

Salvage Treatment of Acute Respiratory Failure after Transcomposite Myocutaneous Flaps Transplantation for Chronic Empyema Combined with Chest wall sinus: A Case Report

Lei Wang

Tongde Hospital Of Zhejiang Province

Zhongliang He (✉ hzpdoctor123@163.com)

Tongde Hospital Of Zhejiang Province

Case report

Keywords: empyema, chest wall sinus, free musculocutaneous flap, respiratory failure, case report

Posted Date: July 7th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-656848/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background

Chronic empyema with chest wall sinus is a complex and refractory disease caused by multiple factors. It may be combined with bronchopleural fistula, residual bone and other necrotic tissue, causing local infection difficult to control, and the disease is a vicious circle.

Case presentation

This paper reports a 62-year-old male patient who underwent right pneumonectomy for squamous cell carcinoma of the lung 11 years ago and began to develop empyema with purulent sinus in the anterior chest wall 3 years ago. Therefore, he was admitted to our medical center for further treatment. Chest computed tomography (CT) showed the right pleural effusion with the chest wall rupture sinus. According to his clinical symptoms and imaging examination, he was diagnosed as chronic empyema with chest wall sinus. Due to the large empyema cavity, the patient should be treated with free vastus lateralis musculocutaneous flap combined with pedicled pectoralis major muscle flap transplantation. After the operation, acute respiratory failure occurred due to left lung aspiration pneumonia.

Conclusions

After a series of treatment measures such as tracheal intubation, tracheotomy, anti-infection, maintenance of circulatory stability, and rehabilitation training, he was finally rescued and cured. Follow-up after discharge showed that the tissue flap survived and empyema was eliminated.

Introduction

The treatment of chronic empyema with chest wall sinus is complicated, especially empyema caused by postpneumonectomy. Some patients even contain a huge purulent cavity because the collapse of the chest is not obvious on the affected side, which often results in poor infection control, more complications, and high mortality (1–2). These often require comprehensive treatment methods, including the management of bronchopleural fistula (BPF) and thoracic cavity, the degree of infection control, and the optimization of general conditions (3). The compound myocutaneous flap is used to treat chronic empyema with a huge empyema cavity. After the operation, it mainly prevents the occurrence of vascular crisis between the donor and the recipient. Among the operation-related complications, the incidence of acute respiratory failure caused by aspiration pneumonia is not high.

We report a case of empyema combined with anterior chest wall sinus after right postpneumonectomy. After transplantation of composite myocutaneous flaps, the patient developed acute respiratory failure and was finally rescued and discharged from the hospital.

Case Presentation

A 62-year-old male patient was diagnosed with poorly differentiated squamous cell carcinoma (central type) 11 years ago and underwent right pneumonectomy. He received 4 chemotherapy before surgery and 2 chemotherapy after surgery. Empyema with anterior chest wall sinus began to appear 3 years ago. During the illness, many times of treatment such as open drainage and closed drainage were performed, but the effect was not good. Chest CT showed thickening of the right pleura with pleural effusion, while chest wall sinus was connected to empyema cavity (Fig. 1A). According to the patient's clinical symptoms and imaging examination, we diagnosed the right chronic empyema with chest wall sinus. During the operation, the chest wall sinus and surrounding scar skin tissues are completely removed. In order to fully expose the abscess cavity, the 5th and 6th rib segments on the right side need to be resected at the same time. Then, the purulent necrotic tissue was fully removed, and the volume of the abscess cavity was about 200ml. Intraoperative bronchoscopy and chest cavity exploration did not find tracheal stump fistula. Finally, two drainage tubes were placed in the thoracic cavity and the incision was sutured. *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* were identified as pathogens in postoperative pus culture. After 16 days of thoracic cavity lavage, sensitive antibiotics to fight infection, and nutritional support, the patient received further radical surgical treatment (preoperative requirements: hemoglobin up to 100g/L; plasma albumin 30g/L; the color of pleural drainage fluid became clear, The drainage volume is less than 100ml per day; the pathogen culture is negative again; the infection is initially controlled, and the surface of a wound granulation is expected to be fresh). First, prepare an ipsilateral thoracic and dorsal artery, two accompanying veins and thoracodorsal nerve in the upper right thoracic cavity as the recipient vascular nerve pedicle. Then take 30cm×10cm free vastus lateralis musculocutaneous flap from the right thigh retaining the descending branches of the lateral femoral circumflex artery, veins and muscular nerve branches at the donor area, and 12cm×8cm pedicled pectoralis major muscle flap (Fig. 1B), Finally, the blood vessels and nerves were anastomosed with 9-prolene and 10-Prolene lines with the aid of microscope (Fig. 1C). After washing the residual cavity wound repeatedly, the compound myocutaneous flap was transplanted to the recipient area to eliminate the residual cavity, and the skin island was tension-free sutured with the healthy skin around the chest. Intraoperative blood transfusion included 1.5 units of suspended red blood cells and 210ml fresh frozen plasma. After operation, the patients were treated with anti-infective, antispasmodic and anticoagulant therapy. The skin island color was closely observed and the right upper limb was immobilized(4).

