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Sangeetha Priyadarshini Ms

*Manipal College of Nursing, Manipal Academy of Higher Education, Manipal, sangeetha.p@manipal.edu*

Pramod Kumar Dr

*KMC, Manipal Academy of Higher Education, Manipal*

Elsa Sanatombi Devi Dr

*Manipal College of Nursing, Manipal Academy of Higher Education, Manipal, elsa.sana@manipal.edu*

Anice George Dr

*Manipal College of Nursing, Manipal Academy of Higher Education, Manipal, anice.george@manipal.edu*

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## Management in paediatric burns: A case report

### Cover Page Footnote

I acknowledge the Indian Council of Medical Research (ICMR) for the fund and the help provided

# Management in paediatric burns: A case report

Sangeetha Priyadarshini\*, Pramod Kumar, Elsa Sanatombi Devi, Anice George, Mamatha S Pai, Vijay Kumar

Email: sangeetha.p@manipal.edu

## Abstract

Burns are common childhood injuries among children, mainly caused by scald, fire or abuse. The authors presented the case of a one-year child who presented with second degree thermal burns due to fall of hot liquid on the child. Most of the burn injuries, which occur in the early ages of life, are mostly due to the negligence or lack of supervision of the child during the growing period. So, proper management of burn injury and adequate education of parents should be considered as an important aspect in prevention of burns in children. Further, the classification of burns injury helps in deciding treatment of burns. Management of burns in children is a teamwork, which involves expertise from of paediatricians, anaesthesiologists, surgeons, intensivists, nurses, respiratory therapists and healthcare workers who can help these vulnerable children. Survival rates among the burns affected children improve when there is correct fluid management. The purpose of fluid management is to have a good perfusion of tissues in the beginning of shock.

**Key words:** Burns, body surface area burn, burns management, child abuse, fluid resuscitation, neglect

## Introduction

Burns involve injury to the skin and muscles underlying, caused mainly by heat, electricity, cold, chemicals, radiation and light (Herndon, 2012). Child may get fatal complications like shock, infection, respiratory distress and electrolyte imbalance, which basically depend upon the location and the degree of severity of injury. Burn injuries in most paediatric cases occur at home, which could be prevented. The cause of injury varies with the child's age and historical clues. Scald is the frequently occurring mechanism of injury in small children whereas electrical and chemical burns occur as children grow older (Shah, Suresh, Thomas, &

Smith, 2011). According to a study, 72.5% burn injuries are due to scald, 22.7% due to flame and 3.2% are due to electrical burn. The burn mortality was 7.4% in children (Kumar, Chirayil, & Chittoria, 2000). Burn injuries in children occur due to contact with hot stove, hot oven door and irons, but as they grow, the burns cause may be due to contact with hot grills or engines (Sheridan, Remensnyder, Schnitzer, & Schulz, 2000). Paediatric burns are mostly accidental, but about 20% of burn injuries occur mainly due to child abuse. The burns due to child abuse will have history, which is inconsistent; such cases must be informed to the child protective authorities (Barrow, Spies, Barrow, & Herndon, 2004).

**Case:** A child aged one year was admitted in the burns unit with a history of hot tea spilled on him at home in the morning. Child had superficial burns on the head 3%, neck 1%, trunk front 10%, trunk back 2%, left upper limb 4%. First aid was given by a nearby hospital. He was otherwise healthy and immunized. Child was diagnosed to have second degrees thermal burns. Child was well oriented to the surroundings; consent was taken from the concerned authorities and parents before taking the child's history. On examination child's body temperature was 37.5 degree Celsius, pulse 120

**Sangeetha Priyadarshini<sup>1</sup>, Pramod Kumar<sup>2</sup>, Elsa Sanatombi Devi<sup>3</sup>, Anice George<sup>4</sup>, Mamatha S Pai<sup>5</sup>, Vijay Kumar<sup>6</sup>**

1. Asst Professor, MCON, MAHE, Manipal

2. Consultant Plastic Surgeon Saudi Arabia

3. Professor, MCON, MAHE, Manipal

4. Dean, MCON, MAHE, Manipal

5. Professor and HoD, Child Health Nursing, MCON, MAHE, Manipal

6. Professor and Head, Paediatric Surgery, KH, Manipal

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\*Corresponding Author

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b/m, respiration 20 b/m, saturation of oxygen was 100% and his weight was 10 kg. Child was alert, active, with moderate distress. The total body surface area burned was (TBSA) 20%. Child's serum urea was 10mg/dl, total protein 5.5g/dl, serum albumin 3.8 g/dl and globin 1.7g/dl. Haematologic investigation showed haemoglobin 10g/dl. Haematocrit -31.4%, culture report showed no growth after 60 hours of incubation. Child was started on intravenous fluid Isolyte P 20 to 30 ml/hour for three days, IV antibiotics and analgesics. Collagen dressing was done. The physician recommended Calpol, Zincovit and Cetirizine. Wound surface was covered with the sterile and saline soaked gauze. Normal saline was used to clean the open areas. Tissues that were around the ruptured blisters were debrided. Antibiotics ointment was applied to the burns and dressed. Child was discharged with instructions given to the parents regarding cleansing the burns, applying the antibiotic ointment, and changing the dressing daily and follow-up. Follow-up showed progressive improvement in child's condition.

