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Surgical Intervention for Endobronchial Tuberculosis with Total Bronchial Occlusion: A Case Report

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Abstract

Introduction. Endobronchial Tuberculosis (EBTB) is a specific TB form affecting the tracheobronchial tree with microbial and histopathological evidence. Early diagnosis is essential to provide timely treatment and prevent complications but also proves difficult due to the low positive rate of acid–fast bacilli (AFB) staining of sputum smears and non–specific clinical and radiological findings.
Case Illustration. We reported a 19–year–old man with a productive cough suspected of pulmonary tuberculosis, with a positive GeneXpert test and negative AFB smear. He received anti–tuberculosis drugs for six months. Although the symptoms initially seemed to improve, the patient complained of dyspnea during moderate activities in the sixth month. Chest x–ray showed complete atelectasis of the left lung. Further investigation with thorax computed tomography and confirmation with bronchoscopy revealed total occlusion of the left main bronchus. Left pneumonectomy was successfully conducted.
Conclusion. Endobronchial tuberculosis may progress to an advanced stage despite adequate anti–tuberculosis drugs. Therefore, early diagnostic strategies are required to prevent the progression of the disease, particularly due to the insidious nature of its pathophysiological process.

Keywords: bronchial occlusion, destroyed lung, endobronchial tuberculosis, pneumonectomy

Introduction

Indonesia ranks second in the world in the number of TB cases after India.[1] Although sputum culture is the golden standard for diagnosis,[2] Acid Fast Bacilli (AFB) microscopic evaluation followed by radiographic findings and GeneXpert assay are the preferred tests in Indonesia.[3] Tracheobronchial or endobronchial TB (EBTB) involvement was first reported in 1968, resulting in the hindrance of complete recovery.[4] EBTB is a specific TB form affecting the tracheobronchial tree, with microbial and histopathological evidence.[5] It is essential to provide timely treatment and prevent complications in EBTB. However, the early diagnosis of this disease is difficult. Some contributing factors are the low positive rate of acid–fast bacillus staining of sputum smears, non–specific clinical manifestations, and misleading radiological findings.[6,7] These may lead to delayed treatment. In bronchoscopic findings, hypertrophy with luminal narrowing, erosion, edema, ulceration, cicatricial stenosis, or total stenosis can be found. We report a total bronchial occlusion and destroyed lung in an endobronchial tuberculosis patient who underwent pneumonectomy.

Case Illustration

A 19–years old male with no previous history of illness complained of a productive cough with white phlegm for one month before admission. He complained of no fever, dyspnea, hemoptysis, anorexia, and night sweats. He was living together with his father, a pulmonary tuberculosis patient on routine anti–tuberculosis drugs. Initial chest x–ray showed infiltrates at peri hilum and right supra hilum. Acid fast–bacillus of sputum smears was done three times; all resulted in negative. GeneXpert (Xpert® MTB/Rif assay) examination showed positive for mycobacterium tuberculosis, with rifampicin resistance negative. He was treated with anti–tuberculosis drugs of category I according to the Indonesian Ministry of Health,[9] which are rifampicin, isoniazid, pyrazinamide, and ethambutol for two months, followed by rifampicin and isoniazid for an additional four months.

During follow–up, the complaint of cough improved in the second month, and no coughs were present in the fifth month. Acid fast–bacillus of sputum smears showed three negative results both in the second and fifth months. During an examination in the sixth month, the patient complained of dyspnea exerted at moderate activities. On physical examination, the chest appeared asymmetric, with decreased vesicular sound at the left hemithorax without rhonchi and wheezing. Acid–fast bacillus staining in the sixth month showed negative results, and a chest x–ray showed full opacities at the left hemithorax, indicating atelectasis. This shows concern because even after six months of the initial TB treatment, there was an apparent deterioration in comparing the before and after treatment chest x–ray (Figure 1).

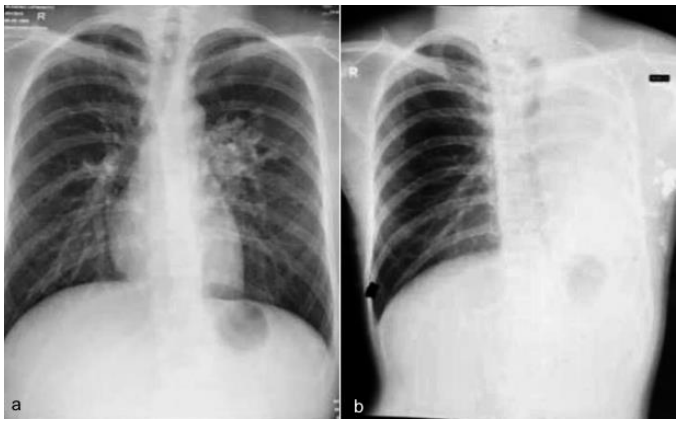

Figure 1. Chest X–ray of the patient before (a) and six months after treatment (b). In the initial chest X–ray (a), infiltrates were found in both left and right perihilar areas. There were no signs of any bronchial obstruction. Repeat chest X–ray six months after antimicrobial treatment (b) showed full opacity on the left hemithorax, raising the suspicion of progressing endobronchial tuberculosis.

