

## Occult Foreign Body Aspiration Resulting in Massive Hemoptysis from Bronchial Artery Pseudoaneurysm

Stacey Speer<sup>1</sup>, Gillian Ross<sup>2\*</sup>, Mark Landis<sup>3</sup>, Ian Ross<sup>4</sup>, Richard Inculet<sup>5</sup> and Daniele Wiseman<sup>6</sup>

<sup>1</sup>Department of Medical Imaging, London Health Sciences Centre, Victoria Hospital, London, Ontario, Canada

<sup>2</sup>Western University, BSc class of 2022, London, Ontario, Canada

<sup>3</sup>Department of Medical Imaging, London Health Sciences Centre, Victoria Hospital, London, Ontario, Canada

<sup>4</sup>Department of Medical Imaging, London Health Sciences Centre, Victoria Hospital, London, Ontario, Canada

<sup>5</sup>Department of Thoracic Surgery, London Health Sciences Centre, Victoria Hospital, London, Ontario, Canada

<sup>6</sup>Department of Medical Imaging, London Health Sciences Centre, Victoria Hospital, London, Ontario, Canada

### \*Correspondence to:

Gillian Ross  
Western University  
London, Ontario, Canada  
Tel: 226-919-7456  
E-mail: [gross24@uwo.ca](mailto:gross24@uwo.ca)

Received: March 27, 2022

Accepted: May 07, 2022

Published: May 10, 2022

**Citation:** Speer S, Ross G, Landis M, Ross I, Inculet R, Wiseman D. 2022. Occult Foreign Body Aspiration Resulting in Massive Hemoptysis from Bronchial Artery Pseudoaneurysm. *J Med Imaging Case Rep* 6(1): 11-15.

**Copyright:** © 2022 Speer et al. This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY) (<http://creativecommons.org/licenses/by/4.0/>) which permits commercial use, including reproduction, adaptation, and distribution of the article provided the original author and source are credited.

Published by United Scientific Group

### Abstract

Occult foreign body aspiration can present as a diagnostic challenge due to the poor awareness of events and often lack of specific clinical symptoms to facilitate the diagnosis. We report a case of an exceedingly rare clinical presentation with unique co-existing features involving a foreign body aspiration with subsequent development of a potentially catastrophic rupture of a bronchial artery pseudoaneurysm. Interventional radiology performed a bronchial artery embolization, which successfully occluded the right bronchial artery and thereby provided immediate hemostasis and a significant reduction in patient morbidity and potential mortality.

### Keywords

Foreign body aspiration, Bronchial artery pseudoaneurysm, Bronchial artery embolization, Massive hemoptysis; Foreign body retrieval, Bronchoscopy

