Journal of the African Society for Paediatric Infectious Diseases
Volume 2

CASE REPORT

A case of empyema necessitans in a paediatric patient with *Mycobacterium tuberculosis*

Asante A[*1], Rabie H[1], Goussard P[1], Gie A[1], Frigati L[1]
[1]Stellenbosch University, Cape Town, South Africa
*Corresponding author: amorkorm@yahoo.com

How to cite this article

Asante A, Rabie H, Goussard P, Gie A, Frigati L. A case of empyema necessitans in a paediatric patient with *Mycobacterium tuberculosis*. Journal of the African Society for Paediatric Infectious Diseases. 2023;2:1-5. DOI: https://doi.org/10.15641/jafspidVol2pp1-5/1668

Article Information

Received: 30 July 2023
Accepted: 3 October 2023

Key words

Empyema necessitans, Mycobacterium tuberculosis

Abstract

Empyema necessitans is a rare complication of pneumonia in which pus formed in the pleural cavity extends into the surrounding tissue. In children it is mostly caused by Mycobacterium tuberculosis, but other bacterial organisms are implicated occasionally. Early diagnosis through appropriate imaging, cultures and molecular diagnostic tests of samples taken from the lesion is recommended. Outcome is good provided appropriate medical and surgical treatment are provided.

Introduction

Empyema necessitans (EN) is a rare condition that results from infection of the soft tissues of the thoracic wall due to a sinus tract from empyema and is usually accompanied by pneumonia and osteomyelitis.

The term has its origin from the Greek word 'Em' meaning in or into and 'puon' which means pus and the Latin term necessitans meaning unavoidable or compulsion.[1]

EN is a complication of pneumonia with *Mycobacterium tuberculosis, Staphylococcus aureus*, *Streptococcus pneumoniae*, *Actinomyces* and *Norcardia* being the most commonly described causes.[2-4] Following the development of antibiotics and their use for pneumonia the incidence of EN has decreased significantly. It is rarely seen in the paediatric population.[3] In 2018 there was one case reported from Cape Town, South Africa of a six month old girl with EN secondary to *Mycobacterium tuberculosis.*[4] A 3 year old male child was also reported to have EN due to *Aspergillus* in Kenya in 2019.[5]

Due to its uncommon presentation, there is the need to create awareness in health care workers to help make early diagnosis, treat promptly, and prevent further complications. We present a case of EN due to *Mycobacterium tuberculosis.*

Case report

A 6-year-old, previously well, HIV negative boy presented to our hospital with a 2-week history of anterior chest wall swelling that had progressively increased in size. There was no history of trauma to the chest wall or associated fever or pain, but he was coughing and was losing weight. In addition, a household contact diagnosed with pulmonary tuberculosis (TB) was identified.

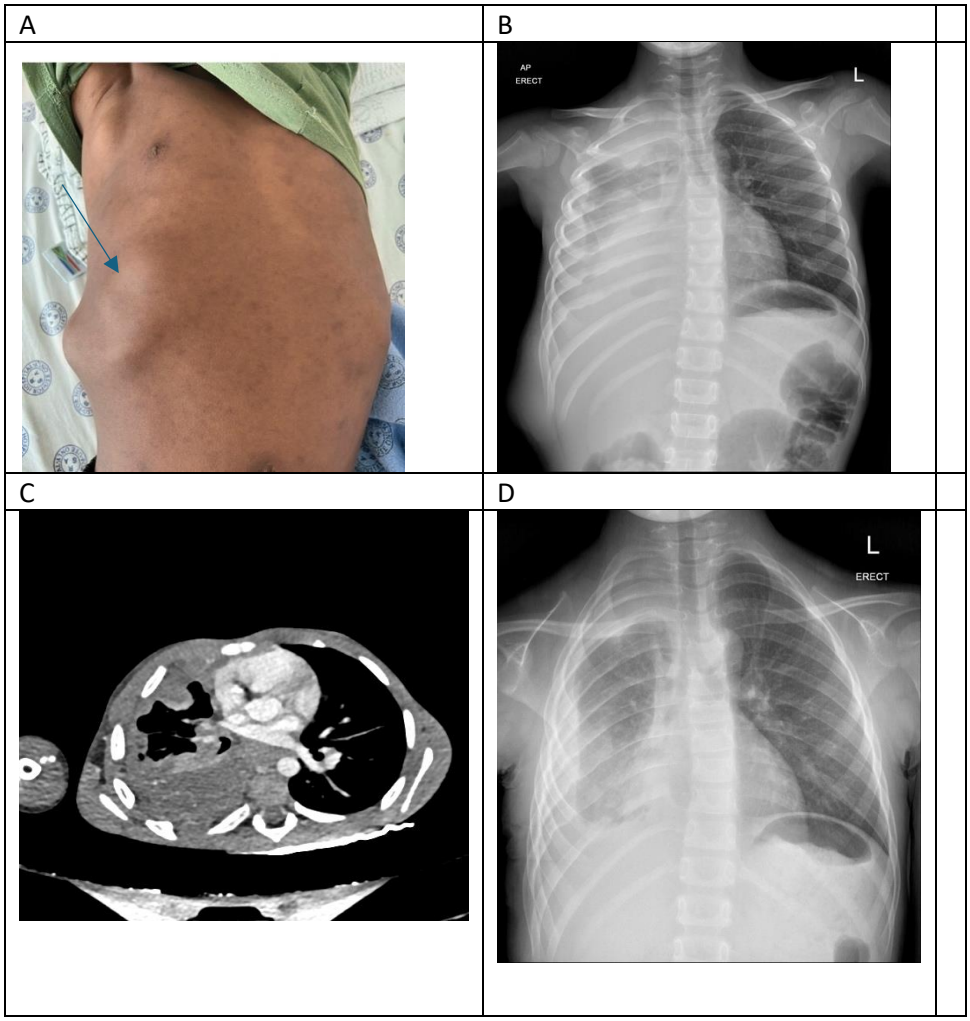
On examination the child did not appear acutely ill. There was no pallor or jaundice, and he did not have finger clubbing, but there were multiple enlarged lymph nodes in the right cervical, submandibular and axillary regions. These lymph nodes measured 1 to 2 cm, were mobile and non-tender. A BCG scar was present. The examination of the chest wall showed a 6cm x 4cm non-tender fluctuant mass, located at the right costal margins in the midclavicular line, Figure 1A. On respiratory examination the oxygen saturation in air was 98% and the respiratory rate was normal with no chest indrawing. On auscultation air entry was reduced in right middle and lower zones anteriorly with stony dullness to percussion in the same zones. No added sounds were heard. The rest of the assessment was within normal limits.

