

# Empyema Necessitans Involving the Ribs and Vertebra-A Rare occurrence

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## ABSTRACT

The extension of pleural infection into the chest wall and neighbouring structures is called Empyema Necessitans (EN). We are reporting a rare case of 45-year-old female presenting with chest pain and history of tubercular pleural effusion evaluated with haematological, biochemical and radiological investigations and diagnosed to have right sided EN with extensive involvement of chest wall. She was managed surgically with thoracotomy and decortication of lung. Patient succumbed to complications of septicæmia, multi-organ dysfunction syndrome.

**Keywords:** Decortication, Thoracotomy, Tuberculosis

## CASE REPORT

A 45-year-old female presented with right sided continuous dull aching chest pain since three months. She had pleural effusion with increased Adenosine Deaminase (ADA) levels and was diagnosed with right sided tubercular pleural effusion seven months back and had completed six months of anti-tubercular treatment. On physical examination she was about 45 Kg in weight, afebrile, had tachycardia and clubbing of fingers. She had decreased breath sounds on auscultation and dullness on percussion in right infrascapular space. On blood investigations she had raised total count of 27000 cells/cu.mm and Erythrocyte Sedimentation Rate (ESR) of 55 mm at one hour. Her sputum was negative for Acid fast bacilli with ZN staining. She was negative for HIV and HBsAg by Enzyme Linked Immunosorbent Assay (ELISA).

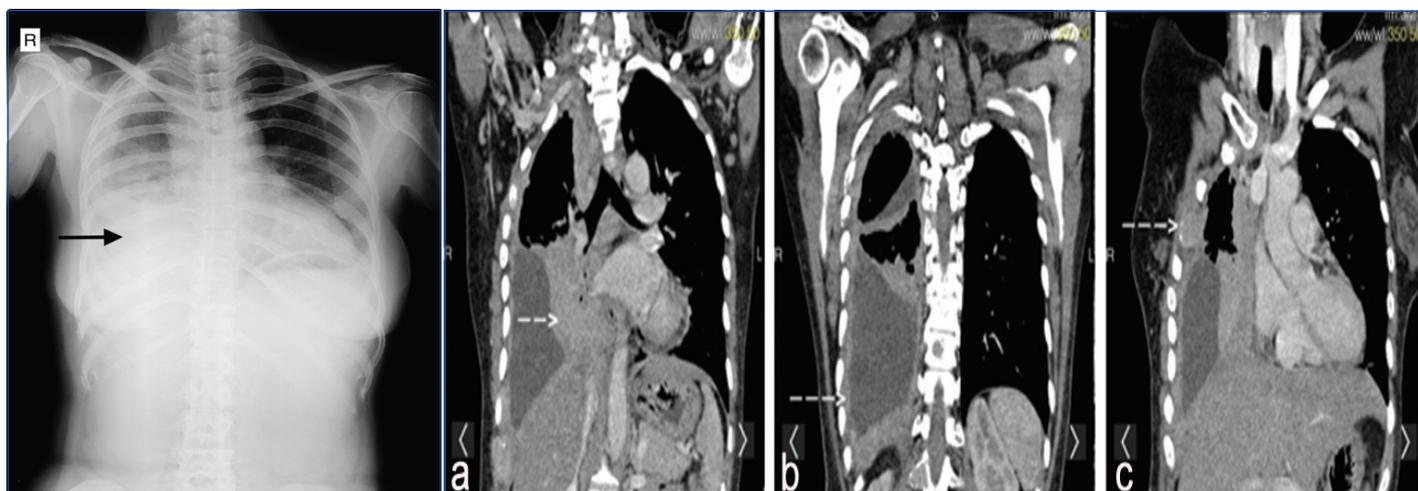
Chest radiograph revealed homogenous opacity involving the middle and lower zone of right lung with obliteration of right cardio phrenic and costophrenic angles with partial decrease right lung volume [Table/Fig-1]. She was referred to department of Radio Diagnosis and underwent Multi Detector Computed Tomography (MDCT) of thorax before and after I.V contrast with Siemens Somatom perspective 128 slice CT machine [Table/Fig-2]. Image reconstruction was done in both coronal and sagittal planes. Her MDCT revealed collapse consolidation (HU: 35-55) of right middle and lower lobes secondary to pleural effusion (Hounsfield unit, HU:

5-15) with fibrotic strands in right upper lobe. Moderate right pleural effusion with thickening and enhancement of pleura. Erosions in ribs 3, 5, 6, 7, 8, and 9 on right side and lytic lesion (HU: 50-70) in 7<sup>th</sup> Cervical and 6<sup>th</sup> Thoracic vertebral bodies were seen.

