NHS London and South East Burns Clinical Network

TOXIC SHOCK

BACKGROUND

Paediatric Burns-Related Toxic Shock Syndrome (PB-TSS) is a **life-threatening sequelae of paediatric burns**, mediated by toxins produced by bacteria, most commonly Staphylococcus aureus or Streptococcus pyogenes [1]. **Children under the age of 4 years old with skin loss are more susceptible** to PB-TSS as they have not developed antibodies against the common toxin, Toxic Shock Syndrome Toxin 1 (TSST-1) [1].

Clinical presentation is often late, due to vague initial symptoms which mimics other common childhood respiratory or gastrointestinal viral illnesses [2]. PB-TSS is the leading cause of death in children following burns, with quoted **mortality rates of up to 50% in untreated cases**. Early recognition is key to reducing overall morbidity and mortality risk [3].

CONTACT DETAILS

ST ANDREWS CENTRE (CHELMSFORD)
Adults: **0300 44 30475**
Children: **0300 44 30405**

CHELSEA & WESTMINSTER HOSPITAL (LONDON)
Adults: **020 3315 2500**
Children: **020 3315 3706**

THE ROYAL LONDON HOSPITAL (LONDON)
Adults & Children: **020 3359 45693**

QUEEN VICTORIA HOSPITAL (EAST GRINSTEAD)
Adults: **01342 414440**
Children: **01342 414469**

STOKE MANDEVILLE HOSPITAL (AYLESBURY)
Adults & Children: **01296 315040**

JOHN RADCLIFFE HOSPITAL (OXFORD)
Adults & Children: **01865 234760**

The majority of PB-TSS cases are in <10% Total Body Surface Area (TBSA) burns – these are often managed conservatively, meaning the infective locus is not excised [4]. The American Centre for Disease Control (CDC) has a case definition for TSS which is generalised for all causes and age groups (Appendix 1) [5]. **Cole and Shakespeare developed an abbreviated diagnostic criteria** specific to thermal injury associated TSS in paediatric populations [2].

Management of established PB-TSS involves: Patient stabilisation, antibiotic therapy, FFP/IVIG for passive immunity against TSST-1 toxin, and definitive burns management. **Definitive management should be undertaken in a specialist environment** with availability of relevant Burns, Paediatric and PICU expertise to ensure higher level patient monitoring and supportive care, due to the potential for rapid clinical deterioration, particularly in delayed presentations, or during burns debridement [1].

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MANAGEMENT OF PAEDIATRIC BURNS IN A WELL CHILD

2.1) FOCUSED BURN HISTORY

- [ ] Burn Date and Mechanism
- [ ] Details of any burns first aid or management
- [ ] Past Medical History, Allergies and Vaccination Status
- [ ] Social history and safeguarding screening

2.2) BURNS ASSESSMENT AND MANAGEMENT

- [ ] Give analgesia
- [ ] Examine burn wound and take pictures
- [ ] Deroof and clean burn wound with sterile saline and Chlorhexidine Solution.
- [ ] Dress burn in non-adherent dressing (Bactigras/ Jelonet/ Adaptic), gauze, wool and crepe

2.3) PRIOR TO DISCHARGE:

- [ ] Contact Local Burns Unit for further advice, and send pictures if feasible
- [ ] Ensure Paediatric Burn Outpatient follow up is arranged.
- [ ] **Provide TSS safety netting advice** (verbal and written where possible)

TSS SPECIFIC SAFETY NETTING ADVICE

TSS is a rare but serious condition that can occur with any burn, even a minor one. It can develop quickly and may be life-threatening if not treated promptly.

- **Most Common Symptoms:** **High temperature** (38°C or above), **Widespread rash, Diarrhoea, Vomiting**
- Other Important Symptoms: Confusion or irritability, Reduced oral intake, Reduced urine output, Drowsiness or Lethargy, Mucosal Hyperaemia
- **Call 999 immediately if**: difficulty waking, unusually drowsiness, mottled skin, difficulty breathing, cyanosis
- **Return to the nearest Emergency Department as soon as possible if you suspect TSS.**
- **Tell medical staff your child has recently had a burn injury and you are worried about TSS**

Important Note: TSS can still occur even in very small burns, clean burns, and even if your child is already on antibiotics. TSS can mimic or be masked by other viral illnesses such as a cold, flu or a tummy bug.

Preventing Infection: Keep burn dressings clean and dry, return to healthcare if the dressing becomes wet, loose, or soiled, do not remove dressings at home.

MANAGEMENT OF SUSPECTED TSS IN A FEBRILE CHILD WITH A RECENT BURN

UNWELL CHILD WITH A FEVER AND RECENT BURN?

PERFORM A-E ASSESSMENT AS PER PLS GUIDELINES

IF CLINICALLY UNSTABLE, MANAGE AS PER PLS GUIDELINES AND INFORM PAEDIATRIC TEAM/HDU/PICU AS AVAILABLE

COLE AND SHAKESPEARE CRITERIA

- **Fever >39**
- **Rash**
- **Diarrhoea +/- vomiting**
- **Irritability**
- **Lymphopaenia**

4.1) FOCUSED HISTORY

- ☐ Burns History (*see 2.1*)
- ☐ **History of current illness:** Illness timeline, recorded fevers, diarrhoea/ vomiting, localised/ widespread rash, lethargy/drowsiness, irritability, wet/dirty nappies, oral intake, mucosal hyperaemia

4.2) BURNS ASSESSMENT

- ☐ Give analgesia
- ☐ Take down any burns dressings
- ☐ Examine burn wound and take pictures if feasible
- ☐ **ANTIBIOTICS**: 1st line = IV Flucloxacillin + IV Clindamycin.
  Allergy = IV Clindamycin + IV Vancomycin.
- ☐ Re-dress burn in non-adherent dressing (bactigras/jelonet/adaptic), gauze, wool and crepe
- ☐ **Do not attempt to clean/debride burn if TSS is suspected** as this can result in clinical deterioration and should be done in a specialist setting where PICU monitoring and specialist treatments (such as FFP/IVIG) are available.

