

Staphylococcal Scalded Skin Syndrome in Child. A Case Report and a Review from Literature

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ABSTRACT

Staphylococcal scalded skin syndrome (SSSS) is the medical term used to define a skin condition induced by the exfoliative toxins produced by *Staphylococcus aureus*. The disorder is also known as Ritter disease, bullous impetigo, neonatal pemphigus, or staphylococcal scarlet fever. The disease especially affects infants and small children, but has also been described in adults. Prompt therapy with proper antibiotics and supportive treatment has led to a decrease in the mortality rate.

The current case report describes the clinical progress of a patient with generalized erythema and fever, followed by the appearance of bullous lesions with tendency to rupture under the smallest pressure, and with extended areas of denudation.

The patient aged four years and six months was admitted to our clinic to establish the aetiology and treatment of a generalized bullous exanthema, followed by a skin denudation associated with fever and impaired general status.

Based on clinical and paraclinical examinations a diagnosis of Staphylococcal scalded skin syndrome was established which responded favourably to antibiotic treatment, hydro-electrolytic re-equilibration, and adequate local hygiene.

Staphylococcal infection can represent a problem of significant pathological importance sometimes requiring a multidisciplinary approach involving paediatricians, dermatologists, infectious diseases specialists, and plastic surgeons.

Keywords: *Staphylococcus aureus*, child, scalded skin

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INTRODUCTION

Staphylococcus aureus is a *Staphylococcus* type pathogen, which can produce suppurated infections or sepsis with different types of manifestation such as impetigo, pyodermas, infections of the skin, and pneumonia. Staphylococcal scalded skin syndrome (SSSS) is caused by an exfoliative toxin produced by roughly 5% of *Staphylococcus aureus* [1]. Two exfoliative toxins (ETA and ETB) have been isolated and characterized, but the mechanism that leads to exfoliation has, until recently, been uncertain. These toxins act at a remote site resulting in a red rash and separation of the epidermis beneath the granular cell layer. Bullae form, and diffuse sheet like desquamation occurs [2]. Two types of SSSS are thought to exist: a localized form, in which there is only areal involvement of the epidermis, and a generalized form, in which significant areas are

involved, remote from the initial site of infection [3]. Staphylococcal scalded skin syndrome is most common in children and neonates, and it has been described in adults with renal failure, immunologic deficiency, and other chronic illnesses [4-7]. Children present a higher risk due to their lack of immunity and immature renal clearance ability [8].

Staphylococcal scalded skin syndrome presents as a macular erythema followed by diffuse epidermal exfoliation. A prodromal localized *staphylococcal* infection of the skin, throat, nose, mouth, umbilicus, or gastrointestinal tract usually occurs. General malaise, fever, irritability, skin tenderness may be noted. Other signs can also be present, such as facial edema, conjunctivitis, and perioral crusting. Mucous membranes are spared, but dehydration may be present and significant. Nikolsky's sign may be noted [9].

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The treatment includes the administration of anti-staphylococcal antibiotics, liquids, electrolytes and the local treatment of the denudated areas [10].

■ CASE PRESENTATION

The clinical progress of a patient with a macular erythema followed by diffuse epidermal exfoliation from the face, thorax, members, and scalp is described. The patient aged four years and six months, was admitted to the Paediatrics Clinic 1, Tirgu Mures, in December 2015 to establish the diagnosis of a generalized skin rash associated with fever. The family and the personal physiological histories were not known because the patient has been in foster care since the age of eight months. The personal pathological history disclosed frequent upper airways infections, acute adenoiditis and tonsillitis.

The subject and the institution agreed with presentation of these data and all the procedures described were carried out following approval of the institution where the patient was treated.

The history of the disease

The onset of the disease occurred approximately thirty days before the admission to the clinic, with the development of an erythematous rash on the face and thorax, afterward extended onto the entire body. The patient was initially admitted to a territorial Clinic of Dermatology where antibiotic treatment with cephalosporin and corticosteroids for an acute generalized exanthema pustulosis, was administered. Because after seven days of treatment there was no improve-

ment, the patient was admitted to our clinic for investigations and speciality treatment.

