Case Report

Staphylococcal toxic shock syndrome in a small infant

Sameeh S. Ghazal, MRCP(UK), CAB, *Mansour N. Al-Hawasi,* MRCP(UK), FRCP(Edin), *Sulaiman A. Al-Mosallam,* MBBS, DCH (Edin), *Yousef K. Ghazal,* MRCP(UK), CAB, *Aysha M. Al-Shammary,* MBBS, DCH.

ABSTRACT

Non menstrual staphylococcal toxic shock syndrome is rare in small infants. This is a 4-month-old infant presented to us with a picture of bronchiolitis and few postuler skin lesions, treated with antistapylococcal antibiotics in addition to other supportive medications. On the 4th day of therapy the patient developed sunburn like erythroderma, hypotension, and high grade fever. The dose of antibiotics was increased to the maximum possible dose, in addition to other supportive medications. The patient improved and developed extensive desquamation in both hands and feet on the 14th day of hospitalization, which confirms the diagnosis.

Keywords: Toxic shock syndrome, nonmenstrual, toxic shock syndrome in infants, children, staphylococcal toxic shock syndrome, toxic shock syndrome toxic 1, enterotoxins.

Saudi Med J 2002; Vol. 23 (2): 229-231

Toxic shock syndrome (TSS) is a rare, life–threatening, acute multisystem illness characterized by: sudden onset of high–grade fever, diffuse sunburn–like erythroderma, shock, hypotension, multiple organ failure and desquamation.[1] Toxic shock syndrome is initially described in association with the use of tampons in menstruation.[2] Toxic shock syndrome has complicated a variety of surgical procedures and burns as well.[3,4] Nonmenstrual TSS has been reported with increasing frequency in small children, men and women.[5] To the best of our knowledge this is the first case reported in an infant at the age of 3 months in the Kingdom of Saudi Arabia.

Case Report. We report a 3 month-old male infant, who presented to our emergency room with complaint of shortness of breath for 2 weeks, Vomiting and poor feeding for one day, and no fever. Systemic review was unremarkable. He was treated with antibiotics and ventoline nebulizer in several clinics before admission with no improvement. Past history revealed full term, normal spontaneous vaginal delivery in hospital. At age 17 days he was admitted to another hospital due to fever and vomiting, to rule out sepsis (where Staphylococcus aureus (S.aureus) grew in umbilical and nasal swabs and was treated with ampicillin and gentamicin for 6 days). After discharge he continued to have cough and wheeze, and was treated with ventoline nebulizer in different clinics. At the age of 2 and a half months he was admitted to the same hospital due to wheezy chest, but was discharged against medical advice. He was vaccinated with Bacille Calmette-Guerin, and Hepatitis B (1st dose). Development was normal. He was on bottle feed. The family history was unremarkable and an overall examination revealed a temperature of 36.5°C. A heart rate of 150/bpm was

From the Department of Pediatrics, Sulaimania Children's Hospital, PO Box 59046, Riyadh 11525, Kingdom of Saudi Arabia.

Received 16th April 2001. Accepted for publication in final form 20th October 2001.

Address correspondence and reprint request to: Dr. Sameeh S. Ghazal, Consultant and Clinical Asst. Professor of Pediatrics and Infectious Diseases, Sulaimania Children's Hospital, PO Box 59046, Riyadh 11525, Kingdom of Saudi Arabia. Tel. +966 (1) 4656666/4656532. Fax. +966 (1) 4657160. E-mail: dr_sameeh_ghazal@hotmail.com

recorded, the respiratory rate was 42/m, the weight was 5kg >25% percentile, a height of 62cm and head circumference of 35.5cm:=50th percentile of newborn. No cyanosis and no dysmorphic features. Ear nose and throat: free. The patients chest had mild sub-costal recession, decreased air entry, rhonchi and crepts bilaterally. Cardiovascular system and abdomen revealed nothing abnormal, central nervous system recorded microcephaly, anterior fontanel: 1cm, spastic 4 limbs, brisk deep tendon reflex. The skin had several pustules at the back of the neck, not surrounded by erythema and 2 excoriated areas (one lateral to the left eye and one on the external genitalia (1x1cm) not surrounded by erythema as well.

Initial investigations. A complete blood count was carried out and recorded a white blood count of 6.7 (P:23%, L:70%), hemoglobin was 11mg/dl, platelets were 280,000/mm^3 and the erythrocyte sedimentation rate was 24. Urea and electrolytes normal. Deep pharyngeal swab for respiratory syncytial virus was negative, pustule swab culture and sensitivity (C/S) revealed *S.aureus,* Blood C/S recorded no growth. Chest x-ray result showed hyperinflated, no consolidation. Abdomen ultrasound was normal. Brain ultrasound could not be carried out. Congenital infection screening (TORCH) was negative. Urine analysis, stool analysis and C/S were all negative.

