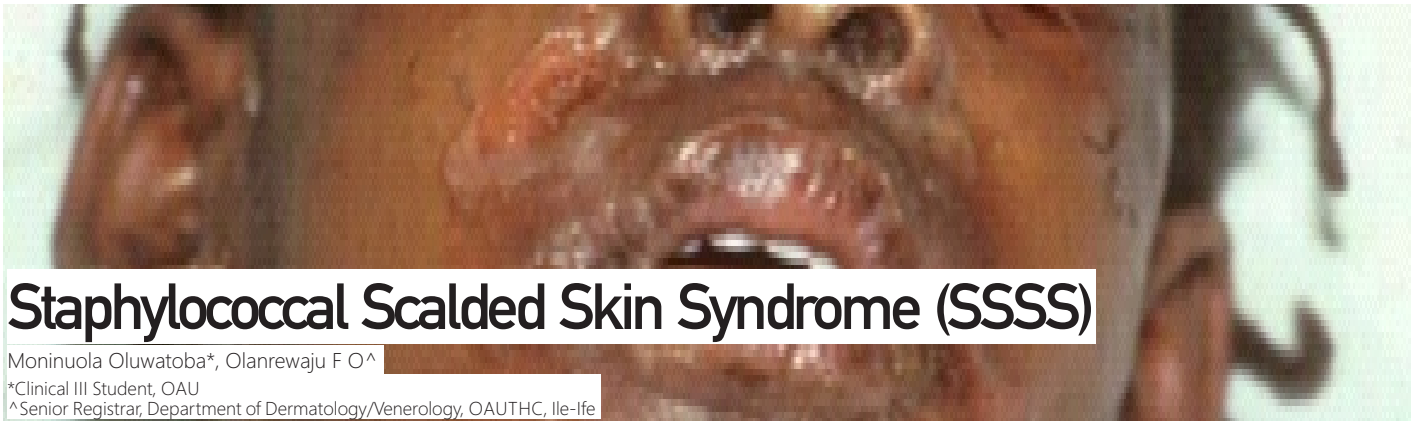

Staphylococcal Scalded Skin Syndrome (SSSS)

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INTRODUCTION

Staphylococcal scalded skin syndrome (SSSS) was known in the past as Ritter's disease or staphylococcal epidermal necrolysis or dermatitis exfoliativa neonatorum. It is a superficial exfoliative disease, occurring most commonly in neonates and young children. It has been reported rarely in adults with renal compromise and immunosuppression. SSSS is caused by the exfoliative toxins of some strains of Staphylococcus aureus.

It is a syndrome of acute exfoliation of the skin typically following an erythematous cellulitis. Severity of staphylococcal scalded skin syndrome varies from a few blisters localized to the site of infection to a severe exfoliation affecting almost the entire body. A mild form of the illness involving desquamation of just the skin folds following impetigo has been described[1]

EPIDEMIOLOGY

Frequency

Staphylococcal scalded skin syndrome is rarer in adults, but it has been described in adults with renal failure, immunologic deficiency, and other chronic illness.[2, 3] Staphylococcal scalded skin syndrome (SSSS) is most common in children and neonates. Overall incidence is higher in developing countries and wherever the incidence of staphylococcal infections is higher. Additionally, some geographic differences exist in the incidence of staphylococcal strains and the types of exotoxins produced. A retrospective study at Lagos University Teaching Hospital in Nigeria over a 12-year period reported confirmed SSSS to be 9% of the 19 patients studied.[4]

Mortality/Morbidity

The mortality rate from staphylococcal scalded skin syndrome (SSSS) in children is very low (1-5%), unless associated sepsis or an underlying serious medical condition exists. The mortality rate in adults is higher (as high as 50-60%), although this may be a reflection of the underlying disorder, which increased susceptibility to SSSS, and not SSSS itself. [5, 6, 7]Significant morbidity can result from hematologic or local spread of infection. [8]Complications are usually the result of sepsis, superinfection, and dehydration or electrolyte imbalance due to denuded skin.

Sex

No gender predilection is documented in children. In adults, the male-to-female ratio is approximately 2:1.

Age

Staphylococcal scalded skin syndrome (SSSS) primarily is a disease of children.

Children are more at risk because of lack of immunity and immature renal clearance capability (exfoliative toxins are renally excreted). Maternal antibodies transferred to infants in breast milk are thought to be partially protective, but neonatal disease can still occur possibly as a result of inadequate immunity or immature renal clearance of exotoxin. [9,10,11,12]

SSSS can occur individually or as outbreaks in nurseries. Outbreaks are usually due to asymptomatic carriers who spread the disease to susceptible individuals.[13]

Most children (62%) are younger than 2 years, and almost all (98%) are younger than 6 years.