The vital signs of the patients were stable and no vascular crisis occurred in the first 3 days after operation. On the 4th day after surgery, the patient had sudden dyspnea at night, sitting upright breathing, cyanosis, no obvious rales in the left lung, oxygen saturation maintained 50% – 70% under oxygen mask, and blood pressure was 102 / 60mmhg. The related examination showed that D-dimer, BNP and myocardial enzyme were normal or slightly high. There was no obvious thrombosis on the vascular ultrasound of the lower extremities. The Bedside chest X-ray showed increased left lung markings. In order to shorten the rescue time, the patient was immediately intubated and transferred to EICU for further treatment. After the circulation was stable, the chest CT scan was performed immediately, which showed that the changes after the right thoracic muscle flap tamponade, the left lung transparency increased,

multiple air cavities and patchy increased density shadow. Combined with the patient's symptoms, signs and imaging examinations, acute respiratory failure caused by aspiration pneumonia should be considered. After endotracheal intubation, vasoactive drugs and other treatments, respiratory circulation is still difficult to maintain, we choose tracheotomy, ventilator assisted breathing. To make matters worse, the free skin island became necrotic due to long-term use of vasoconstrictors. In order to avoid infection, the necrotic scab on the surface was removed and vacuum sealing drainage(VSD) device was placed on the wound surface. After maintenance of anti-infection, postural drainage, sedation, blood transfusion and other treatments, the lung infection improved slightly in the short term, but after a period of treatment, it worsened again, and the respiratory failure was not significantly controlled. At this time, we had to reflect on whether there was a tracheal stump fistula on the right side. When the bronchoscopy airway care was performed for the 5th time, we found suspicious small bubbles on the right tracheal stump, and then treated with sclerosing agent in time (Fig. 2). After a series of long-term treatment, the patient was finally rescued and discharged from the hospital, and the incision healed well (Fig. 3A). Follow-up for 2 months, re-examination of chest CT showed that the right tissue flap survived, empyema was eliminated, and left lung infection disappeared(Fig. 3B).

Discussion

Patients with chronic empyema with chest wall sinus need long-term flap drainage or closed drainage of empyema, especially those who have undergone postpneumonectomy or have lung tissue infection necrosis, BPF, which is a major challenge for current clinical treatment. It is very important to choose the operation method and deal with the postoperative complications in time, especially in the elderly patients, once there is such as muscle flap necrosis, respiratory failure and other critical cases, timely treatment has a positive impact on the prognosis (5, 6). Respiratory failure caused by acute empyema is very common in clinic, and even some special bacteria have been reported (7). However, acute respiratory failure caused by chronic empyema combined with chest wall sinus tract tissue flap transplantation is rarely reported.

Aspiration pneumonia complicated with respiratory failure is a common acute and severe disease, which often occurs in patients with long-term bedridden, severe trauma, shock after major surgery. Due to the experience of transplantation of free lateral thigh myocutaneous flap and pedicled pectoralis major myocutaneous flap, this patient has great trauma and needs special posture after operation. At the same time, because of analgesia or anesthesia, the ability of airway protection such as swallowing reflex and cough reflex weakened or disappeared, gastrointestinal function weakened, and the risk of reflux and aspiration increased. Of course, bronchoscopy found suspicious air bubbles in the tracheal stump, and it cannot be completely ruled out that there is a tracheal stump fistula on the surgical side. In any case, rescue treatment measures for acute respiratory failure are inevitable. Despite the increased risk of mechanical ventilation caused by rescue treatment, prolonged hospital stay in EICU, the use of antibacterial drugs is inevitable, and even de-escalation treatment and combination medication are required (8), for patients with only one lung and suffering from extensive inhalation infection, such successful rescue and cure cases are commendable.

