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Case report

Management of life-threatening staphylococcal septic shock in a breastfeeding woman with breast abscess: A case report

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ABSTRACT

Introduction and importance: Breast abscess is a common problem in breastfeeding women. However, septic shock secondary to methicillin resistant *Staphylococcus aureus* (MRSA) from breast abscess is very rare. Successful management of this condition in our center may provide experience of treatment for similar patients.

Case presentation: A 20-year-old breastfeeding woman with breast abscess was transferred to our center. General condition of the patient deteriorated rapidly to life-threatening septic shock. Culture of pus later demonstrated MRSA infection, with vancomycin susceptibility. Several measures were emergently implemented, including removal of necrotic tissue, continuous catheter irrigation and drainage, intravenous infusion of vancomycin, pumping norepinephrine, fluid resuscitation and transfusion of plasma. The patient was cured and discharged after 10 day's treatment.

Clinical discussion: Life-threatening septic shock secondary to MRSA in breastfeeding women with breast abscess is very rare. Nevertheless, clinicians should remain vigilant to early symptoms and signs of septic shock. Catheter irrigation and drainage, vancomycin and fluid resuscitation are essential for septic shock in lactational breast abscess.

Conclusions: We highlight the importance of the diagnosis and management of life-threatening septic shock secondary to MRSA in breast abscess to help us further understand this rare and fatal disease.

1. Introduction

Breast abscess is a common problem in breastfeeding women. About 0.4% to 11% of breastfeeding women may suffer from breast abscess [1,2]. However, septic shock secondary to methicillin resistant *Staphylococcus aureus* (MRSA) in breastfeeding women with breast abscess is very rare.

Here we present a case of life-threatening staphylococcal septic shock in a breastfeeding woman with breast abscess, whose condition deteriorated rapidly and was cured successfully. This case report has been reported in line with the SCARE 2020 Criteria [3].

2. Case report

A 20-year-old female, G1P1, with a lactational breast abscess was transferred to our center with chief complaints of pain, erythema and edema in her left breast for 10 days. The patient delivered a baby 33 days ago, and made pure breastfeeding. She got fever with a highest temperature of 38.3 °C and sought help in a community hospital. Complete blood count revealed that the white blood cell count, neutrophil proportion and C-reactive protein (CRP) was 14.57×10^9/L, 83.8% and 13.76 mg/L, respectively. Ultrasound showed heterogeneous hypo-echo in her left breast. The body temperature returned to normal after a few days' antibiotics, but the symptoms remained poorly controlled despite one week's antibiotic therapy with Amoxicillin Potassium Clavulanate and Metronidazole. Subsequently, the patient demanded to terminate breastfeeding and transferred to our hospital.

The vital signs were stable upon admission: temperature 36.4 °C, heart rate 105 beats/min, respiratory rate 20 breaths/min, blood pressure 105/69 mmHg. Physical exam revealed an 8 cm × 6 cm painful

Abbreviations: MRSA, methicillin resistant *Staphylococcus aureus*; MSSA, methicillin-sensitive *S. aureus*; CRP, C-reactive protein; PCT, procalcitonin; INR, international normalized ratio; ICU, intensive care unit; CVC, central venous catheter.

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mass, with erythematous, edematous and fluctuant skin, in the upper outer quadrant of her left breast (Fig. 1A). Ultrasonography showed anechoic mass with internal heterogeneous hypo-echo. Complete blood count revealed a high white blood cell count of 15.43 × 10^9/L, neutrophil proportion of 85.3%, CRP of 11 mg/L. Liver, renal and coagulation function test were normal.

