BANGLADESH J CHILD HEALTH 2023; VOL 47 (3) : 178-181

Unraveling Empyema Thoracis: A Pediatric Case Report

ARUP KUMAR DUTTA[1], MOHAMMAD NURUL ALAM[2], SHAMSHUZZAMAN BABOR[3], ATAUR RAHMAN[4], TASLIMA NEWAZ[5], ABU TAYAB[6], SROBONTI DUTTA PURBA[7]

Abstract

Empyema thoracis, an effect of pneumonia characterized by the accumulation of pus in the space between the lungs and the chest wall, poses a considerable difficulty in the field of pediatric medicine. This case report examines the progression of a child with empyema thoracis, focusing on the diagnostic and treatment methods followed. The patient is a 10-year-old boy who has a history of right-sided chest pain, difficult breathing with sputum and also high fever. Diagnostic imaging indicated the existence of pleural effusion, and thoracentesis retrieved purulent fluid, confirming the diagnosis. The management of the ailment required a holistic strategy that involved the administration of antibiotics, drainage of the chest tube, and provision of supportive care. The patient exhibited a gradual enhancement in response to the treatment, underscoring the significance of swiftly detecting and vigorously addressing empyema thoracis in children to mitigate adverse health consequences and mortality. The aforementioned example demonstrates the significance of being vigilant in pediatric patients with pneumonia, particularly those with persistent or worsening symptoms, to prevent complications such as empyema thoracis.

Keywords: *Empyema thoracis, Para-pneumonic effusion, children.*

DOI: https://doi.org/10.3329/bjch.v47i3.82892

Introduction

Empyema thoracis is a severe and likely fatal illness in children, marked by the buildup of pus in the pleural space. Empyema is a common result of juvenile pneumonia, with a documented progression rate of 0.6% in cases of pediatric pneumonia.[1] Postponing treatment or refusing to address the issue might result in significant morbidity and mortality. Empyema thoracis can be caused by various types of infections, such as bacteria, viruses, and fungi. The treatment of this illness usually requires a multidisciplinary approach that encompasses both medical and surgical interventions. This syndrome usually occurs as a consequence of bacterial pneumonia, specifically infections caused by Staphylococcus aureus or Streptococcus pneumonia.[4] The present rise in the prevalence of pediatric empyema can be attributed to changes in vaccination techniques and the escalating issue of antibiotic resistance. Empyema thoracis in children may manifest with various symptoms, but the most common ones include respiratory distress, cough, chest pain, and fever. Children with empyema thoracis have a better prognosis when they receive timely and adequate medical attention. However, if the illness is not well managed, it might result in substantial adverse effects over time.[5] To enhance patient outcomes, it is imperative to comprehend the clinical and epidemiological characteristics of empyema thoracis in minors and make well-informed decisions on treatment alternatives.[1,2] The diagnosis is often determined by combining a clinical examination, radiographic imaging (such as a chest X-ray or ultrasound), and analysis of pleural fluid. A complete approach is employed to effectively treat juvenile empyema, which includes the use of

1. Principal & Head of the Department of Pediatrics (BGC Trust Medical College), Chattogram
2. Professor, Department of Pediatrics, Cox's Bazar Medical College, Bangladesh.
3. Associate Professor, Department of Pediatrics, Cox's Bazar Medical College, Bangladesh.
4. Assistant Professor, Department of Pediatrics, Cox's Bazar Medical College, Bangladesh.
5. Assistant Professor, Department of Community Medicine(BGC Trust Medical College), Chattogram
6. Medical Officer, District Sadar Hospital, Cox's Bazar
7. Lecturer, Department of Pharmacology, Marine City Medical College, Chattogram

Corresponding Author: Dr. Taslima Newaz, Assistant Professor, Department of Community Medicine, BGC Trust Medical College, Chittagong, 826/A (2nd floor), Bolaka R/A, Bakolia Access Road, Chittagong. E-mail: taslimanewaz1@gmail.com, Orchid ID: https://orcid.org/0009-0001-5661-1930. Mobile: 01839-575697, 01996-270698

antibiotics, thoracentesis, chest tube drainage, and, in certain circumstances, surgical procedure.

Case Description

A 10-year-old child presented with complaints of severe respiratory distress for one day, followed by right-sided chest pain and a productive cough, as well as a high-grade fever for five days. Fever was continuous in nature, sometimes associated with chills and rigor, and occasionally subsided by taking antipyretics at home. The patient experienced more chest pain during inspiration, and his sputum had a yellowish color. The patient had been initially treated for pneumonia with oral antibiotics by a primary care physician, but his symptoms had progressively worsened.