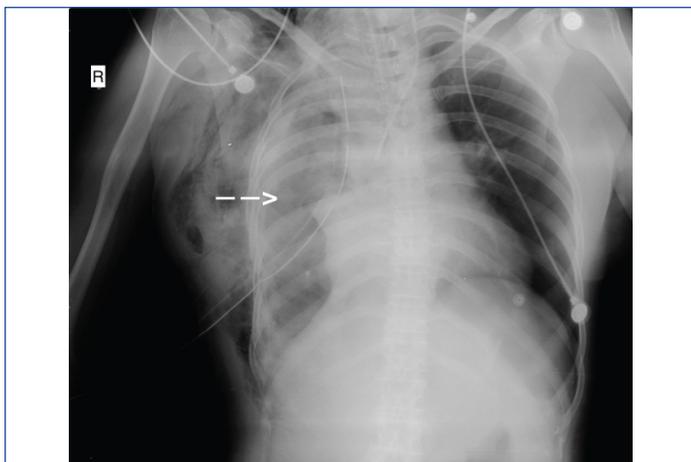
She was managed surgically with right limited thoracotomy and decortication of lung. Her pleural biopsy revealed epithelioid granulomas and revealed Acid Fast Bacilli (AFB) On Ziehl Neelsen (ZN) stain. She was shifted to surgical Intensive Care Unit (ICU) with endotracheal tube and was put on ventilator support. Postoperative radiographs revealed improvement of right lung volume compared to preoperative radiographs, increased 4<sup>th</sup> intercostal space corresponding to thoracotomy [Table/Fig-3]. On second postoperative day, she succumbed to complications of Septicæmia, Multi Organ Dysfunction Syndrome (MODS).

## DISCUSSION

The word empyema is derived from Greek words "Em" meaning in or into, "Puon" meaning pus. The word necessitans is derived from Latin word "Necessitans" meaning unavoidableness or compulsion. Egyptian physician Emhotep in around 3000 BC gave the first description of EN. While Hippocrates in around 500BC gave the first reliable scientific description [1] and Guillain de Baillon in 1640 reported the first case of Empyema [2]. Sir William Osler, the father of modern medicine, is said to have died in 1919 at age 70 due to empyema [3].



**[Table/Fig-1]:** Plain radiograph chest AP view showing homogenous opacity involving the middle and lower zone of right lung with obliteration of right cardio phrenic and costophrenic angles (black arrow) with partial decrease right lung volume. **[Table/Fig-2]:** CECT of thorax in coronal section: a) showing collapse consolidation of right middle and lower lobes (white arrow); b) fibrotic strands in right upper lobe and Moderate right pleural effusion with thickening and enhancement of right pleura (white arrow); c) showing Erosions in right 3rd rib (white arrow). Images from left to right



**[Table/Fig-3]:** Chest Radiograph AP view showing postoperative improvement of right lung volume, increased 4th intercostal space corresponding to thoracotomy (white arrow).

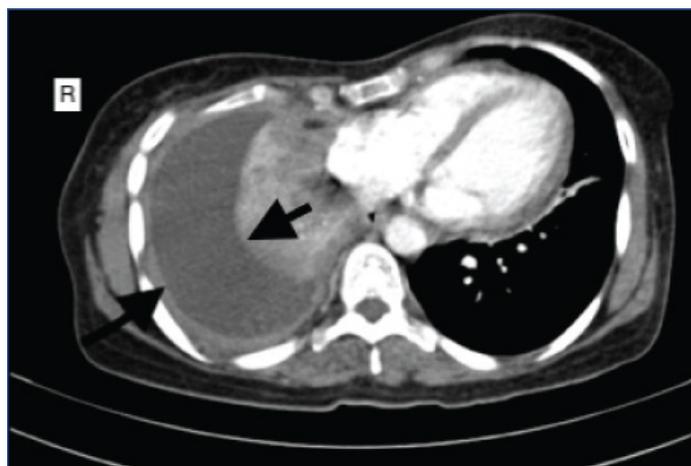
EN is a rare complication of Tubercular Pleural Effusion (TPE). Incidence of Tuberculosis (TB) in India is around 28 lacs cases with mortality of around 4.2 lacs per year [4]. TPE occurs in about 30% of patients with TB [5]. The mortality rate from EN remains high and it ranges between 6%-24% [6].

