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Treatment for a Bronchial Fistula at the Bronchial Membrane with Extensive Postoperative Ischemic Bronchitis: Combination of a Free Pericardial Fat Pad and Muscle Flaps

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Case Report

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ABSTRACT

Postoperative ischemic bronchitis can cause a bronchial fistula, which can sometimes be fatal. We report the case of a 79-year-old man who developed a bronchial fistula at the bronchial membrane with extensive postoperative ischemic bronchitis after right lower lobectomy for lung cancer. He was cured by the combination method, reinforcing the bronchial membrane with muscle flaps and closing the fistula with a free pericardial fat pad. The combination treatment of a free pericardial fat pad and muscle flaps can be considered as a therapeutic strategy for a bronchial fistula at the bronchial membrane with extensive postoperative ischemic bronchitis.

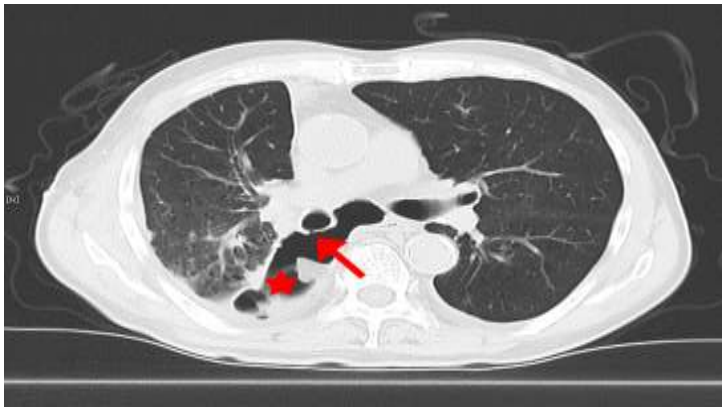
INTRODUCTION

A bronchial fistula after lung cancer surgery is a very significant postoperative complication that can be fatal at times [1]. One cause of a bronchial fistula is Postoperative Ischemic Bronchitis (POIB) due to node dissection at the tracheal bifurcation [2]. We report a case of bronchial fistula at the bronchial membrane with extensive POIB successfully treated by the combination treatment of a Free Pericardial Fat Pad (FPFP) and muscle flaps.

CASE PRESENTATION

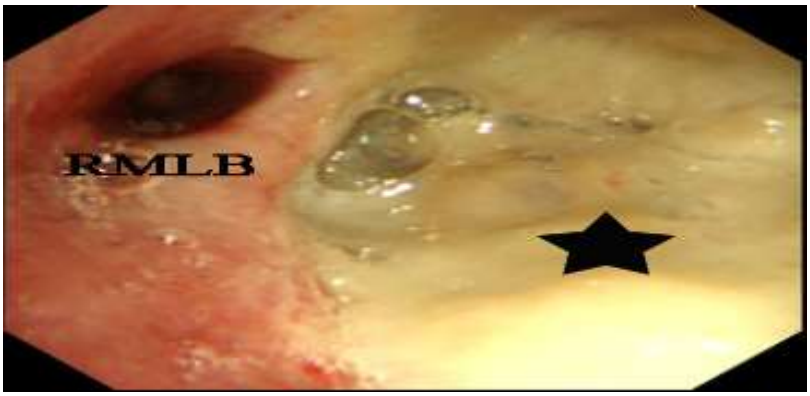
A 79-year-old man underwent video-assisted thoracoscopic right lower lobectomy and lymph node dissection (ND2a-1) for lung cancer. After cutting the right lower bronchus using a stapler, the FPFP was fixed on it with fibrin glue. Since air leakage was not observed from the end of surgery to the 3rd Postoperative Day (POD), the chest drainage tube was removed. He developed pneumonia on the 4th POD, and antibiotic treatment was started. A chest computed tomography scan on the 8th POD, when the patient's respiratory condition worsened, revealed an air space in the right thoracic cavity, suggestive of a bronchial fistula (Figure 1A).

Figure 1A. Axial chest computed tomography image on the 8th POD reveals an air space in the right thoracic cavity (red star) with a suspected bronchial fistula (red arrow).



He underwent thoracic drainage and received nutrition management under the guidance of the Nutrition Support Team. Bronchoscopic findings on the 13th POD showed that the bronchial membrane changed color from the 2nd carina to the bronchial stump (Figure 1B).

