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SHORT COMMUNICATION

Adult Staphylococcal Scalded Skin Syndrome Successfully Treated with Plasma Exchange

Takeshi Kato[1], Noriki Fujimoto[1]*, Gen Nakanishi[1], Yasuyuki Tsujita[2], Kazuhiro Matsumura[2], Yutaka Eguchi[2] and Toshihiro Tanaka[1]

[1]Department of Dermatology, and [2]Critical and Intensive Care Medicine, Shiga University of Medical Science, Setatsukinowa, Otsu, Shiga 520-2192, Japan.
**E-mail: noriki@belle.shiga-med.ac.jp*
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Staphylococcal scalded skin syndrome (SSSS) is a blistering skin disorder that usually affects young children, and sometimes affects adults especially with immune suppression or kidney failure (1). SSSS is often misdiagnosed clinically as toxic epidermal necrolysis (TEN) in adults (2). TEN is usually treated with systemic glucocorticoid, which is a contraindication for SSSS. The mortality rate of SSSS is much higher in adults than in children (3). We present a case of adult SSSS successfully treated with plasma exchange (PE), which is considered to be effective for TEN (4), and possibly also for SSSS. To our knowledge, this is the first case of adult SSSS in the English literature successfully treated with PE.

CASE REPORT

A 68-year-old man was admitted to our hospital because of infective endocarditis, sepsis, and disseminated intravascular coagulation in March 2013 treated with meropenem the day before admission. Medical history was pertinent for hypertension. He had no prior history of autoimmune disease or diabetes mellitus. He underwent surgical treatment for gastric cancer 3 years before. However, no recurrence or metastasis had been observed. Laboratory examinations showed elevated C-reactive protein (32.1 mg/dl; normal range < 0.3 mg/dl) and serum creatinine (2.9 mg/dl; 0.6–1.1 mg/dl) levels. Antibodies against HIV-1 and -2 were not detected. Clinical examination revealed tender erythema on his back, lower abdomen, and extremities with formation of flaccid bullae and desquamation (Fig. 1A). Histopathological examination of a skin biopsy specimen from the forearm revealed upper epidermal layer detachment without inflammation in the epidermis and dermis. No apoptotic keratinocyte cells were seen in the epidermis (Fig. S1A[1]). Methicillin-resistant *Staphylococcus aureus* (MRSA) was isolated from cultures obtained from the blood and erosion, which was considered as the same strain according to drug susceptibility. Multiplex PCR for exfoliative toxin A (ET-A), ET-B, and ET-D (5) revealed that the MRSA was capable of producing ET-B (Fig. S1B[1]).

Since our initial diagnosis was drug eruption, we changed all medications, including antibiotics besides daptomycin. However, the erythematous lesions expanded, and slight erosion occurred on his lower lip at 3 days after admission. No other mucosal lesion was observed. We clinically diagnosed him with early stage TEN and, later as SSSS at day 6 after admission based on the result from the skin biopsy and bacterial culture. Although we administered 5,000 mg intravenous immunoglobulin (IVIg) and 62.5 mg methylprednisolone, both for 3 days after admission, the lesions further expanded (Fig. 1B). Thus, we conducted PE at 4 days after admission. The cutaneous lesions improved immediately after PE (Fig. 1C). The lesions were almost healed at 11 days after admission. The patient was treated with daptomycin from the first day of admission to the day of PE and with linezolid after PE for sepsis due to MRSA. Although he contracted septic brain embolism and secondary cerebral haemorrhage subsequently, he was discharged in December 2013.

DISCUSSION

Since the patient presented with diffuse erosive erythema with Nikolsky sign following the intake of antibiotics, and had erosions on body and extremities including his lip, clinical presentation was more likely TEN. The

