



## Case report

# Endoscopic closure of the fistula stump of the bronchus after pneumonectomy

A. Ualikhanov, MD, K. Batyrbekov, MD, PhD<sup>\*</sup>

National Research Oncology Center, Nur-Sultan, Kazakhstan



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## ABSTRACT

A 58-year-old male patient with a bronchopleural fistula underwent endoscopic installation of an occluder at the mouth of the fistula. The fistula was located in the stump of the main bronchus of the right lung after a pneumonectomy in 2019. During medical bronchoscopy, mucopurulent contents were actively received from the mouth of the fistula. To close the fistula, the patient was simultaneously drained of the pleural cavity by Bulau and installed an occluder from an improvised tool designed for cleaning the endoscope's biopsy channel. In dynamics, purulent contents do not come from the mouth of the fistula and the liquid content in the pleural cavity has significantly decreased. The patient with improved General condition was discharged for observation at the place of residence.

## 1. Introduction

A Bronchopleural fistula (BPF) is a cavity that develops between the bronchial tree and the pleural space. It is estimated that the rate of BPS after pneumonectomy for lung cancer is 4.5–20% [1]. This is a severe complication after pneumonectomy and carries a high mortality rate, ranging from 25% to 67% [2,3]. The etiology of BPF includes incomplete resection of the tumor, use of steroids, intraoperative infection, and long-term postoperative mechanical ventilation as the main risk factors for BPF [1]. Moreover, the left bronchial fistula occurs 5 times less often than the right. Some authors emphasize the significant role of bifurcation lymphodissection in the development of ischemic lesions of the tracheobronchial wall, since it is during bifurcation dissection that the bronchial arteries (including those feeding the main bronchus stump zone) can be affected. Ischemia is the main cause of post-pneumonectomy bronchopleural fistula (BPF). The resulting post-pneumonectomy bronchial fistula is a serious problem and sometimes negates all the efforts of the surgeon. With the improvement of preoperative preparation methods, the introduction of suturing devices and the improvement of the technique of suturing the stump of the bronchus, the number of complications of bronchial fistula has steadily decreased. But still, this complication is not uncommon to this day. The defect of the stump of the bronchus is considered as a true bronchial fistula not earlier than the process of granulation development ends, i.e. after almost 3 weeks. As the bronchial epithelium passes to the walls of

the pleural cavity, its layers creep, a bronchial fistula is formed. Clinical manifestations of BPF are often classified as acute, subacute, or chronic. Acute BPF is a strained pneumothorax in which the pleural cavity communicates abnormally with the respiratory tract, and is associated with expectoration of purulent sputum, shortness of breath, and a decrease in the pleural cavity. Treatment of this serious postoperative complication remains a challenge. Therapeutic options range from extensive surgery, including repeated thoracotomy, thoracoplasty, or chest wall fenestration. Traditional treatments for BPF include post-drainage thoracotomy and primary repair, which is based on vascularized muscle flaps and omentum tissue grafts [4]. Endoscopic closure of the fistula is a therapeutic alternative, and allows non-surgical treatment of this pathology. Persistent healing of the broncho-pleural fistula by individual methods ranges from 26% to 44%. Previously, it was possible to hope for conservative closure of the fistula only if the diameter of the fistula did not exceed 3 mm. The clinic uses a new technology in the treatment of bronchopleural fistulas using a petal occluder, which is the distal part of a medical device for cleaning the endoscope biopsy channel (Fig. 1). The occluder has an axis made of colored plastic with a diameter of 1.5 mm with plate rings located on it with a diameter of 5.0 mm in the amount of 3–4 pieces made of silicone. All materials are non-toxic.

<sup>\*</sup> Corresponding author. National Research Oncology Center, Nur-Sultan, Kerey, Zhanibek Khandar St 3, Nur-Sultan, 010000, Kazakhstan. Tel.: 8 7172 702944. E-mail address: [dr.kanat77@gmail.com](mailto:dr.kanat77@gmail.com) (K. Batyrbekov).



Fig. 1. Occluder.

1.1. Main text

A 60-year-old male patient was admitted to the surgical department of our cancer clinic with complaints of shortness of breath at rest up to 48 per minute, violation of night sleep due to shortness of breath, rapid fatigue.

A history of pneumonectomy for general right lung cancer from 2019. The CT scan image shows up to 500ml of fluid in the pleural cavity. Fig. 2 on the day of hospitalization, a diagnostic bronchoscopy was performed, the examination revealed the failure of the suture of the stump of the main bronchus up to 0.3 cm, there is a metal bracket at the mouth of the fistula, and Muco-purulent, cloudy contents actively enter from the mouth. Next, the patient is drained by Bulau into the right pleural cavity to sanitize the pleural cavity.

