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BACK ABSCESS AND CELLULITIS DUE TO MULTIDRUG-RESISTANT STAPHYLOCOCCUS AUREUS INFECTION IN PREVIOUSLY HEALTHY NEONATE

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ABSTRACT
We report a case of a nine-day-old male baby who was born term, spontaneously with normal birth weight, a history of forty-eight hours of premature rupture of membrane, and no history of early-onset sepsis. He suffered from fever followed by a small red bump on his back, which worsened, extended, and became an ulcer in the right axilla. The pediatric surgeon performed the debridement and modern wound care without a skin graft. The pus culture isolated. Staphylococcus aureus, resistant to oxacillin and at least three other non-β-lactam antibiotics. We then administered vancomycin for fourteen days. The patient was discharged after thirty-one days of hospitalization. Multidrug-resistant Staphylococcus aureus infection in neonates can manifest as severe progressive skin and soft tissue disease. However, proper management could deal with the prognosis.
Keywords: *Staphylococcus aureus,* rupture membrane, back abscess, cellulitis

INTRODUCTION

Staphylococcus aureus is a gram-positive bacterium that causes various manifestations from skin lesions to life-threatening systemic infections. Nosocomial infections due to this pathogen are common in many countries. A published review of *S aureus* infection in resource-limited countries in south and east Asia in 2009 revealed that the incidence of the disease was the highest in neonates with broad clinical manifestation including soft tissue infection, bacteremia, endocarditis, meningitis, brain abscess, pneumonia.(Nickerson et al., 2009) However, published studies on *S aureus* infection in neonates in Indonesia are limited. We do not know precisely the epidemiological data and various manifestations of community-acquired S aureus disease among neonates in our area. It may imply that the disease is yet not the main concern in our public health agenda.

RESEARCH METHODS

The study is a case study of a 9-day-old male baby suffered from skin and soft tissue disease with the initial symptom of high-grade fever. He was born spontaneously at 41 weeks of gestational age to a 28-year-old, gravida 3, para 2, abortion 1 mother. The baby weighed 3300 grams and cried spontaneously soon after birth. There was a premature rupture of the membrane for 48 hours. The pregnancy was uneventful, and no other known risk factors for neonatal sepsis were identified from the mother before delivery. The baby had received the Hepatitis B-0 vaccine and vitamin K injection. He urinated and passed meconium within 24 hours of his life. The midwife discharged both mother and her baby after 24 hours of observation. The mother breastfed her baby exclusively, and the follow-up care was carried out at the midwife's clinic. The baby was considered healthy, and the midwife educated the parent on how to care for neonate at home. The parents' sponge bathed the baby twice a day with warm water and always applied baby oil afterward. They used well water as the water source for bathing.

On day 9, he experienced fever and was irritable. The parents gave home remedy to their baby and visited a baby masseur who smeared baby oil on his skin, and massaged the baby. The fever ceased temporarily and 4 days later, the mother noticed a small red bump on her baby's back. There was neither history of trauma nor drug consumption before the emergence of the skin lesion. The parents did not visit the midwife or any health care facility, and only observed their baby at home. A week later, the red bump on the back worsened, extended, and even an ulcer resulted in the right armpit area. There was no other symptom but intermittent fever and skin lesion. The parents subsequently visited the midwife, and their baby was referred to the district hospital. The doctor gave no treatment and decided to refer the baby to our tertiary hospital due to the severity of the disease.

