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Case Report

Purulent lymphadenitis caused by ST59 community-associated Methicillin-resistant *Staphylococcus aureus* in an infant

Yifan Ren[1]

[1] *Department of Pediatrics, Shaoxing Keqiao Women and Children's Hospital, Shaoxing, PR China*

Abstract

Introduction: Methicillin-resistant Staphylococcus aureus (CA-MRSA), which has the potential to produce serious infections, was a common cause of skin and soft tissue infections, acute purulent lymphadenitis was rare.

Case report: The patient was a female infant with lumps, tenderness, and fever on the right side of the neck and groin. Laboratory tests suggested a bacterial infection. The diagnosis of acute purulent lymphadenitis was made based on the clinical signs and the results of a supporting exam. After three days, MRSA developed in the secretions of suppurative lymph nodes. Her mother's nasopharyngeal swab sample results revealed MRSA. The genotypes of two bacterial strains that underwent molecular analysis were identical.

Results: 17 days after admission, the patient showed signs of clinical recovery.

Conclusions: The incident brought to light the possible spread of CA-MRSA in the Chinese population. Even without a definite path of infection, CA-MRSA should be taken into consideration when the standard treatment for children with acute purulent lymphadenitis is ineffective. Early infancy MRSA acquisition may be mostly caused by maternal-infant horizontal transmission.

Key words: CA-MRSA; Purulent lymphadenitis; multiple drug resistance.

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Introduction

Staphylococcus aureus was the predominant pathogen in pediatric cervical suppurative lymphadenitis [1]. According to antibiotic sensitivity to methicillin and according to the epidemiology, *Staphylococcus aureus* is split into methicillin-sensitive *Staphylococcus aureus* (MSSA) and resistant *Staphylococcus aureus* (MRSA), whereas, MRSA is divided into community-acquired MRSA (CA-MRSA) and hospital-acquired MRSA (HA-MRSA) [2]. Patients with CA-MRSA infections tend to be younger and healthier than those with HA-MRSA infections. Additionally, CA-MRSA can acquire genes for drug resistance, and this resistance has grown over time, making CA-MRSA therapy difficult [3]. We describe a rare instance of acute suppurative lymphadenitis brought on by CA-MRSA in this study to further educate doctors about the dangers of the bacteria.

Case report

A Chinese female infant, 8 months old, was admitted to our hospital on August 14, 2020, due to "the right neck mass for 10 days, and mass at the right inguinal region with fever for 1 week." Ten days earlier, her parents had discovered a peanut-sized mass on the right side of her neck, which was accompanied by tenderness and a lack of appetite. She did not exhibit any symptoms of cough, urinary frequency, urinary urgency, dysuria, or diarrhea. The patient was first admitted to a nearby hospital for treatment and was given oral "amoxicillin" for 4 days, but this treatment proved futile. The mass at the right neck gradually increased to the size of the grape. One week earlier, her parents found a grape-sized mass with tenderness in the right inguinal region, and the patient developed a fever, with a peak temperature of approximately 38.9 °C; besides, the type of fever was irregular, and her appetite was poor. Therefore, the patient was readmitted to the local hospital, and a blood routine examination showed the following data: white blood cell (WBC) count, 15.1 ($\times 10^9$/L); hemoglobin (Hb) level, 114 (g/L); platelet (PLT) count, 294 ($\times 10^9$/L); neutrophil (N) count, 58.6%; and lymphocyte (L) count, 27.8%; in addition, amoxicillin was discontinued, and "roxithromycin and Xiaocaihu granules" were orally administrated for 5 days, while the therapeutic effect was poor; the patient still had a fever, and masses at the right neck and inguinal region were not decreased. She was then transferred to our hospital for further treatment. The patient had no history of lung tuberculosis or other

infectious diseases. Additionally, she had no history of drug allergy and was regularly vaccinated. The patient hadn't received treatment in any hospitals and/or treatment with antibiotics in the last 30 days. In addition, she was the first child in full-term birth and vaginal delivery. Her parents were healthy and her mother smoked frequently. She had no family history of hereditary diseases. She came from the countryside to the city two months ago, following her parents, and the family's living conditions were poor.

