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Chorioamnionitis caused by *Serratia marcescens* in a healthcare worker: A case report

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Abstract

BACKGROUND

Healthcare workers (HCWs) are at an increased risk for exposure to infections. *Serratia marcescens* (*S. marcescens*) is a gram-negative, opportunistic and nosocomial pathogen belonging to the Enterobacteriaceae family. A few case reports have been published of chorioamnionitis caused by *S. marcescens* infection. Immunological changes during pregnancy can also affect the risk of infection. However, few studies have examined hospital-acquired bacterial infection in pregnant HCWs.

CASE SUMMARY

A 33-year-old woman, a resident in anesthesiology, was admitted at 14 wk gestation for fever with chills. She had no medical history other than contact dermatitis of both hands that started from the beginning of the trainee. There was no obvious infection focus and no bacterial growth in blood cultures. She was discharged after 1 wk of empirical antibiotic treatment. At three weeks before the fever started, she had a blister on the site of contact dermatitis on both hands, she applied antibiotic ointment for three days and the blisters had healed. At 19 wk gestation, she had a high fever and was readmitted. Physical examination and image studies were nonspecific and the patient had no other symptoms. *S. marcescens* grew in blood cultures at 19 wk gestation. Treatment with intravenous antibiotics was started. However, she suffered a miscarriage at 22^{4/7} wk gestation. Pathologically, the amniotic membrane showed chorioamnionitis with a focal infarct. Subsequently, a placenta tissue culture grew *S. marcescens*.

CONCLUSION

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HCWs can be exposed to pathogens that can cause opportunistic infections such as *S. marcescens*. Pregnancy affects the immune system, making it susceptible to opportunistic infections. Therefore, pregnant HCWs may require more preventive measures, including hand hygiene and avoid risk factors (ex. wrapping the skin).

Key Words: *Serratia marcescens*; Chorioamnionitis; Healthcare workers; Pregnancy; Case report

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Core Tip: In this case, a 33-year-old female patient suffered a miscarriage due to chorioamnionitis caused by *Serratia marcescens* infection. Although she performed aseptic procedures and hand hygiene during medical practice, it is suspected that the cause of the infection was the weakening of the skin line due to contact dermatitis. In addition, it is thought that changes in the immune system caused by pregnancy may also have an effect. Therefore, it is recommended that pregnant healthcare workers perform more meticulous hand hygiene and avoid infection risk factors (ex. wrapping the skin).

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INTRODUCTION

Serratia marcescens (*S. marcescens*) is a Gram-negative anaerobic bacillus in the Enterobacteriaceae family. It is not a normal member of the human bacterial flora, although it can colonize the gastrointestinal, urinary, and respiratory tracts. The incidence of nosocomial infection of *S. marcescens* is 1%-2%, but it shows high mortality rate of 37%[1,2]. There have been a few case reports of *Serratia* bacteremia associated with pregnant women, four of which resulted in miscarriage[3-8]. Hand-to-hand transmissions by HCWs is the major mode of spread[9].

Healthcare workers (HCWs) are at increased risk for exposure to infections, including blood-borne, air-borne, and contact-transmitted infection. Blood-borne infections include human immunodeficiency virus and hepatitis B and C viruses[10]. Air-borne transmitted infectious diseases include tuberculosis and viruses contained in operating room smoke[11]. There are some reports of methicillin-resistant *Staphylococcus aureus* (MRSA) carriage and infection in HCWs, which is spread by contact[12].

Pregnant women tend to be more severely affected by infections due to the immunological changes caused by altered hormone levels[13]. Therefore, pregnant HCWs may need more attention and care for infection prevention. However, hospital-acquired bacterial infection in pregnant HCWs has been studied less often. Here, we report a pregnant HCW with *S. marcescens* bacteremia that resulted in a spontaneous abortion.

CASE PRESENTATION

Chief complaints

A 33-year-old woman was admitted at 19 wk gestation for a fever with chills.

History of present illness

She was hospitalized at 14 wk of pregnancy with fever and dry cough. At that time, after receiving empirical antibiotic treatment (intravenous ceftriaxone 2 g and azithromycin 500 mg orally) for 1 wk, it improved. After discharge, she had an intermittent mild fever (37.5-38.0 °C) for 3 wk.

History of past illness

She had contact dermatitis of both hands that started from the beginning of trainee. She applied steroid ointment intermittently to control the symptoms of contact dermatitis. At three weeks before the 1st fever event (gestation 11 wk) had a blister on the site of contact dermatitis on both hands, she applied antibiotic ointment for three days and the blisters had healed.