RESULTS AND DISCUSSION

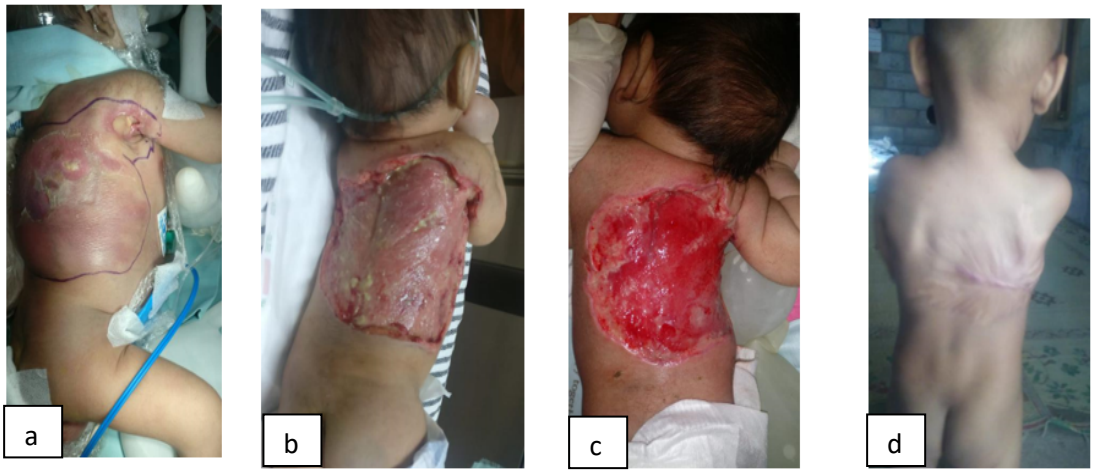

Figure 1. (a) Before debridement. The border of the skin lesion was marked by black ink. (b) Day 1 after debridement. (c) Day 10 after debridement. (d) Debridement scar after 1 year

Investigations

Upon admission to our tertiary hospital, neonatal sepsis workup was planned. Laboratory findings showed leucocytosis (25.15 x 10^3 /µL) with the predominance of neutrophils (53%), an increase of immature to mature (1.96) & total granulocyte ratio (0.33), and high C-Reactive Protein level (144 mg/L). These findings led the physicians to consider bacterial infection in the patient. However, the blood culture did not isolate any bacterium. We also performed a culture of the pus from the wound during debridement and isolated *S aureus,* which is resistant to oxacillin, penicillin G, gentamicin, cefuroxime, cefepime, cefoxitin, ceftriaxone, ciprofloxacin, levofloxacin, imipenem, meropenem, trimethoprim/sulfamethoxazole, cefixime, moxifloxacin, cefotaxime, ceftazidime, amoxicillin/clavulanic acid, amoxicillin, carbenicillin, cefadroxil, and ceftizoxime. Meanwhile, only several antibiotics were tested to be sensitive, including clindamycin, linezoid, tetracycline, vancomycin, and rifampicin.

Differential Diagnosis

We considered late-onset sepsis and bacteremia due to history of 48 hours of premature rupture of membrane, fever as a systemic sign of infection, and blood tests which supported bacterial infection. For the extensive and deep skin and soft tissue manifestations, the possibilities were panniculitis and necrotizing fasciitis. We subsequently collaborated with a pediatric surgeon who performed the wound debridement and sent the pus specimen for culture.

Treatment

On admission, the baby was taken to the isolation room. Intravenous ampicillin 50 mg/kg/8 hours and gentamicin 4 mg/kg/day were promptly commenced due to the suspicion of bacterial infection. The antibiotics were then changed to vancomycin for 14 days based on the culture and sensitivity test. Intravenous metronidazole was also administered for 14 days. We collaborated with a pediatric surgeon and wound care team. The pediatric surgeon conducted surgical debridement without a skin graft. Daily wound care was done after surgery.

Outcome And Follow-Up

After surgical debridement and proper antibiotics, the fever gradually improved, and the wound healed slowly. We evaluated the wound culture at 3 weeks after debridement and no bacterium was isolated. The parents had learned home wound care and the patient was discharged after 31 days of hospitalization. No recurrence was observed, and the surgery scar remained visible at 12 months of follow-up.

Discussion

We reported a patient with extensive skin and soft tissue infection (SSTI) on the back due to *S aureus*. We have not found any study which reported the back area as a site of *S aureus* colonization or infection. A multicentered study in China described clinical characteristics in children with methicillin-resistant *S aureus* (MRSA), concluding that infection of MRSA was mainly found in infants less than 3 years old

and mainly acquired in the community.(AKINTAN et al., 2022) In Asian populations, multidrug-resistant (MDR) accounted for 73.1% and 83.7% in community-acquired MRSA and hospital-acquired MRSA. In the southern hospital in Vietnam, the MDR rate was 51.8% in MRSA isolate. (Thai et al., 2019)

In Indonesia, there are several studies related hospital-acquired *S aureus* infection. A study conducted in the intensive care unit of our tertiary hospital at 2014-2016 showed that *S aureus* colonization was isolated in 17.7% patients and MRSA colonization was isolated in 8.8% patients.(Dahesihdewi et al., 2018) Another study conducted in the burn unit of a general hospital in Bali also described MRSA as a common pathogen to infect burn wounds.(Bramardipa et al., 2019) However, those studies focused on nosocomial infection and not on the neonatal population. We found a multidrug-resistant organism study conducted in neonatal intensive care unit (NICU) in other tertiary hospitals in Indonesia, but *S aureus* was not isolated and neither was it identified as a common pathogen in their setting.(Estiningsih et al., 2016)

S aureus is capable of promoting adherence to the skin, evading neutrophil, and inhibiting the host immune response. The release of proinflammatory cytokines induces keratinocyte production of the antimicrobial peptide, cytokines, chemokines, adhesion molecules, and granulopoiesis factors which subsequently promote neutrophils recruitment.(Krishna & Miller, 2012) In our patient, elevated leucocyte was dominated by neutrophil as well.