For patients with refractory chronic empyema complicated with chest wall sinus, most of them underwent thoracic surgery such as closed thoracic drainage, open window thoracostomy(OWT) or thoracoplasty, especially the posterolateral thoracic incision cut off the local muscles and blood vessels of the chest wall. It is impossible to obtain a large enough muscle flap nearby to eliminate the huge empyema cavity(9, 10). Since it was reported that extrathoracic skeletal muscle was implanted into the thoracic cavity in 1989, living tissues such as omental flaps, rectus abdominis myocutaneous flaps and latissimus dorsi myocutaneous flaps have also been clinically used. Although the surgical trauma is great, the tissue utilization rate is higher and the empyema cavity can be completely eliminated. In this case, we selected the free vastus lateralis musculocutaneous flap and pedicled pectoralis major myocutaneous flap for treatment. Compared with other free myocutaneous flaps, this combined myocutaneous flaps have the advantage of convenient anatomy, easy access, large volume and rich muscle tissue, which can meet the requirements of filling huge cavities, it can enrich the vascular anastomosis between donor and recipient (11, 12).

To analyze and summarize this operation, we can't just focus on whether there is tissue flap necrosis caused by vasospasm and blockage after reconstruction. Due to the occurrence of acute respiratory failure, we should reflect on the causes, because no tracheal stump fistula was found during the operation, and the postoperative fiberoptic bronchoscopy was verified for many times, only suspicious signs were found in one examination, Is it the aspiration of the patient or the existence of a small fistula? Combined with this experience, it is worth discussing the feasibility of prophylactic use of sclerosing agent in the next operation for patients with the same condition.

In conclusion, the chest CT of the patient showed that there was no recurrence of empyema and chest wall sinus in the later follow-up, and the transplanted combined tissue flap survived. Although there was acute respiratory failure after the operation, it correctly grasped the rescue opportunity and accumulated some valuable experience for the full evaluation of the next operation.

Abbreviations

CT
Computed tomography
BPF
Bronchopleural fistula
VSD
Vacuum sealing drainage
OWT
Open window thoracostomy

Declarations

Availability of data and materials

Not applicable.

Acknowledgments

None.

Funding

None.

Declarations

Ethics approval and consent to participate

All procedures carried out in this study were in accordance with the ethical standards of the institutional and national responsible committee on human experimentation and the Helsinki Declaration of 1964 and its later amendments or equivalents. This study was approved by the Ethics Committee of Tongde Hospital of Zhejiang Province. Informed consent was obtained from all individual patients included in the study.

Consent for publication

Written Informed consent for publication was obtained from all individual patients included in the study.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

LW and ZH designed the study. LW collected the data. Material preparation and the data analysis were performed by LW. All authors read and approved the final manuscript.

References

1. He Z, Shen L, XU, W, et al. An 83-year-old-male with bronchopleural fistula and empyema successfully treated with multidisciplinary management of thoracostomy, endoscopic, and surgical treatment: a case report. *Ann Transl Med.* 2021;9(5):427.
2. Farhan AM, Sohail SC, Usama Z, et al. VATS thoracoscopic decortication for empyema thoracic: A retrospective experience and analysis of 162 cases. *JPMA* 2021;71: 502.
3. Mazzella A, Pardolesi A, Maisonneuve P, Petrella F, Galetta D, Gasparri R, et al. Bronchopleural fistula after pneumonectomy: risk factors and management, focusing on open window thoracostomy. *Semin Thorac Cardiovasc Surg.* 2018;30:104–13.

4. Fricke A, Bannasch H, Klein HF, et al. Pedicled and free flaps for intrathoracic fistula management[J]. *Eur J Cardio-thorac Surg.* 2017;52(5):1211–7.
5. Zanotti G, Mitchell JD. Bronchopleural fistula and empyema after anatomic lung resection. *Thorac Surg Clin.* 2015;25:421–7.
6. Walsh MD, Bruno AD, Onaitis MW, et al. The role of intrathoracic free flaps for chronic empyema. *Ann Thorac Surg.* 2011;91:865–8.
7. Wang HK, Teng LJ, Chen YC, et al. Lactobacillus salivarius empyema with respiratory failure. *J Microbiol Immunol Infect.* 2017;50(6):923–5.
8. Yamasaki K, Kawanami T, Yatera K, et al. Significance of anaerobes and oral bacteria in community-acquired pneumonia[J]. *PLoS One*, 2013, 8(5):e63103.
9. Lu C, Feng Z, Ge D, et al. Pedicle muscle flap transposition for chronic empyema with persistent bronchopleural fistula: experience of a single clinical center in China. *Surg Today.* 2016;46(10):1132–7.
10. Watanabe K, Kiyokawa K, Ino K, et al. Treatment strategies for refractory pulmonary fistula using a latissimus doris muscle flap[J]. *J Plast Reconstr Aesthet Surg.* 2011;64(8):1014–21.
11. He Z, Liu Z, Shen L, et al. Treatment of chronic postoperative empyema by free vastus lateralis musculocutaneous flap transplantation[J]. *Chin J Thorac Cardiovasc Surg.* 2020;36(8):502–4.
12. He X, He Z, Shen L, et al. Free musculocutaneous flap transfer for refractory chronic empyema with chest wall sinus in a 43-year-old male with hemophilia A. *J Thorac Dis.* 2018;10:E416-9.

