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Case report

Epidermal exfoliation of over 95% after a burn in an 18-month-old boy: Case report and review of the literature

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ABSTRACT

This report concerns an 18-month-old boy who presented with a 6% total body surface area scald. The subject of this report is unique in that he developed the largest exfoliation described in literature. After 3 days an epidermal exfoliation with the appearance of a deliberately inflicted scald developed. As the exfoliation progressed to over 95% total body surface area the suspicion of child abuse or neglect could be abandoned. The diagnosis Staphylococcal scalded skin syndrome was set, due to the finding of *Staphylococcus aureus* on swabs, the lack of mucosal engagement, and the patient's age. The boy's skin healed within 3 weeks.

The few reports published are all case reports and most frequently described visually infected burns with smaller epidermal exfoliations, and clinically based exfoliation diagnosis. *S. aureus* often cause burn wound infections that can lead to complications caused by cross-infection. It is important for burn surgeons and intensive care specialists to be aware of the increased possibility of Staphylococcal scalded skin syndrome occurring in patients who have a reduced barrier to infection such as burn patients and also, that the diagnosis can be difficult to make.

1. Introduction

Patients with severe exfoliative disorders are often admitted to a burn unit for fluid resuscitation and topical management of skin lesions. The subject of this report is unique in that while treated for minor conventional burn wounds he developed the largest exfoliation described in literature.

2. Case report

A previously healthy 18-month-old boy of African-American decent sustained a 6% total body surface area (TBSA) superficial dermal scald to his face, thorax, and upper left arm after being exposed to hot water (Day 0). The boy's parents sought medical attention at the patient's regional pediatric

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hospital. Examination of the burn showed no infection. After the wound was cleaned the scald was dressed with silver containing polyurethane foam (Mepilex® Ag, Mölnlycke Health Care AB, Göteborg, Sweden). The boy was given acetaminophen and ibuprofen. The treatment was conservative with planned follow-up 4 days later.

Three days later (Day 3), the patient returned to the emergency department since he had decreased urinary output and symmetrical epidermal exfoliation of 50% TBSA in the area under the eyes, the right cheek, the palms of the hands, and the perianal area. The boy was perceived to have malaise and pain, and to be irritable. The epidermal exfoliation had the appearance of a deliberately inflicted scald due to neglect or child abuse. The boy was admitted to the hospital's pediatric ward. Complete blood count, differential status, C-reactive protein (CRP), and arterial blood tests were taken showing only a mild acidosis and slightly elevated CRP, 17 mg/L (reference interval <5). The patient was given supportive therapy with fluids, cefotaxim, and clindamycin intravenously. A urine catheter was inserted and the in- and output was closely monitored. The dressings were changed to a soft silicone wound dressing (Mepitel®, Mölnlycke Health Care AB). The core temperature decreased to 31.2 °C during the change of the dressings. The boy was dressed with special heating clothing and warm fluids were given orally and through the urine catheter. Since the hypothermia continued, preparations to start ECMO (Extracorporeal Membrane Oxygenation) were made. However, before ECMO was commenced core temperature increased to normal. Contact was taken with our burn center for transfer.

The patient arrived to our burn unit on Day 4, intubated with a core temperature of 36.5 °C. Examination showed a progress of the exfoliation to over 95% TBSA. The exfoliation was difficult to distinguish from a plain erythema as the epidermis was detached from the whole body except for at the rims of the finger and toe nails, the back of the skull, and around the right elbow (Fig. 1). Nikolsky's sign was positive around the right elbow [1]. The rest of the body was slightly moist with a partly soapy appearance. The nails of toe I to III had detached bilaterally. The wounds were cleaned and dressed with silver containing polyurethane foam (Mepilex® Ag). The suspicion of neglect or child abuse could be abandoned. The working hypothesis became Staphylococcal scalded skin syndrome (SSSS). Complete blood count, differential status, CRP, creatinine, urea, liver tests and coagulation status were taken daily, but were approximately within reference intervals, with the exception of CRP, that increased and peaked at 47 mg/L Day 6. Culture swabs (including swabs for Methicillin resistant *Staphylococcus aureus* (MRSA)), blood cultures, and two 3-mm punch biopsies were taken.

On Day 5, the patient was dehydrated due to extensively leaking skin surfaces. Resuscitation was enhanced. The patient was kept normothermic using forced-air warming. No mucosal engagement was found with fiberbronchoscopy and the eyes were unaffected. The dressings were changed as they became saturated. Culture swabs from the burned area on the thorax and abdomen showed growth of *S. aureus*, but no exfoliative toxins. Other swabs and blood cultures were negative. The skin biopsies were taken from the thorax and left thigh and showed epidermal loss with degenerated squamous cell epithelia, keratinocyte necrosis, acantholysis and no inflammation. The biopsies could neither confirm nor dismiss the diagnoses of SSSS or TEN. For the diagnosis of SSSS to be set, subcorneal pustulas should be seen but since the specimen contained no stratum corneum eventual pustulas could not be evaluated. Acantholysis should be present in SSSS, but necrotic keratinocytes are usually not seen [2]. In TEN the skin biopsy should show total necrosis of the epidermis and inflammation intradermally [3].

Still, the working hypothesis was considered to be SSSS; both skin swabs showed *S. aureus*, the patient had no mucosal engagement, and was of the right age. Furthermore, the only difference in therapy between SSSS and TEN is the use of intravenous antibiotics. As the extension of the exfoliation was over 95% TBSA and the recommendation often is treatment with intravenous antibiotics even in TEN due to the high risk of infection with large detachments of epidermis, the antibiotic therapy was continued.

On Day 6 a positive fluid balance with a weight increase of over 20% was noted (13.5–16.5 kg). The exfoliation progressed to the left arm and an erythema developed and spread from the chest to the abdomen and left thigh (Fig. 2). Antibiotics were changed to clindamycin and flucloxacillin. Thereafter, the patient's condition gradually improved and the skin on the abdomen began to dry up.

The patient could be extubated on Day 9 with normal weight and improved laboratory tests, except albumin, that was taken for the first time and was low, 18 g/L (reference interval 38–47). Blood samples for exfoliatins A and B were taken and proved negative. The patient was transferred to our hospital's pediatric ward, then transferred back to the referring institution's pediatric ward on Day 10, and dismissed on Day 18. Within 3 weeks the boy's skin healed without scarring.

3. Review

Performing a PubMed literature search of SSSS and burn/s resulted in 11/15 articles, whereas TEN and burn/s resulted in 283/465 articles. Three of the SSSS articles [4–6] and eight of the TEN articles [7–15] were considered to be of interest (Table 1). In these articles, six burns that developed into SSSS or TEN were described. Only in half of the cases were the TBSA of the burn and of the exfoliation stated. When stated, the burns were small, 1–6% TBSA, but the exfoliation were large, 50–85% TBSA (Table 2).

Also, four articles described four cases diagnosed as burns until the exfoliation progressed [4,8–10], pin pointing the difficulties to initially differ between burns and exfoliative disorders. The remaining findings consisted of two articles describing dermatoses in general [7,16]. Two articles that were considered relevant were not analyzed since they were written in Russian and Italian, respectively [11,12] (Table 2).

Concerning the SSSS diagnosis, it was most commonly based on wound swab finding of *S. aureus*. The TEN diagnosis was most frequently based on a skin biopsy consistent with TEN and the finding of a suspected causative drug. However, several TEN diagnose criteria were not commented on in the articles (Tables 3 and 4).