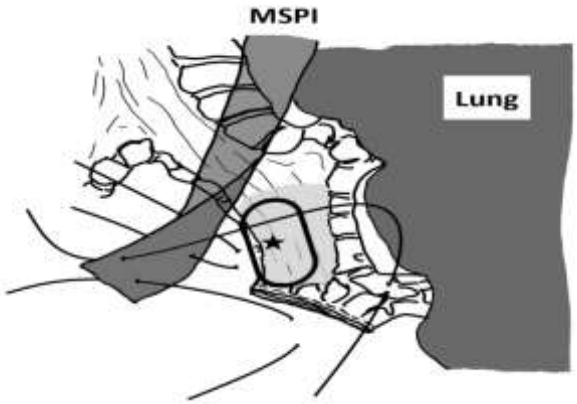
Figure 1B. Bronchoscopic findings on the 13th POD show that the bronchial membrane has changed color from the 2nd carina to the right lower lobe bronchial stump (black star).



Despite the recovery of serum total protein and serum albumin, which had been significantly reduced after the first surgery, persistent air leaks led to the following operation on the 33rd POD. In pleural effusion culture examination 2 days before re-operation, no significant bacterial growth was observed.

Under general anesthesia with one-lung ventilation and with the patient in a left lateral decubitus position, a lateral thoracotomy with resection of the 7th rib was performed, while the musculus latissimus dorsi was temporarily retained to the cranial side. In the thoracic cavity, serous pleural effusion had accumulated, but an abscess was not present. The FPFP, which had been fixed on the bronchial stump during initial surgery, adhered to the stump and the neighboring lung parenchyma. However, there was no leakage in the stump itself, and a fistula was found at the bronchial membrane on the truncus intermedius. After washing the thoracic cavity with saline, the musculus serratus posterior inferior was fixed to the bronchial membrane from the right main bronchus to the bronchial stump. We filled the newly collected FPFP and fixed it on the fistula through the gap between the bronchus and the muscle flap with fibrin glue (Figure 2).

Figure 2. Schema: The MSPI is fixed by suturing so as to surround the fistula (star), and the gaps between the bronchial membrane and the muscle flap are filled with a newly collected free pericardial fat pad (oval). (**Note:** MSPI: Musculus Serratus Posterior Inferior).



The musculus latissimus dorsi was inserted into the thoracic cavity and fixed around the bronchial stump to reinforce it. After confirming that there was no air leakage, the surgery was completed.

On the 2nd POD after re-operation, a wide range of reticular shadows were found in both lungs on chest radiography, and the patient's respiratory condition worsened. We diagnosed bacterial pneumonia and acute respiratory distress syndrome, and started steroid pulse and antibiotic therapy. However, his respiratory condition worsened, and we re-intubated the patient the next day. Since his respiratory condition improved gradually, ventilator management was stopped on the 15th POD from re-operation, and the thoracic drainage tube was removed. Bronchoscopic findings at 3 months after re-operation showed the color of the bronchial membrane to be normal, and the fistula was closed and scarred (Figure 3A). A chest computed tomography scan 2 year later revealed that the cavity had disappeared and the FPFP had remained in place (Figure 3B).

Figure 3A. Bronchoscopic findings at 3 months after re-operation show the color of the bronchial membrane to be normal, and the fistula to be closed and scarred (black arrow). (**Note:** RMLB: Right Middle Lobe Bronchus).

