Egyptian Journal of Bronchology

Vol 3, No 1, June, 2009

CASE REPORT

A PATIENT WITH FOCAL AND POSITIONAL WHEEZING

By
Septimiu D. Murgu, Henri G. Colt,
Pulmonary and Critical Care Medicine, Department of Medicine, University of California School of Medicine, Irvine, CA.

Keywords: Airway obstruction, endobronchial tuberculosis, bronchoscopy, computed tomography.

A 61 year-old man presented with a one year history of dry cough and wheezing while lying on his left side. Albuterol inhaler, antibiotics, inhaled and systemic corticosteroids transiently improved his symptoms. His cough had become productive of white clumps of sputum. He denied other symptoms. He had no active or passive smoking history and no known tuberculosis exposure. Laboratory work up including human immunodeficiency virus (HIV) serology was negative and the CD4 count was 800. The PPD (purified protein derivative) skin test was negative. Chest radiograph was unremarkable. Chest computed tomography (CT) showed a right middle lobe infiltrate which improved significantly 4 weeks later (Figs. 1a,b). The expiratory images showed air trapping in the left lung and collapse of the left mainstem bronchus (Figs. 1c,d). Physical examination revealed rhonchi and wheezes over left posterior chest. Pulmonary function tests showed scooping of the flow volume loop and mild obstructive ventilatory impairment with no response to bronchodilators. Diffusing capacity of the lung for carbon monoxide (DLCO) was normal. Lung volumes showed normal total lung capacity (TLC) and residual volume (RV) by plethysmography but they were mildly reduced when measured by helium dilution suggesting air trapping. Bronchoscopy revealed small whitish plaques in the upper trachea and large white necrotic cheese-like pseudomembranes on a background of edematous and hyperemic mucosa extending throughout the lower trachea into the left mainstem and left upper lobe bronchi (Fig. 2). Bronchial washings and endobronchial biopsies were performed from this material and underlying mucosa.

What is the diagnosis?

Diagnosis: Endobronchial tuberculosis-actively caseating type

DISCUSSION

Bronchial washings showed 3+ acid fast bacilli (AFBs) and endobronchial biopsies showed necrotizing granulomas and AFBs (Fig. 3). Nucleic Acid Amplification Testing confirmed mycobacterium tuberculosis infection. Bronchial washing culture revealed 4+ (>500 colonies) sensitive Mycobacterium Tuberculosis Complex.

This patient presented with positional and focal wheezing. Unilateral wheezing suggests airway obstruction distal to the carina. Its persistence should prompt further investigation 1. Positional wheezing also suggests dynamic obstruction such as excessive dynamic airway collapse, malacia, positional worsening of an already narrowed airway or endobronchial obstruction by benign or malignant tumor potentially causing ball-valve phenomenon. Mucosal inflammation associated with even mild respiratory tract infections can cause swelling and mucus production, which may further occlude the lumen. Patients may thus be misdiagnosed as having an exacerbation of chronic obstructive pulmonary disease or asthma, especially because symptoms often improve temporarily after therapy targeting a superimposed infection. Recurrent or persistent symptoms unresponsive to bronchodilators should, therefore, raise suspicions for central airway obstruction.[1]

The tests for detecting central airway obstruction include pulmonary function studies, imaging studies and bronchoscopy. Spirometry and flow volume loops are insensitive and non specific. The classic flattening of the inspiratory and/or expiratory curves is seen with severe tracheal obstruction but not with lesions distal to the carina. Unilateral complete mainstem bronchial obstruction may, in fact, result in an apparent restrictive ventilatory pattern of the expiratory curve, reflecting loss of function of the affected side.[2] Less severe partial obstruction may result in a mixed obstructive and restrictive pattern from initial normal emptying of the unaffected side, followed by slow emptying of the affected side. This pattern can be masked in patients with asthma or emphysema.[3] In endobronchial tuberculosis (TB), the restrictive pattern is seen in 47% of cases whereas a mixed pattern, as noted in this patient, occurs in at least 23% of patients. A purely obstructive pattern is rare (~6%).[4]

Paired inspiratory-expiratory dynamic CT scanning is also valuable when airway obstruction is suspected because it may reveal associated air trapping as well as the airway anatomy, morphology of adjacent structures and because it allows objective quantification of the degree of collapse.[5] CT scanning might thus be preferred over bronchoscopy for the initial evaluation of patients with suspected airway narrowing and narrowed distal airways not easily accessible by flexible bronchoscopy. In our patient, the repeat inspiratory CT images were unremarkable except for thickening of the left main bronchial wall (Fig. 1) but the expiratory images showed collapse of the left main bronchus and consequent air trapping in the left upper lobe. Although our patient had no significant parenchymal infiltrates on chest radiograph or CT scanning at the time of presentation to our institution, these may be seen in 13% of TB patients 6. In patients with endobronchial TB, CT scanning helps evaluate the length of the stricture, peribronchial thickness, luminal patency and lymph node enlargement.[4] CT scans should probably be obtained before bronchoscopy in patients with suspected endobronchial TB because it allows evaluation of lung parenchyma distal to the endobronchial lesion and might guide additional diagnostic procedures when parenchymal abnormalities or mediastinal lymphadenopathy are present.