Personal and family history

She was an anesthesiology resident and worked in intensive care units at gestational periods. She rounded the patients and, if necessary, performed endotracheal intubation or central venous catheterization. Family history was unremarkable.

Physical examination

The physical examination was unremarkable and the patient did not complain abdominal pain or urinary symptoms. A vaginal examination showed no leaking amniotic fluid.

Laboratory examinations

Laboratory tests indicated mildly increased white blood cell count, high C-reactive protein (CRP) (15.8 mg/dL; normal 0-0.3 mg/dL), and mildly elevated procalcitonin level (0.503 ng/mL; normal 0-0.5 ng/mL). Her thyroid, liver, and renal functions, coagulation profile, electrolytes, and lactate levels were normal. Polymerase chain reaction results of a vaginal discharge for sexually transmitted diseases were normal. Laboratory studies to rule out rheumatological diseases were all normal. After 2 d, the blood cultures grew *S. marcescens*.

Imaging examinations

Abdominal ultrasonography was nonspecific other than a 0.5 cm gallbladder polyp. The fetus and placenta appeared normal in obstetric ultrasonography. An additional abdominal and pelvic magnetic resonance imaging scan was also performed to find the cause of the fever, but it was also normal.

FINAL DIAGNOSIS

Fever was caused by *S. marcescens* cultured in the blood, and the site of infection was the chorionic tissue (later) found after abortion.

TREATMENT

Empirical cefepime 2 g intravenous (IV) was given every 8 h. After 2 d, the blood cultures grew *S. marcescens*. The antibiotic was changed to ceftriaxone 2 g IV daily as the bacteria were susceptible to ceftriaxone. On the 4th day of admission, she had a fever again, so the antibiotic was stepped up to cefepime. [Figure 1](#) shows the timeline of the major clinical events.

OUTCOME AND FOLLOW-UP

Twenty-three days after admission, at 22^{4/7} wk gestation, she had a watery discharge and preterm premature rupture of the membrane (PPROM) was diagnosed as the vaginal discharge showed pH 8, pooling (+), Fern (+), and AmniSure (+). Cefepime 2 g IV every 8 h and clarithromycin 500 mg PO were started after taking blood cultures. Labor was induced and she delivered a 360 g dead male fetus. After 7 d of IV cefepime and 5 days of PO clarithromycin, the patient was afebrile and the leukocytosis and CRP level had normalized. She was discharged in good condition. The tissue culture from the placenta subsequently grew *S. marcescens*. Pathologically, the amniotic membrane showed chorioamnionitis with a focal infarct ([Figure 2](#)).

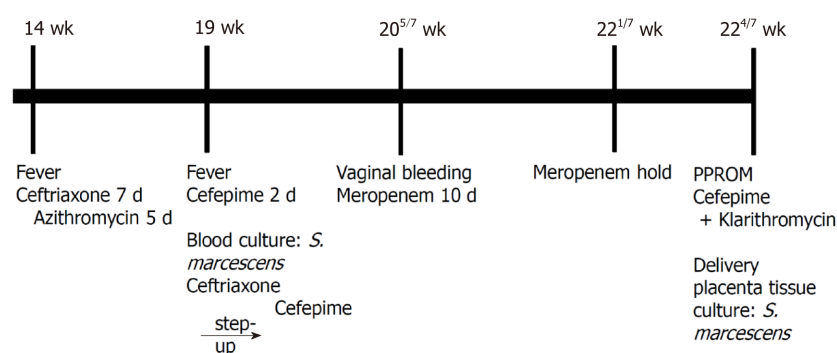


Figure 1 Timeline of the clinical events and antibiotic treatment. *S. marcescens*: *Serratia marcescens*.

