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CASE REPORT

Empyema Necessitans Caused By Methicillin Resistant Staphylococcus Aureus – Two Rare Presentations

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ABSTRACT

Empyema Necessitans refers to the spread of pus from the pleural cavity into adjacent soft tissue structures; and usually presents as a bulge over the thoracic wall or a pleuro-cutaneous fistula. There are medical and surgical options for management of these patients. The choice of antibiotics in empyema necessitans is determined by the etiological organism; and Methicillin Resistant Staphylococcus Aureus (MRSA) is one of the reported causes. We report two cases with unusual presentations of MRSA-associated empyema necessitans. Patient 1 was a 2-month old child who presented with fever, respiratory distress and a painful bulge on left side of chest. Radiological investigations revealed left pleural effusion with extent into chest wall subcutaneous planes. There was associated 4th rib osteomyelitis. Pus culture showed MRSA growth and the patient was managed with intravenous antibiotics along with chest-tube thoracotomy and drainage of abscess. Patient responded and was subsequently discharged. Patient 2 was a 10-year old boy who presented with right knee swelling after trauma 7 days back. This was followed by swelling over left side of chest extending to left side of neck and back. Work-up revealed loculated left-sided empyema necessitans with MRSA as the cause. Patient underwent incision and drainage of knee and back abscesses along with chest tube thoracotomy and intravenous antibiotics. The authors propose that further studies be done on these patients to formulate management guidelines.

Key Words: *Empyema necessitans, Methicillin-resistant Staphylococcus Aureus, Pleural effusion*

INTRODUCTION

Empyema Necessitans also called 'Empyema Necessitatis' refers to the outspread of pleural infection and subsequent pus beyond the pleural cavity into adjacent soft tissue structures.[1] Most commonly, this extension is anteriorly in the chest wall between anterior axillary and mid-clavicular lines; and the patient may present with a firm bulge over the thoracic wall or occasionally a fistulous communication between the pleural cavity and overlying skin.[2,3] The first such case found in literature dates back to 1640.[1] However, it still remains an extremely rare entity particularly in the pediatric age group and to the best of our knowledge, only two pediatric cases have been described in Pakistani children to date.[4,5] A review article in Turkey described 9 cases of empyema necessitans in 4 years with only 2 pediatric patients aged 17 and 13 years respectively.[6]

Risk factors for the development of empyema necessitans include previous surgery or trauma involving the thoracic cavity, chronic poorly managed pleural effusion/empyema thoracis or immunodeficiency.[7,8] The diagnostic modality of choice for empyema necessitans is CT-chest with contrast which demonstrates the connection between pleural cavity and adjacent chest wall and its extent.[1,5] With proper timely diagnosis and management, including medical as well as surgical options, the prognosis of empyema necessitans is generally good with very low mortality.[6,9] Two cases of empyema necessitans are hereby being reported with unusual presentations.

CASE REPORT – 1

A 2 months old female child, resident of Sheikhupura district, presented with complaint of fever gradually worsening fever for 2 weeks; which was followed by swelling on the left side of chest, progressively increasing in size and associated with erythema and pain. There was associated respiratory distress for the previous 2-3 days. There was no history of repeated skin, lung or gastrointestinal infections. She had uneventful antenatal and postnatal events and was vaccinated till date. There was no history of contact with tuberculosis patient. She was mother-fed with insignificant family history. She had normal anthropometric measures and was conscious & alert. She was febrile with a pulse rate of 160/min, respiratory rate of 62/min and normal blood pressure. A hot, tender swelling of about 4x6 cm was found on examination just below the nipple on left side of anterior chest wall; with erythema of surrounding skin, which was fluctuant and non-adherent to adjacent structures. Respiratory system examination was suggestive of left-sided pleural effusion while the rest of examination was unremarkable. Complete blood count showed TLC of $50.7x10^3$/uL with 71% polymorphs and Hemoglobin of 8.0 gm/dl. C-Reactive Protein was high (77 mg/dL). Chest X-Ray and ultrasonography revealed left-sided moderate pleural effusion with a hypo-echoic area on left side of chest wall in subcutaneous planes.