**Discussion:** The care of critically ill burn injured children requires an expertise and coordinated effort at a burn care unit (Sheridan, Remensnyder, Schnitzer, & Schulz, 2000).

A burns care includes initial assessment for life-threatening problems. In case of flame or history of smoke exposure, the airway evaluation need to be done as it causes inflammation of the airways, face, nasal hair burn and carbonaceous sputum (Barrow, Spies, Barrow, & Herndon, 2004). So, treatment should be quick and aggressive in order to prevent obstruction of airways. In case of laryngeal edema, tracheal intubation is needed. Respiratory failure may cause hypoxemia and tachypnea, which necessitates endotracheal intubation and mechanical ventilation. A carboxyhaemoglobin level and blood gas analysis is done for carbon monoxide poisoning for a child with smoke exposure. Classification of burns is done as per the TBSA involved and the depth (Carlsson, Uden, Hakansson, & Karlsson, 2006). Burn depth estimation requires careful wound surface observation, tissue debridement and removal of large blisters.

Initial management includes removal of the clothing

and jewelry from the area of the burn. Adhered cloth can be removed while cleansing the wound. A cooled, saline-soaked sterile gauze reduces pain and cools the burn. The wound is cleansed to remove debris after administering analgesia. Necrotic tissue is debrided to minimize infection using collagenase and papain-urea preparations. Small firm blisters can be left alone. Parents should be counselled. Patient's tetanus immunization should be updated. A topical antibacterial ointment is used to prevent infection. Silver sulfadiazine ointment is a standard topical medication (Krishnamoorthy, Ramaiah, & Sanjay, 2012). Wound should be dressed daily. Full thickness burns need eschar excision and skin grafting. Immobilization and elevation of affected extremity may be helpful to reduce edema. Child with circumferential burns in an extremity needs observation for development of compartment syndrome, a life threatening condition. In the chronic wounds treatment, negative pressure wound therapy (NPWT) a non-invasive adjuvant therapy is found useful as it improves blood circulation to the wound, helps in the granulation of tissue formation, leads to early healing due to re-epithelialization, decreased bacterial load, reduced exudate, edema and keeps a moist environment for proper healing (Alaña, López, Playá, & Zubizarreta, 2013).

To avoid ischemia, lactic acidosis and shock caused due to hypovolemia among children with more than 10% to 15% of TBSA burns, parenteral or intravenous fluids are administered. If TBSA is 15–20%, fluid shifts occur due to systemic inflammatory response syndrome, which causes edema and shock. Fluid replacement is given within two hours of a thermal injury, in order to prevent multi-organ failure and mortality (Barrow, Jeschke, & Herndon, 2000). The best indicator of hydration is urine output. Maintain the rate of fluid replacement, so that there is an hourly 30 ml of urine output in older children and one to 2 ml/kg among children weighing below 30 kg. Other parameters monitored during fluid resuscitation include vital signs, capillary refill and sensorium (Wong & Hockenberry, 2010). Physician must be consulted if urine color is red or brownish.

Other aspects of management include protecting the

child from hypothermia, the nutritional needs of the child should be carefully assessed and managed since the BMR increases in burn injury, so, provide nasogastric feedings as needed. Multivitamin supplementation is given (Sheridan, Remensnyder, Schnitzer, & Schulz, 2000). Burns may lead to scarring and contracture that can be reduced by wearing pressure garments continuously for a year. Rehabilitation including physical, occupational therapy, ambulation, and helping in daily activity and emotional support maximizes the cosmetic and functional outcome of the patient.

Nursing care should focus on assessment and management of shock, fluid resuscitation, and pain assessment using pain scale and changing the child's position frequently. Analgesics should be used before all dressing change. Monitoring vitals, capillary refill time, central venous pressure, estimating insensible fluid losses, hypernatremia and hyperkalaemia is an important part of nursing care activity. Distal pulse should be monitored hourly and notified to the physician, if there is decrease or absence of pulses. In burn shock, pulse is a parameter than arterial blood pressure and hypotension, which is a late finding. At early periods of burn shock (first to third day) fluid shifts very fast, so to plan the proper method of fluid management the haematocrit, osmolality, blood electrolytes, glucose, calcium and albumin monitoring should be done. The main indicator is the hourly assessment of urine output (Barret & Herndon, 2005). If peripheral intravenous access is difficult then surgical vascular access or central venous catheterization is done. To monitor the child's fluid balance, urinary catheter insertion and a nasogastric feeding is considered (Haberal, 2006). Intravenous infusion is regulated to maintain a urinary output of at least 1 to 2 ml/kg in children below 30 kilograms of weight; 30 to 50 ml/hr of output is expected in children weighing above 30 kg. Specific gravity, vital signs, laboratory data and signs of adequate hydration guide the rate of fluid administration. Monitor infection control procedures and ensure that staff and visitors comply with established protocols to prevent cross contamination. Provide an opportunity to choose meals. Encourage parents to stay with the child, plan group tasks and activities, performing range-of motion

exercises. Provide referral to social services or parent support group, the psychological needs of the children and their families should not be overlooked. In addition to feeling concern for their child, the family experiences guilt related to the fact that the parents did not or could not protect the child. Consistency in the information presented and the attitude of the staff creates a sense of familiarity and stability during the emergent phase (Wong & Hockenberry, 2010).

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