CASE REPORT

# Empyema Necessitans Secondary to Tuberculosis: A Case Report

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## ABSTRACT

Empyema necessitans (EN) is a sporadic disease in the 21st century. It is a condition where the empyema has diffused and is loculated in the extrapleural space. It is usually caused by Tuberculosis (TB) infection or immunocompromised condition. Its manifestation, which is often vague in the beginning, leads to diagnostic dilemmas and delays in management. This has considerably affected patients adversely and incurred avoidable healthcare costs. We describe a rare case of empyema necessitans secondary to pulmonary tuberculosis in a 43-year-old male who presented to the emergency department with right anterior chest wall swelling, which was associated with pain, lethargy, malaise and significant loss of weight. Targeted ultrasonography of the anterior chest wall revealed a right anterior chest wall collection with intrathoracic extension. Contrast-enhanced computed tomography of the chest showed a multiloculated right chest wall collection with intrathoracic extension. Percutaneous drainage of the collection was performed, and the pus sent for Mycobacterium tuberculosis culture was positive. This case highlights the importance of a high index of suspicion and clinical awareness for this dangerous and silent disease.
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## INTRODUCTION

Empyema necessitans (EN) is a sporadic disease in the 21st century. It is defined as an empyema that diffuses into the extrapleural space and is often accompanied by localising symptoms of chest pain and systemic symptoms of lethargy, malaise and loss of weight(1). Tuberculosis (TB) is known to be the most common cause of EN, although such manifestation is rare(2). This rare disease can often be seen among both the immunocompromised and immunocompetent populations. The long duration and vague symptoms of this disease often lead to a diagnostic dilemma and, eventually, delay in management. This condition is treatable by both medical and surgical means. However, delay in diagnosing this condition often leads to considerable adverse effects on the patient's condition and strains the health care system. This is seen in TB endemic areas. We herein describe a rare case of empyema necessitans secondary to pulmonary tuberculosis in a 43-year-old male.

## CASE REPORT

A 43-year-old male presented to the emergency department complaining of progressively increasing right anterior chest wall swelling since two years ago. This condition worsened over the past two weeks and is associated with fatigue, malaise, intermittent fever, significant weight loss, and dyspnoea. On examination, his vital signs were normal, apart from mild tachypnea. There was no significant abnormality on our examination of the head, neck, nose, ears and lymphatic systems. Inspection of the chest revealed an apparent chest wall asymmetry with diminished right chest wall inspirational expansion. A large mass measuring 10x10 cm over the right chest wall was erythematous. This mass was fluctuant and tender on palpation. The right chest was dull on percussion, and there was reduced air entry over the right middle and lower zones on auscultation. A chest radiograph depicted a heterogeneous opacity over the right lung field (Fig.1). Targeted ultrasound of the thorax revealed an extensive heterogeneously hypoechoic collection measuring 3.9 x 13.2x16 cm in size over the right anterior chest wall, which extended intrathoracically (Fig.2). Contrast-enhanced computed tomography of the chest depicted an extensive right hypodense collection with rim enhancement

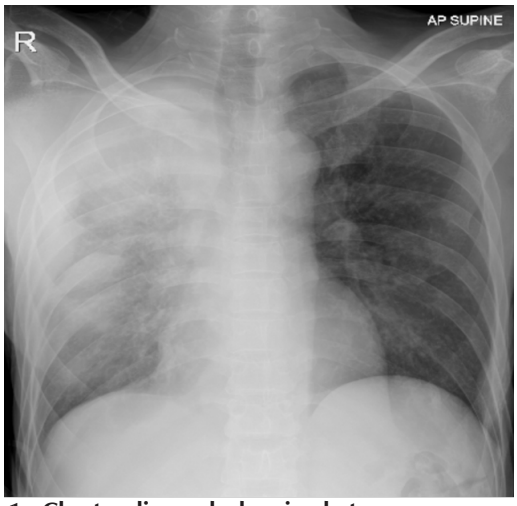


**Figure 1: Chest radiograph showing heterogenous opacification of the right lung field**

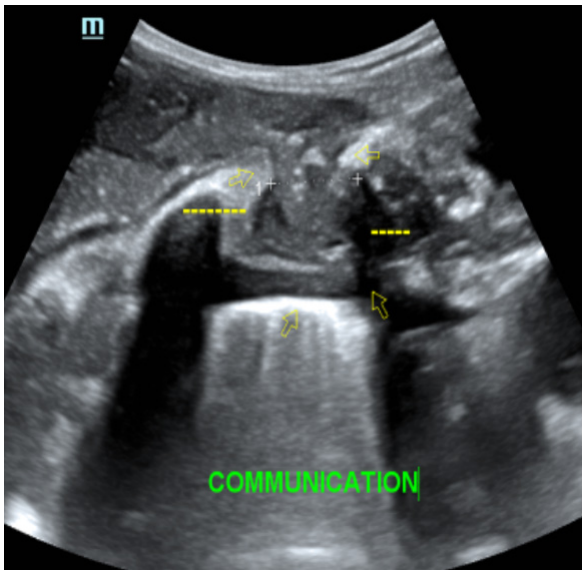


**Figure 2: Ultrasonography of the chest wall showing a collection between the anterior chest wall and the pleural cavity (yellow arrow)**

