

Black Bronchoscopy

AFEERAH MUMTAZ, MD; ALLISON NAVARRETE-WELTON, MD²⁴; RABEEA AHMED, MBBS; TARO MINAMI, MD; KAMRAN MANZOOR, MD

INTRODUCTION

Black Bronchoscopy refers to the presence of black pigmentation (hyper-pigmentation) in the mucosa of the endobronchial tree. It is a rare finding, and many etiologies have been noted including inborn errors of metabolism, melanosis, ochronosis, *Aspergillus niger* infection, healed tuberculosis, anthracosis, metastatic melanoma,^{1,2} charcoal aspiration, and teratoma¹. We report a patient who presented with dyspnea and hemoptysis while on warfarin therapy with a supratherapeutic INR. Bronchoscopy revealed black discoloration of the mucosa which subsequently resolved after holding anticoagulation.

CASE REPORT

A 75-year-old woman with a past medical history significant for hypertension, hyperlipidemia, and atrial fibrillation on warfarin presented with progressive shortness of breath for several days. She had also been coughing up bright red blood for the past three days. There was no history of recent fever, night sweats, weight loss, hematemesis, or melena. On admission, vital signs were notable for hypoxemia with oxygen saturation in the mid-80s, requiring 4 Liters of supplemental oxygen via nasal cannula. Her admission ECG was consistent with atrial fibrillation. The laboratory workup revealed anemia with a 2 g/dL drop in hemoglobin (baseline 9.5 g/dl) and PT/INR elevation to 5.2. The CT chest was unremarkable. Warfarin was held. Given ongoing hemoptysis, a bronchoscopy was performed, which revealed multiple areas of extensive mucosal ecchymosis (Figures 1,2). Bronchoalveolar lavage revealed no evidence of diffuse alveolar hemorrhage, the infectious workup was

negative, and no malignant cells were identified. After holding the warfarin, the patient's hemoglobin level remained stable, and hypoxemia resolved. Bronchoscopy five weeks later showed complete resolution of the extensive mucosal hyperpigmentation, and there was no evidence of submucosal abnormalities.

DISCUSSION

The term "black bronchoscopy" was first used by Packham and Yeow in 2003 to describe endobronchial metastasis from malignant melanoma.^{1,3} Since then, many other causes of black bronchoscopy have been identified, including warfarin use.

Our patient's initial presentation with progressive dyspnea and hemoptysis with anemia warranted airway surveillance with bronchoscopy that revealed black pigmentation of the airways. In the absence of occupational exposure and thermal inhalation injuries, a black bronchoscopy raises concerns for infections (tuberculosis and fungal)⁴, an inborn error of metabolism (ochronosis, alkaptonuria),⁵ substance use (marijuana, crack cocaine, or tobacco smoking)^{5,6} and malignancy (malignant melanoma, melanotic schwannoma, or melanotic carcinoid tumor). In this case, the history, physical examination, and diagnostic tests with anemia and elevated INR strongly suggest the presence of bleeding in the airway.⁷ While endobronchial biopsy could not be performed due to ongoing hemoptysis and the patient's anticoagulated status, the resolution of the black pigmentation within several weeks of holding warfarin supported this diagnosis.

The etiology of black bronchoscopy can be determined by reviewing the history for the risk factors such as recent

Figure 1a,b. Bronchoscopy images reveal extensive mucosal ecchymosis at the level of the carina and right main bronchus.

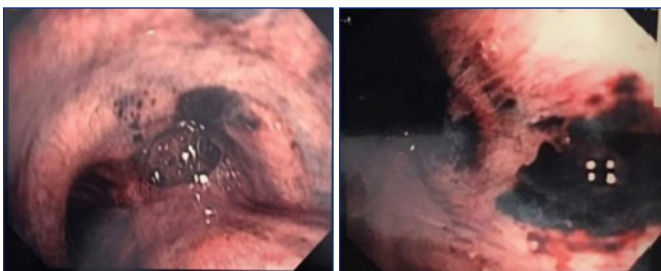
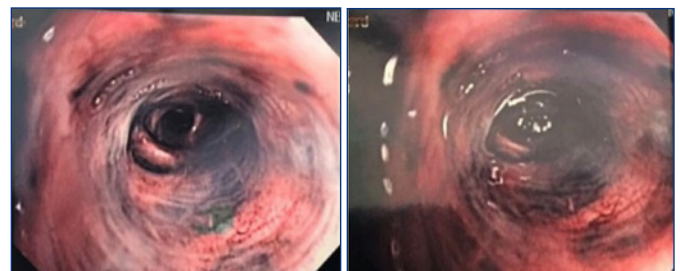