Further investigation with thorax computed tomography (CT) showed total occlusion of the left main bronchus at the level of trachea

bifurcation, causing a complete collapse of the left lung and enlargement of the right lung (Figure 2). A bronchoscopy was performed on the patient, confirming total occlusion at the left main bronchus (Figure 2). Pneumonectomy of the left lung was successfully carried out. Resection lung tissues showed extensive caseous necrosis, consistent with the classic picture of pulmonary tuberculosis. Caseous (which translates to "cheese–like") necrotic tissue appears in tubercular infections, and the area with caseous necrosis is called granulomas. (Figure 3).

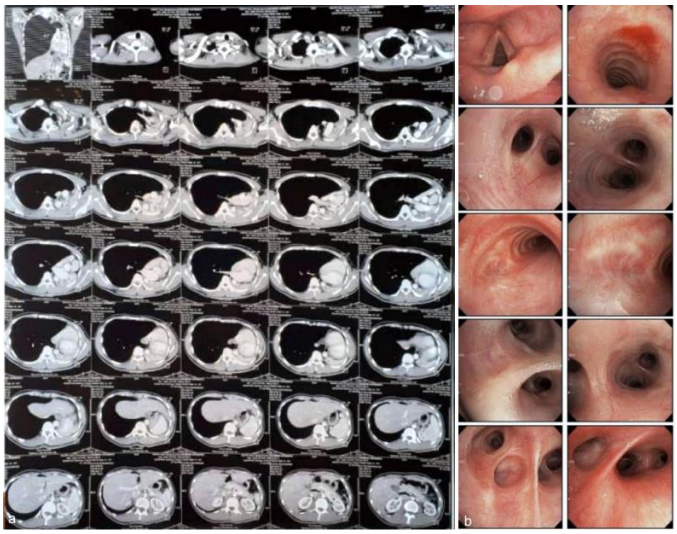

Figure 2. Figure 2. Chest MSCT (a) and bronchoscopic finding (b). Chest MSCT showed total occlusion of the left main bronchus at the level of trachea bifurcation, which causes a complete collapse of the left lung and enlargement of the right lung as compensation. The bronchoscopic finding showed total occlusion at the left main bronchus.

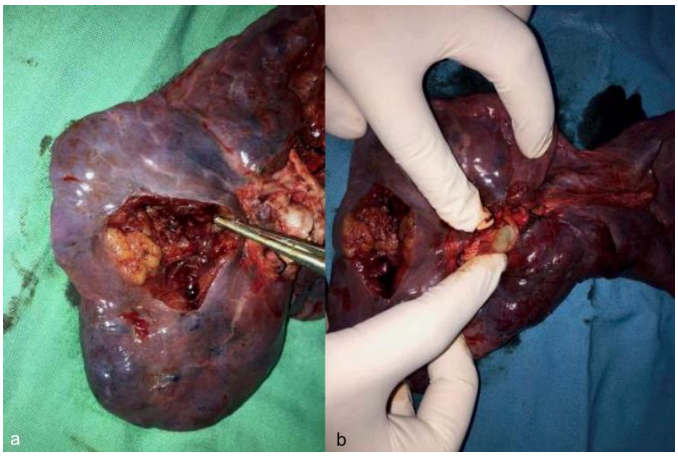

Figure 3. The resection of lung tissues showed extensive caseous necrosis

Post–surgery, according to the Indonesian Ministry of Health, the patient was given category II anti–tuberculosis drugs, which add streptomycin and extended administration of ethambutol compared to category I. After eight months of treatment, the patient had no symptoms and had been recovering well.