On physical examination at admission, she was clear-minded and had satisfactory mental status. A mass was palpable at the right neck and inguinal region, respectively; moreover, they had similar size, about 2.5 × 2.0 cm, and the mass had tough nature and mobility was poor; the pain aggravated when that was pressed, and the surface had no swelling and ulceration; no fluctuation was present; pharyngeal congestion was observed as well. Furthermore, the breath sounds of both lungs were clear without dry and moist rales; heart sounds were powerful, with regular cardiac rhythm, and no pathological murmurs were heard. Her abdomen was flat and diffusely tender, with her liver edge palpable 1 cm below the right costal margin. The initial WBC count on admission was high (WBC, 16,300/mm^3), with a neutrophilic predominance (N, 54.8%; L, 34%). She also had elevated inflammatory markers (C-reactive protein, 72.3 mg/L; Procalcitonin, 1.02 ng/mL). T-SPOT was negative. In addition, B-scan ultrasonography showed cervical lymphadenectasis and inguinal lymph-denectasis on both sides, especially on the right side (Figures 1 and 2). A transthoracic echocardiogram was normal. Infective endocarditis was not supported. The cellular immunity and humoral immunity were normal. A throat swab and blood culture were negative; She was initially diagnosed with acute purulent lymphadenitis. Ceftriaxone was initiated for 3 days. The patient's temperature had no improvement; the neck mass was slightly softer than before, and the mass in the inguinal region was not changing. B-scan ultrasonography revealed purulent lymphadenitis of the right neck (Figure 3). The abscess underwent incision and drainage, and the secretions were submitted to the laboratory for culture. After 3 days, MRSA was observed, which is resistant to penicillin, cephalosporin, clindamycin, erythromycin, and tetracycline, as well as being sensitive to linezolid, vancomycin, sulfamethoxazole, gentamicin, and ciprofloxacin. Nasopharyngeal swab samples of the parents and vaginal samples of the mother were collected for bacterial identification and drug-susceptibility testing during the same period. The results of nasopharyngeal swab samples of the father and vaginal samples of the mother showed negative. The nasopharyngeal swab sample results of the mother showed MRSA, which was similar to the drug

Figure 1. Purulent lymphadenitis at the right neck. The hypoechoic nodule was noted at the right neck, which was similar to lymph node echo, with the size of about 2.10 × 1.21 cm; it was regular and had a clear boundary; for the internal echo, the boundary between cortex and medulla was clear. CDFI showed a limited number of blood-flow signals in peripheral and internal regions.

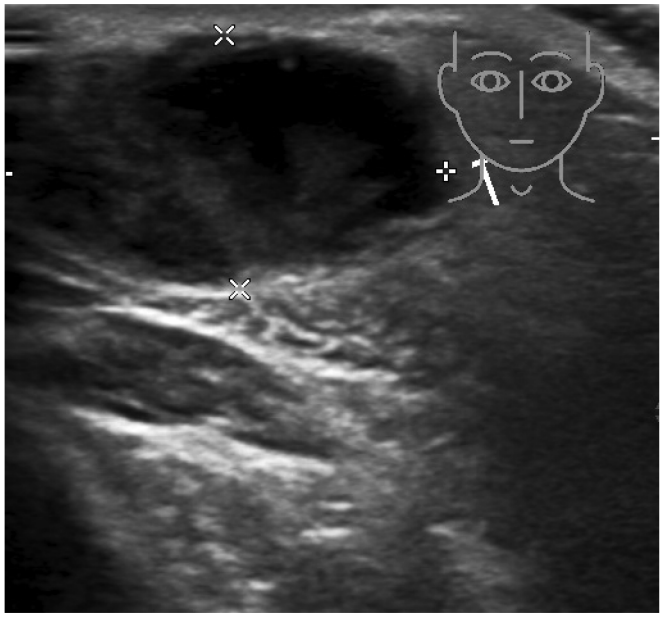


Figure 2. Purulent lymphadenitis at the right inguinal region. The hypoechoic nodule was found to be present at the right inguinal region, which was similar to lymph node echo, with a size of about 3.04 × 1.64 cm; it was regular and had a clear boundary; for the internal echo, the boundary between cortex and medulla was clear. CDFI revealed a limited number of blood-flow signals in peripheral and internal regions.

resistance spectrum of the patient. The molecular results of two bacterial strains revealed identical genotypes (ST59/PVL-negative/SCCmecIV), which was one of the epidemic lineages of community-associated CA-MRSA isolates, according to reports [4]. Vancomycin was administered for 5 days as an anti-infection treatment in place of ceftriaxone; However, despite being softer than before and fluctuating, the inguinal mass did not dramatically diminish. B-scan ultrasonography showed an abscess in the right inguinal region (Figure 4), which immediately underwent incision and drainage. Regular disinfection and dressing change of wounds at the neck and inguinal region were performed. Vancomycin was continued for 2 weeks.

Figure 4. A heterogeneous echo area at the inguinal region. A heterogeneous echo area was noted at the inguinal region, with a size of about 33 × 17 mm. No capsule was observed, while a thick dark area was noted. CDFI showed that blood supply was not abundant.

