

Closure of pulmonary cavity of a multidrug-resistant tuberculosis patient with catheter insertion – A case report

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SUMMARY

The treatment of multidrug-resistant tuberculosis (MDR-TB) relies heavily on optimal chemotherapy, but interventional therapies can be adopted as adjuvant treatment to speed up illness control and increase the cure rate. We present a case of a 31-year-old MDR-TB male patient with a massive pulmonary cavity in the right lower lung cured by chemotherapy with a catheter inserted in the cavity as adjuvant treatment. This case illustrated that early interventional therapy increases the treatment success rate for pulmonary MDR-TB patients with empyema and massive cavity without the need of major invasive surgery and consequently preserve lung functions.

Introduction

Massive pulmonary cavity is a life-threatening complication of chronic and reactivated tuberculosis, especially in patients with multidrug-resistant tuberculosis (MDR-TB). Although mainstream MDR-TB treatment relies on chemotherapy, interventional therapy, at times, will be adopted as adjuvant treatment. We describe the successful treatment of a multidrug-resistant tuberculosis patient with massive pulmonary cavity in the right lower lobe by catheter drainage. Follow-up with the patient has been ongoing for over 2 years after treatment completion and no recurrence has been observed.

Case report

A 31-year-old gentleman presented to our department with a 3-month history of cough, fever, right-side pleuritic chest discomfort, night sweat, and weight lost (3 kg in 2 months). He was diagnosed with pulmonary tuberculosis 8 years prior to presentation and had not complied with the prescribed anti-TB therapy. He had no history of smoking and alcohol use. There was neither recent travelling history, nor exposure to occupational or agricultural lung diseases.

On physical examination, the patient's temperature was 37°C. Blood pressure was 113/69 mmHg, pulse was 99 beats per minute, respiratory frequency was 20 breaths per minute. His oxygen saturation level was 98% in room air. He weighed 50 kg and measured 168 cm in height. Auscultation revealed stable rales in the right lower lung. Head and

neck examination results were normal. Cardiac examination confirmed a regular rhythm, no gallop or murmur. Abdomen was not tender. Bowel sounds were normal. There was no hepatosplenomegaly. Extremities showed no pitting edema. There was no visible sign of any skin rash.

Laboratory tests came back with the following results: hemoglobin of 135 g/L, leucocytes of $6.79 \times 10^9/L$ with 67.4% neutrophils. CRP was 38.2 mg/L (ref.: <10 mg/L). ESR was 58 mm/H (ref.: <15 mm/H). Electrolytes, blood glucose level, renal and liver function tests were normal. HIV \ HBV \ HCV screening tests were negative. Electrocardiogram (ECG) showed sinus tachycardia. Chest computed tomography (CT) showed a massive pulmonary cavity in the right lower lung (Fig. 1). Sputum culture for bacteria and fungus were negative. Sputum smear and TB-DNA were positive. Mycobacterium tuberculosis test using GenoType® MTBDRplus from Hain Lifescience GmbH, Nehren, Germany showed rifampicin and isoniazid resistance with no katG mutation. Subsequent TB-culture and drug susceptibility test (DST) confirmed the same results.

Based on GenoType® MTBDRplus results and the intermittent treatment history, diagnosis of pulmonary multidrug-resistant tuberculosis was made. We promptly adjusted regimen to amikacin \ levofloxacin \ pyrazinamide \ ethambutol \ protonamide \ high dose isoniazid followed WHO's programmatic management guideline for MDR-TB patients. After 1 week of treatment, tuberculous empyema was observed in the cavity due to poor abscess drainage of the bronchus. A pig-tail catheter was inserted into the cavity immediately and the