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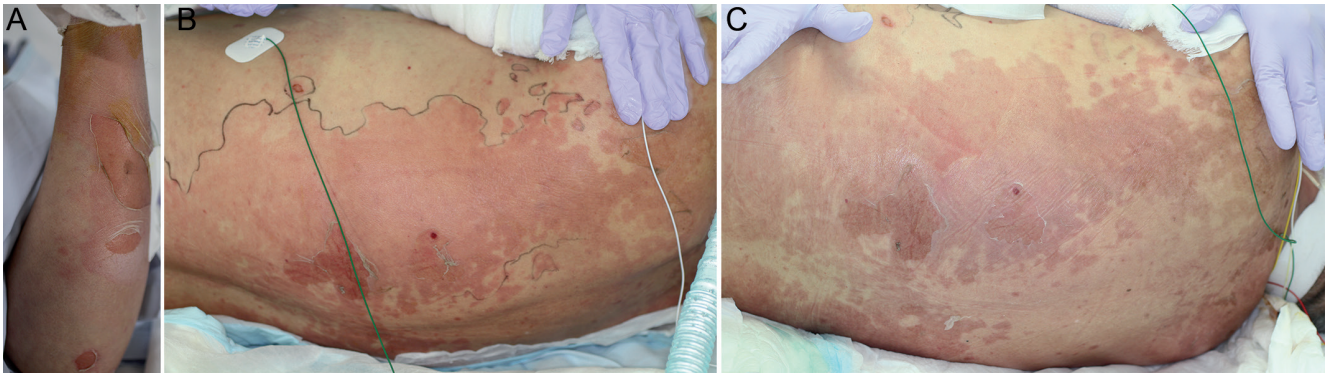

Fig. 1. Clinical presentation. (A) Tender erythema on his forearm with formation of flaccid bullae and desquamation were seen on the next day after admission. (B) Extensive well-defined erythema with flaccid blister was seen on the day before PE. (C). Expansion of erosive lesion ceased and erythema considerably improved on next day after PE.

results from the skin biopsy and bacterial culture which were consistent with SSSS arrived first after PE. We suspected then that he contracted infective endocarditis, sepsis, and SSSS caused by identical MRSA.

SSSS is a bullous disease caused by exfoliative toxins, such as ET-A, ET-B, and ET-D, secreted by certain types of *Staphylococcus aureus* (3). These toxins affect the Desmoglein 1 and provoke the loss of cellular adhesion. Antibiotics including anti-MRSA drugs are generally administered to reduce the secretion of exfoliative toxins (6). The molecular weight of ET-A is 26,951 and ET-B is 27, 318 (7). Thus, these toxins can be removed by PE but not by double filtration plasmapheresis (8).

Other treatments, besides PE, possibly improved SSSS. First, IVIg could have cured SSSS. There has been a few case reports that described the use of IVIg in SSSS (9, 10), in which improvement was noted the next day after administration of IVIg (9). Although IVIg was administered for 3 days in our case, the cutaneous lesions did not improve. Second, antibiotics could have positive effect on SSSS. Since no more MRSA was detected from blood culture when we conducted PE, daptomycin was effective for MRSA. However, the extensive erosive cutaneous lesions still expanded before PE. Moreover, expansion of erosive lesion ceased and erythema considerably improved on next day after PE. Therefore, we concluded that PE, in combination with appropriate antibiotics, improved SSSS in our case.

The occurrence of SSSS in adults has a high mortality estimated to 40% (3, 11). TEN has similar clinical findings to SSSS and also a high mortality. The reported mortality rate of TEN is 30%, while it is 5% in Stevens-Johnson syndrome (12). Although prompt treatment is needed because of high mortality, it is sometimes difficult to distinguish between SSSS and TEN judging from clinical findings only. It has been reported that histological examination using immediate cryosections, Tzanck smear, and blister roof may be useful as rapid tools to diagnose SSSS (13). However, histological examination using cryosections is more vague than paraffinised samples. Keratinocytes with small nuclei and large cytoplasma are observed in the specimen of Tzanck smear for SSSS. The accurate histological judgement using Tzanck test and blister roof require plenty of experience. The most reliable method to diagnose SSSS is histological examination of paraffinised and haematoxylin eosin-stained section. The progression of SSSS and TEN did not allow us to wait for determination of the histological examination.

Systemic glucocorticoid treatment is commonly indicated for drug eruptions including TEN (14), but is contraindicated for SSSS (6). When treating an adult patient in which clinical differentiation of SSSS from TEN is difficult, we should not use systemic glucocorticoid before the results of histopathological and bacterial examination are revealed. On the other hand, PE is used in TEN and it was reported that side effects of PE occurred in less than 5% of 4,857 PE treatments, and the incidence rate of severe, potentially life-threatening adverse reactions was only 0.12% (15). Therefore, we should consider the treatment of PE in treating adult cases of SSSS, especially when the discrimination from TEN is difficult from clinical presentation.

The authors declare no conflict of interest.

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