Case Report

Investigating a unilateral pleural effusion: A tale of a medical error and diagnostic delays

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ABSTRACT

We report the case of an elderly Asian man where a medical error and diagnostic delays obscured the diagnosis of pleural tuberculosis (TB). The patient was hospitalized for evaluation of a unilateral pleural effusion. Initially, the patient was subjected to a pleural aspiration on the wrong side due to a lack of bedside ultrasound guidance. Subsequently, the patient underwent several investigations but not a blind closed pleural biopsy (BCPB) due to a lack of equipment. Furthermore, the patient was deemed to be too sick to undergo a thoracoscopic pleural procedure. Eventually, a bronchoscopy was performed, and washings from the right upper lobe were cultured, which established the diagnosis of TB. This case highlights the need to use bedside ultrasound in the investigation of pleural effusions, the role of BCPB especially in frail patients and finally the utility of bronchoscopy in establishing a diagnosis of pleural TB.

KEY WORDS: Bronchoscopy, induced sputum, pleural effusion, tuberculosis

INTRODUCTION

Pleural effusions can be caused by over sixty medical conditions.¹ Hence, it is important to achieve a diagnosis efficiently with minimum patient morbidity. The British Thoracic Society have provided guidelines that detail a systematic approach to the investigation of unilateral pleural effusion.² A crucial recommendation is the use of bedside pleural ultrasound to guide pleural aspiration.² Our case highlights the potential for serious harm when pleural procedures are performed without bedside pleural ultrasound.

Pulmonary tuberculosis (TB) is a leading cause of death worldwide, especially in developing countries. Diagnosis can be made from sputum for microscopy for acid-fast Bacilli (AFB) and TB culture. Pleural TB usually presents with symptoms such as pleuritic chest pain, cough, and fever and it is recommended that when pleural TB is suspected, patients should undergo thoracocentesis and a blind closed pleural biopsy (BCPB).³ In our institution, BCPB is not performed, which posed a dilemma since the patient was deemed too unwell for a thoracoscopy.

CASE REPORT

Our patient was an 86-year-old man, never smoker, who presented to a regional hospital with a 4 weeks history of nonproductive cough, dyspnea, and left pleuritic chest pain. He had migrated to Australia from Korea 40 years ago, and his only significant medical illness was atrial fibrillation for which he was receiving oral digoxin 125 mcg daily.

At the time of hospital presentation, blood tests demonstrated leukopenia 3.2 × 10 × 9/L and lymphopenia 0.76 × 10 × 9/L. C-reactive protein was

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145 mg/L (normal <5 mg/L). A chest X-ray showed left sided pleural effusion [Figure 1]. A decision was made by the treating team to perform thoracocentesis. However, the medical officer did not use image guidance and mistakenly attempted the thoracocentesis on the right hemithorax instead of the left side. Subsequently, the patient was transferred to our institution for further management.

In our institution, we performed a bedside pleural ultrasound-guided thoracocentesis. The pleural fluid analysis revealed the fluid to be an exudate (protein 54 g/L and lactate dehydrogenase 289 U/L). No malignant cells, organisms, specifically AFB were detected in pleural fluid. Since the cause of the effusion was unknown, 1 week later a 2nd thoracocentesis was performed which was also nondiagnostic. Adenosine deaminase was within normal range 55 U/L (normal <70 U/L). The patient underwent a computed tomography (CT) chest which revealed a moderate amount of left-sided pleural effusion and an irregular left upper lobe linear nodular opacity [Figure 2]. Our institution does not offer an induced sputum test, and consequently, the patient underwent a bronchoscopy, and bronchial lavage was performed on the left upper lobe.

Clinically, the patient continued to deteriorate and was now bed bound. To obtain a pathological diagnosis, it was decided that a pleural biopsy must be performed as a next step investigation. BCPB equipment was not available in our institution. Due to his poor performance status, video-assisted thoracoscopic surgery was deemed unsafe. Furthermore, there was no discrete pleural tissue that could be biopsied using CT image guidance.

Six weeks later the bronchial lavage culture grew mycobacterium TB, which was sensitive to first-line anti-TB agents. Hence, he was commenced on standard daily regimen antibiotic treatment consisting of isoniazid 300 mg daily, pyridoxine 25 mg daily rifampicin 600 mg daily, pyrazinamide 1500 mg daily, and ethambutol 800 mg daily were prescribed for 2 months followed by isoniazid and rifampicin for 4 months. Over the course of the 6 months, the patient’s pleural effusion and pulmonary interstitial changes resolved completely. Finally, 8 months after he initially presented to hospital, he was discharged from the respiratory clinic after completion of anti-TB treatment.

**DISCUSSION**

We believe that this case report has highlighted three pertinent issues in the management of patients’ with pleural effusion: Wrong side thoracocentesis, lack of equipment to perform BCPB and induced sputum.

Thoracocentesis is an important diagnostic procedure in patients with an undiagnosed pleural effusion.\[^{[2]}\] It is estimated that approximately 178,000 thoracenteses are performed per year in the United States.\[^{[4]}\] Typically, thoracocentesis is a safe procedure but can result in significant complications including pneumothorax, hemorrhage, and death. Despite these efforts, wrong side thoracocentesis can still occur. Miller *et al.* performed a root cause analysis of 14 wrong side thoracocentesis.\[^{[4]}\] They found that absence of verification images to be cause in almost 50% of cases. Consequently, there has been a trend to the widespread implementation of ultrasonography, training, and restriction of thoracentesis to experienced health care professionals.\[^{[4]}\]

Another reason for the delay in diagnosis was the lack of availability of equipment to perform a BCPB in our institution. This technique is an inexpensive, sensitive technique with few complications.\[^{[3,5]}\] Its major indication is the study of malignant and TB effusions.\[^{[5]}\] The diagnostic sensitivity of BCPB in pleural TB is reported to be around 90–95%.\[^{[5,6]}\] However, it has now been demonstrated that if the pleural biopsy is guided by an imaging technique (ultrasound or computed tomography), its yield is even better.\[^{[6]}\] The increasing availability of

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**Figure 1:** Chest X-ray showing moderate amount of left sided pleural effusion

**Figure 2:** Computed tomography chest showing left sided pleural effusion and apical pulmonary nodular opacity
video-assisted thoracoscopy and the low prevalence of TB effusions in developed countries has led to the declining use and experience with BCPB.[7]

The third reason for delays in the diagnosis of TB was the lack of availability of induced sputum in our institution. A randomized study previously demonstrated that induced sputum has a greater diagnostic yield and is more cost-effective than bronchoalveolar lavage in detecting active pulmonary TB in patients who cannot produce spontaneous sputum.[8] Induced sputum is performed with hypertonic saline solution delivered by nebulizer and samples can be obtained readily.[9] This is in contrast to bronchoscopy, where immediate availability is not always possible due to staffing, bronchoscopy suite availability, and time constraints.

This case highlights certain health care system deficiencies that resulted in delays and potential harm to our patient with pleural TB. Importantly, these deficiencies are readily amenable to correction, and our health care service is currently undertaking reform to rectify these errors.

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Conflicts of interest
There are no conflicts of interest.

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