Figures

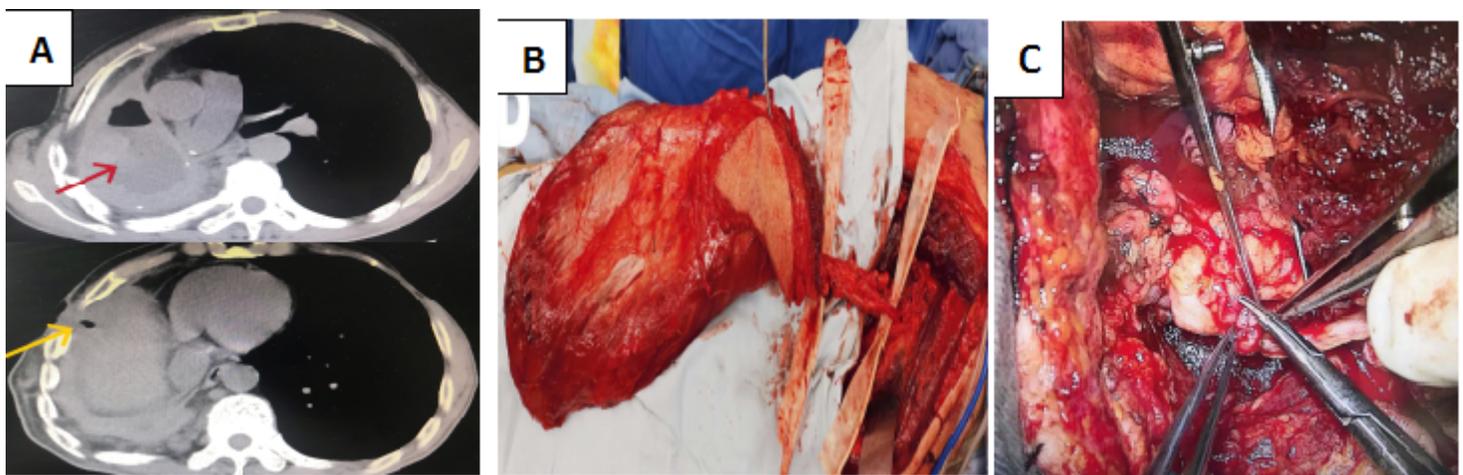


Figure 1

Clinical data of patient (A) Preoperative CT of the chest showed pleural effusion on the right side (red arrow), and the chest wall sinus was connected to the thoracic cavity (yellow arrow). (B) The free vastus lateralis musculocutaneous flap with neurovascular pedicle was completed during the operation. (C)

Anastomosis of blood vessels and nerves between the donor and the recipient was completed under a high-power microscope.