Treatment and hospital course. The patient was admitted to the respiratory care unit with the provisional diagnosis of cerebral palsy and bronchiolitis and *staphylococcal* skin infection, and was started on ventoline nebulizer, oxygen, intravenous cloxacillin (100mg/kg/day) and gentamicin (7.5mg/kg/day). During days 2–3, the patient improved regarding cough and respiratory distress. On day 4 the patient developed a loose motion and continued a high–grade fever of 39.8ºC and tachypnea. During days 5 and 6 the patient deteriorated, continued fever, vomiting, loose motion and abdominal distention. Blood pressure was 50/30, generalized sunburn like erythroderma, hepato splenomegaly, and metabolic acidosis. The patient was transferred to the Pediatric intensive-care unit.

Investigations. A complete blood count was carried out, white blood cells equalled 1.09 (Polymorph 50%, Lymphocyte:44%), hemoglobin was 8 gm/dl, platelets were 124,000/mm^3, reticulocytes were 5%, erythrocyte sedimentation rate was 55, C reactive protein was positive, urea was 10.5 mmol/L, creatinine was 45umol/L, sodium was 125mmol/L, potassium was recorded at 3.5 mmol/L, alanine transaminase was 329, aspartate transaminase was 116; alkaline phosphatase was 128, total bilirubin was 10, total protein was 35, albumin was 18, stool for occult blood was positive, C/S was negative, prothrombin time, partial thromboplastin time, fibrin degradation product was normal, metabolic screen was negative and serum ammonia was normal.

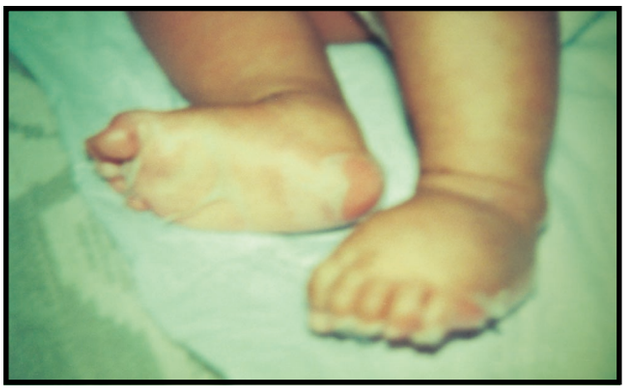

Figure 1 - Photograph of the patient's feet showing the unique extensive desquamation in both feet that developed 2 weeks after starting his illness.

Diagnosis: Toxic Shock Syndrome. The patient was treated with intravenous fluids, inotropics, blood products, and antibiotics (Vancomycine and Imipenam). On days 7 and 8 the patient started to improve, fever disappeared, urea and electrolytes, a complete blood count normalized. On day 14 there was desquamation of palms and feet. **(Figure 1)** on day 16 the patient was discharged with follow up.

Discussion. Staphylococcal toxic shock syndrome first described by Todd and co workers[6] in 7 children aged 8-17 years, 5 of these patients were colonized with phage group[1] *S.aureus*. They believed that the multisystem dysfunction was related to one or more new exotoxins. In 1984 the term ''toxic shock syndrome toxin 1'' (TSST-1) was adopted to describe the toxin. Cone and co workers described a toxic shock–like syndrome caused by group A Streptococcus (S. Pyogenes).[7] Most of the cases in the early 1980s were in women (95%) and began during menstruation (90%), leading to the misconception among physicians that TTS occurred only in association with tampon use.[8] Nonmenstrual TSS has occurred with various types of staphylococcal infection including: surgical wound infection, abscess, osteomyelitis, lymphadenitis, pneumonia, cutaneous and subcutaneous infection, burns, bites, insulin pump infusion machine, ear piercing, sinusitis, and nasal packing.[3,4]

Toxic shock syndrome is the consequence of the pathogenic effects of several staphylococcal products, acting alone or together. Evidence of the central role of TSST-1 in TSS are: 1. More than 90% of isolates from patients with TSS produce TSST-1; 2. The absence of acute phase antibody to TSST-1 in more than 90% of patients with menstrual TSS; 3. The increase in anti–TSST–1 antibody in the recovery phase in nonmenstrual TSS; 4. Absent or low antibody titer in recurrent menstrual TSS; 5. Comparable illness inducible with TSST–1 in vivo

animal models; and 6. The neutralization of interleukin-1 (IL-1) stimulation and response to TSST-1 by antibody to TSST–1.[9] There is increasing evidence of other S.enterotoxins (S.enterotoxin A, S.enterotoxin B, S.enterotoxin C) as an alternative TSST-1 causing TSS.[9]

Two factors are responsible in the pathogenesis of TSS: Dramatic hemodynamic changes causing decline in intravascular volume, central venous pressure, systolic blood pressure resulting in poor perfusion (most striking) and direct effect of toxin or inflammatory mediators.[10]