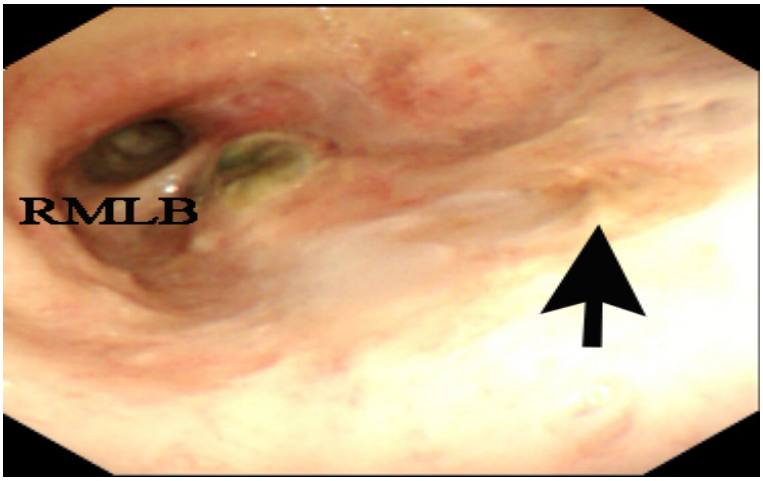
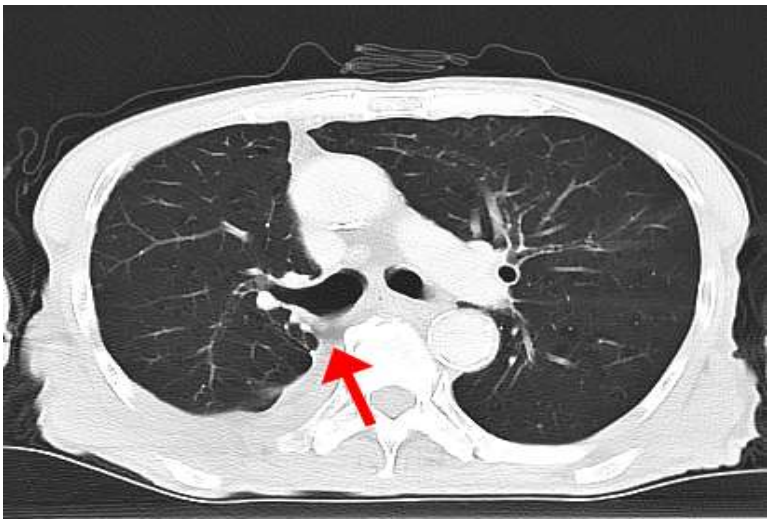


Figure 3B. Axial chest computed tomography image 2 year later reveals that the cavity disappeared and the free pericardial fat pad remained in place (red arrow).



RESULTS AND DISCUSSION

POIB is considered to be due to impaired blood flow to the bronchial stump. Depending on the extent of the blood flow disorder, not only the bronchial stump but also more extensive bronchial ischemia may occur. Benhamed reported that the localization of POIB was mostly at the bronchial stump (62%) but sometimes extended to the unilateral bronchial tree (32%) and the contralateral bronchial tree (6%) [3]. Hyperbaric oxygen therapy has been attempted as a treatment for POIB 3, but its effect is limited and the facilities in which it can be used are limited; therefore it is not a treatment option in our institution.

In general, a muscle flap and/or an omental flap are used to close the bronchial fistula [4]. An omental flap is useful because, not only is it obtained in an amount sufficient to fill the chest cavity; it should have an immunological effect on bacterial infection, in addition to an angiogenic effect [5]. Since an additional abdominal surgery is also required to harvest it, using the omental flap is more invasive.

An FPFP can be easily collected with video-assisted thoracoscopic surgery [6]. And it is also used for the closure of pulmonary fistula, making it a convenient and versatile biological tissue. In addition, it is expected to produce various angiogenic and growth factors that promote wound healing as well as an omental flap [7,8].

In this case, we considered that the bronchial fistula was caused by bronchial ischemia, and that improvement of blood flow was necessary. Therefore, we used a muscle flap to reinforce the bronchial membrane and an FPFP to fill the gap between the muscle flap and bronchus with the expectation of an angiogenic effect on ischemic bronchi. The tissues were easily collected and the procedure was minimally invasive compared with an omental flap. Since the fistula was cured in spite of the very severe conditions after re-operation, these tissues performed as expected. If there is no bacterial infection in the chest cavity and the chest cavity is not large, a combination treatment of an FPFP and muscle flaps, which has not been reported, is a therapeutic strategy for bronchial fistulas that appear at the bronchial membrane with extensive POIB.

CONCLUSION

There are some potential limitations to this combination treatment. It may not be applicable to all cases, such as when it is difficult to collect an FPFP due to adhesion, the chest cavity is so large, or a serious bacterial infection is involved, and it is necessary to accumulate additional cases in the future. There is no standard surgical procedure to close a postoperative bronchial fistula; thus, it is necessary to select and combine appropriate materials. The combination treatment of an FPFP and muscle flaps reported here was very useful for a bronchial fistula with extensive POIB.

DECLARATIONS

Consent for publication

The patient in this case report provided written informed consent.

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Author's contributions

MH designed this report. MY, KT, RK and MO cared for the patient. MH drafted and revised this manuscript. SS supervised this report and revised the manuscript.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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