The extension of pleural infection into the chest wall and neighbouring structures is called Empyema Necessitans. [7]. It is formed by breakage of the empyema through the parietal pleura or spontaneous discharge of its contents due to inadequate treatment of an empyema [8]. It characteristically occurs following a necrotizing pneumonia or pulmonary abscess, it can also occur after thoracic surgeries or trauma [7]. Mycobacterium tuberculosis accounts for about 70% of cases of EN [9], which was also the causative organism in the present case. The second most common cause is Actinomyces which classically presents with haemoptysis. Other fungal pathogens like Blastomyces, Aspergillus species and Mucor mycosis have been implicated less frequently [7]. This complication can also occur with mixed anaerobic species [10].

The most common site of EN is subcutaneous tissue of the chest wall; other sites include the esophagus, breast, retroperitoneum, flank, groin, pericardium and vertebral column [8]. Patients classically present with a painful chest wall mass typically between the second and sixth intercostal spaces. EN can also present as fistulous tracts into the bronchi, esophagus, breast, diaphragm, retroperitoneum, and groin [10]. Patients usually suffer from an acute febrile illness, anaemia and digital clubbing [11].

On plain radiographs empyema can resemble a pleural effusion and can mimic a peripheral pulmonary abscess, usually unilateral or markedly asymmetric. The present case also presented with unilateral homogenous opacity involving the right lung with obliteration of right cardio phrenic and costophrenic angles [Table/Fig-1]. Empyemas are lenticular in shape and appear larger in one plane compared to the corresponding orthogonal plane on chest radiographs; they form an obtuse angle with the chest wall. They can be differentiated from pleural infection having crescentic shape by their characteristic lenticular shape. MDCT scan provides the most sensitive technique for detecting and characterizing the extent of chest wall and adjacent structure invasion [10] which we used in evaluating the present case. It has advantages of obtaining sub centimetric cuts in short time span, high spatial resolution and ease of reconstructing images in sagittal and coronal images, therefore advantage of viewing images in 3 Dimensional (3D) views. Images can also be viewed in different window settings so that both bony elements of the chest wall and the airway spaces can be seen clearly with adequate contrast. It can lead to a diagnosis of EN by allowing simultaneous visualization of intra-thoracic and extra-thoracic lesions which was seen in the present case [Table/Fig-2a-c]. Its findings include a well demarcated, thick walled fluid collections in intra-

thoracic and extra-thoracic locations [8]. A fistulous track between a pleural fluid collection and an extra thoracic fluid collection is often revealed. Pleural thickening, seen as a "split pleura sign" [Table/Fig-4] on contrast-enhanced study, which is demonstrated from the present case [11].



**[Table/Fig-4]:** CECT of thorax in axial section showing pleural thickening, seen as a "split pleura sign" (black arrows).

Ultrasonography (USG) allows characterisation of pleural fluid collections, while septations and loculations being better appreciated than CT. Pleural thickening and the extent of pleural disease throughout the thorax are more difficult to assess on USG. Para pneumonic effusions and empyema contain internal echoes and may appear completely echogenic on USG [10]. Chest Magnetic Resonance imaging (MRI) is limited to assessing patients with known pleural infection who have suspected spinal or rib involvement [10]. Major disadvantage of MRI is its long acquisition time and difficulty in performing scans in patients who are breathless, like in the present case.

Differential diagnosis for cases of empyema involving the chest wall are benign, malignant soft tissue tumours, soft tissue infection, abscess and skeletal lesions [12]. Biopsy plays an important role in identification of type of malignancy. Tubercular pleural effusions can be confidently diagnosed by pleural fluid ADA levels and newer biomarkers like N-terminal pro-brain natriuretic peptide (NT-proBNP) and mesothelin. Other causes of unilateral pleural effusion like malignancy where the effusions are often bloody, pleural metastasis, chylothorax with ruptured or injured thoracic ducts have to be strongly considered. Complications include pleural thickening with trapped lung, bronchopleural fistula, fibrothorax and reduced volume of the affected hemithorax [11], the resultant subcutaneous abscess may eventually rupture through the skin [7], septicemia and MODS. Patients with chronic empyemas, most notably tuberculous empyemas, can develop pyothorax-associated lymphoma; Most of these tumours are Non-Hodgkin lymphomas [10].

## CONCLUSION

EN most commonly involves subcutaneous tissue of the chest wall, but it can involve other sites also. In view of its serious complications and high mortality rate, It is essential for thorough work-up using proper imaging modalities. CT scan is the most sensitive technique for detecting and characterizing the extent of chest wall and adjacent structure invasion. The above case emphasises the importance of timely intervention and adequate treatment without which EN can be fatal.

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Date of Submission: **Sep 29, 2018**

Date of Peer Review: **Nov 05, 2018**

Date of Acceptance: **Dec 28, 2018**

Date of Publishing: **Jan 01, 2019**

**FINANCIAL OR OTHER COMPETING INTERESTS:** None.