Contrast enhanced CT-chest showed areas of segmental and sub segmental consolidations in left upper lobe involving apicoposterior & inferior lingual segments; and superior and basal segments of left lower lobe. There was also "enhancing split pleura sign" with mild amount of mixed-density fluid along left anterolateral and posterior chest wall representing empyema necessitans. Irregularity and erosion were seen in left 4^{th} rib with adjacent small air fluid level, suggesting osteomyelitis. Pleural fluid examination showed exudative picture (WBCs = 1500/uL with polymorphs = 80%, RBCs = 3500/uL, Sugar = 12 mg/dL, Protein = 3.9 g/dL). Blood cultures revealed no growth. Work-up for HIV, tuberculosis and immunodeficiency was negative. She was managed with supportive care and empirical I/V antibiotics (Ceftriaxone and Co-Amoxiclav). Chest-tube thoracotomy along with incision and drainage of the abscess was done and 60-70 mL of pus drained. There was growth of Methicillin-resistant Staphylococcus Aureus (MRSA) on pus culture; sensitive to Vancomycin, Teicoplanin, Amikacin, Tazobactam/Piperacillin and Linezolid. The patient was consequently switched to Tazobactam/Piperacillin and Vancomycin. She responded to the treatment as her fever settled and swelling reduced. Chest extubation was done on 8^{th} day of admission and antibiotics continued for 3 weeks. At follow-up after 2 weeks, patient was well-thriving with resolution of symptoms and radiological findings.

