

Catastrophic pulmonary haemorrhage after endobronchial biopsy of necrotic lung mass

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Abstract

Flexible bronchoscopy (FB) is instrumental in the diagnosis and treatment of respiratory illness, with low rates of bleeding post-procedure but unpredictable degrees of severity. Although exceedingly rare, massive pulmonary haemorrhage after FB is often catastrophic. We present a case of massive pulmonary haemorrhage after endobronchial biopsy of a 67-year-old patient with a prior diagnosis of right upper lobe (RUL) necrotic lung mass. Imaging revealed possible lymphangitic carcinomatosis and tumour invasion into the lymphatics and vasculature. Significant RUL tumour burden was visualized during the procedure, however, routine endobronchial biopsy resulted in massive pulmonary haemorrhage leading to pulseless electrical activity. Prevention of massive pulmonary haemorrhage may be possible with identification of known risk factors. Catastrophic outcomes from massive pulmonary haemorrhage remain high despite current therapies. Further studies identifying modifiable risk factors, treatment protocols, and the formulation of a multi-disciplinary action plan could prove lifesaving.

KEYWORDS

case report, catastrophic pulmonary, flexible bronchoscopy, haemorrhage, haemorrhage

INTRODUCTION

Flexible bronchoscopy (FB) is instrumental in the diagnosis and treatment of respiratory illness. FB is common, with bleeding post-procedure incidence between 0.26% and 5% but unpredictable degrees of severity.¹ For severe cases, massive haemorrhage is often catastrophic. Despite the critical nature of massive haemorrhage and the recommendations regarding its perioperative management, outcomes remain poor.

It is estimated that 90% of massive pulmonary haemorrhages are due to high pressure arterial system bleeds from bronchial vasculature.¹ Hence, bronchial artery embolization (BAE) is an effective first-line treatment with high-success rates (70%–99%).¹ BAE succeeds in treating haemorrhages due to tuberculosis, bronchiectasis, malignancy and pneumonia but requires complete angiography of the pulmonary vascular tree.² Still, re-bleeding occurs in approximately 58% over the next 30 days.¹ If conservative therapies fail, surgical

resection must be considered, recognizing mortality rates up to 35%.¹ Consequently, catastrophic outcomes after massive pulmonary haemorrhage remain high despite current therapies. We present a case of catastrophic haemorrhage following FB with endobronchial biopsy of a necrotic lung mass.

CASE REPORT

A 67-year-old male presented to the emergency department with progressive generalized weakness, fever, chills, poor appetite, and a 24 kg weight loss over the past 6 months. Two months prior, the patient was diagnosed with a right upper lobe (RUL) lung mass of unknown aetiology. PET scan revealed a standardized uptake value of 15.5, representative of intense hypermetabolism, suggesting malignancy. CT thorax with contrast (Figure 1) demonstrated a consolidative density in the RUL measuring 7.6 cm × 7.2 cm with coarse interstitial thickening at the borders and multiple