SSSS is rare in adults, with fewer than 50 cases formally reported in the literature. Adults with SSSS are most often chronically ill, are immunocompromised, or have renal failure. SSSS can also appear in adults in cases with a high burden of staphylococcal infection where the quantity of exotoxin is significant. There is also a case report of SSSS in an adult after tooth extraction.[14]

PATHOPHYSIOLOGY

Staphylococcal scalded skin syndrome (SSSS) is caused by an exfoliative toxin produced by roughly 5% of Staphylococcus aureus; Group 2 Staphylococcus aureus most commonly phage types 3A,3B,3C,55 or 71 is the causative agent in most cases. As the syndrome evolves, an initial infection occurs, commonly at a site such as the oral or nasal cavities, throat, or umbilicus. [15]Epidermolytic toxins are produced by the infecting Staphylococcus species; these toxins act at a

remote site leading to a red rash and separation of the epidermis beneath the granular cell layer. Bullae form, and diffuse sheet-like desquamation occurs. Two types of staphylococcal scalded skin syndrome are thought to exist: a localized form, in which there is only patchy involvement of the epidermis, and a generalized form, in which significant areas of are involved, remote from the initial site of infection.

Two exfoliative toxins (ETA and ETB) have been isolated and characterized, but the exact mechanism by which they cause exfoliation had until recently been uncertain. The toxins likely act as proteases that target the protein desmoglein-1 (DG-1), an important cell-to-cell attachment protein found only in the superficial epidermis.[16,17,18] The relative quantity of DG-1 in the skin differs with age and may partially explain the increased frequency of staphylococcal scalded skin syndrome in children younger than 5 years. It is theorized that immature renal function in this age group may contribute to impaired clearance of circulating exotoxins, contributing to more extensive disease.[2] Another theory suggests that the exfoliative toxins may possess a superantigenic activity.[3]

The decrease in frequency of staphylococcal scalded skin syndrome (SSSS) in adults is thought to be explained by the presence of antibodies specific for exotoxins and also improved renal clearance of toxins that are produced

Staphylococcal scalded skin syndrome differs from bullous impetigo. Both are blistering skin diseases caused by staphylococcal exfoliative toxin. However, in bullous impetigo, the exfoliative toxins are restricted to the area of infection, and bacteria can be cultured from the blister contents. In staphylococcal scalded skin syndrome, the exfoliative toxins are spread haematogenously from a localized source potentially causing epidermal damage at distant sites.

Staphylococcal scalded skin syndrome differs from the more severe toxic epidermal necrolysis (TEN), in that the cleavage site in staphylococcal scalded skin syndrome is intraepidermal, as opposed to TEN, which involves necrosis of the full epidermal layer (at the level of the basement membrane).

Staphylococcus scalded skin syndrome has been reported among infants who were breastfed by mothers with Staphylococcus aureus breast abscess. Maternal-fetal transmission of SSSS at birth has also been reported.

CLINICAL FEATURES

History

Staphylococcal scalded skin syndrome (SSSS) presents as a macular erythema followed by diffuse epidermal exfoliation.

A prodromal localized S aureus infection of the skin, throat, nose, mouth, umbilicus, or GI tract occurs. Such an infection often is not apparent before the SSSS rash appears.

The following may be noted:

- General malaise
- Fever
- Irritability
- Skin tenderness

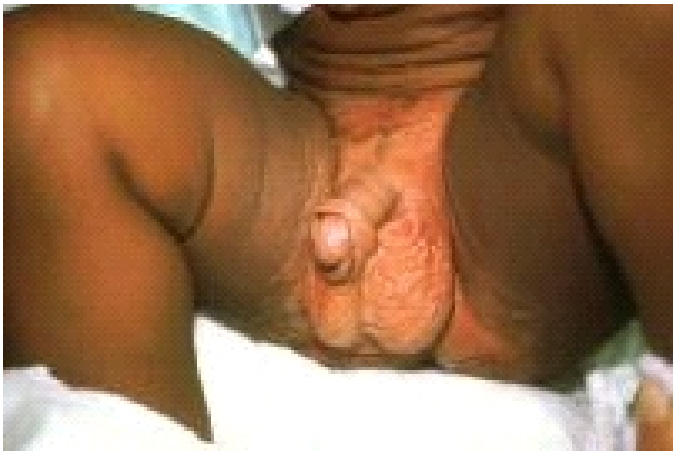

Figure 1
Staphylococcal scalded skin syndrome.

Physical examination

The following may be noted:

- Fever, although patients may be afebrile
- Tenderness to palpation
- Warmth to palpation
- Facial edema
- Perioral crusting
- Dehydration may be present and significant.
- Nikolsky sign (gentle stroking of the skin causes the skin to separate at the epidermis).[19,20]
- Diffuse erythematous rash often begins centrally, is sandpaper-like (progressing into a wrinkled appearance, and accentuated in flexor creases.
- It should be noted that most patients do not appear severely ill.

DIFFERENTIAL DIAGNOSES

Burns, Chemical
Burns, Thermal
Cellulitis
Dermatitis, Contact
Dermatitis, Exfoliative
Erysipelas
Erythema Multiforme
Gas Gangrene
Impetigo
Necrotizing Fasciitis
Pediatrics, Scarlet Fever
Pemphigus Foliaceus
Scarlet Fever
Stevens-Johnson Syndrome
Toxic Epidermal Necrolysis
Toxic Shock Syndrome

INVESTIGATIONS

Laboratory Studies

White blood count (WBC) may be elevated; however, often WBC is normal.

