

Case Report

Surgical resection of a pulmonary artery pseudoaneurysm after middle lobectomy: Report of a case

Takuro MIYAZAKI¹, Naoya YAMASAKI¹, Tomoshi TSUCHIYA¹, Keitaro MATSUMOTO¹, Koichiro SHIMOYAMA¹, Daisuke TANIGUCHI¹, Naoe KINOSHITA², and Takeshi NAGAYASU¹

Departments of ¹Surgical Oncology and ²Pathology, Nagasaki University Graduate School of Biomedical Sciences, 1-7-1 Sakamoto, Nagasaki 852-8501, Japan

A case of surgical resection of a pulmonary artery pseudoaneurysm after middle lobectomy is reported. A 76-year-old man with lung cancer, interstitial pulmonary fibrosis, and pneumoconiosis was referred for surgical resection. Right middle lobectomy with lymph node dissection was successfully performed. Postoperatively, the patient did well until a sudden high fever developed on postoperative day eight. Antibiotic therapy was started for suspected acute pneumonia, but the low-grade fever did not improve. Contrast-enhanced computed tomography showed a bronchopleural fistula that caused a pulmonary artery pseudoaneurysm. Right lower lobectomy via posterolateral thoracotomy was performed to resect the pseudoaneurysm. The pulmonary artery stump was sutured by monofilament unabsorbable stitches. The bronchus stump was sutured interruptedly with a pedicle of intercostal muscles. The patient's postoperative course following repeat thoracotomy was complicated, including exacerbation of interstitial pneumonia and tracheostomy. He is still in hospital, and weaning off the mechanical ventilator is being attempted.

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Introduction

A bronchopleural fistula (BPF) is a major complication after lung surgery [1]. Several possible etiologies contribute to the development of BPF; ischemic change in the bronchial stump is one of the major factors [2], as well as stapling miss-fire. Once it occurs, it is difficult for clinicians to treat this intractable situation. A fatal situation may develop due to pyothorax, with severe inflammation involving the adjacent pulmonary artery, resulting in a pulmonary artery pseudoaneurysm (PAP). A rare case of surgical resection of a PAP after middle lobectomy is reported.

Case Report

A 76-year-old man with a history of pneumoconiosis, idiopathic pulmonary fibrosis, and hypertension was found to have a shadow on chest X-ray examination for an annual medical check-up. He was referred to our department for further examination and evaluation for surgical treatment. The chest X-ray showed a mass shadow in the right lower lung field. Contrast-enhanced computed tomography (CT) showed a mass in the middle lobe that was highly suspicious of lung cancer; in addition, hilar (#11i) and subcarinal (#7) lymph node swelling was seen, along with honeycomb change in bilateral lower lobes. No distant metastases were seen on routine brain magnetic resonance imaging or fluoro-

Address correspondence: Takuro Miyazaki, M.D., Ph.D. Department of Surgical Oncology, Nagasaki University Graduate School of Biomedical Sciences 1-7-1 Sakamoto, Nagasaki 852-8501, Japan

Tel: +81-95-819-7304, Fax: 81-95-819-7306, E-mail : miyataku@nagasaki-u.ac.jp

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deoxyglucose-positron emission tomography/CT scans. Clinical T2aN2M0 Stage IIIA disease was diagnosed. Pulmonary function tests were in the normal range, except for decreased diffusing capacity of the lung for carbon monoxide (%DLCO: 39.9%). Radiotherapy and chemotherapy were considered difficult for the patient due to his age and comorbidities. Thus, it was decided to operate after obtaining detailed informed consent.

