

Is Drug Therapy Sufficient in Endobronchial Tuberculosis-Post-treatment Airways Stenosis Requiring Lobectomy

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Abstract

A 23 year old female presented with complaints of right sided chest pain, cough and fever of 2 months duration that remained unresponsive antibiotics. Her chest radiograph showed homogenous opacity in right middle and lower zone & HRCT chest revealed collapsed right middle and lower lobes with fluid filled bronchi. Bronchoscopy unveiled pus like secretions in right main bronchus and whitish mucus plugs in right middle and lower lobe bronchi causing significant Luminal narrowing. Acid Fast Bacilli (AFB) were detected in bronchial washings and caseating granulomas were found on bronchial biopsies, diagnostic of endobronchial tuberculosis (EBTB). She completed 9 months of standard anti-tuberculous treatment along with 1 month course of prednisolone. One year after completion of treatment, the patient started experiencing recurrent episodes of cough productive of purulent sputum (AFB negative) that responded to antibiotics on temporary basis. Repeat HRCT showed right lower lobe segments filled with purulent secretions and bronchoscopy revealed distorted and stenotic lower lobe segmental bronchi. Repeated infections in right lung required curative Video Assisted Thoracoscopic Surgery (VATS)-assisted resection of right lower lobe.

Key words: Bronchial washings; endobronchial tuberculosis; endobronchial biopsy; VATS

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Introduction

Tuberculosis (TB) has been a problem of numerous dimensions worldwide and it is still responsible for a huge death toll.¹ World Health Organization (WHO) estimates that nearly one third of the world's population is latently infected with mycobacterium tuberculosis.¹ EBTB is defined as tuberculous infection of tracheobronchial tree with microbial and histopathological evidence.² The term was first coined by Morten in 1698.³ A patient with constitutional symptoms of TB with wheezing and normal radiograph but sputum smear positive for mycobacterium tuberculosis is most likely to have EBTB.⁴ The disease may be present in 10-40% of active pulmonary TB patients and more than 90% of these have some degree of bronchial stenosis.⁴ It is generally found in younger age group, more than half of the cases being seen at ages less than 35 years.⁵ The common symptoms of EBTB include cough with sputum, chest pain, hemoptysis, wheeze and dyspnoea.⁶ While sputum examination is the essential and first step towards the diagnosis of EBTB,

bronchoscopy and CT are the methods of choice for accurate diagnosis of bronchial involvement and assessment for bronchoscopic /surgical intervention. Early diagnosis and treatment may alter the natural course of disease, however, complicated airways stenosis may continue to evolve even with precise use of anti-TB drugs.^{1,2} We report a case of EBTB highlighting the importance of careful follow up to identify late onset of airway associated complications.

Case Report

A 23 year-old-women presented in pulmonary out-patients department with respiratory symptoms and low grade pyrexia of 2 months duration. Pain in right lower part of chest was gradual in onset, moderate in intensity, radiated to back and was aggravated by coughing. Cough was initially productive containing small amount of whitish sputum which became dry after two courses of antibiotics. Antibiotic treatment included use of clarithromycin and co-amoxiclav for seven days and then gemifloxacin for further ten days.

Cough had no relation to diurnal variation and was present off and on throughout the day. There was no history of hemoptysis, dyspnoea, wheezing or weight loss. The patient also complained of low grade fever which was not associated with rigors, chills or sweating and partially relieved by taking paracetamol. Past medical and surgical histories were insignificant except for bronchial asthma for which she was taking montelukast daily and salbutamol aerosol inhaler on as required basis; with satisfactory control of asthma symptoms.

Examination of the chest showed decreased intensity of breath sounds and dull percussion note on right middle and lower parts with decreased vocal resonance posterolaterally. Remaining general physical and systemic examinations were unremarkable. Initial chest radiograph (figure 1a) showed homogenous opacity in right middle and lower zones with ipsilateral shift of mediastinum and positive silhouette sign. Ultrasound chest showed no fluid in right pleural cavity. Chest radiographic findings were suggestive of collapsed right middle and lower lobes which were confirmed on contrast enhanced CT chest (November 2017) that also showed fluid filled bronchi. Right main bronchus was patent but intermediate bronchus orifice was narrowed (Figure 2) suggestive of some endobronchial abnormality/obstruction whose differential diagnoses included a thick mucus plug, blood clot, organic foreign body or a tumor.