Chest radiograph demonstrated a soft tissue mass on the right chest wall, collapse of the right lower zone and a complex pleural effusion with erosion of the costal margins of the fifth to tenth ribs, Figure 1B. Contrast enhanced computerized tomography of the chest (CT chest) confirmed a rim enhancing complex pleural fluid collection with punctate calcifications extending through the chest wall into the soft tissue of the chest wall. The mass effect of the fluid resulted in collapse of the right lower lobe. Additionally, there was central necrosis of the subcarinal, ipsilateral paratracheal, hilar and axillary nodes, Figure 1C.

Biopsy of the right lower lobe for cytology showed necrotizing granulomatous inflammation and there were no malignant cells on the pleural fluid. Xpert MTB/RIF Ultra on sputum was negative but positive on pleural aspirate and sensitive to rifampicin. Subsequent TB culture of the pleural fluid was also positive and a PCR/Line Probe assay for the cultured isolate confirmed rifampicin susceptible but isoniazid resistant tuberculosis.

The patient was treated with isoniazid, rifampicin, pyrazinamide, ethambutol and levofloxacin for 6 months with the possibility to extend therapy according to response. In addition, a right sided posterolateral thoracotomy was done to perform a decortication of the right lung. At surgery a thickened pleura with multiple areas of thick pleural granuloma and a granuloma that ruptured into the pleural space was observed. Post operative chest radiograph exhibited a residual right sided pleural fluid collection with expansion of the right lower lobe and diminished soft tissue swelling, Figure 1D.

Figure 1. A: Arrow indicates a 6cm x 4cm chest wall mass on the lower right chest wall extending posteriorly and inferiorly from the mid-axillary line of the 8th rib. **B:** Frontal chest radiograph demonstrating a complex right-sided pleural fluid collection extending to the apex of the lung with associated chest wall soft tissue mass and erosion of 5th - 10th ribs. **C:** Axial contrast-enhanced CT-scan of the chest in the mediastinal window confirms a complex rim-enhancing pleural fluid collection with extension through the chest wall into the soft tissue. The right lower lobe is collapsed secondary to the mass effect of the fluid collection and ipsilateral hilar lymphadenopathy with central necrosis is present. **D:** Post operative chest radiograph exhibits a residual right sided pleural fluid collection and rib erosions with expansion of the right lower lobe and diminished soft tissue swelling.



Discussion

EN is caused by long standing untreated pneumonia with extension of pus from the pleural space to the chest wall. It can occur in both immunocompetent and immunosuppressed children.

EN can present as a painful or non-painful chest wall swelling with other associated constitutional symptoms depending on the causative organism. It can go unnoticed with late presentation and diagnosis because the swelling can be painless, and it grows insidiously.

Diagnosis of EN includes chest X-ray, CT scan and magnetic resonance image (MRI) where available, with ultrasound guided aspiration of the pus for PCR and culture to identify the organisms involved.

Treatment is both medical and surgical. Medical treatment involves administration of appropriate antimicrobial therapy whilst surgical treatment involves drainage of the pus and decortication with closure of the fistula to restore pulmonary function.

Treatment for severe TB includes 4 drugs with isoniazid, rifampicin, pyrazinamide and ethambutol. Ethambutol is used as it has good bone penetration. This child had multiple lobes involved and so falls into the severe category of the new WHO classification and hence does not qualify for a short course of therapy.[6] The child in this case report had an additional drug levofloxacin added as isoniazid resistance due to an inhA mutation was detected. In the current era of drug-resistant TB it is important that both genotypic and phenotypic testing is carried out as part of the TB investigations to ensure appropriate drugs are administered.

Clinicians should have a high index of suspicion for empyema necessitans in any child who presents with symptoms of pneumonia with chest wall swelling and ensure appropriate investigations are carried out including investigating for tuberculosis to ensure early and prompt treatment in order to avoid complications such as bone and soft tissue erosion.

Author contributions: AA wrote the first draft of the manuscript, AA, HR, PG, AG were all involved in the clinical care of the patient. All authors reviewed and approved the manuscript.
Funding Sources: Nil
Ethics approval: Ethics approval was granted by the Health Research Ethics Committee of Stellenbosch University ethics reference number: C23/05/012
Consenting statement: Informed consent was obtained from the mother.
Competing interests: The authors declare no competing interests.

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