Anterolateral thoracotomy was done at the fourth intercostal space. Right middle lobectomy and lymph node dissection (Node dissection 1a + #7 and #10 lymph node sampling) were performed. The bronchus was auto-sutured by Endo GIA™ Tri-staple™ purple 45-mm cartilage (Covidien Surgical, Norwalk, CT, USA). Fibrin glue and a piece of poly-glycolic acid sheet were applied to the bronchial stump, though no air leakage was seen from the bronchial stump. The patient's postoperative clinical course was uneventful until sudden high fever appeared on the 8th postoperative day (POD). Emergent bronchoscopy did not identify an obvious BPF. Antibiotic therapy was started for suspected acute pneumonia, but the low-grade fever did not improve. On the 17th POD, contrast-enhanced CT indicated a PAP, likely due to inflammation of a BPF (Fig. 1a, 1b). Redo operation was performed via posterolateral thoracotomy. Fibrous adhesions and pleural effusions indicated pyothorax, and dehiscence of suture for the middle lobe bronchus and the PAP were identified (Fig. 2). Right lower lobectomy was necessary to resect the PAP because of the risk of rupture. The right main pulmonary artery was taped, and the stump of the pulmonary artery was sutured by monofilament unabsorbable stitches. The right intermediate trunk stump was sutured interruptedly with 3-0 Nylon in Overhalt fashion. In addition, a pedicle of intercostal muscle was attached to the bronchial stump.

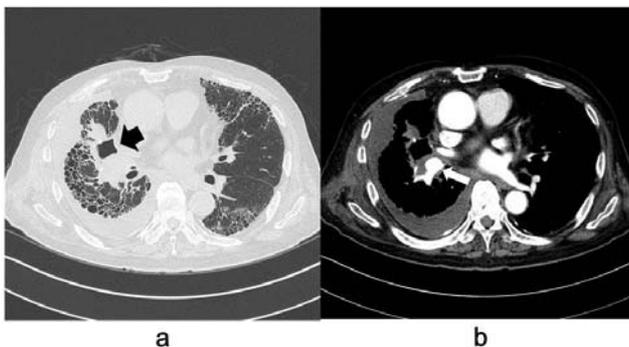


Figure 1a. Chest CT shows an air space between the right upper lobe and the lower lobe, which indicates a bronchopleural fistula (black arrow).

Figure 1b. Chest enhanced CT shows localized saccular dilatation of the interlobar pulmonary artery (9mm) caused by the surrounding inflammation (white arrow).

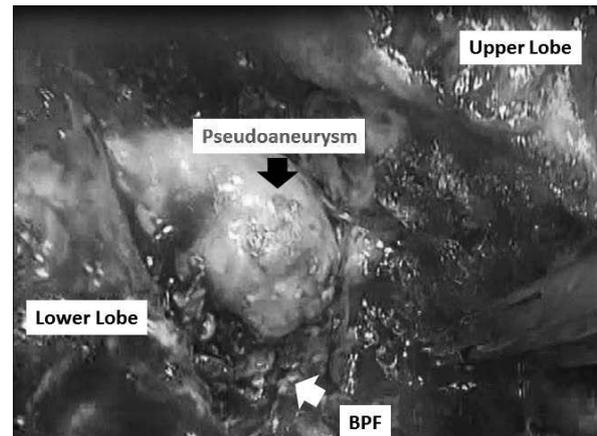


Figure 2. Operative findings. Dehiscence of the bronchial stump (white arrow) and dilatation of the interlobar pulmonary artery (black arrow) are identified.

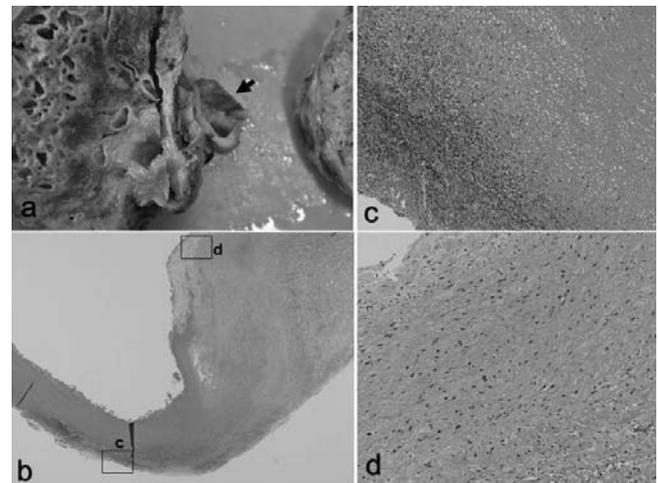


Figure 3. Pathological findings show loss of the muscle layer in the pulmonary artery, and the artery has been replaced by necrotic tissue and abscess.