To evaluate and sample the right sided airways, flexible fiberoptic bronchoscopy (Figure 3) was carried out that showed thick pus like secretions in right main bronchus which were thoroughly suctioned and collected. Right middle and lower lobe bronchial segments were partly obliterated and distorted due to inflammation, granulation tissue and whitish thick mucus plugs. Bronchial washings were taken from right middle and lower lobe segments. Endobronchial biopsies were taken from middle lobe carina. The gross appearance of the airways was suggestive of actively caseating subtype of EBTB that was proven microbiologically (bronchial washings were positive for AFB) and histopathologically (endobronchial biopsy showed chronic granulomatous inflammation with caseation necrosis). Gene Xpert MTB/Rif assay performed in bronchial washings was positive for mycobacterium tuberculosis DNA which was not resistant to rifampicin, suggestive of non-MDR/drug sensitive tuberculosis. She was started on quadruple antituberculous chemotherapy (rifampicin, isoniazid, ethambutol and pyrazinamide) and prednisolone. She responded very well to the treatment and had considerable clinical and radiological improvement (Figure 1 b and c).

One year after completion of treatment and asymptomatic period, the patient presented with recurrent episodes of productive cough and purulent sputum production (repeatedly AFB negative) that responded to antibiotics on temporary basis. Chest radiograph was clear so HRCT chest was done to look for an occult airway/parenchymal disease responsible for repeated episodes of respiratory infections. CT showed segmental atelectasis and stenosis of right lower lobe segments filled with secretions (Figure 4a) and bronchoscopy revealed distorted and stenotic lower lobe bronchi (inflammatory-fibrotic consequences of EBTB) with oozing of purulent secretions (Figure 4b). Culture of collected bronchial secretions revealed growth of *Streptococcus Pneumoniae*, *Staphylococcus Aureus* and *Stenotrophomonas Maltophilia* suggestive of polymicrobial colonization of stenotic lower lobe segments. Repeated lower respiratory infections in the similar anatomical regions required curative VATS-assisted resection of right lower lobectomy through a standard 3 port approach. Upon surgical evaluation, right lower lobe was consolidated and stuck to the diaphragm and the chest wall. It was taken down by a combination of blunt and cautery dissection. The right inferior pulmonary vein and the lower lobe PA trunk were dissected and stapled using endo Gia 45-2.5 mm staples. The lower lobe bronchus was stapled using endo Gia 45-4.8mm staple. The patient made uneventful recovery and was discharged on 4th post operative day and is enjoying good health for last 6 months.

Discussion

Interest in pulmonary parenchymal tuberculosis has eclipsed the study of EBTB after the introduction of modern antituberculous chemotherapy.¹ EBTB is highly infectious disease that remains a diagnostic challenge.^{1,2} It is more prevalent commoner in young adults and exhibits a female preponderance.⁵ Five potential mechanisms have been suggested for the development of EBTB including direct extension from adjacent parenchymal focus, implantation of organisms from infected sputum, hematogenous dissemination, lymph node erosion into bronchus and spread through lymphatic drainage from parenchyma to peribronchial regions.⁷ EBTB may have insidious onset, simulating bronchogenic carcinoma, or may be acute mimicking asthma, foreign body aspiration and pneumonia. Besides usual symptoms bronchorrhea can occur in active EBTB and lymph node rupture may cause chest pain that may be sharp or dull in sternal or parasternal area.⁸

Sputum examination is the first step but bronchoscopy and computed tomography are methods of