His past and family history was insignificant for measles, whooping cough, tuberculosis, or contact with any patient with tuberculosis. His immunization status was unknown, but a BCG mark was seen on his left arm.

On physical examination, the child appeared ill and febrile, with a temperature of 102°F and moderate to severe distress. He had tachypnea, a respiratory rate of 88 breaths per minute, and was using accessory muscles for breathing. In room air, oxygen saturation was 85%. Auscultation of the chest revealed decreased breath sounds and dullness to percussion on the right hemithorax, suggesting the presence of fluid in the pleural space.

A diagnosis of right-sided para-pneumonic effusion was made, and the patient underwent admission. An urgent chest X-ray revealed densely homogenous opacity in the right middle and lower zones of the lung, along with blunting of the cardio-phrenic angle on the right, obliteration of the right costophrenic angle, and central placement of the trachea (Figure 1). A complete blood count showed a white blood cell count of 18600/cumm with a predominance of neutrophils, indicating an acute bacterial infection. A complete blood count also revealed a Hb% of 9.5 g/dl and a hematocrit level of

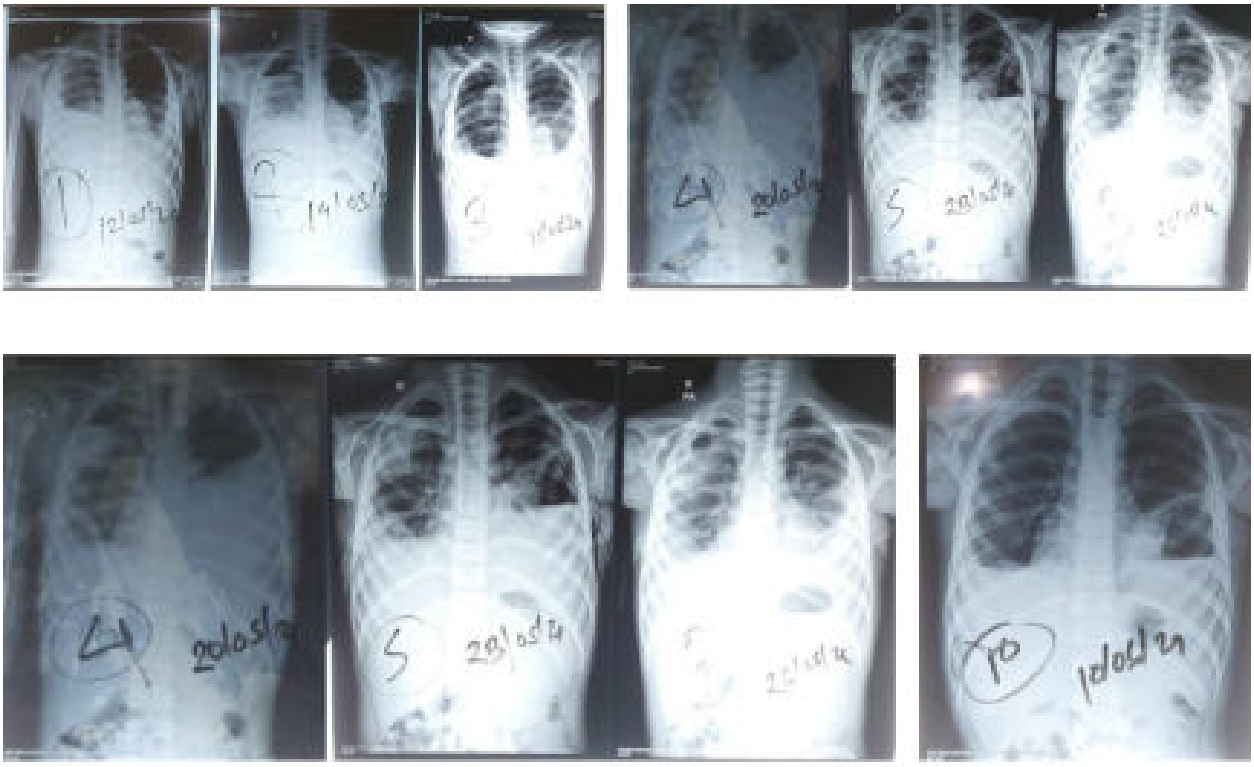

Figure 01: *Shows ten consecutive chest x-ray report of the patient starting from the day of admission.*

The above figure displays the first to last ten x-ray films, which initially showed densely homogenous opacity in the right middle and lower zones of the lung, along with the right cardiophrenic angle being blunted, the right costophrenic angle being obliterated, and the trachea being centrally placed. Subsequently, the density of opacity gradually decreased, and the unique aspect of this case was the central placement of the trachea.