The pulmonary artery is dilated prominently (4a). The arterial wall is attenuated and totally necrotic. HE \times 20 (4b). The muscle layer is completely lost and replaced by necrotic tissue and abscess. HE \times 100 (4c). Intact portion of the pulmonary artery. The muscle layer is preserved. HE \times 100 (4d).

Pathological findings showed a prominently dilated pulmonary artery (Fig. 3a); microscopically, the arterial wall was attenuated and totally necrotic (3b), and the muscle layer was completely lost and replaced by necrotic tissue and abscess.

The patient's postoperative course following redo-thoracotomy was complicated, including exacerbation of interstitial pneumonia and pyothorax. He is still in hospital for nine months, and weaning off the mechanical ventilator is being attempted.

Discussion

A case of surgical resection of a PAP after middle lobectomy was described. PAP is a rare condition, and it has been described as a result of inflammation of the pulmonary artery; it is especially frequent as a complication after invasive medical procedures, such as vascular interventional procedures, [3], radiofrequency ablation therapy [4], endobronchial brachytherapy [5], and pulmonary resection [6-9]. On the other hand, it could also occur in association with progression of lung neoplasms [10]. There is no question in the present case that the BPF after middle lobectomy caused pyothorax, with severe inflammation to the adjacent pulmonary artery that resulted in PAP.

In previous reports, the patients usually presented with hemoptysis, pyrexia, shortness of breath, and chest pain [3-10] after the above-mentioned invasive procedures. It is not difficult for clinicians to diagnose these symptoms. The gold standard for diagnosis is contrast-enhanced CT, which is less invasive for patients than pulmonary angiography. Emergent treatment is essential for this critical situation; observation is not recommended because Soh et al [4] and Chawla et al [5] found that the patients developed shock due to massive hemothorax and hemoptysis from PAP rupture after invasive medical procedures. Treatment can be either surgical resection of the PAP, which usually requires pulmonary resection [9,10], or interventional radiology [5,7,8]. In the present case, the interventional approach seemed very difficult because the PAP was in an interlobar pulmonary artery; intra-aneurysmal embolization could have resulted in infarction of the lower lobe. Therefore, redo thoracotomy was chosen despite the high risk of exacerbation of interstitial pneumonia.

Needless to say, it is important for surgeons to avoid BPFs, which are a major complication after lung surgery [1]. Of the several possible etiologies contributing to the development of BPF, ischemic change in the bronchial stump is a major factor. In the present case, the BPF was likely caused by ischemic change in the bronchial stump after the lymph node dissection, because the bronchial arteries had to be divided due to the subcarinal lymph node swelling (12 mm in the short axis). Satoh et al [2] reported that the incidence of postoperative ischemic bronchitis (POIB) was 2.5% among 1015 patients undergoing lung resection. In that study, being a male, a smoker, having diabetes mellitus, having postoperative respiratory complications, and subcarinal lymph node dissection were significant factors related to POIB. In addition, this POIB happened even in the middle lobe. These factors were also important in the present case, except for dia-

betes mellitus. However, technical problems occurring during bronchial stapling must always be considered. Since the possibility of technical failures including stapling miss-fire could not be totally excluded, the videos of all initial middle lobectomy procedures were rechecked, but no obvious technical failures or stapling miss-fires were identified.

In conclusion, PAP should be recognized as a serious complication of BPF development, and it could happen even following right middle lobectomy. Surgeons should always pay great attention to the blood supply during bronchial resection.

Conflict of Interest

The authors have no personal conflicts of interest or outside support for this research.

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