Community-associated Methicillin-Resistant
*Staphylococcus aureus* Empyema Necessitatis in a 1-year-8-month-old Child

Hui-Ching Lee¹, Ching-Ling Li¹, Da-Ling Liao¹, Wei-Ju Lee², Chih-Min Tsai², Chen-Kuang Niu², Kai-Sheng Hsieh², Hong-Ren Yu²

Department of Respiratory Therapy¹ and Pediatrics², Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Taiwan

**Abstract**

Empyema necessitatis refers to the extension of a purulent pleural effusion beyond the thoracic cavity into the neighboring chest wall and surrounding soft tissues. Empyema necessitatis is rare and are often associated with tuberculosis infection. We reported a previously healthy toddler with empyema necessitatis due to community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) presenting with fever and productive cough prior to her hospitalization. Her left lower chest wall was swollen and tender to palpation. The chest computed tomography demonstrated a left-sided empyema and extended into the left chest wall. She was successfully treated with thoracoscopic decortication, thoracostomy tube drainage and oral linezolid. Despite empyema necessitatis is not common in daily practice, practitioner should consider this rarity in order to achieve early therapy and to decrease morbidity and mortality. (J Pediatr Resp Dis 2015;11:48-51)

**Key words:** Empyema necessitatis, methicillin-resistant *Staphylococcus aureus*, antibiotics, tube thoracostomy drainage

**INTRODUCTION**

Empyema necessitatis refers to the extension of a purulent pleural effusion beyond the thoracic cavity and into the neighboring chest wall and surrounding soft tissues. Empyema necessitatis has been reported primarily in adults and is rare in pediatric patients. According to previous reports, it is caused primarily by *Mycobacterium tuberculosis*. We reported a case of a previously healthy toddler with empyema necessitatis due to community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA).

**CASE REPORT**

A previously healthy 1-year and 8-month-old girl was admitted to our institution with complaints of intermittent fever for one week. She also had sore throat, rhinorrhea, and productive cough. On physical examination, she had a temperature of 38.1 °C, a pulse of 160 beats per minute, a respiratory rate of 28 breaths per minute, and a blood pressure of 142/103 mmHg. Her white blood cell count was 11,000/mm³ and C-reactive protein (CRP) level was 255 mg/L on admission. The
patient’s left lower chest wall was swollen and tender to palpation (Fig. 1). A chest radiograph showed opacification of the left lower lung and obliteration of left lateral costophrenic angle consistent with pneumonia and effusion.

The patient was started on empirical amoxicillin-clavulanate therapy for presumptive pneumonia. However, fever still persisted. A contrast computed tomography (CT) scan of the chest showed a left empyema and extension into the left chest wall at level of 7-8th ribs (Fig. 2). A diagnosis of empyema necessitatis was made. Thoracoscopic decortication of pleura and thoracostomy tube drainage of left pleural space were performed on the 5th day of hospitalization. Culture of the purulent drainage was performed during the surgery. Fever resolved soon after the surgery, and the patient was discharged on the 8th day of hospitalization. After discharge, the culture yielded methicillin-resistant *Staphylococcus aureus* (MRSA). The patient was successfully treated as an outpatient with a 21-day course of linezolid.

**Figure 1.** The patient’s left lower chest wall was swollen and tender to palpation after admission.

**Figure 2.** Contrast computed tomography scan of the chest showed left empyema and extension into the left chest wall 7-8th ribs (arrow).
Empyema necessitatis is a complication of empyema in which the empyema spreads outside of the pleural space. In 1640, Guillan de Baillon reported the first case of empyema necessitatis, a syphilitic aneurysm with purulent discharge through the chest wall. First review of 115 cases was reported by Sindel in 1940, in which tuberculosis was the leading cause of empyema necessitatis. The second most common pathogen in the pre-antibiotic era was *Streptococcus pneumoniae*. The incidence of empyema necessitatis decreased dramatically after the introduction of antibiotic therapy.

A recent literature review revealed that tuberculosis has continued to be the most common pathogen, followed by actinomycosis. Other causal organisms include *Aspergillus*, *Staphylococcus aureus*, *Streptococcus milleri*, *Streptococcus pyogenes*, *Fusobacterium*, *Pseudomonas cepacia*, and *Mycobacterium avium-intracellulare*. To the best of our knowledge, there have been eight cases of empyema necessitatis due to *Staphylococcus aureus* published in the literature, including five cases with methicillin-resistant *Staphylococcus aureus* (MRSA). Among eight cases of *Staphylococcus aureus* empyema necessitatis, four were adults and 4 cases were children. Interestingly, *Staphylococcus aureus* empyema necessitatis in the five pediatric patients (including our case) were all due to MRSA infections presenting with pneumonia and chest wall masses. All five patents received successful drainage and adequate antimicrobial therapy. Our case was treated successfully with drainage intervention and oral linezolid for the first time.

A chest radiograph is capable of showing opacity occupying certain areas of the hemithorax only, which may be consolidated lung parenchyma, pleural peel, or lung abscess. Chest CT scan is the preferred diagnostic study and able to reveal the extent and nature of the abscess such as communication of the empyema with subcutaneous tissue. Since young children are not able to express their discomfort explicitly, clinical examinations and CT imaging are most useful and even diagnostic.

Although the incidence of empyema necessitatis has decreased, the incidence of empyema appear to increase in the past decades paradoxically. Increases of incidence of empyema due to *Staphylococcus aureus* have also been observed. Therefore, the true incidence of empyema necessitatis due to staphylococcus aureus may be under-reported. In Taiwan, the rate of methicillin resistance among community-associated (CA) *S. aureus* isolates in children is on a rise over the past decade, while in United States, CA-MRSA incidence and CA-MRSA (as a proportion of all *S. aureus* infections) have reached a plateau after year 2011. The rates of MRSA carriage and infections among healthy subjects have been increasing in the past decade in Taiwan. Nearly ten percent of all healthy Taiwanese children carry MRSA in the nares and >50% of pediatric CA *S. aureus* infections are due to MRSA.

The main-stay therapy of empyema necessitatis includes drainage of abscess by thoracoscopy, decortication, tube thoracostomy, and adequate antimicrobial therapy. Different antimicrobial regimens have been reported in the literature for the four pediatric patients with MRSA empyema necessitatis. In case 1, an 8-month-old male was treated with surgical drainage and a 10-day course of vancomycin, followed by a 21-day of oral trimethoprim-sulfamethoxazole. In case 2, a 3-month-old female underwent thoracotomy with decortication and tube thoracostomy. Parenteral vancomycin was administered for 14 days, followed by a 7-day course of oral linezolid. In case 3, a 19-month-old male was treated with thoracoscopic decortication and 2-week course of vancomycin and gentamicin. In case 4, a 4-week-old female developed empyema necessitatis after contacting with her mother’s severe mastitis and breast abscess. She underwent percutaneous drainage with a pigtail catheter. A total of 4 weeks of parenteral clindamycin with an additional 4-week course of oral clindamycin was administered.

In conclusion, due to the advent of modern surgery and antibiotic invention, no mortality from empyema necessitatis has been noted since 1966. Due to scarcity of CA-MRSA empyema necessitatis in clinical practice, clinicians should be more aware of this disease.

REFERENCES