30%. C-reactive protein (CRP) levels were elevated at 150 mg/L, further supporting the presence of inflammation or infection. To further assess the nature of the pleural effusion, a chest ultrasound was performed, which revealed bilateral pleural effusion.

A bedside diagnostic and therapeutic thoracentesis was performed under ultrasound guidance to obtain pleural fluid for diagnostic analysis and to alleviate respiratory distress. The pleural fluid was thick and pus-filled, which confirmed the diagnosis of an empyema. About 30 ml of clear pus was drained and sent for a study and culture of the pleural fluid. Pleural Fluid analysis revealed glucose 9.0 mg/dl, protein 6.1 gm/dl and ADA (Adenosine De-aminase) at 160 U/L (raised), while pleural fluid culture showed no growth after 72 hours. For tuberculosis the gene x-pert and AFB (Acid Fast Bacilli) in the fluid was negative.

Following the persistent effusion in the chest X-ray, we performed an intercostal tube thoracostomy under local anesthesia, identifying a safety triangle on the right side. Then an intercostal drain tube was placed within the pleural space, and approximately 850 ml of pus came out immediately after being placed. After ensuring the tube was functioning, we fixed it using a non-absorbable suture.

As the first step in treatment, empiric antibiotic therapy consisted of ceftriaxone (100 mg/kg/day, flucloxacillin (50 mg/kg/dose every six hours) and metronidazole 10 mg/kg/dose were given intravenously to kill common bacteria that cause infections, like Streptococcus pneumonia and Staphylococcus aureus and anaerobic organism. Additional supportive treatments, such as paracetamol, oxygen inhalation, and nebulization, were also available.

The chest tube drain was removed after 8 days, when no further significant collection was noted. He showed good clinical improvement (normal respiratory rate for age, improved air entry into the right lungs, fever resolution). The patient had an uneventful recovery and was discharged after spending 29 days on admission. Follow-up visits at one month and three months post-discharge showed no signs of recurrence, and chest X-rays demonstrated full re-expansion of the lung with no residual effusion.

Figure -2: *The patient on his 10TH Day of admission.*

In this figure, the patient was on his tenth day of admission, demonstrating a gradual improvement in his distress levels. We took the picture after obtaining permission from the patient's guardian.

Discussion

Pediatric empyema thoracis is caused by different bacterial infections depending on the patient's age and location. The most common causative organisms were found to be Streptococcus pneumoniae, Streptococcus pyogenes, and Staphylococcus aureus, according to an Indian inquiry.[8] Fever, dyspnea, and chest discomfort are typical clinical manifestations of empyema thoracis in this case. In a study at the Dr. B. C. Roy Post Graduate Institute of Pediatric Sciences in Kolkata, India, fever (56.25%), respiratory distress (27.08%), and chest discomfort (16.67%) were the most often reported symptoms.[6] In a related study, a 5-year-old child who had a 3-day history of fever and respiratory distress was taken to the hospital. He had a history of pneumonia, and an X-ray and ultrasonography of his chest revealed that he had empyema thoracis.[6] A 21-day-old male neonate experienced respiratory distress one day prior to the current condition, along with a consistently high fever for ten days, the development of pustular skin lesions starting on day 14, and the onset of coughing on day seven.[9]

A complete assessment of empyema thoracis frequently requires a coordinated approach that