3. Treatment, outcome and follow-up

Ultrasound-guided needle aspiration was failed upon admission due to massive milk agglutination and necrotic tissue within the breast abscess. Milk and pus were sent to the lab for bacteria test. Amoxicillin Potassium Clavulanate and Metronidazole was ineffective before admission, thus Cefmetazole was administrated when the patient was admitted. The body temperature rose to 38.6 °C. We surgically removed 150 mL of pus and necrotic tissue, and placed a 16G indwelling needle in the upside of the abscess for irrigation and a catheter in the submammary fold for drainage under general anesthesia (Fig. 1B). After operation, the body temperature rose to 41.2 °C. Blood test showed that the white blood cell count, neutrophil proportion and CRP rose to 23 × 10^9/L, 96.6%, and 138 mg/L, respectively. Antibiotic was changed to Levofloxacin. However, the vital signs were deteriorated rapidly despite sufficient fluid resuscitation. Heart beat accelerated to 150/min, blood pressure declined to 75/40 mmHg. The patient's condition deteriorated to septic shock. She was subsequently initiated on norepinephrine at 1 mg/kg/min and was transferred to intensive care unit (ICU) emergently.

A repeat laboratory evaluation was list below.

White blood cell count 40.56 × 10^9/L (4.0–10.0 × 10^9/L)
Neutrophil proportion 97.4% (50.0%–70.0%)
CRP 186 mg/L (0–10.0 mg/L)
PCT 4.99 (0–0.50)
Lactic acid 3.98 (0.5–2.2 mmol/L)
Alkaline phosphatase 164.5 (35–100 U/L)
Aspartate aminotransferase 38.7 (13–35 U/L)
Alanine aminotransferase 46.3 (7–40 U/L)
Albumin 23.7 g/L(35.0–55.0 g/L)
Total bilirubin 24.1 μmol/L(<21 μmol/L)
Activated partial thromboplastin time 55.8 s(24–42 s)
Prothrombin time 24.3 s (10–14 s)
INR 2.08 (0.8–1.5)

Cultures of blood, stool, and urine samples were negative for microbial agents. Chest X-ray, COVID-19 were negative. Arterial blood gas analysis showed a pH value of 7.421 and a lactic acid value of 3.98 mmol/L.

The patient received treatments including intensive care, placement of central venous catheter (CVC), fluid resuscitation, norepinephrine to

Fig. 1. A 20-year-old female with a lactational breast abscess in the uper outer quadrant of her left breast.
A: Upon admission, there was an 8 cm × 6 cm painful mass, with erythematous, edematous and fluctuant skin.
B: During operation, we placed a 16 G indwelling needle in the upside of the abscess for irrigation and a catheter in the submammary fold for drainage. ⇒, indwelling needle for irrigation; Δ, catheter for drainage.
C: After six days' irrigation and drainage, the syndrome of erythema, edema and pain disappeared, then the tube was extubated.
D: After one week of her discharge, she was completely asymptomatic.

maintain blood pressure, transfusion of plasma to improve coagulation function and continuous irrigation and drainage of breast abcess in ICU. The local erythema and edema of the breast improved significantly one day after operation, but the patient recovered slowly.

Culture of milk and pus later showed *Staphylococcal aureus* and MRSA, separately, both of them were susceptible to vancomycin. Therefore, vancomycin was prescribed to replace Levofloxacin. Five days later, the patient was transferred to our department when the vitals were stable. After six day's irrigation and drainage, the syndrome of erythema, edema and pain disappeared, and pus disappeared too, then the drainage was extubated (Fig. 1C). Meanwhile, the fluid specimen obtained by needle aspiration was sent to the lab for culture, which revealed no bacteria.

The patient was cured and discharged after 10 day's treatment in our hospital. She was completely asymptomatic during follow-up visit at one week, two week and one month after discharge (Fig. 1D).

4. Discussion

Breast abscess is a common problem, especially in breastfeeding women. This condition is most often caused by *Staphylococcus aureus* (*S. aureus*), but MRSA related infection is increasing [4]. In some country and district, MRSA is the most common bacteria in lactational breast abscess [5]. Most patients with MRSA related infections would suffer from significantly more complications, higher mortality and longer hospital stays [6]. This patient developed to a life-threatening septic shock with severely high temperature, rapid heart rate, hypotension, coagulation disorders, hypoproteinemia. Fortunately, we recognized the deterioration timely. Necrotic tissue removal, continuous catheter irrigation and drainage, intravenous infusion of Vancomycin, pumping Norepinephrine, fluid resuscitation and transfusion of plasma, these effective treatments made the patient cured successfully. But why did this patient deteriorate to severe septic shock so rapidly?

