

# Massive hemoptysis secondary to hemorrhagic traumatic pulmonary pseudocysts

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## CASE PRESENTATION

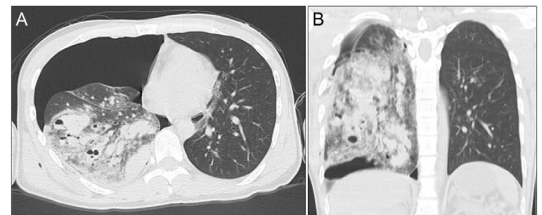
A patient in their 30s was brought to our emergency department after being struck by a car. At the scene, the patient was unconscious, and their blood pressure was unmeasurable. At admission, their vital signs were as follows: Glasgow Coma Scale score 13 (E4V3M6), blood pressure 153/88 mm Hg, heart rate 113 beats/min, respiratory rate 24/min, oxygen saturation (SpO<sub>2</sub>) 100% (under oxygen face mask 10L/min), and body temperature 36.5°C. The primary examination was remarkable for mild subcutaneous emphysema on the right chest wall and diminished breath sounds on the right. Extended-focused assessment with sonography for trauma revealed loss of lung sliding and pleural effusion in the right thoracic cavity. Blood gas analysis showed pH 7.25, partial pressure of carbon dioxide 30.8 mm Hg, partial pressure of oxygen 66.6 mm Hg, HCO<sub>3</sub><sup>-</sup> 13.3 mEq/L, and lactic acid 3.28 mmol/L. No anemia or coagulopathy was observed on the laboratory test. A trauma whole-body CT scan revealed right 4th–10th rib fractures, hemopneumothorax, and multiple traumatic pulmonary pseudocysts (TPPs) with contrast extravasation in pseudocysts localized in the right lower lobe ([figure 1](#); Injury Severity Score 20, Revised Trauma Score 2.0, Trauma and Injury Severity Score Probability survival 0.29). Right tube thoracotomy resulted in small air leakage and mild bloody drainage. The patient started to cough up a moderate amount of bright red blood. The patient became tachycardic and tachypneic. The SpO<sub>2</sub> decreased to the lower 90s.

## WHAT WOULD YOU DO?

- Oxygenation via a high-flow nasal cannula and pulmonary physical therapy.
- Single-lumen endotracheal intubation followed by mechanical ventilation with high positive end-expiratory pressure until bleeding subsides.
- Right lung isolation with double-lumen endotracheal intubation followed by transcatheter arterial embolization.
- Right lung isolation by selective left mainstem intubation with a double-lumen endotracheal tube followed by right lower lung lobectomy.

## WHAT WE DID AND WHY

The patient was intubated into the left mainstem with a double-lumen endotracheal tube under bronchoscopy. The isolated one-lung ventilation started to rest the injured right lung and protect the healthy left lung ([figure 2](#)). On bronchoscopy, bright red blood was continuously flowing from the right



**Figure 1** CT scan of the chest at admission revealed a right pneumothorax and multiple traumatic pulmonary pseudocysts within the lower lobe of the right lung with blood retention on axial view (A) and coronal view (B).



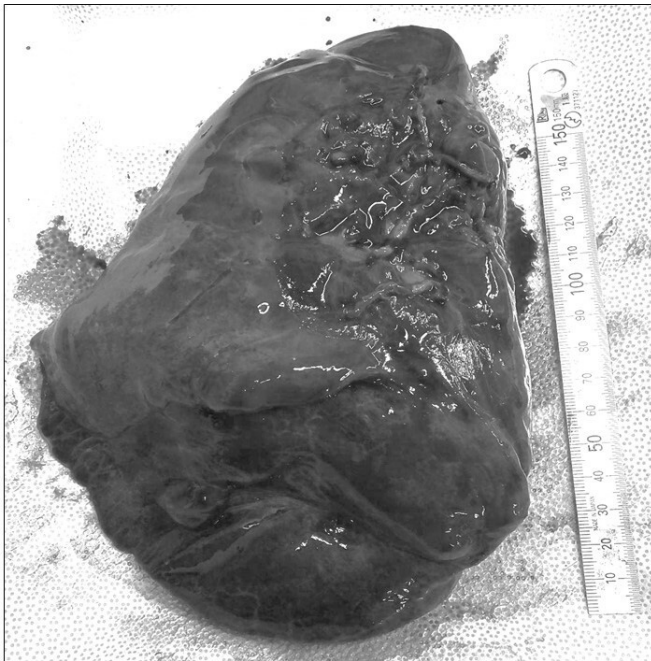
**Figure 2** Plain chest X-ray after insertion of a right thoracic drain and intubation of the left main bronchus with a double-lumen endotracheal tube. The right pneumothorax has improved, but there is a marked decrease in the permeability of the entire right lung field.

main bronchus. Although isolated one-lung ventilation was continued expectantly for several hours, hemoptysis did not subside. Two units of red blood cells were transfused. We decided to transfer the patient to the operating room.

A video-assisted right lower lung lobectomy was performed. The right lower lobe was significantly swollen and dark red in color due to intraparenchymal hemorrhage. The specimen was filled with blood in multiple TPPs and weighed 800 g ([figure 3](#)). The operation time was 3 hours 27 minutes. The estimated intraoperative blood loss was 411 mL. Two units of red blood cells were transfused intraoperatively. The patient was extubated on postoperative day 1 and discharged home on postoperative day 27.

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**Figure 3** Specimen of the resected lower lobe of the right lung. The lung parenchyma was swollen, reddish-black in color, and heavy because it was filled with blood.

## DISCUSSION

We presented a case with massive hemoptysis due to hemorrhagic TPPs, which was successfully treated with lung resection after isolated one-lung ventilation. The persistent hemoptysis prompted us to perform a formal pulmonary lobectomy. Fortunately, only the lower lobe of the right lung was damaged and the left lung remained healthy, so isolated one-lung ventilation and surgical resection were possible.

TPP is a severe form of pulmonary injury caused by blunt chest trauma accompanying pulmonary contusion or rib fractures. This entity is rare, reported in 1% to 10% of cases of chest trauma. Pathophysiologically, it is considered that violated lung parenchyma ultimately creates a cavity that fills with air or blood until equalization of pressures results in cessation of cavity expansion. The literature about TPP mostly concerns the

pediatric population because there is a higher incidence of TPP in children due to the pliability of the costochondral cartilage.

Although TPP is typically considered to be a self-limiting condition that does not require specific treatment, massive hemoptysis and infection require intervention. Because the pulmonary artery and vein are low-pressure circuits, hemorrhage from TPPs often heals spontaneously. Although rare, significant hemoptysis can result in profound respiratory compromise. Control of the airway is accomplished by a double-lumen endotracheal tube, selective mainstem intubation, or bronchial blocker. If hemoptysis does not subside, surgery will be an option.

In the present case, we tried isolated one-lung ventilation with double-lumen endotracheal intubation as soon as hemoptysis started. Because hemoptysis persisted and blood transfusion was required after several hours, we proceeded with surgery before complications in the healthy lung made isolated one-lung ventilation impossible. A formal right lower lobectomy provided definitive hemorrhage control and resulted in a feasible outcome.

In the management of hemorrhagic TPPs presenting with massive hemoptysis, protection of the airway and the healthy side of the lung by double-lumen endotracheal intubation for isolated one-lung ventilation as well as early recognition of indications for surgery, including formal lung resection, are crucial.

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