In our case, the only remarkable perinatal history was the premature rupture of the membrane. However, a study showed that premature rupture of membrane was not associated with *S aureus* carriage among neonates. He was previously a healthy neonate until day 9, he developed a fever which marked the beginning of the disease. Possible early acquisition of *S aureus* from the mother was supported by several studies which showed a positive association of *S aureus* carriage between mother and neonate. (Van Duin & Paterson, 2016)

We consider the case as a community associated infection due to uneventful antenatal history of the baby, his symptoms appeared before hospitalization, he spent <48 hours after being delivered in the maternity clinic, no prior exposure to antibiotics, and absence of indwelling medical devices prior to symptoms. The limitation in this case was inability of our laboratory to differentiate hospital or community acquired through the genetic profile of the *S aureus*.

Transition from nosocomial pathogen to community associated pathogen requires several factors. For a certain strain of MDR bacteria to become community related, genetic information encoding for different roles needs to be acquired. *S aureus* is an example of nosocomial pathogen which successfully transitioned to be community associated pathogen. *S aureus* is also known to cause widespread infection among community. Specific strains of MRSA have been reported to cause outbreak in the community without ongoing antibiotic pressure. (Lin et al., 2018);(Lin & Yao, 2018)

For pharmacological therapy, vancomycin was selected as an antimicrobial treatment for this case based on the sensitivity test. Several studies found that vancomycin is the most effective therapy for MRSA infection.(Van Duin & Paterson, 2016);(Tsoulas & Nathwani,

2015);(Dahesihdewi et al., 2019) The surveillance report of antibiotics resistance in 31 hospitals in Indonesia in 2017 showed that 31.1% gram-positive bacteria was isolated with the most common isolates *were E faecalis, S aureus, and S coagulase-negative,* respectively. This study also concluded that the sensitivity of S aureus isolated from blood, urine, and sputum specimen to vancomycin was good. (Dahesihdewi et al., 2019)Unfortunately, the antibiotic sensitivity pattern in S aureus isolated from pus specimen was not studied.

For the abscess, It is essential to perform incision and drainage.(Breyre & Frazee, 2018) The cornerstone of SSTI remains an aggressive surgical debridement. Nonadherent compressive dressing and monitoring of operative wound are also pivotal.(Montravers et al., 2016) In our hospital, the post-operative wound was also monitored by the pediatric surgeon and wound care team. The length of stay at the hospital was 31 days. We discharged the patient after the fever resolved, the antibiotic course was completed, the operative wound showed no sign of infection, and the parents could do wound care at home.

Education to parents and caregiver to maintain house cleanliness is also important. Transmission of MRSA through commonly handled household surface is associated with persistent colonization and recurrent skin and soft tissue infection. Houses with higher level of cleanliness reduced persistent colonization and decreased incidence of skin and soft tissue infection. (Hogan et al., 2020)

Our report emphasized the occurrence of community-associated MRSA in a neonate, including its manifestation, management, and outcome. Timely diagnosis and management could save the patient's life. Ultimately, further studies related to neonatal community acquired MRSA infection in Indonesia, particularly the identification of bacteria genetic profiles, are needed to improve awareness, diagnosis, management, and outcome of the disease.

CONCLUSION

The study reported a case of extensive skin and soft tissue infection (SSTI) on the back of a 9-day-old neonate due to S. aureus, which was considered a community-associated infection. The patient's perinatal history was uneventful, and the infection was believed to have been acquired early, possibly from the mother. The infection was managed with vancomycin, which was chosen based on sensitivity testing. The patient underwent incision and drainage for the abscess, and the post-operative wound was monitored. The patient was discharged after the fever resolved, the antibiotic course was completed, and the operative wound showed no sign of infection. The study emphasized the occurrence of community-associated MRSA in a neonate, including its manifestation, management, and outcome. The authors highlighted the need for further research on neonatal community-acquired MRSA infection in Indonesia, particularly the identification of bacterial genetic profiles, to improve awareness, diagnosis, management, and outcomes of the disease.

The study's findings are significant as they contribute to the understanding of community-associated MRSA infections in neonates and the importance of timely diagnosis and management in such cases. The management approach, including the use of vancomycin, incision and drainage,

and post-operative wound monitoring, provides valuable insights into the treatment of similar infections in neonatal patients. The emphasis on the need for further research underscores the importance of ongoing investigation and surveillance to improve the management and outcomes of neonatal MRSA infections.

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