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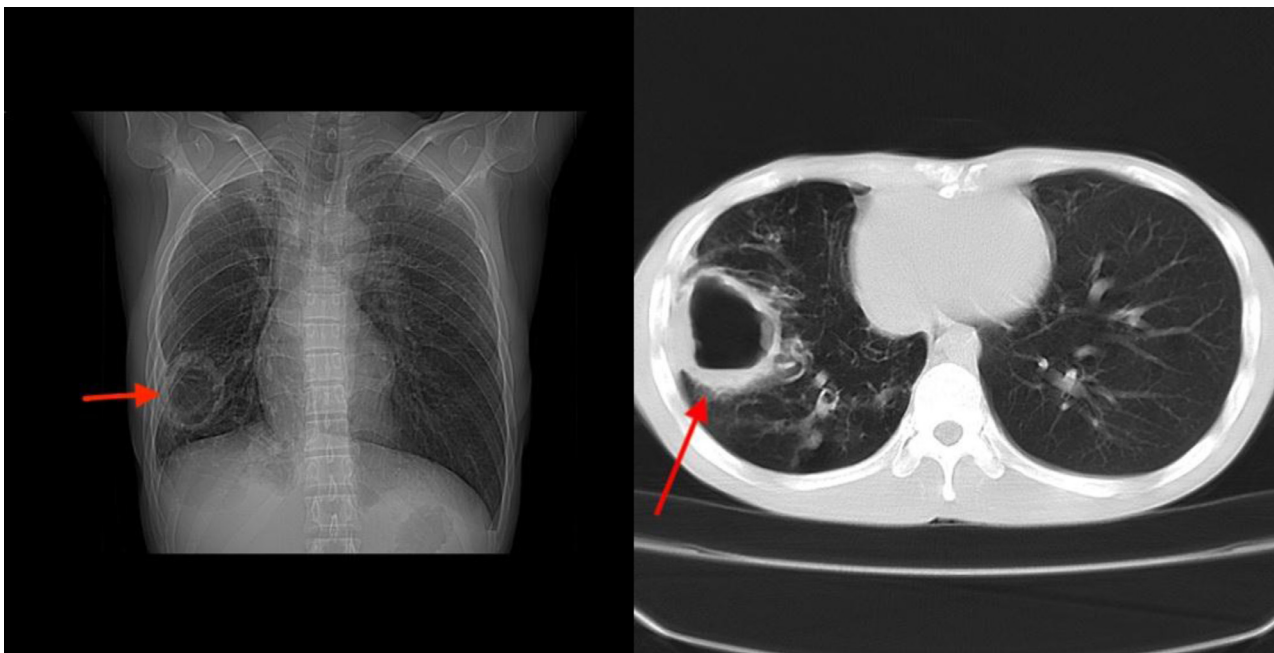


Fig. 1. - Chest CT scan showed massive cavity in the right lower lobe, taken on November 25, 2014.

procedure was guided by CT. The cavity was rinsed with 100 ml of saline once per day, after which 0.4 g of amikacin was administered directly to control the bacterium burden. Amikacin was prescribed on weight-based dosage of 15 mg/KG based on WHO's guideline and original regimen was 0.75 g all via intravenous injection. After the pig-tail insertion, only 0.35 g had to be administered intravenously.

Pleural effusion was found in the right thorax after 1 week of the aforesaid interventional treatment (Fig. 2). Another catheter was inserted into the pleural space to drain the excessive pleural fluid. Pleural fluid culture for TB was positive and DST demonstrated the same result as that of the sputum.

Observing that the right lower lung had partially collapsed, and the

cavity had become smaller in size, the pig-tail catheter in the lung cavity was removed after 10 days of insertion. The catheter in the pleural space was removed 14 days after insertion as no drainage was observed. Anti-MDR-TB treatment continued and the respiratory symptoms improved. Chest CT after 2 months of treatment showed the pulmonary cavity collapsed and pleural wall thickened (Fig. 3). Sputum culture for TB turned negative in the fifth month of treatment. All the clinical symptoms disappeared in the sixth month. Chemotherapy continued and the right lung re-expanded gradually.