measuring 4.5 x 16.1 x 18.1 cm over the right chest wall, which extended intrathoracically (Fig.3 & Fig. 4). The biochemical profile showed a white cell count of 11.5x109 /L, haemoglobin 10.2 g/dL and significant thrombocytopenia with a platelet count of 56x109 /L. He was tested negative for Human Immunodeficiency Virus (HIV) and there was no other clinical sign suggestive of immunodeficiency condition. Subsequently, an ultrasound-guided percutaneous catheter insertion was performed to drain the empyema. Pus cultures were positive for mycobacterium tuberculosis. The patient received a four-drug antituberculosis treatment, namely, (daily peroral dose of Isoniazid 300 milligram, Rifampicin 600 milligram, Ethambutol 1 gram and Pyrazinamide 2 gram), with minimal clinical improvement. After two weeks of treatment, the patient succumbed to Septic shock secondary to disseminated Mycobacterium tuberculosis with multiorgan failure.

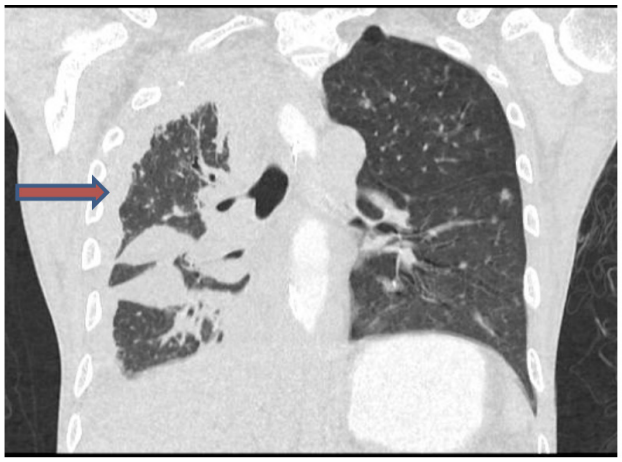

**Figure 3: Coronal view of a chest computed tomography showing a right anterior chest wall collection with intrathoracic extension (orange arrow)**

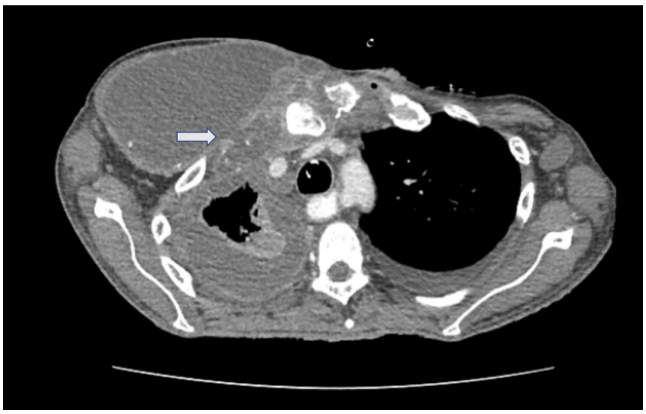

**Figure 4: Axial view of chest tomography showing the communication between the anterior chest wall lesion and the intrathoracic lesion (White Arrow)**

## DISCUSSION

Empyema neccesitans is a rare manifestation of tuberculosis infection, although most cases were caused by tuberculosis infection (2). Accumulation of exudate collection in subcutaneous tissue adjacent to the underlying thoracic pleura is believed to be caused by diffusion or tracking of the accumulating fluid, which originates from the pleural space following lung infection (1, 2). On the contrary, empyema thoracis usually limited to pleural space and rarely affects adjacent soft tissue or bones. This inflammatory process usually remains with vague clinical symptoms for many years and affects both immunocompromised and immunocompetent individuals (2). EN usually presents as a solitary mass in the anterior chest wall, between midclavicular and anterior axillary lines, from the second to sixth intercostal space, and is often not associated with pain at the later stage (1). A significant proportion of pleural space infections usually present as complications in the community or hospital-acquired pneumonia. Other causes include penetrating chest trauma, thoracic surgery and oesophageal rupture.

Independent risk factors for empyema development include disorders with a predisposition to aspiration (seizure, alcoholism, central nervous system disease), IV drug misuse, diabetes mellitus, cardiovascular disease, liver cirrhosis and an immunocompromised state. EN is not only limited to soft tissue but can also affect bones, muscles and adjacent ribs. When symptoms, usually pain, start to emerge, it is usually due to the ensuing necrosis process of the affected structure. At an advanced stage, destruction of the adjacent structure is detrimental, requiring extensive surgical debridement to achieve local infection control.