The clinical exam

The clinical exam on admission recorded malaise, severe loss of appetite, irritability, fever generalized erythematous rash, easily ruptured liquid containing bullae, a respiratory rate of 23/min, SaO₂ 94%, heart rate 125/min, blood pressure 70/50 mmHg, crusted lips, and accelerated bowel transit. After three days, the patient presented with facial oedema, extended seborrhea of the scalp, perioral crusting, skin pruritus, and pain on palpation. Skin erosions on the face, body and limbs were caused by gentle stroking of the skin, but the mucosae were not affected. (Figure 1A and 1B)

The laboratory investigations

On admission the CBC count showed a leucocytosis ($17.75 \times 10^3/\mu\text{l}$) with neutrophilia (63.5%), a mild anemia (haemoglobin 11.4g/dl, haematocrit 34%), thrombocytosis ($672 \times 10^3/\mu\text{l}$), and positive inflammatory markers, (C-reactive protein: 53.75 mg/dL, erythrocyte sedimentation rate 43 mm/h, PCT 2 ng/ml). Hepatic and renal functions were within normal limits. Other blood tests, including total bilirubin, glucose, and blood gasses, were carried out and all were within normal limits. A gram stain and a culture of the nasal and pharyngeal secretions confirmed a *Staphylococcus aureus* (MSSA) infection. A microbiological culture from cutaneous secretions was sterile. Blood culture and HIV tests were negative. A chest radiograph ruled out pneumonia as the original focus of infection. Abdominal ultrasound was normal, except for a plied gallbladder, and abdominal distension, with the fluctuation of air.



Fig. 1A and 1B. The evolution of the patient in the first day of admission

Prompt treatment was initiated including parenteral anti-staphylococcal antibiotic (Oxacillin), fluconazole, correction of the hydro-electrolytic imbalance, followed by maintenance therapy with consideration that fluid losses from exfoliation of skin being similar to a burn patient, proton-pump inhibitors (PPIs), probiotics, and local skin therapy. The clinical outcome was favourable, The CBC count was within normal limits (leukocytes $8.40 \times 10^3/\mu\text{l}$, haematocrit 37.4%, haemoglobin 12.4g/dl, platelets $320 \times 10^3/\mu\text{l}$), negative inflammatory markers: C-reactive protein: 1.60 mg/dL, erythrocyte sedimentation rate 12 mm/h.

The patient was discharged from the hospital two weeks after admission. The parents were recommended to carry out appropriate hygiene measures.

There was complete healing without significant scarring as a result of the treatment. (Figure 2 and 3).

The positive and differential diagnosis

Staphylococcal scalded skin syndrome differs from bullous impetigo. Both are blistering skin diseases caused by staphylococcal exfoliative toxins. In the present case, the exfoliative toxins were spread haematogenously from a localized source causing epidermal damage at distant sites. For this reason, cultures of the bullous material were sterile. In bullous impetigo, the exfoliative toxins are restricted to the area of infection, and bacteria can be identified in a culture of the contents of a blister. Differentiating SSSS from toxic epidermal necrolysis (TEN), which carries a much higher mortality, is important. In our case, the mucous membranes are spared, while in TEN, the mucous membranes of the mouth, conjunctiva, trachea, oesophagus, and anus, are almost always affected.

The definite diagnosis of SSSS, in this case, represented a therapeutic challenge because the patient was initially treated in another medical unit with corticosteroids for an acute generalized exanthema pustulosis,

which led to the delay of appropriate treatment. Nevertheless, the clinical development of the patient was favorable, and the interdisciplinary approach provided a satisfactory outcome.

DISCUSSION

Staphylococcus aureus frequently infects the skin. The most common bacterial infection in children is impetigo, which accounts for approximately 10% of all skin problems [11]. A retrospective study over a 12-year period reviewed the presentation, etiology, and prognosis of nonburn epidermal loss. Only 9% of 19 patients had confirmed staphylococcal scalded skin syndrome [12]. *Staphylococcus aureus* may cause cutaneous and systemic infections such as staphylococcal scalded skin syndrome (SSSS) and toxic shock syndrome (TSS). Although exfoliative toxins A and B, which cause SSSS, and TSS toxin-1 may be produced by different strains of *S aureus*, the two syndromes rarely occur simultaneously [13]. Bullous impetigo due to *S aureus* is one of the most common bacterial infections of man, and its generalized form, SSSS is a frequent manifestation of staphylococcal epidemics in neonatal nurseries [14]. Infants and small children are predisposed to SSSS because of both the inefficient mechanisms related to renal clearance and the lack of protection through anti-toxin antibodies. The disorder can also be present in adult, but only rarely [15]. Recent reports show an increase of admission rates and prescriptions for staphylococcal disease, including SSSS, in England [16].

Morbidity in children who develop cellulitis, sepsis, and pneumonia can be significant [17].

