External fistulous wound with *Pseudomonas aeruginosa* infection and massive bleeding following rupture of pulmonary suppuration

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**Abstract**

We present a 54-year old man with a pulmonary infectious cavity continuing to a cutaneous fistula. Before he was admitted to our hospital, he had undergone open-window surgery for a left thoracic empyema due to the rupture of pulmonary suppuration of the left upper lobe. He had then undergone thoracoplasty with the plombage of the cavity using left pectoralis major muscle. However, this procedure had failed and the external fistulous wound remained infected by *Pseudomonas aeruginosa* and occasional massive bleeding from the cavity occurred. He underwent en bloc left upper lobectomy for the external fistulous wound. The pediced left latissimus dorsi muscle flap was transposed to fill the dead space and reinforce the bronchial stump. He remained in good health and did not experience intrathoracic infection or haemoptysis.

**Keywords:** Pulmonary suppuration • Thoracic empyema • External fistula • *Pseudomonas aeruginosa* • Latissimus dorsi muscle flap

**INTRODUCTION**

Despite developments in antibiotic therapy, surgical techniques and perioperative care, the management of complex infectious diseases in the thoracic area, such as thoracic empyema, lung suppuration and chest wall abscess, remains difficult. Here, we report a case of a pulmonary infectious cavity—skin fistula (external fistula) due to the rupture of pulmonary suppuration and unsuccessful thoracoplasty with the pectoralis major muscle, which was treated by en bloc left upper lobectomy and transposition of the pedicled latissimus dorsi muscle flap.

**CASE REPORT**

A 54-year old man with a history of cholecystectomy for chronic cholecystitis and insulin-dependent diabetes mellitus was admitted to our hospital for treatment of his left pulmonary cavity—skin fistula (Fig. 1). He had suffered from acute lung suppuration with *Pseudomonas aeruginosa* in his left upper lobe six years earlier. He did not have a pre-existing pulmonary disease such as tuberculosis. However, the lung cavity formed due to persistent suppuration which had ruptured to develop a thoracic empyema. He then underwent an open-window procedure at a local hospital to control the empyema. However, *Pseudomonas* infection in the thoracic and lung cavities could not be controlled. He refused radical surgery at the time and he received daily gauze packing at the hospital. Two years after windowing, he experienced haemorrhagic shock due to massive bleeding from a branch of the pulmonary artery within the infectious cavity. After abstirction and intensive care, he underwent thoracoplasty with the partial resection of the chest wall from the second to the ninth rib and left pectoralis major muscle plombage to the cavity. However, *Pseudomonas* infection damaged the muscle and the external fistula from the cavity to the window (Fig.1A). The apicodorsal branch of the pulmonary artery ran near the cavity (Fig. 1C) and was thought to be the cause of the repeated bleeding. Smears and cultures of pus from the cavity repeatedly occurred six months before admission, and he again experienced haemorrhagic shock one month before admission. He was therefore referred to our hospital for the radical surgical treatment of his left chest lesion.

Figure 1A shows an external fistula in the left lower axilla. Chest computed tomography (CT) showed the cavity in his left upper lobe and the fistula extending to the window (Fig. 1B–D). The apicodorsal branch of the pulmonary artery ran near the cavity (Fig. 1C) and was thought to be the cause of the repeated bleeding. Smears and cultures of pus from the cavity were positive for *P. aeruginosa*, which was sensitive to imipenem/cilastatin. We thus planned to resect the left upper lobe en bloc with the skin window. To fill-up the dead space after lobectomy and reinforce the bronchial stump, the transposition of the pedicled left latissimus dorsi muscle flap was selected. We started intensive insulin therapy for his severe diabetes.

In accordance with the recommendation of the infection control team in our hospital, intravenous imipenem/cilastatin...
administration was started two days before surgery for the purpose of perioperative infection control. After general anaesthesia and the commencement of differential lung ventilation, a skin incision was made around the window, which was then closed to avoid the contamination of the operation field. A lower posterolateral skin incision line was then made and the left pedicled latissimus dorsi muscle flap was preserved. The damaged pedicled pectoralis major muscle was transected and en bloc resection of the left upper lobe and the fistula was performed. The pedicled latissimus dorsi muscle flap was wrapped around the bronchial stump and the dead space in the pleural cavity was filled. The operation time was 462 min and blood loss was 600 ml.

In the postoperative course, a subcutaneous seroma developed in his back but was controlled with puncture. All chest drainage tubes were removed by day 12 after surgery. Pathological examination of the resected lung revealed multiple infectious cavities (Fig. 2A). The patient was discharged 40 days after surgery. Chest CT findings after one year revealed no dead space in the left thoracic cavity and the latissimus dorsi muscle flap appeared vital (Fig. 2B). The patient remained in good health and did not experience lung infection, bleeding or recurrence of fistula (Fig. 2C) 30 months after surgery.

DISCUSSION

Our case in which a ruptured infectious cavity continued to the skin window through a long fistulous passageway, with the
occurrence of serious bleeding, was a very complex case of infectious pulmonary disease. It was thought to be a highly specialized case of chronic thoracic empyema with pulmonary fistula. The application of the principles of empyema treatment is of pivotal importance even in complex cases [1]. As appropriate infection control [2], the skin window site was closed ahead of lobectomy for the prevention of surgical site infection. The removal of the empyema space is one of the critical points [1], especially in our case. Because *P. aeruginosa* has strong haemorrhagic and muscle damaging activities [3] and treatment for its infection is difficult even with sensitive antibiotics [4], plombage of the cavity is not valid for the curative procedure, observed after the second operation of our case. Complete resection of the cavity, fistula and skin window infected with *P. aeruginosa* should be needed. Obliteration of pleural space is the other critical point [1, 5]. Many types of muscular flaps have been described for use in the obliteration of pleural space and chest wall reconstruction [6, 7]. In our case, filling-up the dead space after lobectomy as well as the reinforcement of the bronchial stump was achieved using the pedicled latissimus dorsi muscle flap because other muscles and the omental flap had been damaged due to the earlier operations.

Thus, when surgical management of complex thoracic infectious diseases accompanied by the thoracic empyema is required, comprehensive surgical planning according to the principles of the management of the thoracic empyema is important in obtaining a satisfactory outcome for patients.

**Conflict of interest:** none declared.

**REFERENCES**