Erythrocyte sedimentation rate (ESR) frequently is elevated.

Electrolytes and renal function should be followed closely in severe cases where fluid losses and dehydration via denuded skin are a concern.

A polymerase chain reaction (PCR) serum test for the toxin is available.

Cultures of bullae are negative in the absence of contamination.

Blood culture is usually negative in children (but positive in bullous impetigo) and is usually positive in adults

A Gram stain and/or culture from the remote infection site may confirm staphylococcal infection.

Imaging Studies

A chest radiograph should be considered to rule out pneumonia as the original focus of infection.

Procedures

A biopsy of the affected area will demonstrate separation of the epidermis at the granular layer. An inflammatory cell infiltrate is typically not present. Immunofluorescence and the presence of antibodies that are common in pemphigus foliaceous are not present in staphylococcal scalded skin syndrome (SSSS). In toxic epidermal necrolysis (TEN), an inflammatory (lymphocytic) infiltrate is present, and the plane of separation is deeper, at the level of the basement membrane.

Frozen section of the peeled skin confirms the site of cleavage as superficial. Toxic epidermal necrolysis (TEN) shows deeper cleavage below the epidermis.

TREATMENT AND MANAGEMENT

Pre hospital Care

In the pre hospital phase, treatment will be likely limited to antipyretic therapy and treatment of the dehydration with intravenous fluid therapy during transport. Most patients are brought to the emergency department by parents or caregivers.

Emergency Department Care

The major focus of emergency department care should be to identify staphylococcal scalded skin syndrome (SSSS) and to stabilize the patient's condition.

Once SSSS is diagnosed, the treatment consists of supportive care and eradication of the primary infection.

Patients need fluid rehydration, topical wound care similar to the care for thermal burns, and parenteral antibiotics to cover S aureus.

Consideration must be given for the sharply increasing rates of community-acquired methicillin resistant S aureus infection (CA-MRSA). Prompt treatment with parenteral anti-staphylococcal antibiotics is essential. Most staphylococcal infections implicated in staphylococcal scalded skin syndrome have penicillinases and are resistant to penicillin. Nafcillin, oxacillin, or vancomycin is indicated.[21,22,23]

Clindamycin may also be used to inhibit bacterial ribosomal production of exotoxin.

Fluid rehydration is initiated with Lactated Ringer solution at 20 mL/kg initial bolus. Repeat the initial bolus, as clinically indicated followed by maintenance therapy with consideration for fluid losses from exfoliation of skin being similar to a burn patient.

Topical wound care, in severe cases is provided.

Cultures from the exfoliated sites as well as nose, throat, and other potential sites of the original focus of infection should be performed.

A chest radiograph should be considered to rule out pneumonia as the original focus of infection.

Steroids are not indicated and may worsen immune function.

Non-steroidal anti-inflammatory agents and other agents that potentially reduce renal function should be avoided

Differentiating staphylococcal scalded skin syndrome (SSSS) from toxic epidermal necrolysis (TEN), which carries a much higher mortality is important. In SSSS, the mucous membranes are spared. In TEN, the mucous membranes are almost always affected (mouth, conjunctiva, trachea, esophagus, anus, vagina).

CONSULTATIONS

Consultation with the following may be indicated:

- Pediatrician
- Dermatologist
- Possibly, infectious disease and burn specialists (e.g, plastic surgeon)

Transfer

Patients with severe disease may require ICU or burn unit care.

DETERRENCE/PREVENTION

Deterrence and prevention may involve the following:

- Avoidance of the primary staphylococcal infection that may lead to the toxic syndrome
- Timely treatment of established staphylococcal infections
- Identification and treatment of asymptomatic carriers

COMPLICATIONS

Complications of staphylococcal scalded skin syndrome may include the following:

- Dehydration
- Shock
- Hypothermia
- Generalized bacteremia and/or sepsis
- Local or remote spread of infection
- Secondary infections
- Scarring, disability, and death

PROGNOSIS

Prognosis of staphylococcal scalded skin syndrome (SSSS) in children is excellent, with complete healing typically occurring in 10 days without significant scarring.

Prognosis of staphylococcal scalded skin syndrome in adults depends on the host's immune status, the speed in initiating proper treatment, the course of the infection, and the occurrence of complications. Staphylococcal scalded skin syndrome in adults carries significant rates of morbidity and mortality.

CONCLUSION

Staphylococcal Scalded Skin Syndrome can occasionally lead to serious complications like pneumonia, septic arthritis, hypothermia, dehydration, and secondary infections. With appropriate management, however, mortality due to SSSS in children remains below 5% in comparison to about 60% in adults. Therefore, early diagnosis and appropriate treatment can prevent the mortality associated with these complications.

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