



Case report

A case report of using gauze packing to treat postoperative chest bleeding after left pneumonectomy for secondary rifampicin-resistant tuberculosis

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ABSTRACT

One patient with rifampin-resistant tuberculosis underwent emergency left pneumonectomy and thoracic gauze packing for hemoptysis due to recurrent hemoptysis after transcatheter arterial embolization. Vital signs were maintained by mechanical ventilation and medication. Tracheotomy and anti-tuberculosis treatment were performed. After half a year of follow-up, the patient's condition was stable.

A 58-year-old male patient was admitted to the hospital on August 5, 2022, due to "cough, phlegm, and chest tightness for 1 month, aggravated for 1 week". The patient had no obvious cause for coughing up green phlegm a month ago. After exercise, he felt chest tightness and shortness of breath. Since the onset of the illness, the patient's mental status, appetite, and sleep have been normal, and there have been no significant changes in bowel movements, decreased physical strength, or body weight.

History of anti-tuberculosis treatment: ①In 1996, anti-tuberculosis treatment was received for pulmonary tuberculosis and the treatment was stopped by the patient after 2 months. ②In August 2011 and May 2016, sputum smears (+) and tuberculosis cultures (+); drug sensitivity testing showed full sensitivity, and both were treated according to the retreatment plan for 1 year. During this period, chronic cough and dyspnea after exercise gradually appeared. ③In September 2019, the patient hospitalized again due to hemoptysis; drug sensitivity testing of tuberculosis culture showed resistance to rifampicin, rifabutin, and pyrazinamide; he underwent "catheter arterial embolization" and received anti-tuberculosis treatment with LZD-CS-LFX-PTO-Am (LZD: linezolid, CS: cycloserine, LFX: levofloxacin, PTO: pyrazinamide capsules, Am: amikacin) until May 2020, then he stopped the treatment.

Preoperative examination and diagnosis: white blood cell (WBC) count was $13.91 \times 10^9/L$; C-reactive protein (CRP) was 86.70 mg/L; brain natriuretic peptide (BNP) was 6804.00 pg/ml; erythrocyte

sedimentation rate (ESR) was 55.00 mm/h; cardiac ultrasonography showed right heart enlargement, tricuspid regurgitation, and reduced left ventricular diastolic function; electrocardiogram showed 1. sinus tachycardia, 2. left anterior branch block, 3. anterior wall abnormal Q wave, 4. pulmonary P wave; chest CT indicated that the left lower lung lesion had worsened compared to before. Sputum tuberculosis RNA was positive; STB (4+) * 3. The main diagnoses were: 1. Chronic obstructive pulmonary disease with acute lower respiratory tract infection, type II respiratory failure; 2. Pulmonary heart disease, heart function grade III; 3. Rifampicin-resistant tuberculosis, secondary pulmonary tuberculosis, both lungs, smear (+) retreatment with cavity; 4. Bronchiectasis and infection combined with pulmonary fungal infection.

Treatment after hospitalization: Anti-tuberculosis medication and symptomatic treatment: According to drug sensitivity and treatment history, LZD-CFZ-CS-LFX-PTO-PAS anti-tuberculosis treatment was given (CFZ: clofazimine, PAS: Para-aminosalicylic acid). Interventional treatment: Two weeks after admission, the patient coughed up about 100 ml of fresh blood in the early morning; emergency CTA examination was performed. After the hemoptysis exacerbated, with an amount of about 300 ml, emergency "catheter arterial embolization" was performed. Deciding to undergo surgery: The day after embolization, the patient coughed up about 300 ml of fresh blood again, accompanied by urinary incontinence, profuse sweating, blood pressure of 85/52 mmHg, oxygen saturation (SpO₂) of 88% (3 L/min), heart rate of 115 beats/

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minute, and shallow coma. The patient and his family refused to undergo action thrombosis treatment again and strongly demanded surgery.

Intraoperative management: Emergency thoracoscopic-assisted extrapleural left lung resection with fibrous peel removal, thoracic gauze packing and tracheal stump myoplasty. During the operation, there was extensive adhesion of the thoracic cavity and severe bleeding from the wound, with an average bleeding volume of over 100 ml every 10 min and a total estimated blood loss of about 4000 ml, and the blood pressure could not be measured for a period of time. A large amount of blood transfusion was given, combined with norepinephrine and epinephrine to maintain blood pressure. Conventional methods such as electrocoagulation, argon plasma coagulation, and medical hemostatic agents were tried, but the effect was not satisfactory. Compressing with hot saline gauze could relieve bleeding, but bleeding continued after removing the gauze, so thoracic gauze packing was performed. The specific method is to firmly link the gauze with a suture knot, fill the gauze from the periphery to the incision with the surgical incision as the center, and place the end of the last piece of gauze outside the incision. Then suture the wound one by one, avoiding the gauze being sutured to the chest wall and leaving the incision to ensure that the gauze can be removed (Fig. 1).