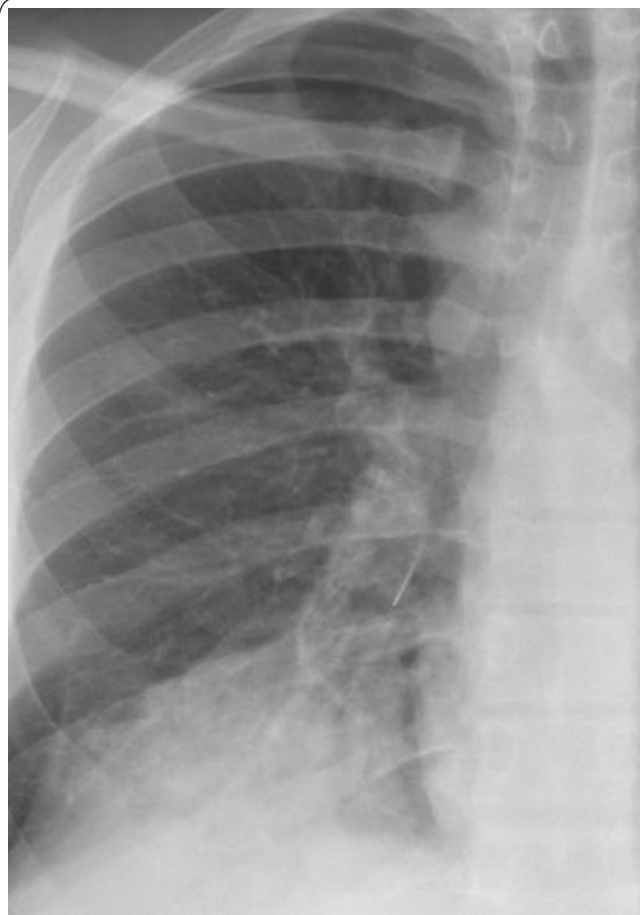
### Introduction

Aspiration of a foreign body can result in serious and catastrophic consequences. We illustrate a case describing the clinical presentation, management and sequelae following a male adult construction worker that unknowingly aspirated a foreign body. After the successful removal of a pushpin from the right lower lobe bronchus via flexible bronchoscopy, the patient developed massive hemoptysis due to a bronchial artery pseudoaneurysm which developed secondary to the tissue damage sustained from foreign body and required an urgent embolization by interventional radiology. The purpose of this illustrative case is to highlight a rare clinical presentation with unique co-existing features involving an occult foreign body aspiration with subsequent development of a potentially catastrophic ruptured bronchial artery pseudoaneurysm and provide a review of the therapeutic management.

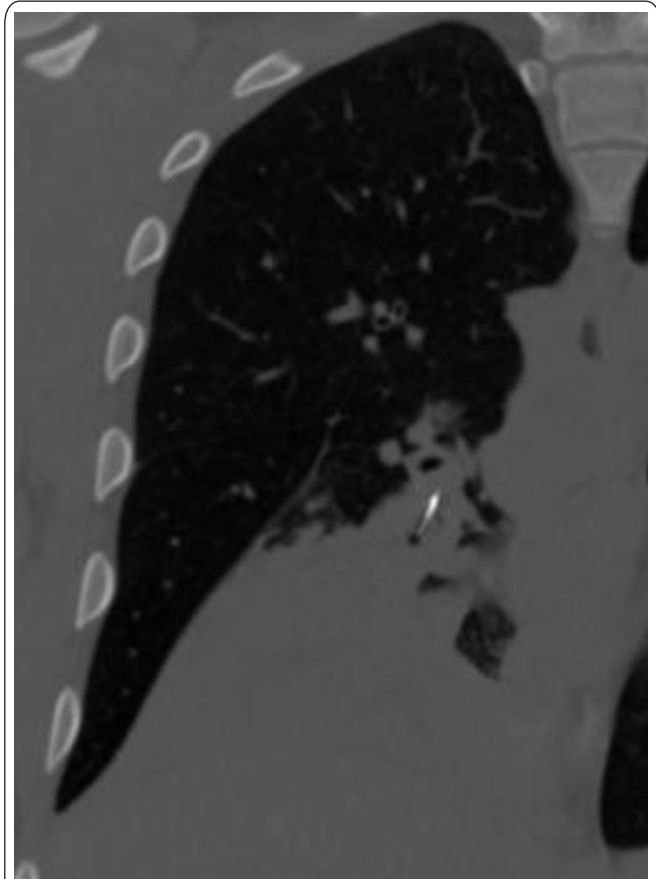
### Case Report

A 20-year-old male construction worker presented to the Emergency Department with small volume hemoptysis. Initial chest radiographs and computed tomography imaging revealed a small linear metallic density in the

right lower lobe bronchus consistent with an unknown foreign body as well as right lower lobe pneumonia (Figures 1 and 2). Laboratory testing revealed an elevated white blood cell count of  $23.5 \times 10^9/L$ , and respiratory culture that confirmed influenza A. The initial hemoglobin was 133 g/L and the patient was clinically and hemodynamically stable at presentation.



**Figure 1:** Chest radiograph of the right hemithorax demonstrating linear metallic foreign body in the right lower lobe bronchus.



**Figure 2:** Computed tomography image of right hemithorax demonstrating linear metallic foreign body in the right lower lobe bronchus as well as dense consolidation and atelectasis of the right lower lobe.

was associated mediastinal and right hilar lymphadenopathy and a small right pleural effusion.

Interventional radiology was consulted to perform a bronchial artery embolization. Informed consent was obtained and the risks, benefits and alternatives were discussed, which included the rare complication of paraplegia.