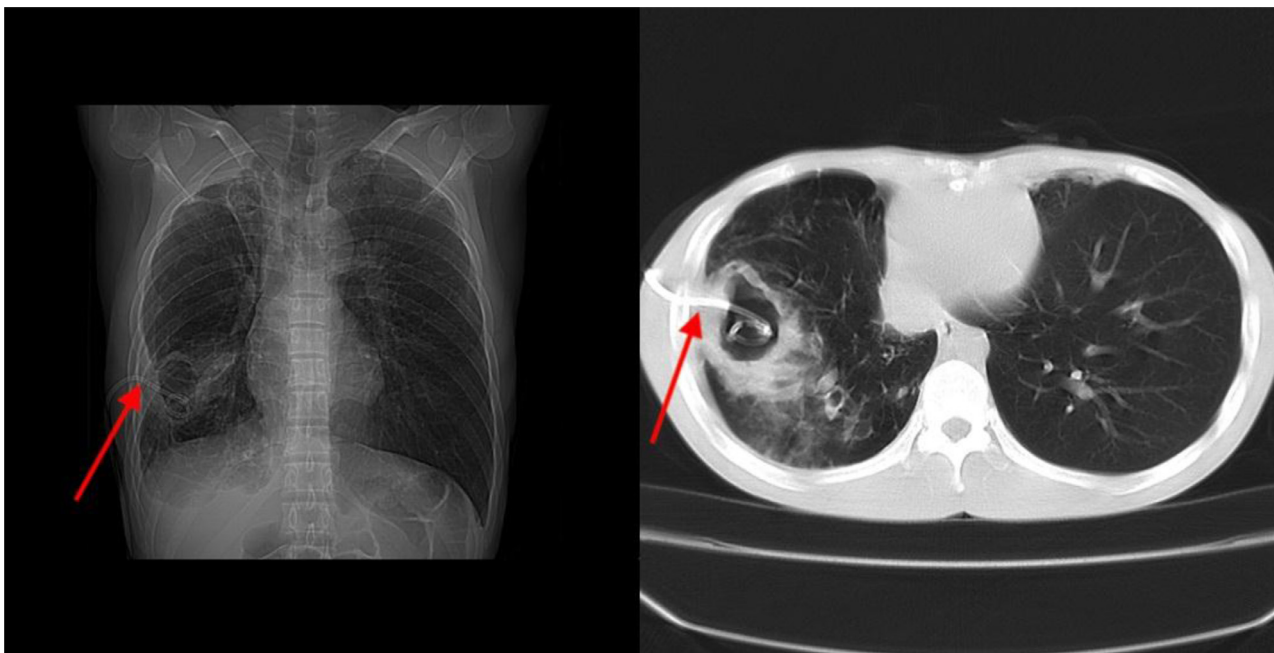


Fig. 2. - Chest CT scan showed a pig-tail catheter in the lung cavity of the right lower lobe and minor degree of effusion in the right pleural space, taken on January 16, 2015.

