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Fluoroscopy-Guided Treatment of a Bronchopleural Fistula with a Platinum Vascular Occlusion Coil and N-butly-2-cyanoacrylate (NBCA) : A Case Report[1]

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A bronchopleural fistula (BPF) following a pulmonary resection is relatively rare; however, it has high morbidity and mortality rates, despite advancements in treatment. Treatment options for a BPF include surgical procedures, conservative therapy, medical therapy, and in particular, the use of a bronchoscopy and different glues, coils, and sealants. This paper discusses a case of the treatment of a postoperative BPF, which is not identified on the bronchoscope, using a platinum vascular occlusion coil (microcoil) and N-butly-2-cyanoacrylate (NBCA) under fluoroscopic guidance. We hereby assert that such an approach as a combination might be an improvement to the minimally-invasive treatment methods currently in use.

Index words : Respiratory Tract Fistula
Embolization, therapeutic
N-butyl-2-cyanoacrylate
Fluoroscopy

A bronchopleural fistula (BPF) is a communication between the pleural space and the bronchial tree. Although rare, it represents a challenging management problem and is associated with an elevated morbidity rate. After pulmonary resection, BPFs can be a life-threatening condition (1).

Treatment options for BPFs include conservative therapy, medical therapy, and surgical therapy. Recently, there has been an increase in the use of minimally-invasive methods for the treatment of BPFs. In addition, there have been a few reports describing the endobronchial occlusion method of BPF using fibrin glue and vascular embolization coils (2); all of which are cases under bronchoscopic guidance.

In our case of BPF treatment, we combined an endovascular occlusion coil (microcoil) and (N-butly-2-cyanoacrylate (NBCA)) under fluoroscopic guidance.

Case Report

Our case study is a 40-year-old patient who had undergone a left lower lobectomy with the diagnosis of pulmonary sequestration.

The patient followed an uneventful course until he developed a febrile sense and purulent sputum on the 25 th post-operative day. At that time, a chest radiograph showed post-operative changes in the left lower lung field. A multi-detector computed tomography (MDCT)

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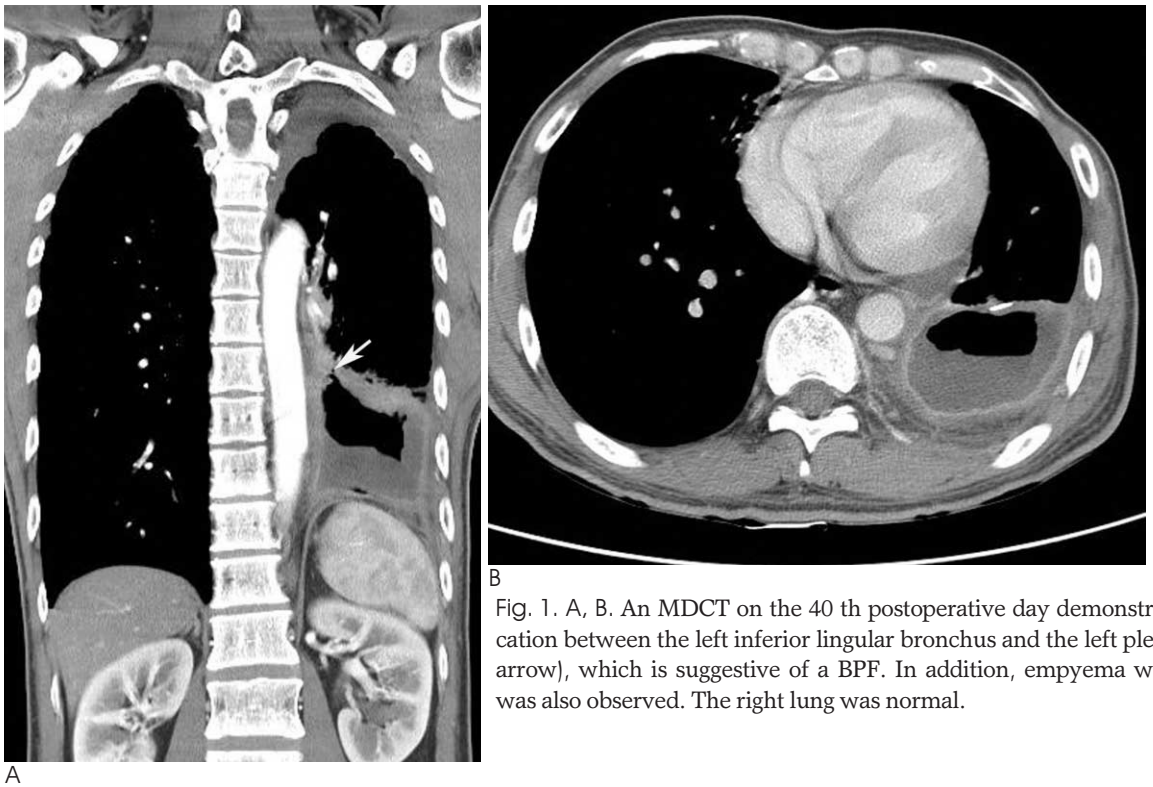
demonstrated a communication between the inferior lingular segmental bronchus and the left pleural space, which is suggestive of a BPF. In addition, empyema with air fluid level was also observed (Figs. 1A, B).