Postoperative symptomatic supportive treatment

①Life support: Vital signs were stable 8 h after surgery, tracheal intubation was removed, and changed to high flow nasal cannula (HHFNC). Blood pressure was normal and hemostatic drugs were discontinued. Non-invasive ventilation was not tolerated, and endotracheal intubation was performed with mechanical ventilation assistance (PEEP 6cmH₂O, IPAP 18cmH₂O).

②Tracheotomy and symptomatic supportive treatment: On the third day after surgery, the dressing was removed completely in one go. In the afternoon, tracheotomy was performed, sedation was discontinued, and mechanical ventilation assistance, intermittent suctioning, anti-infection treatment, expectoration, nebulization, oral care, enteral nutrition through a gastric tube, and preoperative nasogastric feeding of

anti-tuberculosis agents were administered. Bedside rehabilitation training was started and the tube was gradually removed with intermittent functional exercises.

Discussion

The patient had intermittent anti-tuberculosis treatment for more than 10 years due to pulmonary tuberculosis. Gradually, respiratory failure and pulmonary heart disease developed. The disease progressed from drug-sensitive tuberculosis to rifampicin-resistant tuberculosis, and the lesion gradually enlarged. Eventually, due to the failure of internal medical treatment for massive hemoptysis and bronchial artery embolization, the patient chose surgical treatment. However, due to severe intrathoracic adhesion, there was significant bleeding during the operation and it was difficult to control. Chest cavity gauze packing was used to stop the bleeding, and multiple measures were taken to ensure the patient's safety during the perioperative period. This case has the following characteristics: 1) Respiratory and cardiac dysfunction is a relative contraindication for total lung resection [1]; 2) The use of chest cavity gauze packing for hemostasis during total lung resection is rare in literature reports; 3) Reports of mechanical ventilation and circulatory support after chest cavity gauze packing hemostasis are rare both domestically and internationally. The experiences of treating this patient are summarized here and shared with colleagues.

1. Surgical treatment of rifampicin-resistant tuberculosis: surgical methods and indications.

Today, when the cure rate of rifampicin-resistant tuberculosis with single drug therapy has not yet made a breakthrough, the role of surgery in the diagnosis and treatment of multidrug-resistant tuberculosis has been unanimously recommended by WHO guidelines and experts [2,3]. Through surgical resection, the purpose of achieving sputum culture conversion and cure can be achieved. The suitable surgical objects are: localized lesions, continuous bacterial shedding, or those with poor expected results from single drug therapy and can tolerate surgery such as heart and lung functions [3]. The surgical approach depends on the location and extent of the



Fig. 1. The surgeon removes the packing gauze in the chest cavity in a sterile operation.

lesion, including pulmonary wedge resection, pulmonary lobectomy, or total lung resection. In general, total lung resection should be done with caution [3]. The timing of surgery depends on the condition of the disease. Patients with rifampicin-resistant tuberculosis who choose to undergo elective surgery generally require the control of tuberculosis symptoms, limited lesions, and continuous anti-tuberculosis treatment for more than 2 months before the operation can be performed [4]. However, some opinions believe that excessive emphasis on the chemotherapy duration may increase the spread of the lesion and affect the healthy lungs [5]. This patient's preoperative anti-tuberculosis duration was only half a month, and he underwent emergency surgery due to life-threatening massive hemoptysis. Therefore, the timing of surgery should be individually determined based on the disease condition, especially when critical conditions such as emergency hemoptysis and pneumothorax occur, and the inadequate use of drugs should not be a contraindication for surgery [6].

2. Points to consider when selecting gauze for filling and stopping bleeding.

Intrathoracic bleeding is a common complication in thoracic surgery, and is a main reason for re-operation; while extensive adhesions and severe keloid-like adhesions in the thorax are the main reasons for intraoperative and postoperative bleeding [7]. Choosing the timing of surgery after controlling inflammation can significantly reduce wound leakage, so routine measures for managing bleeding during elective surgery can be taken [8]. In this case, the preoperative anti-tuberculosis treatment was short, so in order to avoid contamination of the thoracic cavity by bacteria if the visceral pleura was damaged, we chose to perform left pneumonectomy and thoracic gauze packing. The experience of this case suggests that thoracic gauze packing is suitable for stopping bleeding after extensive and heavy bleeding from the chest wall incision after total lung resection.

3. Gauze filling, postoperative respiratory and circulation maintenance, and timing of gauze removal:

In this case, chest gauze filling and blood pressure maintenance are contradictory. Removing the gauze too early could worsen chest bleeding and cause secondary hemorrhagic shock, while removing it too late could lead to difficulty in maintaining blood pressure and secondary chest infection [9]. Therefore, after weighing the pros and cons, we began gradually removing the gauze and inserting a chest drainage tube 48 h after the operation. This also indicates that chest gauze filling can effectively control bleeding and exudate for 48 h, ensuring surgical safety [10]. As circulation stabilizes, respiratory function also improves, indicating a correlation between postoperative respiratory dysfunction and unstable circulation.

Ethics approval

The ethics committee of Wuhan Pulmonary Hospital reviewed and approved the study protocol. The patient gave written informed consent before enrollment.

Consent

Written informed consent was obtained from the patient for

publication of this case report.

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CRediT authorship contribution statement

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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