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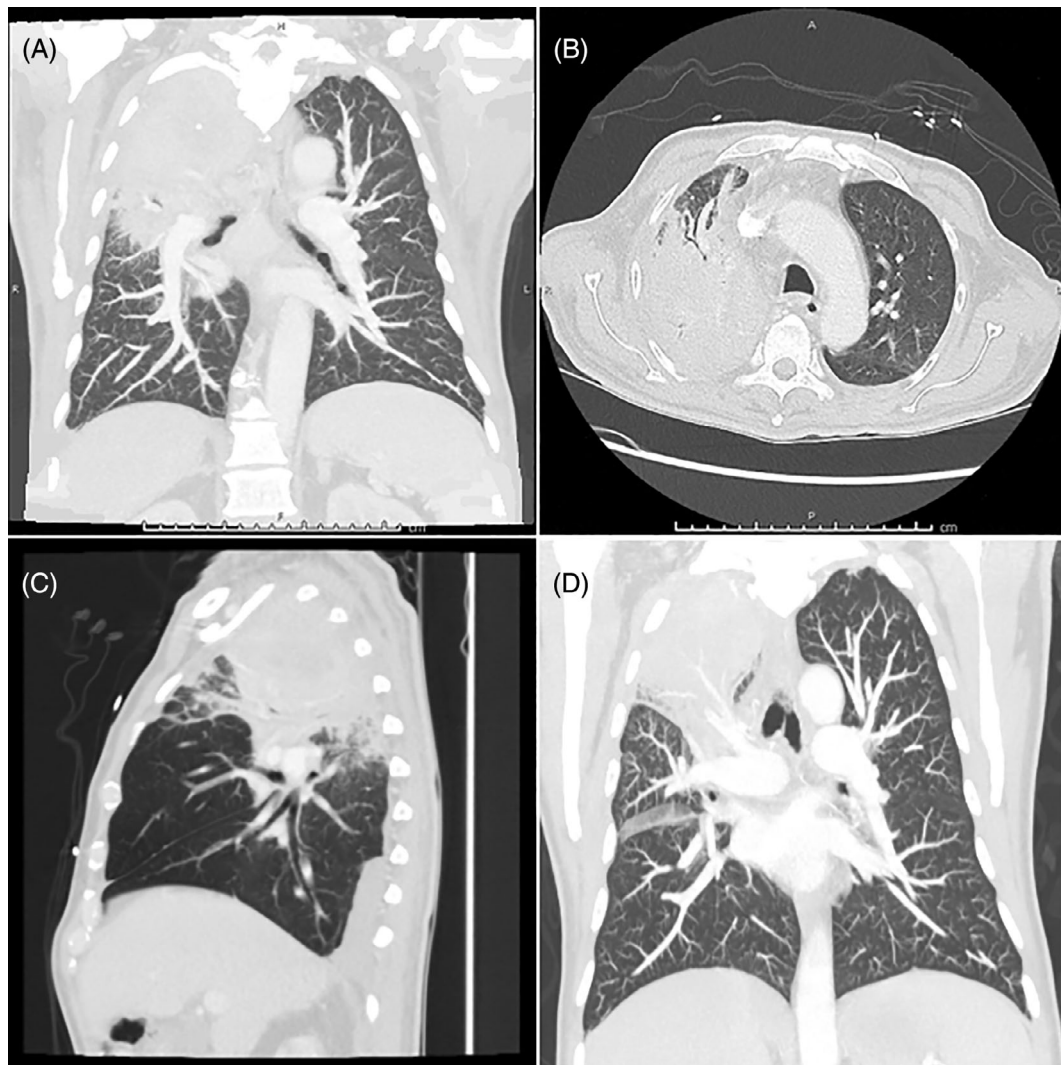


FIGURE 1 CT thorax with contrast: (A) coronal image, (B) transverse image and (C) sagittal image showing tumour burden in the right upper lobe with mass infiltrate. (D) Second coronal image shows the mass and its proximity to the carina.

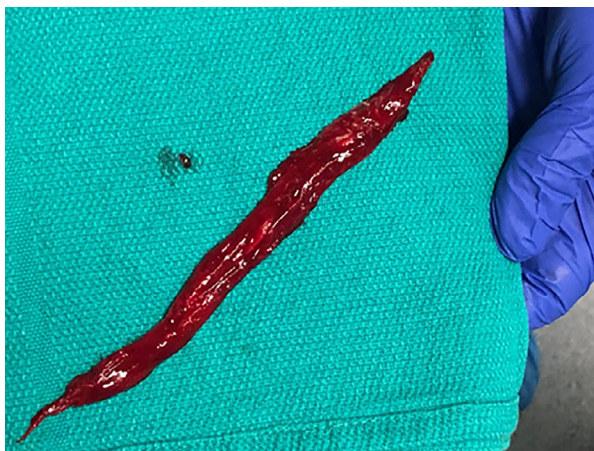
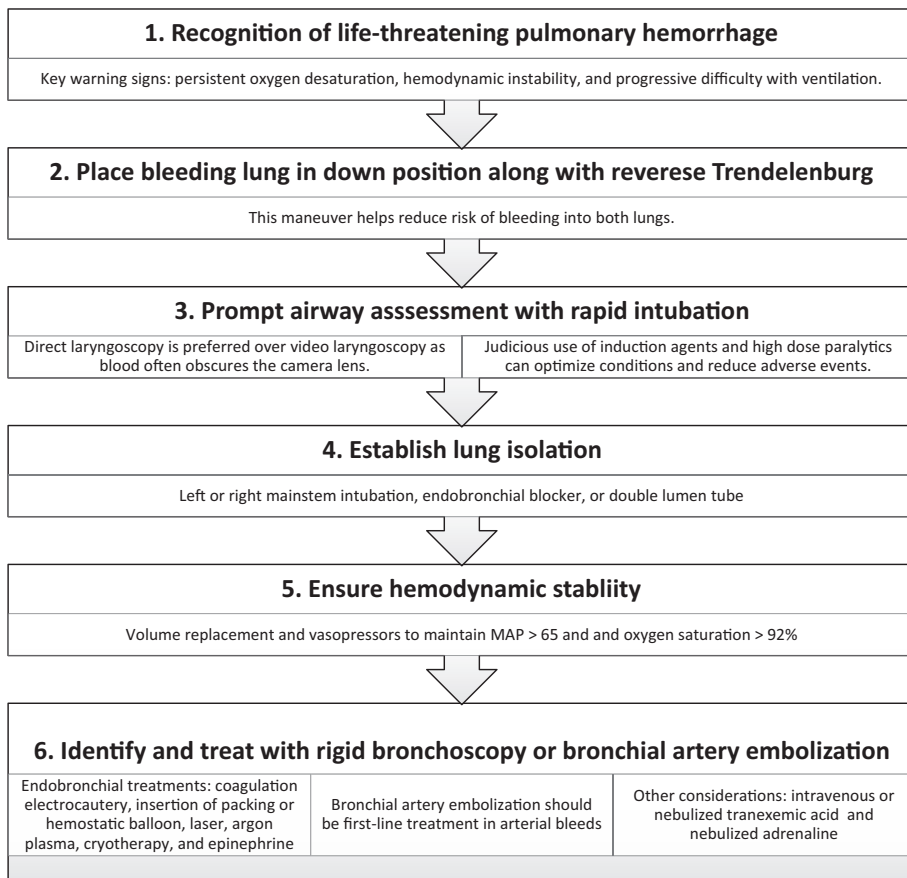