Fig 1: Chest X-Ray of patient 1

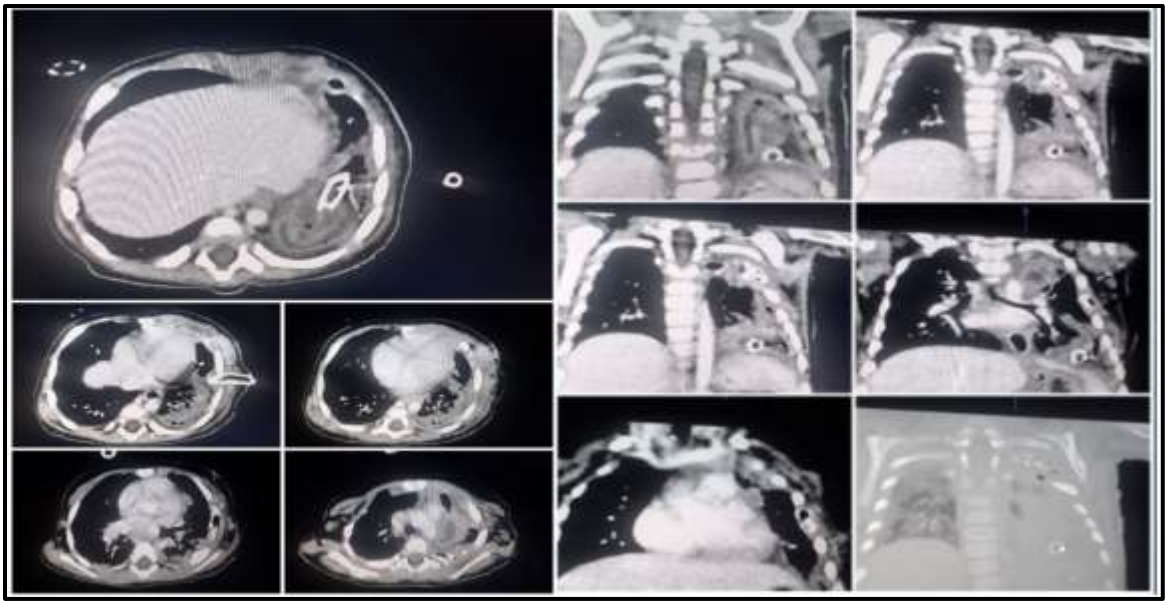

Fig 2: CT-chest images of patient 1

CASE REPORT - 2

A 10-year-old male child, resident of Gujranwala district was admitted with history of trauma to right knee 7 days back. After 2 days, he developed swelling over affected knee followed by high-grade, continuous fever and cough. There was associated development of progressive swelling over left side of chest along with pain and respiratory distress. Past medical and surgical history were unremarkable. He was fully vaccinated with no history of tuberculosis contact. He was toxic-looking with normal anthropometry and obvious respiratory distress. There was a diffuse swelling over left side of the chest extending to left side of the neck and upper back with redness of overlying skin and fluctuation. There was another swelling over the right knee with similar findings. He was tachypneic with respiratory rate of 40/min and spO2 of 86% without oxygen; and clinical findings suggestive of pleural effusion. Ultrasound chest showed moderate amount of debrinous fluid in the left pleural cavity, extending out of pleural space. There was also extension of this collection into the subcutaneous tissue of lateral aspect of left side of the neck. Chest-tube thoracotomy was done and empirical antibiotics started (Ceftriaxone and Vancomycin) in addition to supportive treatment. On CECT-chest, there were multiple nodules of variable sizes ranging from few to 12 mm, scattered in random distribution, some of them showing internal cavitation. There was also moderate pleural effusion and multiple loculated intra-muscular collections largest one extending from left supraclavicular region to postero-lateral chest wall down to the diaphragm approximately measuring 7.2×23×4.5cm. Other small collections were seen along the anterior aspect of right upper arm, Quardratus Lumborum muscle, bilateral gluteal muscles and obturator interni. His Hemoglobin was 6.7 g/dl, TLC was 18.2 x 10^3/uL, with 89% polymorphs and CRP was 128 mg/dl. Pleural fluid examination showed a WBC count of 1500/uL and 80% neutrophils with proteins of 4 g/dl. In addition to chest intubation, surgical drainage of knee abscess was done and about 30-40 mL pus was drained. An incision was also made on upper back to drain pus collection. Pus and pleural fluid cultures had growths of MRSA. Antibiotics were revised according to sensitivity pattern (Cefoperazone/Sulbactam + Linezolid). Tuberculosis and immunodeficiency were ruled out and other workup including echocardiography and HIV screening were negative. Patient responded to treatment well, his chest-tube removed after 14 days and patient was discharged after 5 weeks stay. Antibiotics were

completed for 6 weeks and on follow-up after 3 weeks, patient's wound was healed and chest findings improved.

Fig 3: Wounds of case 2 on i) Upper back – 2 separate wounds of chest tube and surgical drainage of abscess respectively, ii) Right knee

DISCUSSION

The infectious etiology of empyema necessitans deserves special attention as it largely determines the choice of antibiotics which remains a vital part of the treatment of these patients. Previously, Mycobacterium Tuberculosis (35%) and Actinomycosis (20%) were reported to be the most frequent causes of empyema necessitans.[9] However, more recent literature showed that other etiological agents including Staphylococcus aureus, Streptococcus pneumonia, non-tuberculous mycobacterial species and other anaerobes may be isolated from cultures.[10] Both of our index cases had MRSA growth on pus cultures which was community acquired (CA-MRSA) as they did not have any previous surgical or admission history and MRSA growths were isolated from cultures taken within 3 days of hospital stay.[11]

The youngest patient of empyema necessitans described in literature was a breast-fed neonate in whom the source of infection was identified as a breast abscess in the mother which was subsequently incised and drained.[12] Only a few other cases of empyema necessitans in children younger than 6 months have been published.[2,13,14] Although in our case 1, the child was mother-fed, there was no associated abscess or cellulitis in the mother and no potential source of infection in the child could be ascertained. However, our index patient 2 had a history of trauma to right knee a week before presentation with consequent multiple abscesses and empyema necessitans.

A particularly striking feature in both of index cases is the associated sites of infection other than pulmonary and the chest wall tissue. Patient 1 had associated 4th rib osteomyelitis. Osteolytic changes in the ribs have also previously been described in a neonate and a 6 month-old child.[12,14] In a rare case of empyema necessitans, right femur osteomyelitis was reported with femoral and popliteal vein thrombosis.[15] Likewise, index patient 2 suffered from multiple infective collections in extra-thoracic sites like right upper arm and bilateral gluteal muscles. Patient 1 responded to treatment by intravenous antibiotics and surgical drainage of thoracic empyema while patient 2 had to undergo drainage of collections at knee and back in addition to tube thoracotomy. Such infections with MRSA i.e. when they affect an organ or system that is usually sterile are termed as "invasive MRSA".[11]

There is no consensus developed yet regarding the choice or duration of empirical antibiotic therapy for cases with empyema necessitans. It largely depends on the etiological organism, antimicrobial sensitivity pattern and the extent of organ involvement in any particular patient. Index patient 1 was managed with a combination of Tazobactam/Piperacillin and Vancomycin while

patient 2 was given Cefoperazone/Sulbactam and Linezolid for durations of 3 weeks and 6 weeks respectively. However, the authors recommend that further studies should be conducted at national and international level before final management recommendations can be formulated. Moreover, there is a definite role of surgical management in these patients for drainage of collections which may include chest intubation, decortication or thoracotomy; and more cases need to be studied to formulate guidelines for surgical interventions in these patients.[5]

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