Empyema was diagnosed by examining the intra-thoracic fluid with biochemical and microbiological analyses. Percutaneous tube drainage (PCD) was performed to drain the empyemic cavity, followed by the initiation of antibiotic treatment. The intrathoracic cavity was irrigated daily to control clinical stability. Despite the one-month treatment of empyema, the patient's symptoms of purulent sputum and febrile sense did not improve. In addition, a constant air leak from the PCD tube was detected.

On the 50 th postoperative day, a bronchoscopy-guided embolization of BPF was attempted, but failed. The bronchoscopy did not reveal any endobronchial lesions, including the bronchial stump, because of the fistula's small size and peripheral location.

On the 55 th postoperative day, a fluoroscopy-guided embolization was performed for the BPF. After local anesthetics were sprayed by the bronchoscopy, a 5-F angiographic guiding catheter (Berenstein; Cook, Bloomington, Indiana), and a 0.035-inch guide wire (Terumo, Tokyo, Japan) were inserted to the left lingular bronchus under fluoroscopic guidance. Next, an inferior lingular segmental bronchus was selected using a 2.2-F microcatheter (Progreat; Terumo, Tokyo, Japan), followed by a 0.016-inch microguide wire through the 5-F angiographic guiding catheter. We infused contrast agent into the inferior lingular segmental bronchus via the 2.2-F microcatheter and observed the leakage of contrast agent at the fistulous tract of the subsegmental bronchus of inferior lingula (Fig. 2). We selected the BPF tract again and reinserted the 2.2-F microcatheter and microguide wire. We then removed the microguide wire and inserted one microcoil (Cook, Bloomington, Indiana) into the 2.2-F microcatheter. The microcoil was a 2 × 3 mm Tornado coil, 2 cm in length. The microcoil was inserted into the fistulous tract, and we confirmed that the microcoil was stable, fit, and well-balanced within the bronchus and the thoracic cavity under fluoroscopic guidance. NBCA was then mixed with lipiodol at a proportion of 1: 3. An NBCA-lipiodol mixture was injected through the microcatheter on the endobronchial side of the fistula (Fig. 3). The total procedure time was less than 20 minutes. After the embolization of the BPF, the air leak from the thoracic drain stopped immediately.

Following the treatment of the BPF therapy under fluoroscopic guidance, the patient's symptoms improved, and the tube thoracostomy was removed on the third



A B

Fig. 1. A, B. An MDCT on the 40 th postoperative day demonstrated a communication between the left inferior lingular bronchus and the left pleural space (white arrow), which is suggestive of a BPF. In addition, empyema with air-fluid level was also observed. The right lung was normal.

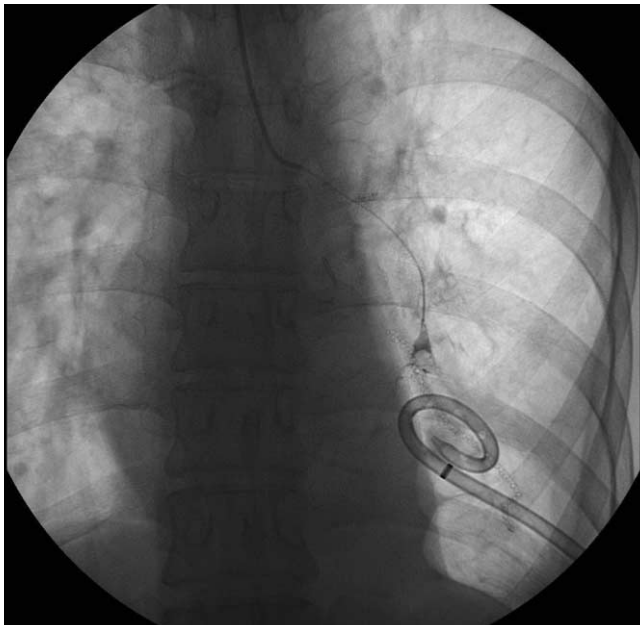


Fig. 2. Contrast agent was infused into the inferior lingular segmental bronchus via a 2.2-F microcatheter. Leakage of contrast agent was observed at the fistulous tract of the subsegmental bronchus of inferior lingula.