Via the right common femoral artery, and 5-French vascular sheath, a 5-French Michealson catheter was utilized to

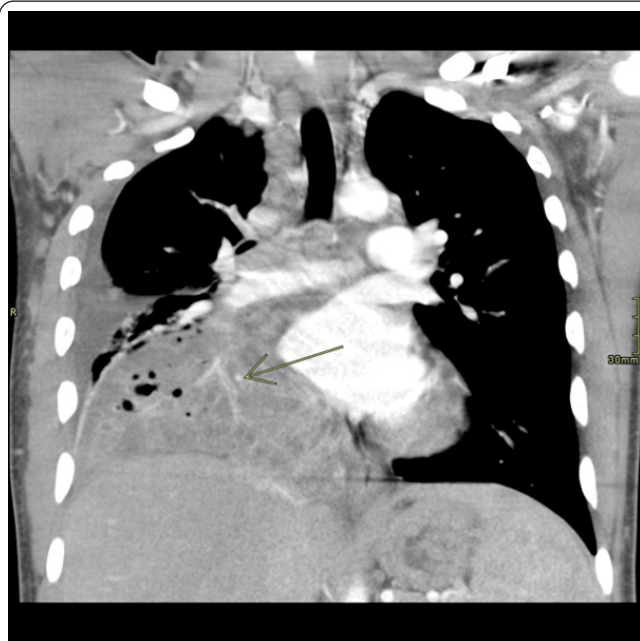
The Thoracic Surgery service performed a flexible bronchoscopy in the operating room for the successful retrieval of a specimen consisting of a yellow plastic pushpin measuring 21 mm in length with a pointed metal tip measuring 9 mm in length as well as tissue fragments confirmed at pathology to be acutely inflamed and reactive squamous epithelium (Figure 3).

Additional history subsequently provided by the patient was that he recalled holding pushpins in his teeth while working on a project two weeks prior but was also smoking cannabis that day and had no recollection of aspirating the pin.

The patient developed massive hemoptysis postoperatively. Contrast enhanced computed tomography of the thorax revealed a 3 mm pseudoaneurysm projecting into the lumen of the anterior basal segment airway of the right lower lobe corresponding to the location of the previously removed foreign body (Figure 4). Complete occlusion of the bronchus intermedius and segmental airways to the right lower lobe was thought to represent hemorrhage given the clinical history. The right lower lobe was densely consolidated with multi-focal rim-enhancing structures concerning for small lung abscesses. There



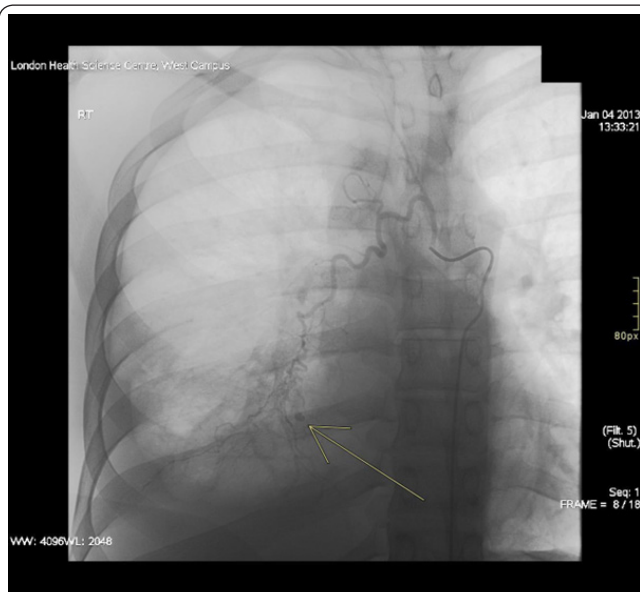
**Figure 3:** Specimen removed via flexible bronchoscopy consists of a plastic pushpin measuring 21 x 10 x 10 mm with a pointed metal tip measuring 9 mm in length and 1 mm in diameter.