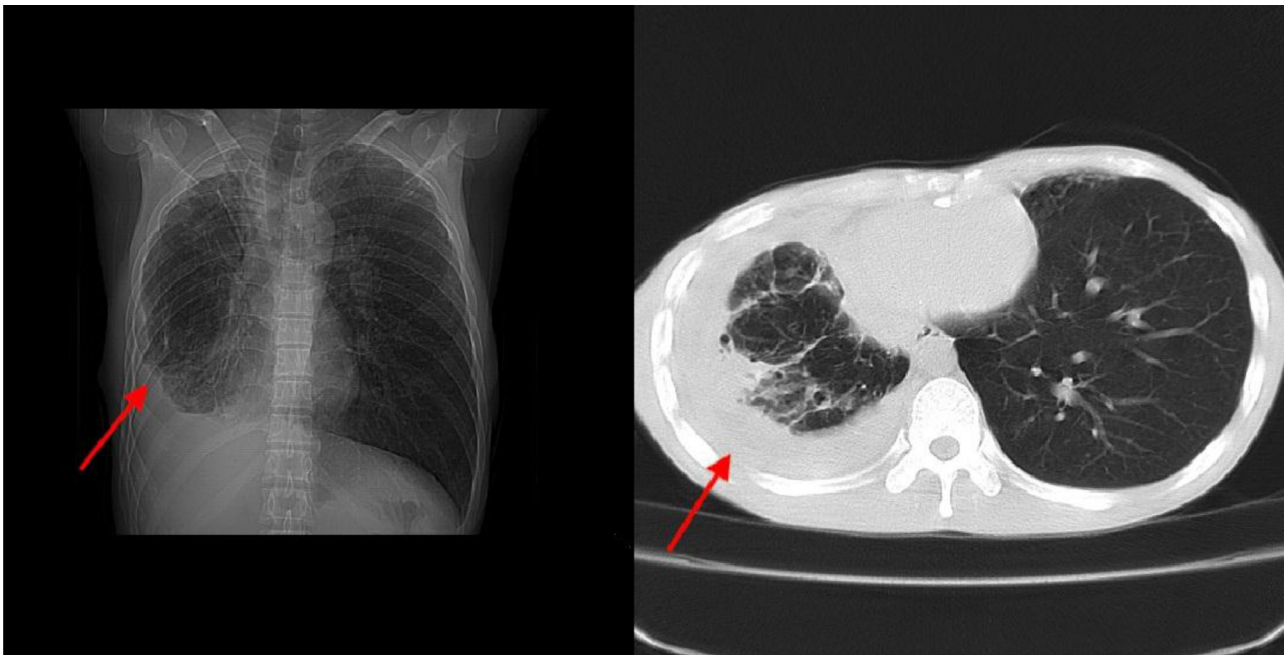


Fig. 3. - Chest CT scan showed right pleural wall thickened and infiltration and bronchiectasis in right lower lobe, taken on March 16, 2015.

Outcome and follow-up

Chest CT after 11 months of treatment showed the cavity closed and a minor degree of bronchiectasis left and almost no pleural thickening was observed (Fig. 4). On treatment course completion in the 18th month, the patient put on weight (55 kg, as measured at the end of the treatment). No liver or kidney function damage and no other side effects had been detected during the treatment. The patient was followed up for over 2 years after treatment completion and there has been no relapse.

Discussion

The emergence of MDR-TB poses a significant burden to the control of TB worldwide [1]. Patients with pulmonary cavities presented poor clinical outcomes and a high mortality rate [2,3]. The destroyed lung parenchyma with cavities creates an ideal environment for bacillus growth. Studies have shown the presence of cavitary lesions to be associated with longer time for sputum culture conversion, and high rates of treatment failure and relapse [4]. MDR-TB patients with pulmonary cavity greatly lowered the cure rate [5]. In some cases, surgery such as lobectomy and pneumonectomy were performed as adjuvant treatment for cure, but concern of the overall surgical efficacy and eligibility remains [6,7]. Lung collapse therapy combined with chemotherapy used