MRSA, a highly toxic bacteria, was first identified in 1960s. Since then, MRSA has been widely recognized as an important pathogen of infections, and become one of the public health issues right now [6,7]. According to a meta-analysis, MRSA accounted for about 43.0% of *S. aureus* isolates, indicating that MRSA infections are becoming prevalent worldwide [8]. MRSA related mastitis and breast abscess are commonly encountered in clinical practice, but septic shock secondary to lactational breast abscess is infrequently reported [9,10]. There were approximately one hundred cases of MRSA related lactational mastitis and breast abscess in our center every year, but this was the first patient who deteriorated to life-threatening septic shock.

MRSA can cause various infections by producing enterotoxins and alpha pore-forming toxins to destroy host tissues [11]. In addition, there are other determinants of virulence, responding by changing the production of virulence factors necessarily [11–13]. Abscesses caused by MRSA can often appear more severe than the typical methicillin-sensitive *S. aureus* (MSSA) abscess [7,14]. Maybe this is the main reason why the patient developed to septic shock.

There are a few lessons in the treatment of this patient which we should pay attention to.

Optimal treatment of breast abscess has advanced to minimally invasive management. Ultrasound-guided needle aspiration is less invasive and is the preferred approach over open surgical incision and drainage [1,15,16]. But needle aspiration could not work in all cases. If there is a large abscess or needle aspiration failed, catheter placement and irrigation may be helpful [17]. On admission, ultrasound-guided needle aspiration was performed, but failed because of necrotic tissue blocking the needle. Therefore we changed the treatment, removed necrotic tissue, placed catheter to irrigate and drain, and got well local control.

Long-term use of antibiotics can lead to the emergence of multidrug resistant strains. And *S. aureus* has ability to develop resistance to all antibiotics exposed to treatment. The occurrence of MRSA is due to the abuse of methicillin antibiotics, resulting in the evolution of *S. aureus* into MRSA [11]. Vancomycin, tigecycline, linezolid, and ceftaroline are the main choice for MRSA treatment, while Vancomycin is the first choice [18]. The patient was treated with Amoxicillin Potassium Clavulanate for one week in community hospital and developed septic shock after admission. When she developed to septic shock, we should consider the possibility of MRSA infection and change the antibiotic to Vancomycin in time, instead of waiting for the results of bacterial culture. That was inappropriate in dealing with this patient. Antibiotic resistance may be produced in patients who are transferred from other hospital after a few day's treatment, so proper antibiotics should be chosen after admission. If infection symptoms persist or do not improve after treatment, the possibility of MRSA infection should be considered. Vancomycin should be given in such condition. In case of MRSA infection, the patient should be isolated in a single room. Patient with MRSA infection has a high risk of recurrence, so antibiotics should cease only when the second culture test is negative.

Clinicians would encounter devastating consequences if these serious complications such as septic shock are not recognized in time, despite the treatment for lactational breast abscess seems quite straightforward. Herein, we report a life-threatening septic shock secondary to MRSA in a lactational breast abscess to arouse physicians to pay attention to such severe condition.

5. Conclusion

Life-threatening septic shock secondary to MRSA in a breastfeeding woman with breast abscess is very rare. We should pay more attention to the early symptoms and signs of septic shock. Catheter irrigation and drainage, vancomycin and fluid resuscitation are essential for septic shock in lactational breast abscess.

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Ethical approval

The study is exempted from ethical approval.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Ping Ning was responsible for the diagnostics and treatment of the disease. Manuscript was prepared by Chunxiang Tian, and reviewed by Ping Ning. All authors approved the final version of the manuscript.

Registration of research studies

Not applicable.

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