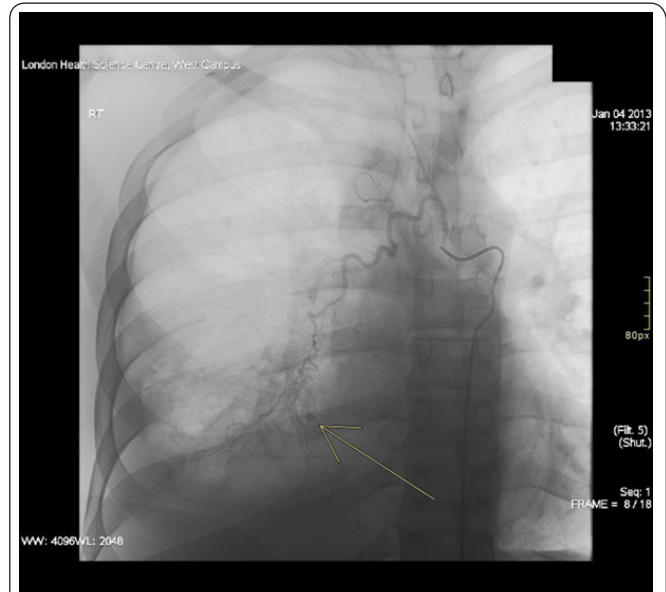
**Figure 4:** Arterial phase enhanced CT demonstrates a small polyploid avidly enhancing 3 mm pseudoaneurysm which projects into the lumen of the anterior basal segment airway of the right lower lobe corresponding to the location of the previously removed metallic foreign body.

select the right bronchial artery at the level of T5. A selective arteriogram was performed that showed supply to the right lower lobe, and the small pseudoaneurysm was identified corresponding to that seen on the computed tomography scan (Figure 5). No spinal artery communication was identified. The Progreat micro catheter was advanced through the 5-French catheter out into the right bronchial artery past the first of the major branches. Two small platinum microcoils were deployed resulting in complete and permanent occlusion of the bronchial artery at this level (Figure 6).

The patient was seen 6 weeks following discharge and reported that he had not experienced any further episodes of



**Figure 5:** Selective right bronchial artery angiogram shows 3 mm pseudoaneurysm (see arrow) corresponding to that seen on CT.



**Figure 6:** Completion angiogram right bronchial artery demonstrating successful placement of two platinum microcoils and complete hemostasis.

hemoptysis. Repeat chest radiograph revealed persistent mild residual volume loss at the right lung base.

## Discussion

The unintended aspiration of a foreign body has been well recognized as a cause of significant morbidity and potential mortality [1]. Occult tracheobronchial foreign bodies have been detected in approximately 1-9% of pediatric patients undergoing bronchoscopy for various reasons. [2]. Although the frequency of occurrence is reduced in the adult population, it has been associated with predisposing factors such as advanced age, underlying neurological disorder, poor dentition, alcohol consumption and sedative use [3]. This gentleman subsequently admitted to fairly heavy cannabis consumption.

Occult foreign body aspiration frequently presents a diagnostic challenge due to the poor awareness of events and often lack of specific clinical symptoms to facilitate the diagnosis. A spectrum of clinical symptoms has been reported in the literature ranging from proximal airway obstruction with resultant acute life-threatening asphyxia to the development of non-specific chronic respiratory symptoms [1, 4] such as cough, dyspnea, and wheezing [4]. A prolonged latent period may ensue lasting from months to years in duration. More severe symptoms related to relapsing pneumonia, purulent expectoration and hemoptysis often occur later in the clinical course [5, 6]. A careful history and high index of suspicion is paramount in the context of unrecognized aspiration of radiolucent foreign bodies and will ultimately facilitate a timely and accurate diagnosis [2, 4].

Diagnostic imaging is often used as an adjunct to physical examination, which may only reveal non-specific findings. Initial chest radiographs can appear normal or reveal focal consolidation, atelectasis, bronchiectasis, or a pleural effusion [1]. Previous case studies of occult foreign body aspiration have reported erroneous diagnoses of asthma, pneumonia, or cancer

[2]. Depending on the nature of the aspirated foreign body, a radiolucent or radiodense object may or may not be visualized. The most commonly aspirated foreign bodies within the adult population can include tracheostomy cannulas, fish and chicken bones, dental material and metallic objects [7]. Fortunately, our case report provides an illustrative depiction of an occult foreign body in a patient that aspirated a pushpin whereby the metallic density was appreciable on chest radiographs, which prompted further diagnostic imaging investigations to characterize the pathology visualized and to facilitate the prompt retrieval of the object via flexible bronchoscopy.

