Tuberculous Empyema Presenting as a Persistent Chest Wall Mass: Case Report

Jennifer Madeo,[1,] Rinal Patel,[2] Wondwossen Gebre,[3] Shadab Ahmed[4]*

Abstract

Empyema necessitatis is an empyema that spreads outside of the pleural space involving the chest wall. Tuberculosis is the most common cause. It occurs in both immunocompetent and immunocompromised patients. Due to the long latency period and the paucity of symptoms, diagnosis can be challenging. Clinicians must have a high awareness of this disease, especially in patients from endemic regions. The disease is treatable with surgical and medical interventions. Failure to diagnose can lead to grave consequences for both the individual patient and public health. This is particularly true in endemic regions where controlling the spread of TB is challenging. We report a rare presentation of pulmonary tuberculosis in an otherwise healthy 72-year-old USA immigrant from Thailand. He presented with a painless, chronic chest wall swelling with minimal systemic symptoms. Imaging revealed empyema necessitatis. Histopathology could not give a definitive diagnosis because the tissue was too necrotic. Despite negative acid-fast staining, sputum cultures were positive for tuberculosis. The case presentation is followed by a brief review of the current relevant literature. This case highlights the importance of clinical suspicion and increased awareness for this silent but serious infection.

Keywords **Empyema necessitatis, tuberculosis, chest wall abscess.**

Introduction

This is the case of a 72-year-old Asian male, immunocompetent, with no significant past medical history. He complains of a persistent right lateral thoracic subcutaneous mass for 1 month. It has not changed much in size. It was initially associated with a mild rash and pruritus that self-resolved. The patient is generally in good health, plays golf and walks for exercise several times a week. He did not complain of any fever, night sweats or cough in the 6 months prior to admission. He was born in Thailand and immigrated to the USA 34 years ago. He has never traveled back to Thailand. He denies recent travel, recent sick contacts, insect bites. He previously smoked half a pack of cigarettes per day for 20 years but he quit 5 years ago. He admits to consuming 1-2 beers daily basis for several years. He lives home with his wife of 40 years. His family history includes a brother who died of lung cancer at 77 years old.

Physical examination reveals a heterogeneous, soft, immobile non-tender mass measuring 3-4 cm in diameter, in the right lower hemithorax. Lung exam reveals decreased breath sounds in the right lower lobe. No adenopathy is appreciated. Chest X-ray reveals elevation of the right hemidiaphragm with thickening of the right lateral pleura (Figure 1). On chest CT, a heterogeneous mass measuring 14.4 x 4.2 x 9.9 cm in the right lower hemithorax is observed, compressing the right hemidiaphragm. This mass contains several foci of calcifications and collateral vessels were identified posteriorly. The mass extends outside the ribcage as a low density 3.2 x 1.6 cm lesion in the right posterior lateral lower chest wall (Figure 2).

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[1]DO, PhD, Department of Medicine, Nassau University Medical Center, East Meadow, New York, USA; [2]MD, Department of Medicine, Nassau University Medical Center, East Meadow, New York, USA; [3]MD, FCAP, Department of Medicine, Nassau University Medical Center, East Meadow, New York, USA; [4]MD, Department of Medicine, Nassau University Medical Center, East Meadow, New York, USA.
[*]Corresponding author: Jennifer Madeo, DO, PhD, Department of Medicine, Nassau University Medical Center, 2201 Hempstead Turnpike East Meadow, East Meadow, New York, 11554, USA; jmadeo@numc.edu

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Figure 1. Initial chest X-ray showing elevation of the right hemidiaphragm with thickening of the right lateral pleura.

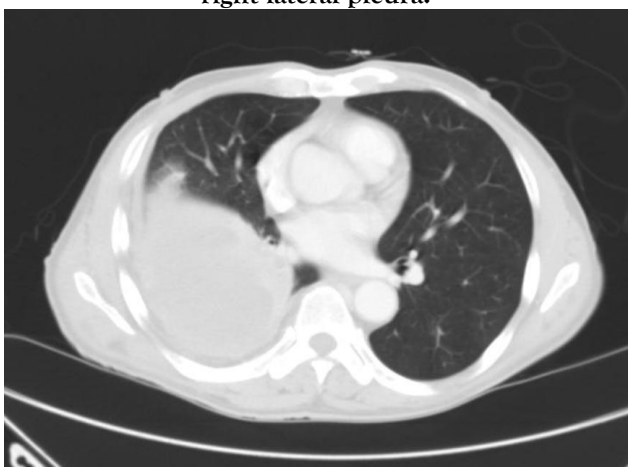


Figure 2. Computed Tomography of the chest showing a 14.4 x 4.2 x 9.9 cm heterogeneous mass in the right lower hemithorax. Consistent with empyema necessitatis, the mass extends outside the ribcage by 3.2 x 1.6 cm in the right lateral lower chest wall.