The next day, the patient underwent a therapeutic bronchoscopy under general sedation with propofol 400 mg. A bronchoscope was conducted through an intubation tube, in the projection of the stump of the main bronchus on the right, the fistula course and metal suture material (bracket) are determined. The diameter of the fistula lumen is 0, 2x0, 3 cm, from which a large amount of turbid mucus of a purulent nature enters the bronchial lumen during active aspiration(Fig. 3). Made a thorough debridement of the cavity, then through the instrument

channel of the bronchoscope endoscopic forceps, with which the produced fixation of silicone brooklyner, the latest work was installed in the lumen of the fistula with a tight fit. (Fig. 4). At the control examination silicone brooklyner tightly fixed, migration is not defined. A six month later, a control study was performed on a computer tomography and bronchoscopy, the dynamics in the pleural cavity of the fluid is not determined (Fig. 5).

2. Conclusion

BPF is defined as an abnormal connection between the lobar or main bronchus and the pleural space and continues to be a severe surgical complication that is associated with high morbidity and mortality . Although BPF is an extremely rare complication, early recognition and close monitoring, as well as timely local endoscopic treatment, prevent additional surgical treatment and improve the patient’s quality of life. Thus, chronic bronchopleural fistulas are successfully blocked by petal occluder, followed by complete scarring and improvement of the patient’s general condition.

Author contributions

Conceptualization: Asset Ualikhanov.  
 Data curation: Asset Ualikhanov.  
 Investigation: Asset Ualikhanov.  
 Methodology: Asset Ualikhanov.

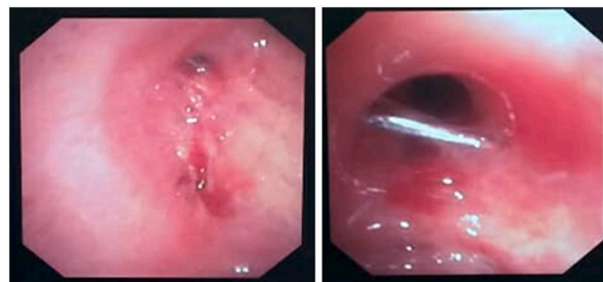


Fig. 3. Ehe bronchopleural fistula.

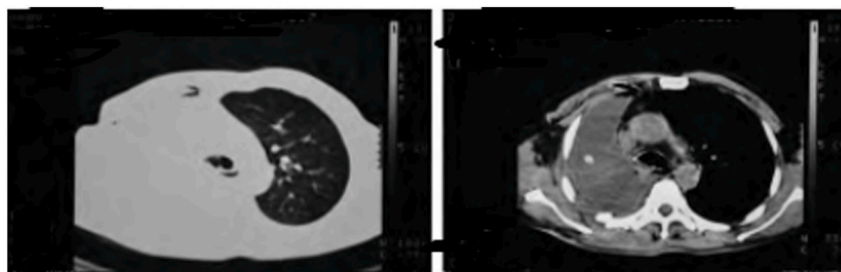


Fig. 2. CT scan before installing the occluder.



Fig. 4. Installation steps of occluder.

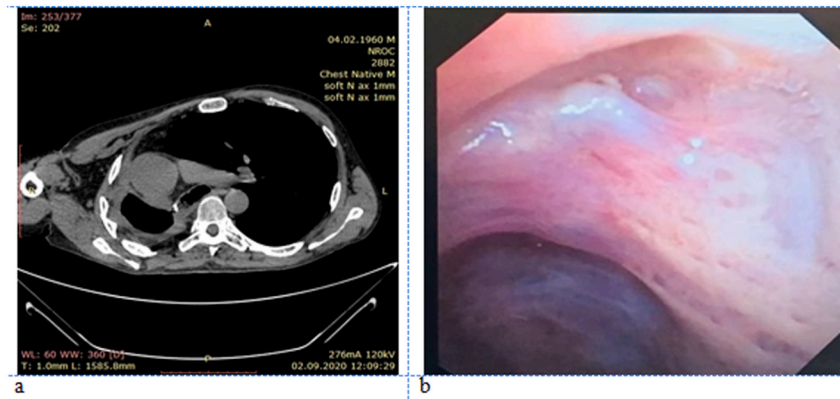


Fig. 5. CT and bronchoscopy control after 6 months.

Resources: Kanat Batyrbekov.  
 Supervision: Kanat Batyrbekov.  
 Validation: Kanat Batyrbekov.  
 Writing-review&editing: KB.

#### Declaration of competing interest

The authors have no financial conflicts of interest.

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