The bronchoscopic findings in our patient of large cheese-like white necrotic pseudomembranes on a background of edematous and hyperemic tracheobronchial mucosa (Fig. 2) can also be seen in patients with aspergillosis, candidiasis, mucormycosis, necrotizing tracheobronchitis, severe smoke inhalation injury with superimposed infection, and lung cancer.[7,8] The actively caseating type of endobronchial TB, as seen in our patient, is the most common form of endobronchial TB, reported in 5.8% of patients with pulmonary tuberculosis. This form appears to

be highly infectious with a reported rate of AFB sputum positivity that exceeds 50% and sputum culture positivity of 70%.[6]

In addition to an actively caseating form of endobronchial tuberculosis, there is also a bronchitic type identified as airway erythema and edema, a granular type with associated submucosal tubercle formation, a mucosal ulcerative type, a tumorous type, an edematous-hyperemic type with significant mucosal inflammation and bronchial narrowing, and a fibrostenotic type causing cicatriceal airway strictures.[6] It is unclear whether there is a true step-wise progression from one type to another or whether each particular type may occur independently without required passage through the other histopathologic forms.[6] The majority of granular, bronchitic and ulcerative types resolve completely without sequelae.[6]

Ten percent of patients with endobronchial tuberculosis, however, are diagnosed with the fibrostenotic type at time of presentation,[6] and in one study, 65% of patients with actively caseating TB had developed fibrostenosis within 3 months of treatment. Most experts agree that routine bronchoscopic follow-up is warranted during and after treatment of endobronchial tuberculosis because patients with airway strictures can be asymptomatic until critical airway narrowing is reached and because strictures can develop despite efficacious antituberculosis chemotherapy.[9] When present, airway strictures can be effectively treated using interventional bronchoscopic procedures such as dilation, laser-resection, and stent insertion.[10]

Clinical Course: Our patient was started on four drug therapy which he tolerated well. His cough and wheezing improved but two months later his wheezing recurred. Follow up bronchoscopy 10 weeks after initiation of therapy revealed a multilevel left main bronchial stenosis with critical narrowings in the proximal and distal left main bronchus (Fig. 4).

Clinical Pearls:

1. Patients with focal and/ or positional wheezing warrant dynamic CT or bronchoscopy to evaluate for central airway obstruction.
2. In patients with central airway obstruction, symptomatic improvement can be seen after therapy with antibiotics or corticosteroids which reduce mucosal swelling and inflammation, thereby improving airway caliber.
3. Infection control measures should be timely and efficiently implemented in cases of suspected endobronchial tuberculosis because this form can be highly infectious.
4. Classifying endobronchial tuberculosis into different subtypes increases the likelihood of predicting development of tracheobronchial stenosis.
5. Follow up bronchoscopy is warranted in patients with endobronchial tuberculosis in order to diagnose strictures in a timely fashion and before advent of potentially life-threatening symptoms related to critical airway narrowing.

Abbreviation List:

AFB: acid fast bacili

CT: computed tomography

DLCO: diffusing capacity of the lung for carbon monoxide

HIV: human immunodeficiency virus

PPD: purified protein derivative

RV: residual volume

TB: tuberculosis

TLC: total lung capacity

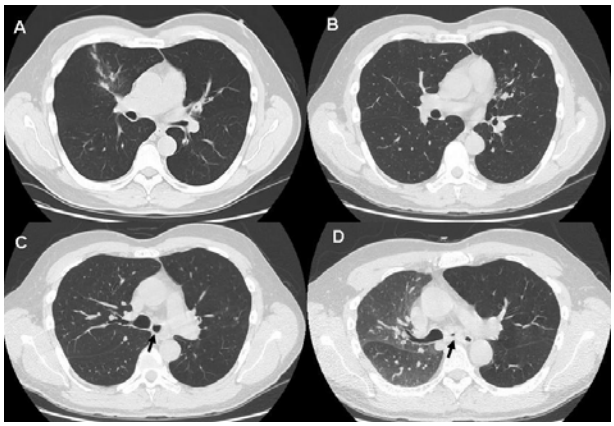

Fig 1. Chest CT shows a right middle lobe infiltrate (A) which improved significantly 4 weeks later (B). Paired inspiratory (C) and expiratory (D) CT images revealed air trapping in the left lung, thickening of left mainstem bronchial wall and expiratory narrowing of the left mainstem bronchial lumen (arrows).

