PUERPERAL INFECTION OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS*

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Humans are a natural reservoir of *Staphylococcus aureus* (*S. aureus*) [1]. *S. aureus* presents as common flora in the upper airway of both children and adults [2]. Infections with methicillin-resistant *S. aureus* (MRSA) are emerging worldwide. Community-associated MRSA infections were first observed in children and adolescents [3,4]. MRSA infections, which were previously confined to hospitals, long-term and intensive-care facilities, have been found to occur in the community [5]. Community-associated MRSA might be complicated by serious skin and soft tissue infections, necrotizing pneumonia, and sepsis, as well as significant morbidity and mortality [6].

Vaginal–rectal colonization by MRSA has also been observed among pregnant women [7]. In recent years, MRSA-related pneumonia arising from an infected episiotomy wound has been reported [8]. The prevention of *S. aureus* infections, especially that of MRSA, in the labor room is essential and critical for nursing procedures. The MRSA-related literature contains few cases of MRSA during the puerperal period. Here, we report one postpartum female suffering from MRSA, as well as its related consequences. To the best of our knowledge, this is one of only a few reports in the obstetric population as well as the first case report in a postpartum Asian.

A 30-year-old female, gravida 1, para 1, was referred on postpartum day 7 with persistent high fever and productive cough for 2 days. There had been severe cough with yellowish sputum, high fever and shortness of breath since postpartum day 5. Under suspicion of influenza, 3 days of medication was administered, which resulted in exacerbation of the symptoms. The past history, pregnancy and normal spontaneous delivery processes were unremarkable. Physical examination revealed a well-healing episiotomy wound, normal vaginal discharge, moderately tender uterus, and lifting pain. Leukocytosis (white blood cells 15,200 counts/mm^3; segmental 91.1%) and elevated C-reactive protein (31.1 mg/dL) were observed. Chest X-ray showed multiple radiopacified patches in both lungs (Figure 1). Pneumonia was suspected and vancomycin was administered.

After 5 days of medication, chest X-ray showed increased infiltrations, pleural effusions and a mass with cavitations over the left upper lung field (Figure 2). Cervical, blood, sputum, urine and episiotomy site cultures revealed the growth of MRSA as well as negative results for cold hemagglutinins, *Mycoplasma pneumoniae*, and *Chlamydia* antibody. Ultrasound-guided aspiration of the pleural effusion revealed no organism growth. Computed tomography of the chest showed a left upper lung cavitary lesion with right pleural effusion (Figure 3). A computed tomography-guided lung biopsy was performed. The pathologic report revealed acute suppurative inflammation and necrosis with no evidence of malignancy. Culture of the lung biopsy further confirmed that the infection was MRSA. Throughout the patient's whole course of illness, community-acquired

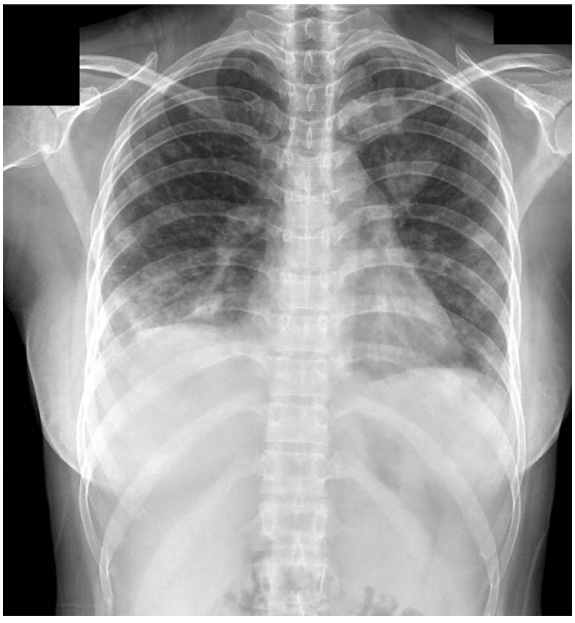

Figure 1. Chest X-ray reveals multiple radiopacified patches in both lungs.

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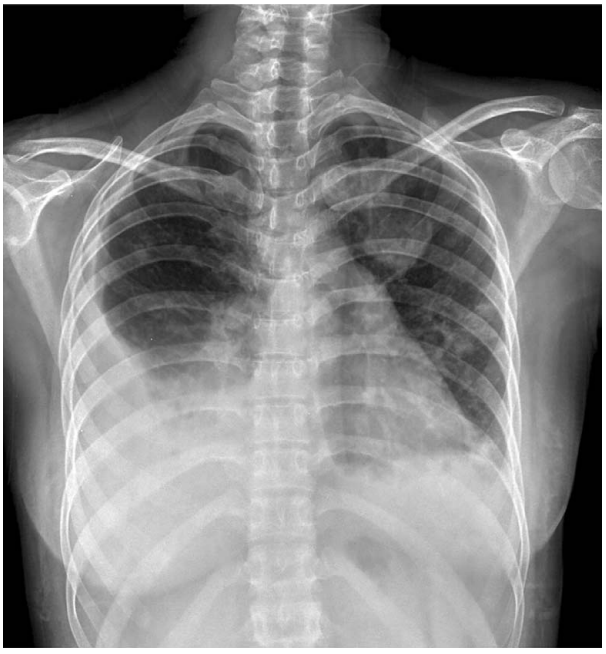

Figure 2. Chest X-ray reveals increased infiltrations, pleural effusions, and a mass with cavitations over the left upper lung field.