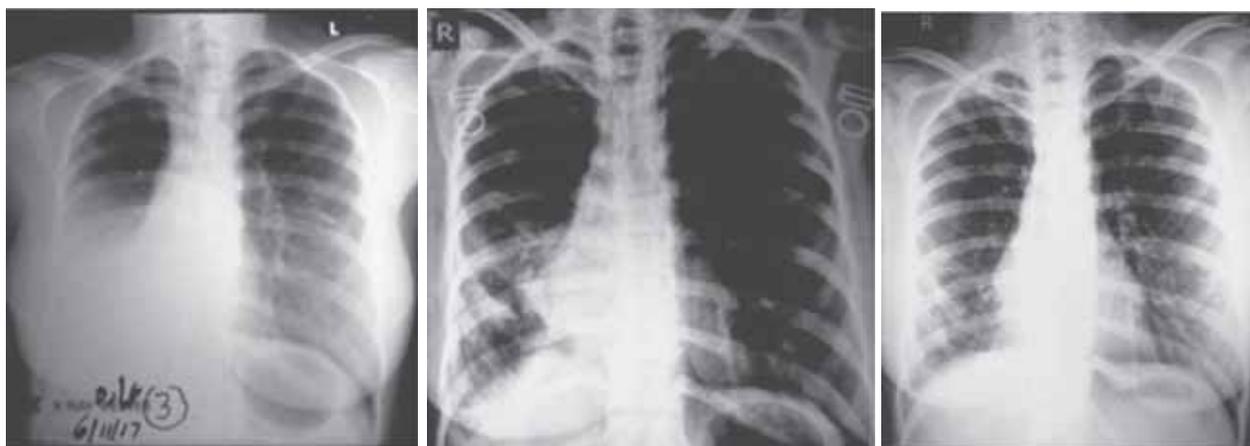


Figure 1: (a) Initial chest radiograph showing homogenous opacity in right middle and lower zones with ipsilateral shift of mediastinum and obliteration of right heart border and diaphragm (positive silhouette sign); (b) follow up chest radiograph at 3 weeks showing ill defined opacities in right lower zone and (c) at 3 months follow up having much visibility of aerated lung parenchyma.

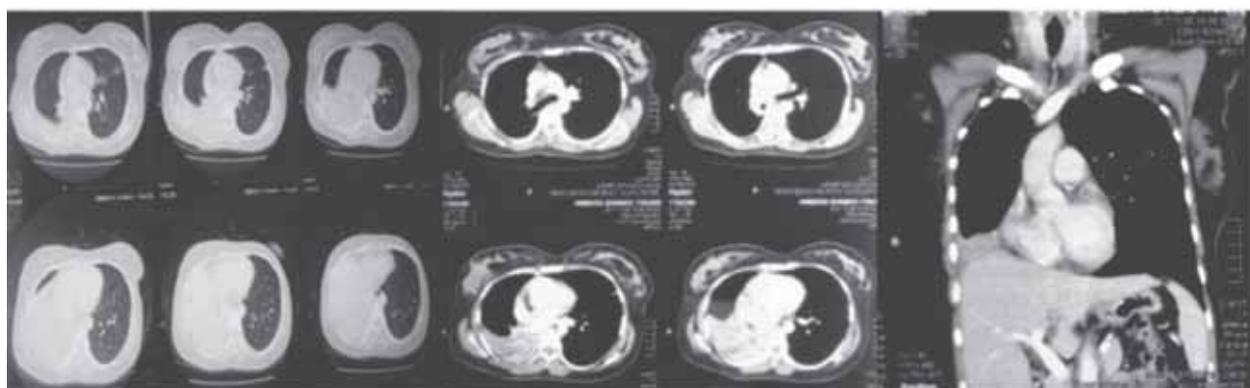


Figure 2: CT chest with contrast, pulmonary window (left), mediastinal window axial images (middle) and coronal image (right) showing loss of lung volume on right side, narrowing of right main bronchus and collapse of right middle and lower lobes.



Figure 3: Bronchoscopic images (actively caseating EBTB) showing pus filled right main bronchus (left), mucus covering the bronchus intermedius (middle) and thick mucus plugs and granulation tissue (right).

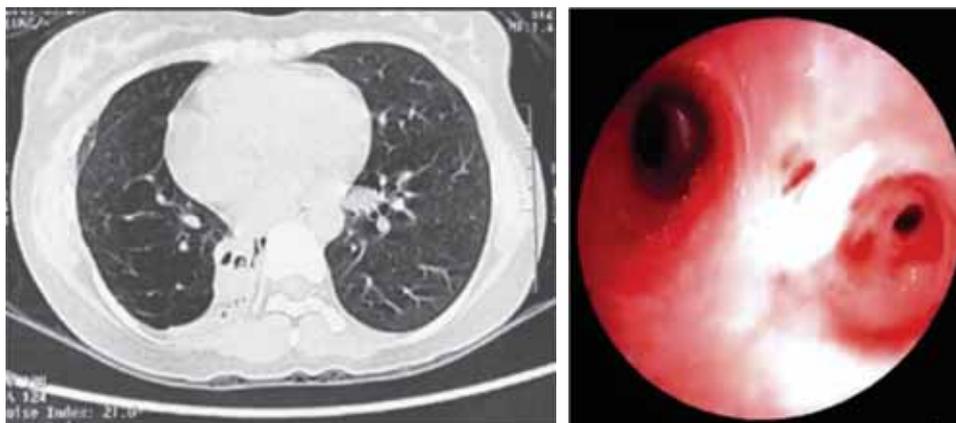


Figure 4: (a) HRCT chest (one year later) showing loss of volume in right hemithorax, atelectatic right lower lobe with stenotic airways (b) bronchoscopic image showing patent right middle lobe (left) stenotic pus filled right lower lobe segments (right).