4.3) ESCALATION PATHWAY

- ☐ **Urgent local senior review** by Paediatric or Emergency team as available
- ☐ **INFORM NEAREST BURNS UNIT/CENTRE FOR ADVICE URGENTLY.**
- ☐ ***Details from focused history and examination are crucial for specialist advice regarding further management/transfer.
- ☐ If high suspicion of TSS, **consider urgent transfer to nearest burns unit** (ideally with PICU availability, however this should not delay initial source control).

*****IF PATIENT IS STABLE AND TSS IS NOT SUSPECTED, PATIENT MUST STILL BE REVIEWED BY A SENIOR DOCTOR, DISCUSSED WITH LOCAL BURNS UNIT PRIOR TO DISCHARGE (SECTION 2), AND PROVIDED WITH TSS SAFETY NETTING ADVICE (SECTION 3).**

*****TSS can be difficult to diagnose, even by healthcare professionals, so a low threshold of suspicion is needed.**
*****TSS can mimic and be masked by common viral respiratory or gastrointestinal illnesses in its initial stages - concurrent viral illness in the household does not automatically rule out TSS.**
*****A minor burn or clean burn does not automatically rule out TSS.**

APPENDIX 1 - CDC Case Definition for Toxic Shock Syndrome

Toxic Shock Syndrome (Other than Streptococcal) (TSS) 2011 Case Definition

Clinical Criteria

An illness with the following clinical manifestations:

- **Fever**: Temperature greater than or equal to 102.0°F (greater than or equal to 38.9°C)
- **Rash**: Diffuse macular erythroderma
- **Desquamation**: 1-2 weeks after onset of rash
- **Hypotension**: Systolic blood pressure less than or equal to 90mmHg for adults or less than fifth percentile by age for children aged less than 16 years
- **Multi-system involvement** (3 or more of the following organ systems):
  - Gastrointestinal: Vomiting or diarrhoea at onset of illness.
  - Muscular: Severe myalgia or creatine phosphokinase level at least twice the upper limit of normal.
  - Mucous membrane: Vaginal, oropharyngeal, or conjunctival hyperemia.
  - Renal: Blood urea nitrogen or creatinine at least twice the upper limit of normal for laboratory or urinary sediment with pyuria (greater than or equal 5 leukocytes per high-power field) in the absence of urinary tract infection.
  - Hepatic: Total bilirubin, alanine aminotransferase enzyme, or asparate aminotransferase enzyme levels at least twice the upper limit of normal for laboratory.
  - Haematological: Platelets less than 100,000/mm3
  - Central nervous system: Disorientation or alterations in consciousness without focal neurologic signs when fever and hypotension are absent.

Laboratory Criteria for Diagnosis

Negative results on the following tests, if obtained:

- Blood or cerebrospinal fluid cultures (blood culture may be positive for *Staphylococcus aureus*)
- Negative serologies for Rocky Mountain spotted fever, leptospirosis, or measles

Streptococcal Toxic Shock Syndrome (STSS) (*Streptococcus pyogenes*) 2010 Case Definition

Clinical Criteria

An illness with the following clinical manifestations*:

- **Hypotension** defined by a systolic blood pressure less than or equal to 90mmHg for adults or less than the fifth
- **Multi-organ involvement** characterised by 2 or more of the following:
  - Renal impairment: Creatinine greater than or equal to 2 mg/dL (greater than or equal to 177 µmol/L) for adults or greater than or equal to twice the upper limit of normal for age. In patients with preexisting renal disease, a greater than twofold elevation over the baseline level.
  - Coagulopathy: Platelets less than or equal to 100,000/mm3 (less than or equal to 100 x 106/L) or disseminated intravascular coagulation, defined by prolonged clotting times, low fibrinogen level, and the presence of fibrin degradation products.
  - Liver involvement: Alanine aminotransferase, aspartate aminotransferase, or total bilirubin levels greater than or equal to twice the upper limit of normal for the patient's age. In patients with preexisting liver disease, a greater than twofold increase over the baseline level.
  - Acute respiratory distress syndrome: defined by acute onset of diffuse pulmonary infiltrates and hypoxemia in the absence of cardiac failure or by evidence of diffuse capillary leak manifested by acute onset of generalised oedema, or pleural or peritoneal effusions with hypoalbuminemia.
  - A generalised erythematous macular rash that may desquamate.
  - Soft-tissue necrosis, including necrotising fasciitis or myositis, or gangrene.

*Clinical manifestations do not need to be detected within the first 48 hours of hospitalization or illness, as specified in the 1996 case definition. The specification of the 48 hour time constraint was for purposes of assessing whether the case was considered nosocomial, not whether it was a case or not.

Laboratory Criteria for Diagnosis

Isolation of group A *Streptococcus*

REFRENCES

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