FIGURE 2 Blood clot removed from right mainstem bronchus during therapeutic bronchoscopy.

enlarged right hilar and mediastinal lymph nodes. The radiologist noted a component of lymphangitic carcinomatosis, indicating a possible tumour invasion into the lymphatics or vasculature.³ The patient lacked evidence of thrombocytopenia, renal or hepatic impairment, or medications that could impact FB.

After induction of anaesthesia and intubation, FB revealed a normal-appearing left lung and an occluded RUL with tumour burden. Biopsy forceps were used with significant haemorrhage encountered after the second sample. The 7.5 mm oral endotracheal tube (OETT) was exchanged for an 8.5 mm OETT to facilitate therapeutic bronchoscopy. Subsequently, two thrombi were removed, a large thrombus from the right mainstem bronchus (Figure 2) and a fragmented thrombus from the left mainstem. After the bronchial wash, no further haemorrhage was visualized. Linear endobronchial ultrasound directed transbronchial needle

TABLE 1 Proposed management pathway for massive pulmonary haemorrhage after biopsy



Abbreviation: MAP, mean arterial pressure.

aspiration samples (EBUS-TBNA) were then performed from lymph node stations 4R and 7. Endobronchial biopsies and EBUS samples were taken but no final tissue diagnosis was made. EBUS-TBNA was chosen due to lower bleeding risk than endobronchial biopsy of tumorous lesions.⁴ No further evidence of haemorrhage was evidenced.

The patient was transferred to the cardiothoracic intensive care unit on mechanical ventilation. Chest radiograph confirmed correct OETT positioning. However, there was significant bleeding within the OETT. Endotracheal epinephrine was given, aggressive suctioning performed, and the bleeding paused temporarily. Despite these efforts, large volume haemoptysis ensued. Bilateral breath sounds were auscultated, the ventilator was disconnected, and manual ventilation proceeded. Soon thereafter, the patient became unresponsive, severely hypotensive and bradycardic. Pulseless electrical activity followed, and cardiopulmonary resuscitation (CPR) was initiated. The OETT was removed due to concern of dislodgement. Bag-mask ventilation and CPR continued while a new OETT was secured. After the bronchoscope was reintroduced, substantial blood was visualized,

filling mainstem bronchi. Return of spontaneous circulation was unachievable, CPR was discontinued, and the patient was pronounced deceased.