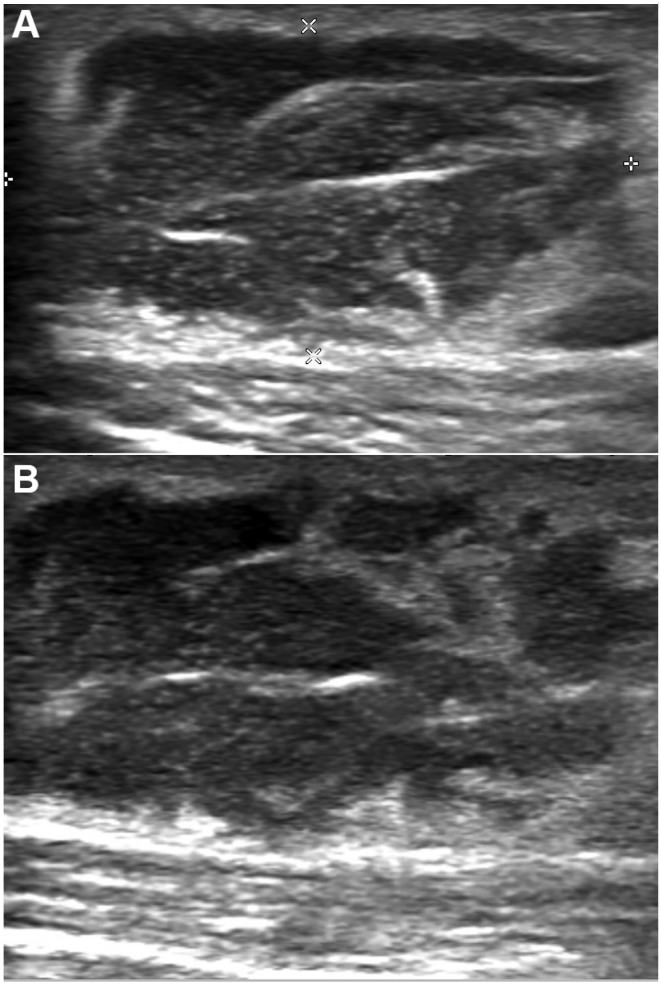
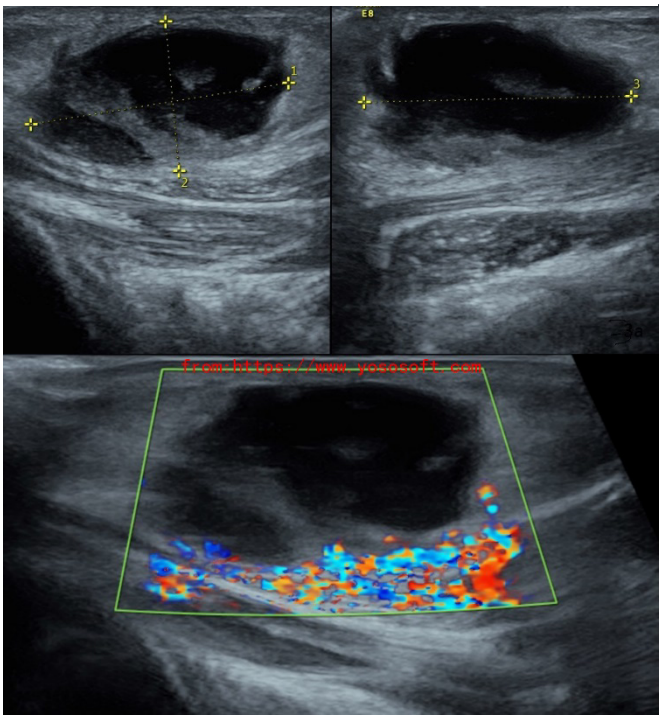


Figure 3. Scanning of the right neck mass. A nodule with poor echo was found to be present in the local subcutaneous region, which had a clear capsule, with a size of about 22 × 12 × 22 mm. The regions mainly involved dark areas of fluid, and poor-echo light spots floated. CDFI displayed no obvious blood-flow signal.



Results

The patient was clinically recovered and discharged from the hospital. Regular dressing changes at the surgical clinic were recommended. The patient was followed-up once per month for 1 consecutive year, and she reportedly had no discomfort.