We find that our case fulfills the confirmatory diagnostic criteria of Centers for Disease Control and Prevention (CDC) -Case definition for public health surveillance.[11] On admission our patient presented with picture of negative respiratory syncytial virus bronchiolitis and improved with supportive therapy provided. Initial investigations did not indicate the possibility of toxic shock syndrome. It is well known that the majority of patients have normal laboratory results within 7-10 days after onset of TSS.[10] The diagnosis of TSS was considered when the patient started to have high–grade fever, vomiting, diarrhea, erythroderma, and hypotension. The diagnosis was confirmed by demonstration of multisystem involvement, and so fulfills the CDC sex criteria for confirmed case of TSS.[11] Microbiologic evaluation carried out in our patient did not reveal any organism except *S.aureus* from the infected skin in the patient's neck, and this is again fulfilling the diagnostic criteria. Usually the skin lesion found in this patient was not surrounded with erythema and gave us the impression of localized infection. This phenomena (absence of erythema around infected wound) is well known in TSS, the explanation for this phenomena is that the production of tissue necrosis factor (TNF)–alpha by macrophages in response to TSST-1 inhibit neutrophil mobilization in vitro.[3] Although, from the beginning the patient was treated with a combination of antibiotics to cover staphylococcal infection and gram negative organisms, the patient started to deteriorate in the 5th day of therapy, this could be explain by the fact that we gave the patient sub-inhibitory concentration of beta–lactam antibiotics that actually may increase TSST – 1 production by *S.aureus*. Andrews et al[12] reported at a concentration of one half the minimal inhibitory concentration, nafcillin can increase toxin production 10-fold more than control condition. In our patient *S.aureus* was not further tested for production of TSST–1 and patient sera for TSS–1 antibodies for raising titer, as both of these 2 tests are not available in our institution and they are not prerequisite for either the diagnosis or the treatment but for research purpose.[11] Our patient was treated successfully with Vancomycine, Imipenam, inotropics and IV fluid. We did not treat our patient with corticosteroid or immunoglobulin as we could restore his normal blood pressure. Appearance of desquamation in the 14th day of the patients' illness confirmed the diagnisis, still we were suspicious regarding the possibility of coexistent Kawasaki disease therefore we carried out echocardiography to rule out coronary dilatation as a complication of Kawasaki disease and any cardiac sequelae for TSS,[9] the result came normal heart. Diagnosis of TSS needs high degree of suspicion especially in patients with high-grade fever, erythroderma, hypotension, and multisystem involvement.

References

1. Fishman G, Ophir D. Toxic shock syndrome. *Harefuah* 1997; 132: 622-4,679.
2. Bartlet SF, Hightower AW, Broome CW, Reingold AL. The relation of tampon characteristics to menstrual toxic-shock syndrome. *JAMA* 1987; 298: 917-920.
3. Bartlett P, Reingold AL, Graham DR, Dan BB, Selinger DS, Tark GW, Wichterman KA. Toxic shock syndrome associated with surgical wound infections. *JAMA* 1982; 247: 1448-1450.
4. Bacha EA, Sheridan RL, Donohue GA, Tompkins RG. Staphylococcal toxic shock syndrome in pediatric burn unit. *Burns* 1994; 20: 499-502
5. Brown CV. Epidemiology of TSS in the United States: Overview. *Rev Infect Dis* 1989; 11: S14-S21.
6. Todd J, Fishaut M, Kapral F, Welh T. Toxic-like syndrome associated with phage-group 1 staphylococci. *Lancet* 1978; 2: 1116-1118.
7. Cone LA, Woodard Dr, Schlievert PM, Tomory GS. Clinical and bacteriologic observation of a toxic shock like syndrome due to Streptococcus pyogenes. *N Engl J Med* 1987; 317: 146-149.
8. Centers for disease control and prevention: Summary of notifiable disease, United States. *MMWR* 1993; 42: 1-73.
9. Chesney PJ, Davis JP. Toxic shock syndrome. In: Feigen RD, Cherry JD. Textbook of pediatric infectious diseases. 4th ed. USA: WB Saunders Co; 1998. p. 849-930.
10. Schlievert PM, MacDonald KL. Toxic shock syndrome. In: Gorbach SL, Bartlett JG, Blacklow NR. Infectious diseases. 2nd ed. USA: WB Saunders; 1998. p. 1689-1696.
11. Centers for Disease Control and Prevention. Case definition for public health surveillance. *MMWR* 1990; 39: 38-39.
12. Andrews MM, Giacobbe KD, Parsonnet J. Induction of toxic shock syndrome toxin-1 (TSST-1) and beta-lactamase by subinhibitory concentrations of beta-lactam antibiotics. Biomedicin 96 Washington DC; 3-6 1996. Abstract N-IN-00111.