DISCUSSION

Prevention of massive pulmonary haemorrhage may be possible with recognition of risk factors. Although the outcome of this case was unexpected and unpredictable, secondary review of the airways on arrival could have been valuable. When considering procedure types, transbronchial lung biopsy was associated with highest risk of severe bleeding (1.1%–2.8%), while EBUS-TBNA has reduced bleeding risk, especially when biopsying tumours.⁴ Malignancy (2.4%), immunosuppression, and history of lung transplant appear to increase the risk of bleeding after FB.¹ Similarly, the presence of inflammatory tissue, primary tumours or metastatic tumour sampling have higher rates of significant bleeding, possibly related to tissue hypervascularization. Furthermore, carcinoid tumours, hypertrophic dysplastic arteries or

pseudoaneurysm have been implicated in cases of massive iatrogenic haemorrhage.⁴ Additional proposed risk factors include mechanical ventilation, thrombocytopenia (20.8%), elevated pulmonary artery pressures, anti-platelet or anti-coagulation therapy (89%), and liver or kidney disease.^{1,4} For this case, utilizing EBUS-TBNA alone for diagnosis may have prevented the fatal haemoptysis.

Massive pulmonary haemorrhage presents a challenge to the surgical, pulmonary and airway management teams. Developing a detailed multi-disciplinary action plan beginning with prompt recognition of a self-limited or life-threatening haemorrhage is crucial (Table 1). Key warning signs of life-threatening haemorrhage include persistent oxygen desaturation, hemodynamic instability, and progressive difficulty with ventilation. Once diagnosed, the bleeding lung should be positioned down using reverse Trendelenburg.¹ Prompt airway assessment and rapid intubation using direct laryngoscopy is preferred, opposed to video laryngoscopy.⁵ Establishment of lung isolation with right or left mainstem intubation or an endobronchial blocker, and ensuring hemodynamic stability using volume replacement and vasopressors while maintaining oxygenation is critical. Judicious use of induction agents and high dose paralytics can optimize intubation conditions and reduce adverse events.⁵ In our case, the use of adequate sedation and paralytic may have prevented coughing and intolerance of the OETT, potentially reducing the risk of rebleeding.

In the hands of an experienced operator, rigid bronchoscopy permits identification of the bleeding site and allows for haemostatic therapies. Notably, rigid bronchoscopy allows for simultaneous breathing and suctioning, making it the preferred method. Endobronchial treatments include coagulation electrocautery, insertion of packing or haemostatic balloon, cryotherapy, laser, and/or argon plasma.¹ Consideration of intravenous or nebulized tranexamic acid should be given, as the literature has shown promise.^{1,4} Overall, reducing catastrophic pulmonary haemorrhage outcomes by identifying modifiable risk factors and developing multi-disciplinary treatment protocols could prove lifesaving in these cases.

AUTHOR CONTRIBUTION

Devan Partridge contributed to the conception and drafting of the work, provided final approval of the version to be published, and agreed to be accountable for all aspects of the work. Randy Eilert contributed to the conception and

drafting of the work, provided final approval of the version to be published, and agreed to be accountable for all aspects of the work. Felecia Newton contributed to the conception and drafting of the work, provided final approval of the version to be published, and agreed to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

None declared.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

ETHICS STATEMENT

The authors declare that appropriate written, informed consent was obtained for publication of this manuscript and accompanying images.

REFERENCES

1. Davidson K, Shojaee S. Managing massive hemorrhage. *Chest*. 2020; 157(1):77–88. <https://doi.org/10.1016/j.chest.2019.07.012>
2. Shao H, Wu J, Wu Q, Sun X, Li L, Xing Z, et al. Bronchial artery embolization for hemoptysis: a retrospective observational study of 344 patients. *Chin Med J (Engl)*. 2015;128(1):58–62. <https://doi.org/10.4103/0366-6999.147811>
3. Soares FA, Pinto AP, Landell GA, de Oliveira JA. Pulmonary tumor embolism to arterial vessels and carcinomatous lymphangitis. A comparative clinicopathological study. *Arch Path Lab Med*. 1993;117(8): 827–31.
4. Bernasconi M, Koegelenberg CFN, Koutsokera A, Ognà A, Casutt A, Nicod L, et al. Iatrogenic bleeding during flexible bronchoscopy: risk factors, prophylactic measures and management. *ERJ Open Res*. 2017; 3:84–2016. <https://doi.org/10.1183/23120541.00084-2016>
5. Kovacs G, Sowers N. Airway management in trauma. *Emerg Med Clin N Am*. 2018;36(1):61–84. <https://doi.org/10.1016/j.emc.2017.08.006>

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