Discussion

Case reports studies on CA-MRSA have been carried out globally, with ST59 being the most common pathotype in China (Table 1). High clone variety, a wide range of clinical symptoms, and predominate clones that have been formed and are circulating globally serve as illustrations of CA-MRSA. For example, as a new variant of ST59, ST338 infection causes Pneumonia and SSTI with a high mortality, posing a great threat to children's health in china mainland [4]. However, ST59/PVL-negative/SCCmecIV was mainly colonized genotypes, causing maternal–infant horizontal transmission in Taiwan [8] and our report. ST6-t701, ST59-t437 and ST965-t062 were the three major CA-MRSA clones in Yunnan province of China, and mainly affects children, leading to pneumonia [9]. As epidemic asymptomatic colonization CA-MRSA clones, ST59 and ST508 were confirmed on environmental surfaces

Table 1. The main clinical manifestations of CA-MRSA infections in children.

Area [Ref.]	Year	Number of cases	Genotype	Primary disease	Prognosis
Japan [5]	2022	1	ST834/PVL-negative/SCCmec-IVc	Cervical purulent lymphadenitis	Recovery
Brazil [6]	2018	1	PVL-negative/SCCmecIV	septic shock syndrome	Death
China [4]	2015–2019	3	ST338/SCCmec Vb	Pneumonia, SSTI	Death
Tokyo [7]	2017	1	ST8/SCCmec IV	Retropharyngeal abscess	Recovery
China [3]	2019	1	ST59/SCCmecIV/PVL- positive	Sepsis, myelitis, purulent arthritis, purulent meningitis, hydropericardium, pneumonia, and empyema	Normal, except for a slight limp in the left leg
Current case	2020	1	ST59/PVL-negative/SCCmecIV	Purulent lymphadenitis	Recovery

in the CA-MRSA patients' households, and transmitted among patients, contacts, and pets in in Zhejiang province of China [10]. According to a study in Germany, most prevalent epidemic lineages were ST8-MRSA-Iva, ST772-MRSA-V, CC80-MRSA-IV, and ST30-MRSA-IV, Which majority originated from community-onset and SSTI [11]. The current study provides comprehension of the epidemiology of CA-MRSA in children in a China metropolitan area.

The etiology of the illness in this infant could be due to a number of factors. First and principally, the maternal-infant horizontal transmission was caused by CA-MRSA colonization in her mother's nasopharynx. Second, the family has a history of leaving the countryside because of the miserable living circumstances there. Additionally, her mother smoked a lot. These pose a significant risk of CA-MRSA carriage. Thirdly, and lastly: Infants' IgG levels were high after birth, but they declined to their lowest levels three or five months later along with the maternal IgG disappeared. At the age of eight months, the patient had a physiologic low amount of IgG and no passive immunity. The most unexpected aspect of the current case was that there was no obvious infection route. A link between influenza and a particularly virulent CA-MRSA strain has been documented, and it is believed that flu may facilitate CA-MRSA infection due to the synergism [6]. In our case, a similar reason might have applied. Therefore, pediatricians and public health experts are highly recommended to focus on the horizontal transmission of CA-MRSA from mother to child.

Methicillin resistance was initially unsuspected due the low prevalence of such reports in this region. Prior to the culture showing positive results, antibiotics were not modified for sensitivity. Antibiotic resistance brought great difficulty to the appliance of antibiotics for children. A study reported that CA-MRSA and hospital-associated Methicillin-resistant *Staphylococcus aureus* (HA-MRSA) showed a significant difference in their susceptibilities to β-lactam and non-β-lactam antibiotics and CA-MRSA are more susceptible to non-β-lactam antibiotics [12]. Patients' prognoses are influenced by both the aggressiveness of the bacteria and their sensitivity to antibiotics. Different strains of CA-MRSA, have completely different adhesion, cytotoxicity, and antimicrobial susceptibility [4]. However, above tests are now only utilized in scientific studies and not clinical settings. In the future, sophisticated testing methods will be required to support doctors in identifying not only bacterial species but also bacterial traits.

Conclusions

The current case highlights the prospect of ST-59 invasive infections without a known route of infection and lends weight to the idea that CA-MRSA infection may be spreading in the Chinese community or other susceptible populations in certain regions of the world. Despite the rarity of this situation, the relevance of active surveillance is highlighted by the potential for epidemics in healthcare facilities. Doctors should be informed that CA-MRSA should be considered in this case if the usual therapy for children with acute purulent lymphadenitis is inadequate. Additionally, focusing on preventing mother-to-child transmission, improving children's hygiene, enforcing strict aseptic procedures in hospitals, and reducing exposure to healthcare facilities may all contribute to reducing the spread of CA-MRSA in hospitals and the general population.

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Corresponding author

Dr. Yifan Ren
Department of Pediatrics,
Shaoxing Keqiao Women And Children′s Hospital,
Shaoxing, PR China.
Tel: + 86 15988296173.
E-mail: renyifan1213@163.com

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