Figure 2a,b. Bronchoscopy images reflect circumferential segmental and subsegmental dark airway pigmentation.



inhalational injury, occupational and substance use exposures, immunocompromised status (which increases the risk of both fungal infections and malignancy), exposure to tuberculosis, amiodarone usage, and a history of multiple joint replacements or degenerative arthritis (which may be suggestive of alkaptonuria). A careful physical examination should include a skin examination for melanoma and an eye and ear examination for the darkened sclera and ear cartilage of alkaptonuria. Anthracosis, the deposition of carbon particles in airways, is found in smokers and those who reside or work in areas polluted with environmental soot.^{7,8} Inhalation injury, mostly with characteristic findings of facial burns and nostril edema, affects airways and lung parenchyma.

More than eight million people in the United States are currently on anticoagulation,⁹ and it is essential to recognize an associated bleeding risk to airways (pertinent to our case) and other sites in the body.

References

1. Tunsupon P, Panchabhai TS, Khemasuwan D, Mehta AC. Black bronchoscopy. *Chest*. 2013 Nov;144(5):1696-1706. doi: 10.1378/chest.13-0981. PMID: 24189863
2. Teo YK, Kor AC. "Black bronchoscopy a case of endobronchial metastases from melanoma. *J Bronchology Interv Pulmonol*. 2010 Apr;17(2):146-8. doi: 10.1097/LBR.0b013e3181da2de4. PMID: 23168731.
3. Packham S, Jaiswal P, Kuo K, Goldsack N. Black bronchoscopy. *Respiration*. 2003 Mar-Apr;70(2):206. doi: 10.1159/000070069. PMID: 12740519.
4. Inaty H, Arora A, Diacovo JM, Mehta A. 'Black bronchoscopy': a case of active mycobacterial tuberculosis. *Oxf Med Case Reports*. 2016 Jul 27;2016(7):135-7. doi: 10.1093/omcr/omw018. PMID: 27471594; PMCID: PMC4962886.
5. Dhillon SS, Harris K, Ylagan L. Black Endobronchial Ultrasound. *J Bronchology Interv Pulmonol*. 2015 Oct;22(4):332-7. doi: 10.1097/LBR.000000000000160. PMID: 26348692.
6. Greenebaum E, Copeland A, Grewal R. Blackened bronchoalveolar lavage fluid in crack smokers. A preliminary study. *Am J Clin Pathol*. 1993 Nov;100(5):481-7. doi: 10.1093/ajcp/100.5.481. PMID: 8249885.
7. Uygungül E, Ayrik C, Narci H, Erdoğan S, Toker I, Demir F, Karaaslan U. Determining risk factors of bleeding in patients on warfarin treatment. *Adv Hematol*. 2014;2014:369084. doi: 10.1155/2014/369084. Epub 2014 Nov 9. PMID: 25431593; PMCID: PMC4241733.
8. Hye Young Kim, Jung-Gi Im, Jin Mo Goo, Jae Yeol Kim, Sung Koo Han, Jae Kyo Lee, Jae Woo Song. Bronchial Anthracofibrosis (Inflammatory Bronchial Stenosis with Anthracotic Pigmentation): CT findings. *AJR Am J Roentgenol*. 2000 Feb;174(2):523-7. doi: 10.2214/ajr.174.2.1740523. PMID: 10658734
9. IBM Truven Health Analytics, 12 months ending December 31, 2018 for Commercial, Medicare and Medicaid patients (October 24, 2019)

Authors

Afeerah Mumtaz, MD, King Edward Medical University, Lahore, Pakistan.

Allison Navarrete-Welton, MD²⁴, The Warren Alpert Medical School of Brown University, Providence, RI.

Rabea Ahmed, MBBS, King Edward Medical University, Lahore, Pakistan.

Taro Minami, MD, The Warren Alpert Medical School of Brown University, Providence, RI; Division of Pulmonary, Critical Care, and Sleep Medicine, Care New England Health System, Providence, RI.

Kamran Manzoor, MD, The Warren Alpert Medical School of Brown University, Providence, RI; Division of Pulmonary, Critical Care, and Sleep Medicine, Care New England Health System, Providence, RI.

Correspondence

afeerah.mumtaz@gmail.com