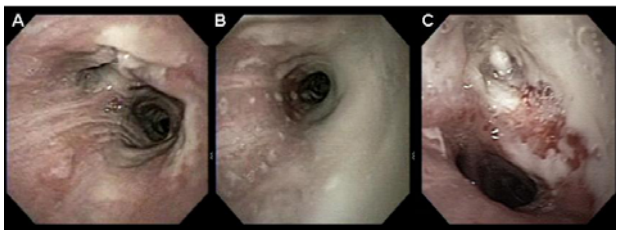

Fig 2. Bronchoscopy shows large white necrotic cheese-like pseudomembranes on a background of edematous and hyperemic mucosa in the lower trachea (A), left mainstem (B) and left upper lobe bronchi(C).

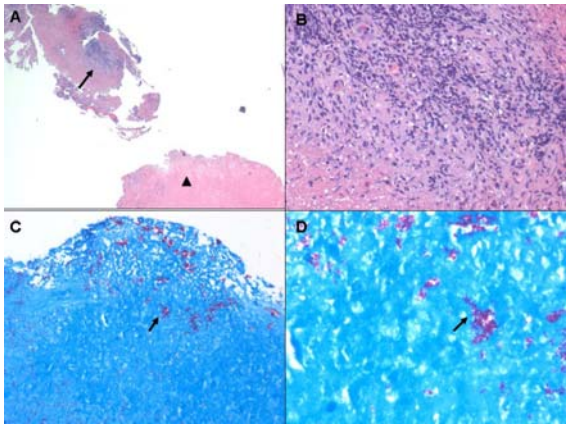

Fig 3. Endobronchial biopsy. H&E stain reveals granulomatous inflammation (arrow) and necrosis (arrowhead) at low magnification (10X) (A) and epithelioid histiocytes and lymphocytes at 20 X magnification (B). Fite -stained sections highlight the acid fast bacilli (arrows) at low (20X) (C) and high magnification (40 X) (D).

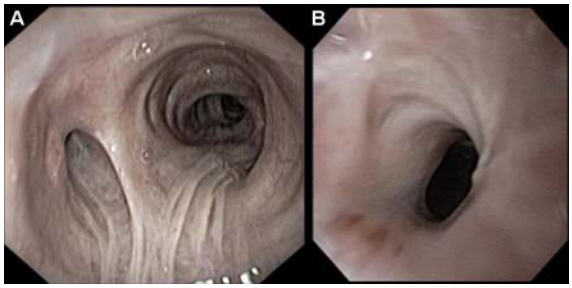

Fig 4. Follow up bronchoscopy shows proximal (A) and distal (B) left main circumferential strictures.

REFERENCES

1. Brichet A, Verkindre C, Dupont J, et al. Multidisciplinary approach to management of postintubation tracheal stenoses. Eur Respir J. 1999;13:888–93.

2. Gelb AF, Tashkin DP, Epstein JD, et al. Physiologic characteristics of malignant unilateral main-stem bronchial obstruction. Diagnosis and Nd-YAG laser treatment. Am Rev Respir Dis. 1988;138:1382-5.

3. Gelb AF, Tashkin DP, Epstein JD, et al. Diagnosis and Nd-YAG laser treatment of unsuspected malignant tracheal obstruction. Chest. 1988;94:767-71.

4. Lee JH, Chung HS. Bronchoscopic, radiologic and pulmonary function evaluation of endobronchial tuberculosis. Respirology. 2000;5:411-17.

5. Boiselle PM, Reynolds KF, Ernst A. Multiplanar and three-dimensional imaging of the central airways with multidetector CT.AJR Am J Roentgenol. 2002;179:301-8.

6. Chung HS, Lee JH. Bronchoscopic assessment of the evolution of endobronchial tuberculosis. Chest. 2000;117:385-92.

7. Matthews JI, Matarese SL, Carpenter JL. Endobronchial tuberculosis simulating lung cancer. Chest. 1984; 86:642-4.

8. Van den Brande P, Lambrechts M, Tack J, Demedts M. Endobronchial tuberculosis mimicking lung cancer in elderly patients. Resp. Med. 1991;85:107-9.

9. Albert RK, Petty TL. Endobronchial tuberculosis progressing to bronchial stenosis. Chest. 1976;70:537–9.

10. Hoheisel G, Chan BK, Chan CH, et al. Endobronchial tuberculosis: diagnostic features and therapeutic outcome. Respir Med. 1994;88:593–7.