involves clinical evaluation, radiographic imaging, and laboratory tests. Chest X-rays and chest ultrasonography are the principal diagnostic modalities used to detect empyema thoracis, even when other imaging techniques are available. Chest X-rays and chest ultrasonography are useful for diagnosing and monitoring pleural effusions.[9] In this instance, a chest X-ray, CBC, pleural fluid analysis, culture for any growth, and ultrasonography were performed initially as part of the inquiry. A combination of pleural space drainage, lung expansion, and antibiotic medication is used to manage and treat pediatric empyema thoracis. Draining any contaminated collection and administering antibiotics which should be customized to any microbiological growth or to the organisms most likely to have caused the infection are essential components of management. Local epidemiological and microbiological data are therefore crucial.[11] The hypothesized etiological agent determines the choice of antibiotics, which should be modified in light of the culture and sensitivity report.[8] As loculations form, effusion drainage becomes harder. For multi-loculated empyema, video-assisted thoracoscopic surgery (VATS) is recommended. If this is not done in a timely manner, the effusions may worsen and reach the fibrotic stage, where fibroblasts from the parietal and visceral pleura develop into the pleural fluid, resulting in a thick pleural peel.[10] Decortication is another surgical technique that involves removing the thickened pleura to make room for lung expansion. Usually, it is saved for situations where less intrusive therapies are ineffective. Video-assisted Thoracoscopic Surgery (VATS), or an open thoracotomy, can be used for decortication.[3] Empyema thoracis can lead to many complications, such as lung entrapment, infection, and respiratory failure. Timely and quick treatment of empyema thoracis in children typically results in a satisfactory outcome. However, inadequate or delayed therapy can lead to significant morbidity and mortality.[6,8]

Conclusion

Empyema thoracis is a severe and sometimes life-threatening condition that requires prompt and effective treatment. In particular, it may present challenges in young individuals, but it can be effectively managed with a combination of timely diagnosis, appropriate administration of antibiotics, and, if necessary, surgical intervention. The determination of the treatment strategy should take into account the stage of empyema, the volume of fluid present, and the results of gram staining, AFB staining and cultures. Antibiotic treatment, fluid removal from the area around the lungs, and lungs inflation are all critical components of the treatment strategy. Unique observations in this case is central trachea placement should not be ignored. However, in cases with Empyema thoracis, it is common for the trachea and mediastinum to be displaced towards the opposite side. The instance highlights the significance of a multidisciplinary strategy that includes pediatricians, radiologists, and surgeons to get the best possible results. Consistent and ongoing follow-up and monitoring are crucial to ensuring full recovery and preventing any long-term complications.

Funding: No funding sources.

Conflict of interest: None declared.

Permission from IRB: Yes

Statement of equal author's contribution: All authors have equal contribution.

References

1. Jha R, Bharani A, Chaube D. Clinico-epidemiological profile and outcome of pleural effusion of infective etiology in children from central India. Asian Journal of Medical Sciences. 2022 Jun 1;13(6):134-8.
2. Baranwal AK, Singh M, Marwaha RK, Kumar L. Empyema thoracis: a 10-year comparative review of hospitalised children from south Asia. Archives of disease in childhood. 2003 Nov 1;88(11):1009-14.
3. Çelebi S, Hacýmustafaoðlu M, Ildýrým Ý, Konca Y. Management of thoracic empyema in children. Pediatric Surgery International. 2002 Feb; 18(1), 21-23.
4. Thomas MF. *The increasing incidence of childhood empyema thoracis: epidemiology and clinical aspects* (Doctoral dissertation, Newcastle University). 2013 Feb 25; 2.
5. Majeed FA, Chatha SS, Zafar U, Chatha UF, Chatha AZ, Farooq Z. Surgical management of pediatric empyema: Open thoracotomy versus video-assisted thoracic surgery. J Coll Physicians Surg Pak. 2020 Mar 1;30(3):309-12.
6. Mandal KC, Mandal G, Halder P, Mitra D, Debnath B, Bhattacharya M. Empyema thoracis in children: A 5-year experience in a tertiary care institute. Journal of Indian Association of Pediatric Surgeons. 2019 Jul 1;24(3):197-202.
7. Molnar TF. Current surgical treatment of thoracic empyema in adults. European journal of cardio-thoracic surgery. 2007 Sep 1;32(3):422-30.
8. Chowdhary SK. Management of Empyema Thoracic in Children Meenu Singh Saroj Kumar Singh. Indian Pediatrics. 2002;39:145-57.
9. Ezuruike EO, Chukwudi NK, Nwokeforo NU, Obioma MA. Empyema thoracis in a Nigerian neonate: case report and brief literature review. International Journal of Contemporary Pediatrics. 2021 Jul;8(7):1271.
10. Murinello A, Figeiredo AM, Semedo J, Damásio H, Ribeiro NC, Peres H. Thoracic empyema–A review based on three cases reports. Revista Portuguesa de Pneumologia (English Edition). 2009 May 1;15(3):507-19.
11. Aujayeb A, Conroy K. A Case of Empyema and a Review of Practice in a District General Hospital. EMJ Respiratory, November. 2019:91-6.