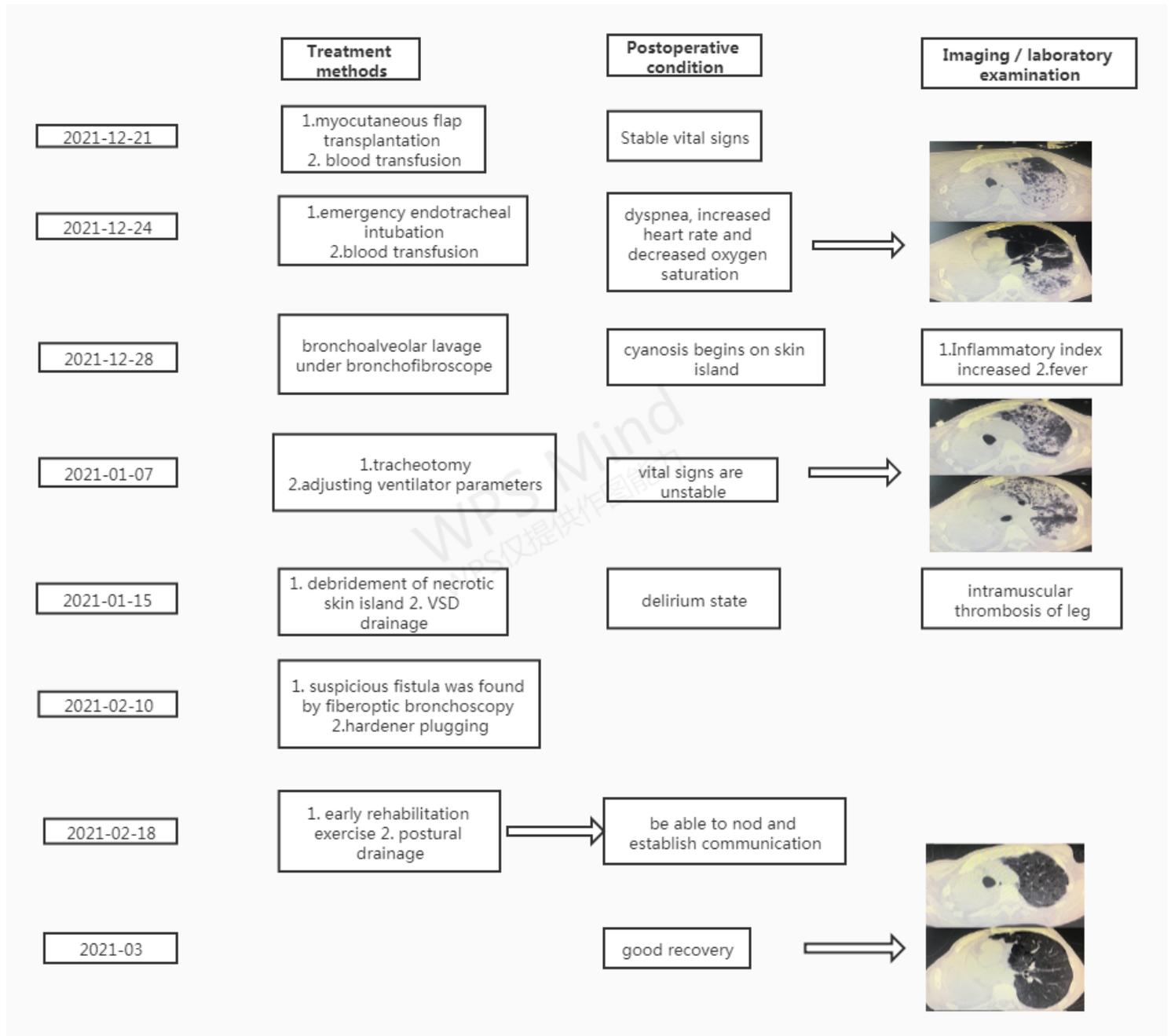


Figure 2

Treatment schedule. The patient undergoes a series of treatment measures to obtain satisfactory results from surgery to recovery.

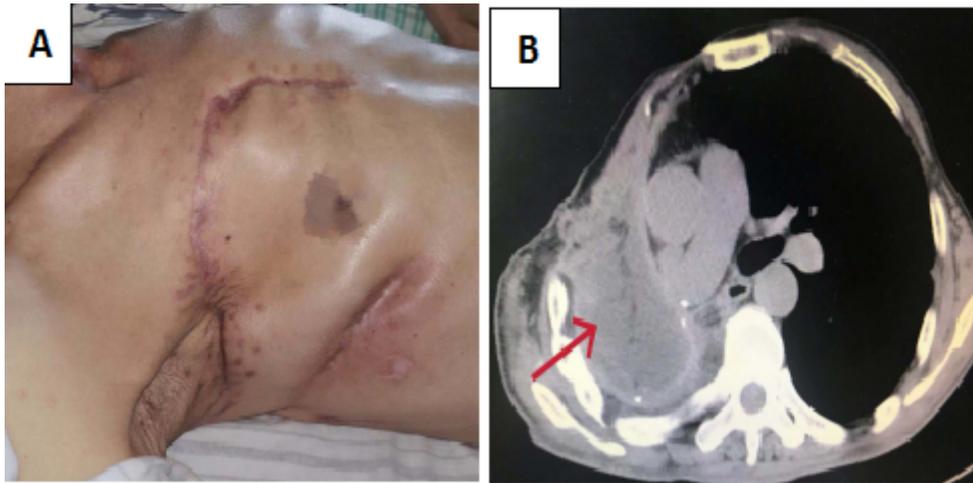


Figure 3

(A) The postoperative chest incision recovered well. (B) Postoperative chest CT showed that the compound myocutaneous flap completely filled the thoracic cavity, and the chronic empyema and chest wall sinus disappeared.