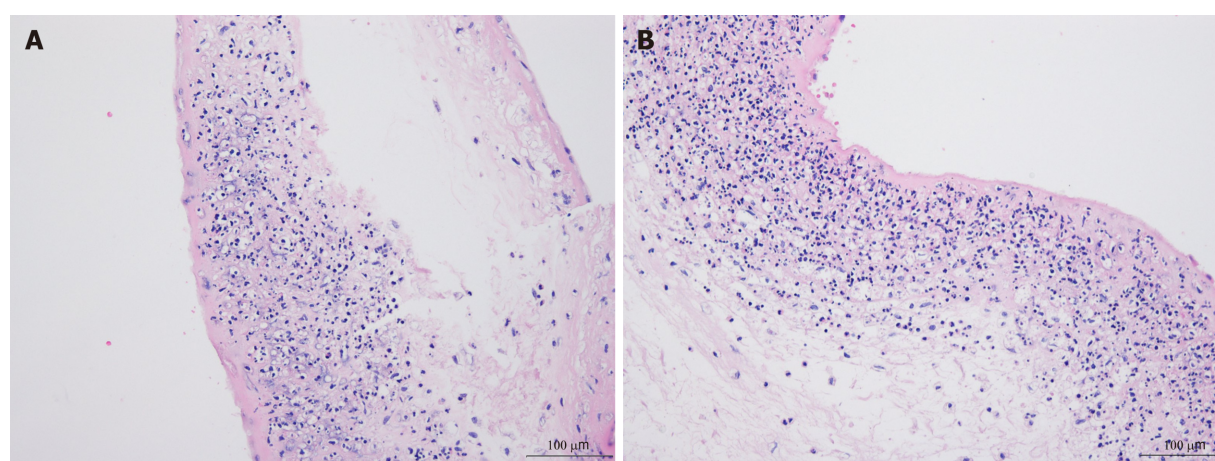


Figure 2 Massive infiltration of neutrophils in the amnion and chorion, suggestive of infectious chorioamnionitis. A: Amnion; B: Chorion.

DISCUSSION

This present case reports healthy pregnant HCW developed an atypical reproductive system infection by *S. marcescens*, a Gram-negative bacillus that survives in environments such as drinking water pipes, hospital disinfectants, and medical instruments[14]. It can also colonize the human gastrointestinal tract and skin for extended periods and is important, frequently found nosocomial pathogen. Many studies have traced *S. marcescens* outbreaks in hospitals to medical instruments[9,15-17]. It is exogenously acquired, mostly *via* the hands of healthcare providers[9].

A few cases of *S. marcescens* infection during pregnancy have been reported[3,5-8]. In four cases, the suspected routes of infection were chorionic-villus sampling[6], urinary tract infection due to a double ureter[6], the placement of a peripherally inserted central catheter[5], and prolonged PPRM[3]. In another three cases, no route of infection was found. Our patient had no *S. marcescens* infection route other than skin route. Of the previous cases, *S. marcescens* infection during pregnancy has a poor prognosis, three had spontaneous abortions, one delivered a dead fetus, and three had live babies. Of the three cases that had live babies, one showed signs of chorioamnionitis[3], and two had placental abscesses on ultrasonography and continued the antibiotic treatment[4,5]. In our patient, however, no infection focus was found until after the spontaneous abortion, so deciding the duration of antibiotic treatment was difficult.

There have been many reviews of adverse pregnancy outcomes among HCWs, such as congenital anomalies, fetal death, and fertility disorders[18-20]. Two reviews considered the relationships between adverse pregnancy outcomes and specific exposures, such as anesthetic gases, antineoplastic agents, sterilizing agents, and radiation. But neither assessed hospital-acquired bacterial infection in a pregnant HCW. March *et al*[21] reported that 66.1% of HCWs in an Italian long-term care facility were colonized by multidrug-resistant bacteria. Liu *et al*[22] reported that intensive care unit HCWs have a higher proportion of multidrug-resistant Gram-negative

bacteria colonization than non-medical workers (41.87% *vs* 28.57%, respectively). Peters *et al*[23] reviewed the occupational infection risk with multidrug-resistant organisms, such as MRSA, vancomycin-resistant Enterococcus, and Gram-negative bacteria, in HCWs, but the comparison of results was limited due to data heterogeneity.

The occurrence of this rare case is suspected to be due to the patient's underlying disease, career and work environment. Skin is essential to maintaining a normal immune state from pathogens. If this barrier breaks down, the normal flora can become pathogens[24]. The patient was in a state of collapsed skin defenses due to contact dermatitis. She applied steroid ointment intermittently to control the symptoms of contact dermatitis. Pregnant women may be more severely affected by infection than non-pregnant women due to major changes in their immune systems^[25]. In addition, since the patient is an HCW, it is a situation in which a lot of exposure to *S. marcescens* is possible, and it is an environment in which medicines can be easily prescribed. Although there is no evidence that the skin lesions that occurred before fever was caused by *S. marcescens*, there is a case report that appeared in the form of blisters during *Serratia* infection[26].

CONCLUSION

This case is important because even a healthy HCW may be vulnerable to infection due to the immune system changes that occur during pregnancy. HCWs should be aware and cautioned that there is a risk of opportunistic infections at work. Also, HCWs who are pregnant may require more preventive precautions, including hand hygiene, and avoid risk factors (ex. wrapping the skin).

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