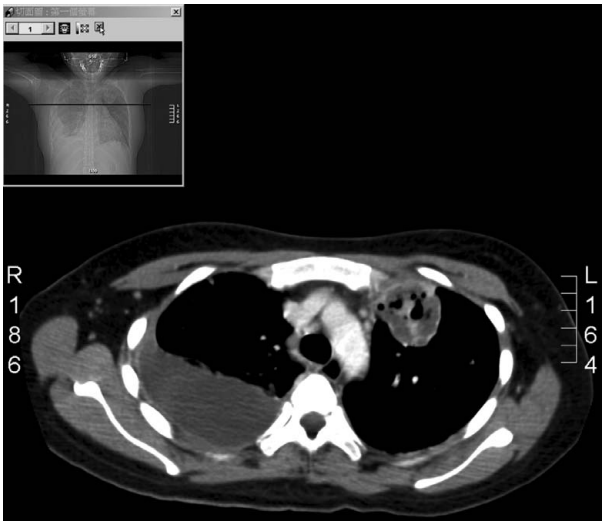

Figure 3. Computed tomography of the chest shows left upper lung cavitary lesion with right pleural effusion.

MRSA during the postpartum period was highly suspected. After changing antibiotic treatment from vancomycin to teicoplanin, her condition improved progressively. After 4 weeks in hospital, the patient was discharged and the subsequent course was uneventful.

S. aureus is a major cause of skin, soft tissue, respiratory, bone, joint and endovascular disorders, and can also cause severe life-threatening infections such as staphylococcal toxic shock syndrome [1]. In obstetrics and neonatology, *S. aureus* is recognized as a cause of abdominal wound infections, breast abscesses, and nursery outbreaks of infection [9]. The incidence of *S. aureus* and MRSA infection during pregnancy has been found to have increased over the years. The prevalence of vaginal *S. aureus* in literature from the 1970s was less than 5% [10]. Research conducted during the 1990s found 7–8% of vaginal cultures from pregnant women positive for *S. aureus* [11], while a recent study revealed vaginal *S. aureus* colonization in 9% of nonpregnant women [12]. This increasing prevalence of *S. aureus* might be due to higher detection rates after the use of selective culture media.

MRSA has become increasingly common in neonatal intensive care units, which might lead to severe outcomes [13]. There were high percentages of MRSA cases transmitted through community-associated routes [14]. Community-acquired MRSA is an emerging problem, which may present as skin and soft tissue infections or sepsis. MRSA can be passed from mother to preterm infant through contaminated breast milk, even in the absence of maternal infection [15]. Nosocomial patient-to-patient transmission of MRSA has also been reported [16]. In recent years, community-acquired MRSA has been demonstrated to be associated with iatrogenic transmission in children during vaccination [17].

The risk factors for MRSA colonization in pregnancy remain largely uncharacterized. The colonization prevalence of *S. aureus* is different between races [18]. Black women seem to have higher carrier rates of *S. aureus* than those of Asians or Caucasians [19]. In comparison with the general obstetric population, patients with MRSA are more likely to be multiparous and to have had a cesarean delivery [7]. The group B *Streptococcus* colonization was also associated with *S. aureus* colonization and MRSA infection [19].

Some genetic factors have been found to be associated with MRSA infection or antibiotic resistance. Methicillin-resistance in *S. aureus* is mediated by the *mecA* gene, which is packaged in a mobile genetic element called the staphylococcal chromosomal cassette (SCC) [14]. Other genetic variations or factors have been demonstrated, including Panton-Valentine leukocidin, the staphylococcal enterotoxin B gene, the gene complex for SCC mec type V, and HCM3A [17]. The mechanisms and correlations of these factors concerning MRSA transmission remain unclear.

The acquisition of MRSA during pregnancy or the puerperal period is uncommon. However, an MRSA infection often has severe consequences. The organs involved in MRSA infection can be diffuse, multiple sites or individual, including skin, soft tissues [7], abdomen, lung [8], kidney [20], iliopsoas [21] and spleen [22]. Most commonly, MRSA presents as a skin or soft tissue infection that involves multiple sites. Seeding from an infected episiotomy site has been demonstrated to be

a potential route of systemic infection [8]. Recurrent skin abscesses during pregnancy should elicit prompt investigation for MRSA [8]. However, in this episode, there were no obvious infection signs in the episiotomy wound or other soft tissues. Other routes of community transmission, such as upper airway infection, might be further considered and investigated.

The effective antibiotics for MRSA include trimethoprim-sulfamethoxazole, vancomycin, rifampin, gentamicin, and levofloxacin [7]. However, in this report, the MRSA was resistant to vancomycin. Therefore, appropriate cultures and antibiotic-resistant surveys are essential for confirming the infection of MRSA. The quick selection of nonresistant antibiotics toward MRSA is critical for control of the illness.

In this study, we present a case of community-acquired MRSA during the postpartum period. The lung manifestation of the infection in postpartum individuals might present as influenza during the early pregnancy stage. The high morbidity and mortality of MRSA infections highlighted the importance of early diagnosis and efficient medical intervention. Quick diagnosis, identification and appropriate intervention with effective antibiotics might minimize morbidity, mortality and long-term consequences. Obstetricians should be alert to the acquisition of MRSA as an emerging pathogen during the puerperal period as well as its wide range of manifestations. However, consistent adherence to hygienic and practice guidelines is essential for the prevention of community-associated MRSA transmission in both inpatient and outpatient settings. Furthermore, with MRSA transmission being an emerging and critical threat to the maternal and neonatal populations, larger scale surveys on MRSA transmission, intervention and related prevention are warranted.

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