The patient's clinical course deteriorated postoperatively, following the retrieval of the foreign body, when massive hemoptysis developed. An urgent angiographic evaluation and therapeutic intervention was conducted to provide lifesaving hemostasis. The development of massive hemoptysis carries a significantly high mortality rate, which has been reported as upwards to 50% if emergent treatment is not instituted [8]. When conservative management is employed, mortality rates of massive hemoptysis can range between 50-100% [9]. Hemoptysis typically presents in patients with underlying airway disease, parenchymal disease, cardiovascular disease and infrequently in patients following a foreign body aspiration [10]. The most common clinical cause of hemoptysis includes tuberculosis, cystic fibrosis, congenital heart disease and more rarely in the context of the development and rupture of a pulmonary artery pseudoaneurysm.

A bronchial artery pseudoaneurysm (or false aneurysm) is caused by focal damage to the arterial wall resulting in a contained hematoma. Pseudoaneurysms of the bronchial arteries are rare and may be caused by trauma, infection, connective tissue disorders (Ehlers-Danlos Syndrome), vasculitis, or malignancy. Traumatic causes can include a penetrating injury or be iatrogenic secondary to an endovascular procedure or a biopsy. Infectious (or mycotic) aetiologies of a pseudoaneurysm may include bacterial organisms (including mycobacteria), fungal species and *Salmonella*. A necrotizing pneumonia may also cause a pseudoaneurysm of a bronchial artery or pulmonary artery.

The presence of an inflammatory process can precede the development of hemoptysis whereby systemic blood supply via bronchial arteries become recruited to the inflamed area [10]. The systemic circulation to the lungs is often regarded as the major source of bleeding and infrequently originates from the pulmonary circulation. A bronchopulmonary arterial shunt can develop because of inflammatory reactive tissue and cause a resultant increase in the vascular flow leading to dilation of the bronchial arteries [8]. Hyperemia, vascular fragility and increased regional blood pressure have been identified as factors that lead to potential rupture of a bronchial artery pseudoaneurysm [10]. In this case, the young adult male did not have any underlying chronic lung disease and his bronchial arteries were regarded as normal caliber in size, which increased the technical difficulty of performing a bronchial artery embolization. The unique clinical details of the case that originated with an occult aspiration of a pushpin, successful retrieval of the foreign body, and subsequent massive hemoptysis from a ruptured bronchial artery pseudoaneurysm proves this case to

be the first of its kind reported to our knowledge.

Interventional radiologists have demonstrated high clinical success in achieving hemostasis as they are technically skilled to evaluate bronchial and non-bronchial arteries that may be contributing to the patient's hemoptysis [8]. Anatomical consideration of the bronchial arteries is paramount as the origin of the bronchial arteries can be quite variable with upwards of 20% having an aberrant origin [8]. The bronchial artery feeding vessel causing the hemoptysis can originate from the right posterior intercostal artery, from a common trunk shared with the left superior bronchial artery or directly from the aorta. A disastrous complication that could result from a bronchial artery embolization relates to the development of ischemic necrosis affecting anatomic structures that are supplied by the bronchial arteries. This could present clinically as a spinal cord infarction, bronchial necrosis and/or esophageal necrosis [10]. Paralysis is a potentially perilous adverse outcome that is of critical importance when reviewing the risks and benefits of the procedure as the intercostal and lumbar arteries can also contribute to the vascular supply of the thoracic spinal cord.

Therapeutic bronchial artery embolization is the primary method of treatment for massive hemoptysis. Intervention is critical when blood loss is estimated to exceed 300 mL in a 24-hour period, when a single episode of hemoptysis of approximately 150 mL occurs as it increases the risk for asphyxia or with recurrent episodes of hemoptysis requiring multiple transfusions to maintain a clinically stable hemoglobin level [8]. Bronchial artery embolization has been demonstrated as a safe and efficacious intervention for massive hemoptysis with an overall success rate reported between 82.0–91.1% [11, 9, 12].