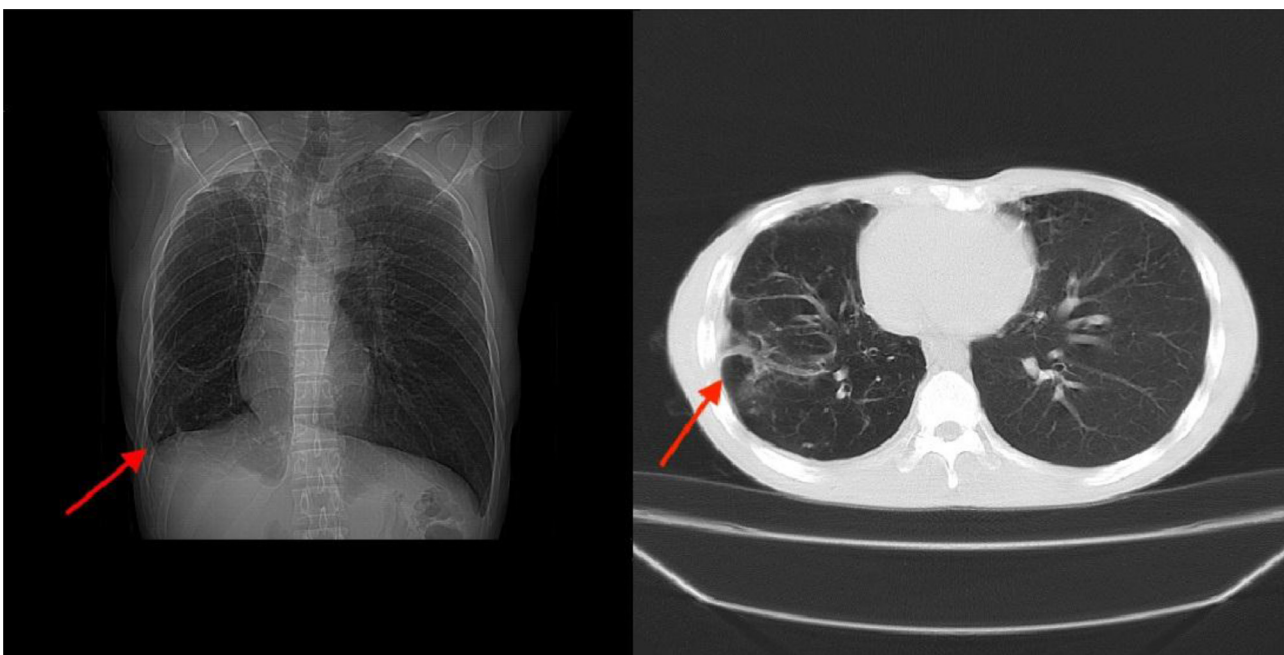


Fig. 4. - Chest CT scan showed almost no pleural wall thickening and only a minor degree of bronchiectasis in right lower lobe, taken on December 30, 2015.

to be adopted for treating pulmonary tuberculous empyema with big cavity and some patients were cured [8]. In some rare cases, an endobronchial back valve was applied to induce hypoventilation and atelectasis in the affected areas of the lung to trigger local lung collapse and cavity closure [9]. The theory of this procedure is similar to that of lung collapse surgery, but its application is complicated and requires a professional team to support.

In our case, prompt initiation of anti-MDR TB treatment was a major life saving step. With the massive tuberculous empyema and bad drainage from bronchus, we doubted that it might be difficult to rely on chemotherapy alone to clear the complications and close the cavity. The location of the cavity being very close to the chest wall was an important consideration for confirming the pig-tail catheter insertion. It appeared to be the least invasive and most promising approach to adopt compared to other surgical procedures. Insertion of a pig-tail catheter was aimed for two purposes - drainage and direct drug administration, both could accelerate the clear up of the empyema and cavity closure and led to eventual local lung collapse. With the catheter insertion for 10 days, the cavity reduced in size and was closed in a short period of time. Even pleural wall thickening, resulted from accumulation of fluid in pleural space, was noticed during the process but it was temporary. Unlike a chronic active infection, we believed the condition would be cleared with adequate drainage facilitation and the ongoing anti-TB treatment. The right lung re-expanded gradually as chemotherapy continued. Lung function was best preserved in the end without having to resort to major surgical procedures, and no sequela was observed.

In the late 20th century, surgical interventions such as lung collapse and artificial pneumothorax which used to be the mainstream treatment for TB were abandoned with the development of successful antimicrobial chemotherapy. Nowadays, in view of the burgeoning number of MDR and XDR tuberculosis cases, physicians are re-examining these once-obsolete approaches as adjuvant treatment to be used with chemotherapy for improving overall survival and cure.

Conclusion

With this case report, we aim to create awareness of early interventional therapy being adopted as adjuvant treatment for MDR-TB with empyema and pulmonary cavity. It can increase the chance to cure the disease and highly preserve lung function while avoiding complicated surgery.

Ethical approval

The work covered in this manuscript has been conducted with the ethical approval of all relevant bodies and in accordance with ethical standards as required by law. The authors would also like to undertake that the above manuscript has not been published elsewhere, accepted for publication elsewhere or under editorial review for publication

elsewhere and is not under consideration by another journal. All the authors have approved the manuscript and agree with submission to your esteemed journal.

Disclosure Statement

No conflicts relevant to the content of the article or financial interest is to declare.

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Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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