Staphylococcal scalded skin syndrome has been reported as a complication of septic arthritis after elective right knee arthroscopy and lupus nephritis associ-

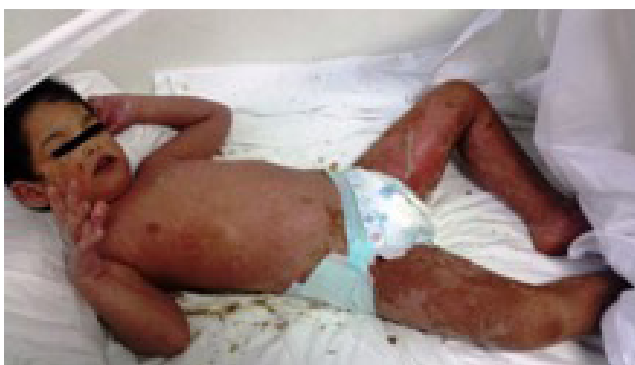


Fig. 2. The evolution of the patient after 3 of treatment



Fig. 3. The evolution of the patient after 10 days of treatment

ated with chronic immunosuppressant therapy [6]. No gender predilection is documented in children. There is at least one report of recurrent SSSS in a neonate [18]. The mortality rate caused by SSSS in children is very low (1-5%), and is much lower in children than in adults unless associated sepsis or an underlying serious medical condition exist [19].

Adults with staphylococcal scalded skin syndrome often have blood cultures positive for toxigenic *S aureus*, and mortality rates can be high (>60%) [17]. Complications are usually the result of sepsis, superinfection, and dehydration or electrolyte imbalance due to denuded skin. Another significant complication of sepsis is represented by septic secondary determinations in other sites or organs, such as septic arthritis [20].

A review of data on isolates referred to the Health Protection Agency's Staphylococcal Reference Unit identified 27 deaths in 27 months from infections with invasive *S. aureus*. These deaths occurred in previously healthy people with community-onset pneumonia, bacteremia, or severe skin and soft tissue infection [21]. The asymptomatic presence of *Staphylococcus aureus* in places such as the nasopharyngeal or perineal area has been recorded in a large percent of the population. Several studies indicate the perineal presence of *Staphylococcus aureus* in over 90% of women with Staphylococcal Toxic Shock Syndrome [22,23]. The initial signs and symptoms can sometimes misguide the physician into establishing a diagnosis of allergic dermatitis and initiating treatment with corticosteroids [24]. The patient in the present case was also treated initially with corticosteroids, the condition being mistaken for acute generalized exanthema pustulosus. The diagnosis of SSSS is mainly a clinical one. The skin exfoliates initially around the mouth, neck, and subsequently on the body and limbs. The mucosae are not involved and Nikolsky's sign is positive. All of these clinical signs were present in the present patient. According to The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3), the patient presented with the qSOFA Criteria (quick Sofa Score) for sepsis identification, i.e. alteration in mental status, decrease in systolic blood pressure of less than 100 mmHg, respiratory frequency greater than 22 breaths/min [25]. No organ failure was identified. Septic shock is a severe, life-threatening condition in which the circulatory impairment and cellular/metabolic damages are profound enough to substantially

increase mortality [26]. Recently, multiple biomarkers have been studied. A study performed on septic patients underlined the fact that even though C-reactive protein and procalcitonin levels are not useful in diagnosing severe sepsis, they can be used in order to predict the fatal progression of this disorder [27]. Soluble urokinase-type plasminogen activator receptor (suPAR) is another important biomarker that seems to have a predictive capacity for bacteremia in sepsis, even though it appears to be an independent factor for mortality prognosis in septic patients [28]. Another study, assessed the levels of Angiotensin 2 and Tyrosine kinase 2 in septic patients and patients without sepsis, and concluded the fact that these two biomarkers had independent diagnostic value in septic patients [29]. Once SSSS is diagnosed, the treatment consists of supportive care and eradication of the primary infection with anti-staphylococcal antibiotics (Oxacillin, Vancomycin) administered by vein for a minimum of seven days. In this case culture of the nasal and pharyngeal secretion confirmed a staphylococcal infection (*Staphylococcus aureus* MSSA). Most staphylococcal infections involved in staphylococcal scalded skin syndrome contain penicillinases and are resistant to penicillin. In penicillinase resistance cases, synthetic penicillin such as nafcillin or oxacillin should be given immediately. In areas with significant MRSA prevalence, or if MRSA is suspected, antibiotics with MRSA coverage, e.g. vancomycin or linezolid, are indicated [30]. Clindamycin is recognized as being useful in staphylococcal infections [31]. Patients need fluid rehydration, topical wound care similar to the care for thermal burns. In our case the child's treatment and monitoring were performed by an interdisciplinary team of paediatricians, dermatologists, infectious diseases specialists, and a plastic surgeon. This interdisciplinary approach resulted in a favourable resolution of the condition without complications or superinfection of skin areas.

■ CONCLUSIONS

The occurrence of fever and exanthema, regardless of patient age, should point to a possible differential diagnosis of staphylococcal scalded skin syndrome, especially as SSSS is mainly a clinical diagnosis. The currently reported case raises awareness of the importance of a multidisciplinary approach in patients presenting with cutaneous symptoms of unknown aetiology.

CONFLICT OF INTEREST

Nothing to declare

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