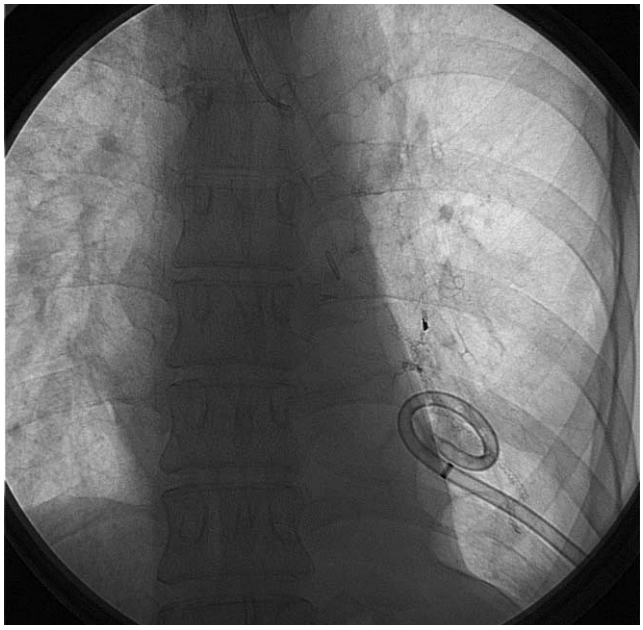


Fig. 3. A platinum vascular occlusion coil was inserted into the fistulous tract. An NBCA-lipiodol mixture (1: 3) was then injected via the microcatheter on the endobronchial side of the fistula.

day after the procedure. Since the treatment, the patient has been periodically monitored in our hospital over the last 12 months without any recurrence of the fistula.

Discussion

A bronchopleural fistula is a rare complication after a pneumonectomy, which carries significant morbidity and mortality rates. It has been known to occur after pulmonary resections for tuberculosis or carcinoma of the lung. The incidence of BPF is significantly higher following pulmonary resection for tubercular conditions, ranging from 2.7 to 10.5 percent.

Computed tomography is the imaging technique of choice for visualizing and characterizing BPFs. With the advent of MDCT, volume acquisition with three-dimensional reconstruction has been used to display the entire course of a BPF. Although chest radiographs do not usually show fistulous communication, they are valuable in suggesting the possibility of a BPF and in monitoring the efficacy of therapy (3).

The treatment of BPFs include surgical procedures, conservative therapy, medical therapy, and in particular, the use of bronchoscopy and different glues, coils, and sealants. Success has been variable and the lack of consensus suggests that no optimal therapy is currently available; rather, the existing interventions seem to be complementary, and it is suggested that treatment should be custom designed (1). The surgical treatments of BPF include standard tube thoracostomy, image-guided percutaneous tube thoracostomy, open drainage, decortication, direct stump closure with intercostal muscles reinforcement, omental flap, transsternal bronchial closure, thoracoplasty with or without extrathoracic chest wall muscle transposition, and thoracoscopy (VATS). Nonsurgical treatments of BPF, including bronchoscopic treatment, have been challenged. In 1977, the first treatment of BPF by bronchoscopy using tissue glue and lead shot was reported. Since then, many studies indicating the use of multiple sealing compounds have been reported. However, all of these publications have been limited to case reports, and no controlled study has addressed the comparative safety and efficacy of these treatment modalities (4).

Watanabe and colleagues (5) have suggested a treatment combination coil and glue. In their study, a coil was placed in the fistula tract and the coil was considered as a core for fibrin glue occlusion (5). Schimizu and associates (6) mounted a 7-cm straight coil and fibrin glue combination powered with oxidized, regenerated cellulose (6). Watanabe and colleagues (7) reported that more metallic coil application would be more effective in large fistulas.

The localization and the apparent size of the fistula

may indicate potential benefits of surgical procedures compared to endoscopic procedures, which may serve as a temporary bridge until the patient's clinical status improves. In other patients who were deemed non-surgical candidates, the aforementioned procedure may be the only option. Distal small BPFs are more suitable for bronchoscopic therapy, while large or central BPFs are best managed with surgery or stent placement. If the BPF appears early after surgery, then reclosure is mandatory (1).

Our case concerns nearly the same application type; however, it contributes by extending the practice area. Moreover, the BPF tract is visualized on MDCT instead of bronchoscopy because the fistula is too small and the location of the fistula is too peripheral. Additionally, during the procedure, we did not embolize the BPF tract under bronchoscopic guidance, but under fluoroscopic guidance.

We think that our case of BPF therapy using a microcoil and NBCA provides a valuable contribution to the noninvasive treatment of BPFs. When BPF tracts are not visualized on the bronchoscope and the location of BPF tracts is too peripheral to access, fluoroscopy-guided BPF therapy with microcoil and NBCA through a microcatheter is very useful.

There are no established guidelines for the proper management of patients with BPF, or even a consensus on how to approach the problem. Further research in these areas may shed light on developing the optimal therapeutic approach for this difficult problem.

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혈관 폐쇄형 코일과 히스토아크릴을 이용한 투시 유도 하 기관지 늑막강루의 치료: 증례 보고[1]

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폐절제술 후에 발생한 기관지 늑막강루는 드물지만, 많은 치료법의 발달에도 불구하고 높은 이환률과 치명률을 보인다. 기관지 늑막강루의 치료는 수술적 치료를 포함하여, 보존적인 치료와 내과적인 치료가 있으며, 최근 기관지 내시경 유도 하에 코일과 글루를 이용하는 비 침습적인 치료가 보고되고 있다. 저자들은 기관지 내시경에서 보이지 않은 폐 절제술 후에 발생한 기관지 늑막강루를 투시 유도 하에 미세코일과 히스토아크릴을 사용하여 치료하였기에 문헌 고찰과 함께 보고하고자 한다.