Discussion

EBTB occurs in 5.8% of pulmonary tuberculosis cases.[4] It is more common in females, possibly related to the hypothesis that the female bronchi are narrower than males.[10,11] Female gender was also a risk factor for a higher grade of stenosis, and females had a more active type of EBTB and a tendency to have multiple–level EBTB.[12] Majority of cases occur in the second or third decade of life, and the second–highest occurrence was found in old age.[11,13]

EBTB could affect any sites from the bronchial tree, with the most commonly affected areas being primary bronchi, bilateral superior lobar bronchi, and right middle lobar bronchus.[10] EBTB may affect any layer of the tracheobronchial wall, including lamina muscular and cartilage.[6] The clinical course of EBTB is highly variable because there are several potential pathogenetic mechanisms. Interaction between the effect of mycobacteria, host immunity, and anti–tuberculosis drugs may factor in different courses of disease progressions. Chung et al. classified EBTB into seven subtypes according to the bronchoscopy appearances: (I) actively caseating (bronchial mucosa being swollen, hyperemic, and diffusely covered with whitish cheese–like material); edematous–hyperemic (bronchial lumen narrowed due to severe mucosal swelling with surrounding hyperemia without caseous material nor fibrous contracture); (III) fibrostenotic (marked narrowing of the bronchial lumen with fibrosis); (IV) tumorous (endobronchial mass whose surface usually covered with caseous material, nearly occluding the lumen completely); (V) granular (pattern resembling scattered grains of boiled rice, with underlying bronchial mucosa showing severe inflammatory change); (VI) ulcerative (appearance of bronchial ulcer imitating peptic ulcer); and (VII) nonspecific bronchitis (only mild mucosal swelling/hyperemia were seen).[9]

The presentation of the disease is variable. It may be acute, insidious, or delayed, appearing after or during anti–tuberculosis treatment.[14] Symptoms found in EBTB are similar to patients with pulmonary tuberculosis. A dry or productive cough is the most common symptom in 80% of the patients. Hemoptysis may occur in 15–40% of patients, ranging from mild to massive hemoptysis. Symptoms like decreased appetite and general weakness are found in less than 35% of patients.[7] Fever usually starts mild but may become more prominent in advanced cavitary disease.[10] Dyspnea, wheezing, and decreased breath sounds may present if the endobronchial lesion has a stenosing effect.[15]

Unlike typical pulmonary tuberculosis, which is relatively easy to diagnose with bacteriological and radiological findings, EBTB is more difficult due to its nondistinctive clinical manifestations.[6] All patients suspected of EBTB should be subjected to sputum smear tests and culture examination for tuberculosis.[16] Sputum smear for Acid fast–bacillus in EBTB often yields negative results, with studies reporting positivity rates ranging from 16% to 53.3%.[17–19] In the late fibrostenotic stage, the positivity rate of microbiological methods drops to 0%.[20] Absence of abnormality in chest x–ray examination does not rule out TB, but chest CT scanning may find tracheobronchial lesions that occur in EBTB.[7,21] Bronchoscopy remains the most valuable method to help pinpoint the diagnosis of EBTB. Other procedures could also be done with bronchoscopies, such as biopsy, brushings, needle aspiration, and bronchoalveolar lavage.[10,12,22]

The eradication of *Mycobacterium tuberculosis* and the prevention of tracheobronchial stenosis are the main goals of EBTB treatment.[10] Anti–tuberculosis medications have been used for treatment with different results, and the curative effect may help prevent tracheobronchial stenosis from shaping. For patients in which fibrostenosis is already in the latter stage, the curative effect of anti–tuberculosis medications is generally poor.[6] Corticosteroids have been used to prevent fibrostenosis with systemic and local administration, but still lacking evidence from more extensive prospective trials.[23,24] Bronchoscopic procedures such as balloon dilatation and stent implantation are indicated for fibrostenotic EBTB.[25] Surgical bronchoplasty may help enlarge narrowing bronchus due to inflammatory stenosis that frequently occurs in EBTB. For bronchial stenosis that coexists with a destroyed lung, pneumonectomy is considered the most effective method, and bronchial stenosis does not constitute an obstacle to pneumonectomy.[26]

Conclusions

EBTB poses a difficult challenge for physicians to make an early diagnosis due to its insidious nature and nondistinctive manifestations. Bronchoscopy should be performed in suspected EBTB patients despite negative acid–fast bacillus sputum smears and normal radiological findings. Once the diagnosis is established, aggressive treatments should be conducted to eradicate *Mycobacterium tuberculosis* and prevent tracheobronchial stenosis. If chemotherapy is insufficient to prevent the formation of fibrostenosis, various bronchoscopic and surgical techniques should be utilized. Future studies should be directed toward understanding the pathogenesis of this disease better and increasing the sensitivity of diagnostic measures.

Disclosure

The authors declare no conflict of interest.

Role of authors

Author1 Conceptualization Data curation Formal analysis Funding acquisition Investigation Methodology Project administration Resources Software Supervision Validation Visualization Writing

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