A Case of Severe Neonatal Exanthematous Disease Accompanied with Septicemia Caused by Methicillin-resistant Staphylococcus aureus

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Introduction

We experienced a case of severe neonatal exanthematous disease accompanied with septicemia caused by methicillin-resistant Staphylococcus aureus (MRSA), which was a producer of Toxic Shock Syndrome Toxin-1 (TSST-1). The feature of eruption in this case was unique and the clinical course resembled Toxic Shock Syndrome (TSS). TSS is a rare condition with few confirmed occurrences in infancy. In the neonatal period the criteria of TSS have never been validated\(^1\).

Recently a new concept of neonatal MRSA infection was reported and the authors proposed the name of “neonatal TSS-like exanthematous disease” (NTED)\(^2\).

In the following context we would like to emphasize that this patient had a severe case of NTED and we must pay attention to this disease.

Case Report

A 14-days-old male infant was admitted to Chiba Children’s Hospital because of generalized papular erythema and a high grade fever. The patient was a full-term infant weighing 2,854 g at birth. On the 7th day of life, a small pustule was noted on his neck, whereafter similar eruptions gradually spread over his whole body. The following day he became febrile but fed well. On the day of admission, his rectal temperature was 39.0°C, and his skin surface showed diffuse confluent papulopustular erythema with diffuse induration (Figure). The laboratory tests at admission indicated a leukocyte count of 10,200/mm\(^3\) and C-reactive protein 1.8 mg/dl. Total cultures were taken before antibiotic treatment, which consisted of parenteral administration of cephalothin (150 mg/kg per day). After admission his general condition took a sudden turn for the worse. At forty eight hours after admission, MRSA was confirmed from blood cultures. Nasopharyngeal and stool cultures also yielded MRSA. The patient’s clinical condition deteriorated and multisystemic involvements developed, i.e. oliguria, hyponatremia and disseminated intravascular...
Severe neonatal exanthematous disease caused by MRSA

Fig. Diffuse confluent popular erythema with many pustules and induration on the skin surface over the whole body.

coagulation. Antibiotic treatment was changed from cephalothin to vancomycin (45mg/kg per day), and anticoagulant therapy was also started. On the 6th hospital day, generalized desquamation of the skin started at the feet and hands. The general condition then improved slowly. The patient recovered from the illness without any sequelae and was discharged on the 28th hospital day.

Discussion

Generally, the carrier state of MRSA in neonates does not cause any clinical signs and symptoms. Although MRSA is an occasional pathogen of septicemia in high risk premature babies, most of these patients do not show erythroderma or other eruptions.

We report a case of neonatal MRSA septicemia accompanied by severe eruptions. The skin condition in this case is exceptional and may be caused by biologically active substances produced by MRSA. We therefore examined the strains of MRSA isolated from this case for TSST-1, exfoliative toxins, enterotoxins, and epidermal cell differentiation inhibitor (EDIN). EDIN is the extracellular product of *Staphylococcus aureus* that inhibits terminal differentiation of cultured mouse keratinocytes and also reversibly inhibits terminal differentiation of cultured epidermal cells. Such inhibitory activity may be related to the formation of skin lesions in staphylococcal infection. MRSA strains in this case produced TSST-1, exfoliative-toxins A and B, and enterotoxin C, but did not produce EDIN.

In the neonatal period the criteria of TSS have never been validated. Takahashi *et al.*, recently reported the clinical investigation of cases with systemic exanthema and thrombocytopenia in the early neonatal period. They proposed “neonatal TSS-like exanthematous disease” (NTED) as the name for this
condition. All their patients showed colonization of MRSA producing TSST-1. Although TSS is a multisystemic illness characterized by high fever, hypotension, erythroderma and desquamation, most fullterm patients recovered spontaneously without antibiotic treatment within 5 days of the illness. In regard to the difference between TSS and NTED, the authors proposed supposed that the amount of superantigenic exotoxins produced by MRSA in NTED is too small to trigger the production of cytokines required to induce shock and the other serious signs and symptoms of TSS. Alternatively, the amount of cytokines produced by peripheral T cells in NTED patients may be too small to trigger serious signs and symptoms, because of the immaturity of T cell functions in neonates.

The presented case was a neonate and the isolated MRSA strains produced TSST-1. However, the clinical features including diffuse subpapular erythema with many pustules on the skin surface over the whole body were different from NTED. We speculated that if a large amount of TSST-1 were released into the blood, even though the patient was a neonate who had immature immunity, the cytokines would induce serious signs and symptoms that we have observed. Thus, when we treat any neonatal exanthematous disease, we should take blood cultures and pay close attention to the clinical course.

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References