: August 10, 2011; Accepted: February 20, 2012
Corresponding author: Interventional Pulmonology Unit, Yedikule Teaching Hospital for Thoracic Medicine and Surgery, Zeytinburnu, 34303 Istanbul, Turkey
Email: leventdalar@gmail.com
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Fig. 1 The chest X-ray before embolization of Endobronchial Watanabe Spigot.



Fig. 2 The chest X-ray after embolization. Spigots can be seen in right hilar site.

Case Report

A 39-year-old male patient was admitted to emergency service with complaints of dyspnea, bilateral chest pain, and deterioration.

Patient had six years of rheumatoid arthritis history. He was on 16 mg methylprednisolone and different non-steroidal anti-inflammatory drug treatment since diagnosis of rheumatoid arthritis. During the last 15 days, there was a progressive increase in the amount of sputum and symptoms, which did not improve, in spite of antibiotic therapy. Spontaneous pneumothorax and pleuritis were detected (**Fig. 1**) and pleural fluid examination revealed acid-fast bacilli. The patient was admitted to the intensive care unit (ICU) due to empyema and respiratory failure associated with tuberculosis.

Noninvasive mechanical ventilation (NIMV) was administered with IPAP: 15 and EPAP: 5 cmH₂O and sO₂ was 92% with FIO₂ 40% and blood pressure was 126/95 mmHg. Antibiotics were initiated together with four anti-tuberculosis drugs as isoniazid, pyrazinamide, rifampicin and ethambutol.

At day 3, *Acinetobacter baumannii* was isolated, and antibiotics were modified accordingly. At the same day, thorax computed tomography revealed large cavity at upper and middle lobes and bronchopleural fistula. Rigid bronchoscopy was performed under intravenous general anesthesia. A Fogarty balloon catheter was used to occlude segments of the middle lobe, and after the occlu-

sion, the amount of leakage was significantly reduced. Two 7 mm and one 6 mm EWSs was administered to middle lobe with flexible bronchoscope via rigid bronchoscopy. There was a considerable decrease in the amount of leakage. Oxygen need of the patient after the procedure decreased, and NIMV was terminated. The patient was discharged from ICU to the ward. Medical treatment of the patient was continued, and on day 7, chest tube and underwater seal drainage were removed (**Fig. 2**). A Pezzer drain was placed for the intention of drainage of the empyema. Pezzer drain is a silicone drain used to provide drainage following open renal or bladder surgeries and has a much softer texture than chest tubes, but this type of drain is used in prolonged pleural drainage due to its softer texture for improved patient comfort. In this case, it was chosen to provide drainage of the empyema following the cessation of air leak and removed after the drainage has ceased.

At day 50 EWSs were removed, and medical treatment was maintained.

Discussion

Tuberculosis empyema and tuberculosis associated bronchopleural fistula are only rarely seen because of effective medical treatment.³⁾ The treatment is very difficult and sometimes major surgery such as thoracoplasty is needed.

Bronchopleural fistula may lead to increase in morbidity

and mortality with a prolongation of duration of stay in hospital.⁴⁾ Simple fistulas may be effectively treated with tube thoracostomy or pleurodesis whereas more complex cases associated with tuberculosis empyema and prolonged air leakage may need to be treated with decortication, thoracoplasty and omental or muscle transposition.⁵⁾

Nonsurgical management of air leakage is based on reduction of gradient between airways and pleural space. The successful treatment of chronic bronchopleural fistula is associated with control of infection, effective drainage of the thoracic cavity, closure of fistula with vascularized tissue and obliteration of the thoracic cavity.⁴⁾

Also, flexible bronchoscopy is a valuable tool both in diagnosis and in treatment. In the presence of a distal bronchopleural fistula, an endobronchial balloon is valuable for detecting the segment with fistula by systematic occlusion of bronchial segments. After detection of the segment with fistula, some obliterating tools (sealant) may be used.⁴⁻⁶⁾ In bronchoscopic bronchopleural fistula treatment, the fistula should be visualized or by using balloon occlusion the cessation or reduction of leakage should be confirmed. Currently there are many sealant agents. Some of these are available to be applied to visualized fistulas directly whereas some are for distal air leakage. Sclerosing agents, such as fibrin glue, gelatinous sponge, and cyanoacrylate are short-acting options, suitable for visualized fistulas.⁵⁾ To exclude distal bronchopleural fistula metallic coils, tracheobronchial stents and endobronchial valves are available.⁴⁾

EWS is a silicon device available during last 10 years to treat bronchopleural fistula and is observed to be successful. The efficacy of EWS, developed by Watanabe and et al., has been shown in different series. In a report published by Watanabe et al. in 2003, 63 cases treated with ESW were reported. In 23 cases, air leakage was totally stopped, and in 22 cases, the amount of leakage decreased considerably. No complication was reported.⁶⁾ In a report published by Sasada et al at 2001, 24 EWS cases were reported. Four of these cases had prolonged air leakage associated with tuberculosis. In 23 cases, leakage side has been detected with balloon occlusion test. Of those in 12 cases complete resolution and in 7 cases considerable decrease and in 5 cases healing were observed. The mean time to removal of chest tube after ESW insertion was 18 days. The most frequent intervention related complications were migration and atelectasis. Interestingly, all migrations developed at EWSs inserted to lower lobes.⁵⁾

Another option to treat distal air leakage may be the

valves used to reduce the volume. Toma et al. obtained successful results in two cases with Emphasys valves.⁷⁾ In our case, we chose EWS due to considerable infection of the bronchial tree. Both tuberculosis and acinetobacterial infections were considered as a risk for obliteration of valves and progression of infection. Price was also another reason to choose EWS. Similarly, coils, calf bones, and atrial septostomy catheters were reported as effective tools for closure of fistulas,⁴⁾ but experience with these modalities are limited to case reports.

Embolization with EWS is one of the first line options in conservative management of broncho- pleural fistula. In this case, since the need for noninvasive mechanical ventilation, presence of rheumatoid arthritis and poor general condition of the patient did not allow a major surgical intervention; palliative treatment with EWS was preferred. Procedure was performed under general anesthesia with rigid bronchoscopy to secure airway. With a fiberoptic flexible bronchoscope passed through a rigid tube, three EWS were inserted to segments of the right middle lobe and the air leakage reduced considerably. The reason to use balloon occlusion test was the association of the pleural space with the cavity located at middle lobe and possible contribution of all segments to air leakage. This situation was confirmed with CT examination. Air leakage reduced considerably with the occlusion of middle lobe. Migration reported as the most frequent complication of ESW, was observed only in one case. The possible reason of this may be sharp angle of middle lobe bronchial three.

EWS successfully reduced the air leakage and chest tube was removed at day 7. At day 50, EWSs were removed with flexible bronchoscope by using forceps without any complication. There is no consensus about the timing for removal of EWS. It should be assessed for each case and it should be decided by considering the extent of infection in obliterated region.

As a conclusion, in inoperable bronchopleural fistula and pyopneumothorax cases, EWS should be considered as an effective treatment option. By considering the difficulties in management of tuberculosis associated empyema, EWS should be noted as a relatively cheap, effective and easy to use treatment option.

Disclosure Statement

The authors declared that they have no financial or other interest in the manufacture or distribution of the device or that they do have a financial interest in the

manufacturer of the device, or receive financial incentives from the manufacturer. All authors have no conflict of interest.

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