## Conclusion

Massive hemoptysis is a serious and potentially life-threatening consequence of a ruptured bronchial artery pseudoaneurysm. Our case demonstrates unique and uncommon features following an aspiration of a foreign body that have not yet been reported in the literature. We aimed to highlight the expertise of interventional radiology, which was crucial in performing an urgent bronchial artery embolization and thereby ultimately reduced the possible catastrophic consequences incurred by the patient. The advent of minimally invasive interventional radiology procedures has greatly contributed to improving patient morbidity and mortality.

## Conflict of Interest

The authors declare no conflicts of interest.

## References

1. Wolkove N, Kreisman H, Cohen C, Frank H. 1982. Occult foreign-body aspiration in adults. *Jama* 248(11): 1350-1352. <https://doi.org/10.1001/jama.1982.03330110046025>
2. Yilmaz A, Akkaya E, Damadoglu E, Gungor S. 2004. Occult bronchial foreign body aspiration in adults: analysis of four cases. *Respirology* 9(4): 561-563. <https://doi.org/10.1111/j.1440-1843.2004.00621.x>

3. Zubairi AB, Haque AS, Husain SJ, Khan JA. 2006. Foreign body aspiration in adults. *Singapore Med J* 47(5): 415-418.
4. Zissin R, Shapiro-Feinberg M, Rozenman J, Apter S, Smorjik J, et al. 2001. CT findings of the chest in adults with aspirated foreign bodies. *Eur Radiol* 11(4): 606-611. <https://doi.org/10.1007/s003300000619>
5. Yang T, Hsu M. 2003. Occult foreign body aspiration in adults. *Otolaryngol Head Neck Surg* 128(1): 154-156. <https://doi.org/10.1067/mhn.2003.76>
6. Al-Majed SA, Ashour M, Al-Nobeireek AF, Al-Hajjaj MS, Alzeer AH, et al. 1997. Overlooked inhaled foreign bodies: late sequelae and the likelihood of recovery. *Respir Med* 91(5): 293-296. [https://doi.org/10.1016/s0954-6111\(97\)90033-0](https://doi.org/10.1016/s0954-6111(97)90033-0)
7. Dogan K, Kaptanoglu M, Onen A, Saba T. 1999. Unusual sites of uncommon endobronchial foreign bodies: Reports of four cases. *Scand Cardiovasc J* 33(5): 309-311. <https://doi.org/10.1080/14017439950141588>
8. Stoll JF, Bettman MA. 1988. Bronchial artery embolization to control hemoptysis: a review. *Cardiovasc Intervent Radiol* 11(5): 263-269. <https://doi.org/10.1007/BF02577032>
9. Chun JY, Belli AM. 2010. Immediate and long-term outcomes of bronchial and non-bronchial systemic artery embolisation for the management of haemoptysis. *Eur Radiol* 20(3): 558-565. <https://doi.org/10.1007/s00330-009-1591-3>
10. Kalva SP. 2009. Bronchial artery embolization. *Tech Vasc Interv Radiol* 12(2): 130-138. <https://doi.org/10.1053/j.tvir.2009.08.006>
11. De Gregorio MA, Medrana J, Mainar A, Alfonso ER, Rengel M. 2006. Endovascular treatment of massive hemoptysis by bronchial artery embolization: Short-term and long-term follow-up over a 15-year period. *Arch Bronconeumol* 42(2): 49-56. [https://doi.org/10.1016/s1579-2129\(06\)60117-1](https://doi.org/10.1016/s1579-2129(06)60117-1)
12. Yu-Tang GP, Lin M, Teo N. 2002. Embolization for hemoptysis: A six-year review. *Cardiovasc Intervent Radiol* 25(1): 17-25. <https://doi.org/10.1007/s00270-001-0047-1>
13. Moore KL, Dalley AF, Agur AMR. 2009. Clinically orientated anatomy, 6<sup>th</sup> edition. Lippincott, Williams & Wilkins Philadelphia, United States. <https://doi.org/10.1111/j.1469-7580.2009.01136.x>