Ultrasound guided fine needle aspiration is done which did not reveal any organisms, only a moderately increased white blood cell (WBC) count. Purified Protein Derivative (PPD) test was positive with 25 mm of induration. His Human Immunodeficiency Virus (HIV) status is negative. The diagnosis of empyema necessitatis is made and seven days after admission thoracotomy with surgical debridement is done. Differential diagnoses include lung cancer and bacterial abscess. The mass and surrounding tissue contained purulent necrotic material. Due to the size of the mass and the lack of imaging improvement, a second thoracotomy is recommended but the patient refuses. He is discharged after a total of 12 days, with instructions on proper wound care. He completed a 10-day course of vancomycin and piperacillin-tazobactam in the hospital and was discharged without any antibiotics.

He is admitted again 2 months later with cough, which had been worsening over 3 weeks and fever (maximum temperature, 38.3°C). Sputum is blood-tinged. At this time the chest X-ray shows the empyema increasing in size. Six days after this second admission he undergoes a thoracotomy with wedge resection and decortication. The right lower lung mass is removed with resection of 8th and 9th rib. The right hemidiaphragm and chest wall is reconstructed with dermal graft. Pathology reports active chronic inflammation of the skeletal muscle tissue. Right middle lobe resection shows a chronic organizing pneumonia, non-caseating granulomas with foreign body type histiocytic giant cells. There is extensive fibrosis and subpleural necrosis of the lung tissue. Acid-fast staining was negative. No fungi or bacteria were seen on microscopy exams.

The mass lesion shows no growth of bacteria or fungi on culture medium and blood cultures are negative. Respiratory aspirate and sputum grows *Mycobacterium tuberculosis* 15 days after collection. All the acid-fast smears are negative. This emphasizes that culture is more sensitive than acid-fast stain. If clinical suspicion for TB is high, a negative acid-fast stain does not rule it out. Therefore 2 days after his discharge he is readmitted for the third time and therapy is immediately started. He remains on respiratory isolation for 2 weeks. He is treated with rifampin 600 mg daily, isoniazid 300 mg daily, pyrazinamide 1 g daily and ethambutol 800 mg daily. Two weeks after beginning therapy, induced sputum cultures are repeated to check for acid-fast bacilli, and come back negative three times. Respiratory isolation is discontinued. He is stable and afebrile during this time. The plan is to continue this four drug regimen for a total of 2 months while being followed as an outpatient. After this his antibiotic treatment will be reevaluated, to decide on the total duration of

therapy – 6 months or longer, if needed. He was discharged 1.5 months ago and did not have any symptoms on his last outpatient clinic visit.

Discussion

Extrapulmonary tuberculosis is present in about 15% of all tuberculosis cases, with bone and joint involvement accounting for less than 2%.[1] Abscesses of the chest wall are found in less than 10% of cases involving musculoskeletal tuberculosis.[2,3] Abscess formation is driven by chronic inflammation of the pleural space, initially causing an empyema, which triggers development of a bronchopleural fistula allowing exudative material to enter the chest wall. The result is empyema necessitatis, a rare complication characterized by the dissection of purulent material through the soft tissues and eventually involving the skin.[4] The infection usually spreads via intercostal lymph nodes.[5,6] This inflammatory process may be present for years with a paucity of clinical symptoms. This infection occurs in both immunocompromised and immunocompetent patients.[7,8] These lesions commonly present as a painless solitary mass overlying the chest wall, as described in this case report.[5,9] Patients can also have multiple lesions and these can sometimes be painful.[7,10-17]

Empyema necessitatis can lead to serious destruction of bones, muscle and soft tissues, particularly the ribs. This may not produce symptoms until significant necrosis has already occurred.[12,18] TB has a special preference for the bones of the thorax which commonly include the ribs, vertebrae, sternum and sternoclavicular joints, affecting the periosteum while preserving the medulla.[19] Chest wall abscesses can either be a primary infection site or spread from lungs. Infection of the lung parenchyma which extends through the ribs is very rare.[8,20,21]