choice for diagnosing EBTB.^{7,8} Our patient had dry hacking cough at the time of presentation so sputum examination could not be done. Chest radiograph may be normal in 10-20% of patients.⁹ Radiological manifestations of tuberculous bronchial stenosis includes segmental or lobar collapse, lobar hyperinflation, obstructive pneumonia and mucoid impaction.¹⁰ Volume loss on chest radiograph as was evident in index case, suggests bronchial stenosis and bronchoscopy should be considered in such cases.² In our case chest radiograph showed opacity in right middle and lower zones that was initially confused as a pleural effusion but was ruled out after chest ultrasound was performed. High resolution CT chest with multiplanar and 3D images is very useful for understanding the status of tracheobronchial tree and is particularly important for evaluation of focal stenosis of airways.^{8,9} Characteristic findings are patchy asymmetrical centrilobular nodules and branching lines (tree in bud appearance).⁸ In our case CT chest showed right middle and lower lobe collapse. Bronchoscopic sampling has been the key to the diagnosis of EBTB, producing more than 90 % yield on smear as well as on culture.^{5,9} EBTB is divided into seven subtypes based on bronchoscopic appearance, namely actively caseating, edematous-hyperemic, fibrostenotic, tumourous, granular, ulcerative and non-specific bronchitis.¹¹ Our patient's disease was characterized by lesions suggestive of actively caseating EBTB (Figure 3). In advanced disease there are deep ulcers, hyperplastic inflammatory polyps, tumor like collections of granulation tissue and bronchial stenosis.⁸ Lung cancer is the most important differential diagnosis (endobronchial growth causing lobar/lung collapse); however, simple inflammation, sarcoidosis, bronchial asthma, atelectasis, foreign body aspiration,

pneumonia and endobronchial actinomycosis are other differential diagnoses.⁸ Bronchial stenosis and strictures are irreversible, relatively common and delayed complications of EBTB, occurring despite adequate antituberculous therapy. Bronchial stenosis may develop in 60 to 95 % of cases and may involve main stem bronchi.^{7,8} Bronchiectasis is also a common complication of EBTB and most commonly develop as paracicatricial process (traction bronchiectasis).^{7,8} Bronchiectasis is typically asymptomatic and usually occurs in the upper lobes.¹² If it is symptomatic hemoptysis is the most common symptom. Early bronchoscopy is essential for diagnosis and treatment planning.^{9,14} Early introduction of conventional chemotherapy for 6-9 months containing isoniazid, rifampicin, ethambutol and pyrazinamide should control the disease. The role of steroids in reversing or preventing bronchial stenosis is not clear. Although EBTB frequently leads to bronchial stenosis there are no specific therapies to prevent it other than some encouraging results with use of steroids.^{8,9} Other modalities include balloon dilatation, self expanding metallic stents, laser, curettage, resection and anastomosis.^{4,9} Studies have demonstrated that aerosolized streptomycin and corticosteroids in addition to conventional chemotherapy may lead to faster healing of ulcerative lesions and also help to prevent bronchial stenosis.^{13,14}

The prognosis of actively caseating (index case) and edematous-hyperemic type EBTB is poor but is good for granular and nonspecific bronchitis type. Early treatment with steroid therapy may be effective in certain groups.^{8,14} Like in our patient, bronchial stenosis and stricture are the most common complications and may develop in 60 to 95% cases despite adequate antituberculous therapy.^{2,13} Although resectional VATS/open surgery offers

permanent solution to the problem by removal of the diseased lobe of lung, there are various bronchoscopic techniques to relieve airway stenosis including laser, cryosurgery, controlled heat application, balloon dilatation, and stent insertion.¹⁵ For Instance, in our patient, none of these modalities could be utilized because there was involvement of smaller segmental airways which were distorted and stenosed like pin hole slits and resectional surgery was the only curative and recommended option left.

Conclusion

EBTB is a distinct entity which is potentially hazardous because of its damaging effects on involved airways. Vigilance for late onset of airway associated complications should be evaluated by close follow-up even after completion of anti tuberculous therapy.

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