Due to its low prevalence, the lack of understanding of this disease is profound. In a systematic review, empyema necessitans (EN) was seen to affect males (84.7%) predominantly and was associated with chronic presentation (44%) (2). This study has also shown that EN affects a majority of patients with a normal immune system (62.7%) as compared to immunosuppressed patients (8%) (2). As for our patient, apart from a tuberculosis infection, he has a normal immune system. The majority of patients with EN were caused by tuberculosis (TB) infection (40.7%), and other pyogenic microorganisms such as staphylococcus, streptococcus and actinomyces are also responsible for the development of EN (2).

Diagnosing EN at an early stage is complex. Often patients present to a healthcare facility once the symptoms become debilitating. The underlying lung infection may not be detected due to its vague and non-specific clinical manifestation. Clinical assessment comprising clinical examination, radiological imaging and biochemical sampling are essential in determining the underlying cause of EN, enabling treatment initiation. Contrast-enhanced computed tomography of the chest will not only confirm the diagnosis. However, it will provide additional information regarding adjacent tissue or bone involvement and extend the disease into the intra-thoracic structures, facilitating subsequent treatment strategy (3). EN is seen as a collection of exudative fluid connected to the pleural cavity and adjacent extra pleural mass in this modality. Judicious utility of contrast-enhanced computed tomography of the thorax (CECT thorax) in a selected individual that presented with vague chest infection symptoms is advisable to detect empyema thoracis before it progresses into empyema necessitans. Owing to its low prevalence, sufficient research evaluating the ideal investigation algorithm and management is lacking. Diagnosis without surgical intervention is difficult as acid-fast bacilli smear and culture, FNA, and PCR usually yield a negative result. Tuberculosis culture is considered the gold standard, but this test is time-consuming. PCR is a reliable investigation to diagnose EN, which can expedite the initiation of antituberculosis treatment without waiting for a positive culture result. Invasive targeted sampling of the relevant tissue or fluids is required. Aspiration of the collection under an image-guided method to obtain the sample is recommended. Nevertheless, ample histologic samples obtained surgically can still result in false-negative (1). Empyema necessitans is commonly caused by bacterial tuberculosis. However, there are also reported incidents of EN arising from Staphylococcus aureus, streptococcal and actinomycosis infection (2). As in our patient, clinical and radiological investigations were suggestive of EN and pus cultured was obtained by ultrasound-guided pigtail placement into the pleura space, which was suggestive of Mycobacterium tuberculosis infection.

Management of empyema necessitans (EN) encompassed drainage and debridement of the infected tissue and treatment of underlying infection. Optimal treatment can be achieved by incorporating both surgical and medical treatment. Surgical treatment can vary from open thoracotomy with drainage, debridement or lung resection to a less invasive option of video-assisted thoracoscopy. The utilisation of chest tube drainage and repeated thoracocentesis have also proven beneficial in managing EN. In a systematic review by D. S. Kumar et al., 50% of patients underwent VATS, debridement and lung resection, where thoracocentesis and chest tube drainage were employed in 21.4% and 19.6% of patients, respectively, resulting in 80.8% of patients recovered from EN without morbidities (2). In another meta-analysis by Redden et al., where they compared treatment options between VATS and tube thoracostomy, they found no statistically significant difference in either procedural complication or mortality but a significantly shorter mean of hospital stay (4). In another study, Parsons et al. have proven that most cases of EN can be successfully managed with intercostal chest tube drainage and appropriate antimicrobial therapy (5). However, due to its low prevalence, insufficient evidence existed to substantiate EN prognosis. By extrapolating information from the management of empyema thoracis, surgical intervention, either thoracostomy drainage vs VATS, is associated with 5 to 6 in 1000 mortality. (4) EN can recur in the first ten years after the treatment, and it is often attributable to incomplete surgical resection of affected tissue or suboptimal antimicrobial therapy. Hence, it is impertinent to identify the underlying cause to ensure targeted antimicrobial therapy on top of surgical drainage and debridement to ensure a complete recovery from EN. In our case, although intercostal chest tube drainage and antituberculosis therapy were initiated early on presentation, the patient succumbed after two weeks due to overwhelming infection and poor physiological reserve due to the disease's late presentation.

## CONCLUSION

The term empyema necessitans is used when pus of the empyema burrows through the chest wall and becomes superficial as subcutaneous swelling. It usually results from untreated tuberculous (most frequent

cause) or bacterial empyema and manifests as either an inflammatory swelling or cold abscess of the chest wall. This case can be a future reference for empyema necessitans secondary to pulmonary tuberculosis as we should have a high index of suspicion for patients who presented with an anterior chest wall mass with constitutional symptoms (malaise, unintentional weight loss and non-remitting fever) which is not responsive to antibiotics. In such patients, a detailed history taking, physical examination and judicious utility of the thorax's contrast-enhanced computed tomography (CECT) are recommended. Treatment includes antimicrobial therapy, percutaneous empyema drainage and surgical interventions. Persistence of empyema necessitans may result in the sinus of the chest wall. Symptoms of this disease are often vague, and clinicians must have a high awareness and index of suspicion when dealing with such cases.

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