Empyema necessitatis is diagnosed with computed tomography (CT) scan, which demonstrates the pathognomonic pleural effusion connected to the extrapleural chest wall mass.[22] There is a low density area of a juxtacostal soft tissue with rim enhancement, destruction of ribs and thickened or calcified pleura.[19] Rib thickening may also be commonly seen.[7] Bronchopleural fistula tracts are usually present but can be difficult to detect by CT.[23] Ultrasound is a cost-effective and useful modality to characterize underlying rib necrosis and associated soft tissue abscess.[19] CT can also provide information on the functional state of the lung parenchyma. The diagnosis should be considered in USA immigrants of Asian or African origin who have chest wall abscess and show rib destruction and extrapleural soft tissue masses on CT.[24] Histopathological analysis is indicated when these typical CT findings are observed. A definitive preoperative diagnosis is frequently difficult to obtain since acid-fast bacilli smears or cultures, fine-needle aspiration and polymerase chain reaction (PCR) are often falsely negative.[13] PCR is known to give a rapid diagnosis and justify treatment without having to wait for cultures. This technology was not readily available in our institution. Histological examinations of surgical specimens are also commonly falsely negative only producing a definitive result in ~20% of the cases.[6]

Our case showed non-caseating granulomas and negative acid-fast staining on the surgical specimens, emphasizing the importance of sputum cultures when suspicion is high. The absence of caseating granulomas does not rule out TB. Non-caseating lesions have been found in association with TB, particular to the gastrointestinal tract.[25,26]

The most common cause of bacterial empyema necessitatis is TB. The differential diagnosis includes *Staphylococcus* and *Streptococcus* infections and actinomycosis.[27,28] Pulmonary aspergillosis, tertiary syphilis, and typhoid should also be considered. Recent travel and residence in endemic regions are critical elements of the medical history. Non-infectious etiologies should also be considered and include lymphomas, primary pulmonary neoplasms such as bronchogenic carcinoma and mesothelioma and sarcomas.[29,30] Tissue biopsy can usually exclude these etiologies even if a definitive diagnosis of TB cannot be made.

Treatment of TB empyema necessitatis requires both surgical and medical interventions. Surgery is needed to re-expand the trapped lung and enlarge the intercostal spaces.[3] Open decortication can significantly improve pulmonary function.[31] Cold abscesses of the chest

wall which involve the ribs require debridement and wide resection. Surgical removal of all diseased tissue, including bones and cartilage, is a safe approach, rarely complicated by spread of the infection.[2,32] The rate of operative mortality is around 5%.[13] Recurrence of infection is associated with insufficient removal of infected ribs or pleura and can occur up to 10 years after surgery, thus these patients need to be followed carefully for years.[33-35] Many surgeons recommend aggressive treatment including meticulous debridement and resection involving bones and cartilage.[36] This is generally followed by coverage with local musculocutaneous flaps to decrease postoperative complications and facilitate repair of pulmonary function. In the present case a less aggressive approach was taken during the first thoracotomy. The fact that the patient refused further surgery likely played a role in his relapse requiring a second admission 2 months later. It is likely that his symptoms were due to recurrence of an inflammatory response due insufficient removal of infected tissue. Looking retrospectively, it is possible that a more aggressive initial thoracotomy would have avoided this recurrence but the surgeons at the time were not convinced of the diagnosis. This reflects the rarity of this diagnosis in the USA. A recent review of adult patients treated by surgical management showed that complete excision of the abscess and primary closure of the wound prevents recurrence.[37] On the other hand, in children medical treatment without surgery may be an option.[10] Anti-tuberculosis drug therapy is usually needed to avoid recurrence, regardless of surgical management.[38] Most experts suggest between 6 months to a year of anti-tuberculosis drug therapy.[2,35] If the infection has spread to the ribs (primary tuberculotic osteomyelitis) resection followed by a year of anti-tuberculosis drug therapy has been recommended.[39]

Conclusion

Empyema necessitatis is an empyema that spreads outside of the pleural space involving the chest wall. Although accounting only for 10% of pleural empyemas, *Mycobacterium tuberculosis* accounts for most cases of empyema necessitatis.[16] This can cause tubercular cold abscesses of the chest wall, which are rare but treatable lesions. Treatment includes surgical debridement, resection and anti-tuberculosis chemotherapy. Tuberculosis must be on the differential diagnosis for the presentation of a persistent painless chest wall mass, especially in patients whose origin includes endemic regions. This case highlights the necessity to include empyema necessitatis in the preliminary diagnosis when there is a soft tissue swelling on the chest wall. Signs of pulmonary tuberculosis and systemic inflammation can be minimal or even absent. Thus the diagnosis often relies heavily on clinical suspicion. In the present case the only predisposing factor was the country of origin.

Conflicts of interest: All authors – none to declare.

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