

INTRODUCTION

Burns and scalds are relatively common in children. General principles of care are similar to those of adults and this section should be read in conjunction with the management of adult burns.

Scalds, flame or thermal burns, chemical and electrical burns, will all produce a different burn pattern. Inhalation of smoke or toxic chemicals from a fire may cause serious accompanying complications.

As with adult burns, some cases can be complicated by serious injury:

- resulting from falls from a height in fires
- injuries sustained as a result of road traffic accidents, where the vehicle has ignited after an accident
- from explosion, which can induce flash burns and other serious injuries due to the effect of the blast wave and flying debris.

Inhalation of super-heated smoke, steam or gases in a fire, can induce significant major airway swelling and problems in children. This can occur even where steam has been inhaled from a kettle; this has been known to cause fatal airway obstruction.

Non-accidental injury should always be borne in mind when burns have occurred in small children, in particular where the mechanism of injury described does not match the injury sustained, or there is inconsistency in the history (*refer to safeguarding children guideline*).

It is vitally important to remove the heat source and cool the injured area for not more than 10 minutes.

HISTORY

Record the following information:

- what happened?
- when did it happen?
- were any other injuries sustained?
- are any circumstances present that increase the risk of airway burns (confined space, prolonged exposure)?
- any evidence of co-existing or precipitating medical conditions.

ASSESSMENT

Ensure safety of yourself the patient and the scene.

Assess **ABCD's**.

Specific checks should be made for signs of airway burns, including:

- soot in the nasal cavity and mouth cavities
- cough and hoarseness
- coughing up blackened sputum
- difficulty with breathing and swallowing
- blistering around the mouth and tongue
- scorched hair, eyebrows or facial hair.

Assess breathing rate for depth and any increasing breathing difficulty or audible sounds.

The above assessments and records are mandatory in managing burns in children.

It should be noted that the smaller airways in children may make the management of the patient more difficult. Early and rapidly developing airway swelling may soon make intubation very difficult, so rapid transfer to further care is essential, pre-alerting the receiving unit, which ideally should be the local Burns Unit.

Calculation of Burn Area

The Rule of Nines does not work in patients under the age of 14 because of different body proportions.

Local guidance or charts should be used; a rough guide is to assume that the size of the patient's hand, including the digits, equals 1% of the surface area of the child.

If patient is non-time critical, perform a more thorough patient assessment with a brief Secondary Survey.

THE TIME THE BURN OCCURRED is IMPORTANT to DOCUMENT, as is time and volume of **ALL** infusions, as all subsequent fluid therapy is calculated from the time of the burn onwards.

In **ELECTRICAL** burns it is important to search for **entry and exit sites**. Assess ECG rhythm. The extent of burn damage in electrical burns is often impossible to assess fully at the time of injury.

In **SCALDS**, the **skin contact time and temperature** of the burning fluid determines the depth of the burn. Scalds with boiling water are frequently of extremely short duration as the water flows off the skin rapidly. Record the type of clothing, e.g. wool retains the hot

water. Those resulting from hot fat and other liquids that remain on the skin will cause significantly deeper and more serious burns. Also the **time to cold water and removal of clothing** is of significant impact and should be included in pre-arrival advice from Control.

In **CHEMICAL** burns, it is vital to note the **nature of the chemical**. Alkalis in particular may cause deep, penetrating burns, sometimes with little initial discomfort. Certain chemicals such as phenol or hydrofluoric acid can cause poisoning by absorption through the skin and therefore must be irrigated with **COPIOUS**¹ amounts of water.

CIRCUMFERENTIAL (Encircling completely a limb or digit) full thickness burns, may be "limb threatening", and require early in hospital incision/release of the burn area along the length of the burnt area of the limb (escharotomy).

MANAGEMENT

In any situation where smoke inhalation may have occurred, administer high concentration oxygen (O₂) via a non-re-breathing mask, using the stoma in laryngectomy and other neck breathing patients. High concentration O₂ should be administered routinely, whatever the oxygen saturation in all but the smallest burns.

- consider assisted ventilation at a rate equivalent to the normal respiratory rate for the age of the child (**refer to paediatric resuscitation charts for normal values**) if:
 - SpO₂ is <90% on high concentration O₂
 - respiratory rate is <half normal or >three times normal
 - expansion is inadequate.

Should intubation become impossible, needle cricothyroidotomy is the management of choice.

- if the child is wheezing as a result of smoke inhalation, nebulisation with **salbutamol** and an O₂ flow of at least 6-8 litres per minute will frequently improve symptoms (**refer to the drug protocols for dosages and information**). It is important, wherever possible, to obtain a peak flow reading both before and after nebulisation, to assess and record its effect

Vascular access will be necessary if:

- the child requires intravenous analgesia (**see below**)
- the burn is more than one hour old and greater than 10% of the surface area.

Intravenous access in children may be difficult. The intraosseous route should be considered (remember to use local anaesthetic if the child is conscious). Wherever possible, the burn area should be avoided but can be used if no alternative is available.

If an area greater than 25% of the body surface is affected and the time from injury to hospital is likely to be in excess of an hour, then the following fluid therapy should commence:

- Crystalloid should be used in the following initial doses:-
 - 12 years and over – 1000 mls
 - 5 to 11 years – 500 mls
 - Less than 5 years – 10 mls per kg (calculated from tape)

If the burn is complicated by other traumatic injury, then resuscitation should take precedence and management of the other injuries must be the priority.

No creams or lotions should be applied to burns prior to assessment by the hospital team.

Burns should be covered with cling-film; wrapping may have a constricting effect so smaller pieces are better than a circumferential sheet. This avoids removal of the dressing each time the wound needs examining, and reduces pain from contact or draughts. Continue to irrigate over the cling-film or gel based dressing whilst ensuring the rest of the child is warmly wrapped. Be aware of the potential for hypothermia induced by continual irrigation of large areas of the body. It is rare to need more than 10 minutes irrigation except for chemicals that adhere to the skin, for example phosphorus. Cling-film may be applied, followed by wet gauzes to produce cooling by evaporation.

Water gels should be used with caution and only if <12.5% body surface area (BSA) is burnt due to the potential for hypothermia.

- **in alkali burns**, irrigate with water en-route to hospital, as it may take hours of irrigation to neutralise the alkali. This also applies to eyes that require copious and repeated irrigation with water or saline.
- **chemical burns should NOT** be wrapped in cling-film but covered with wet dressings (**refer to CBRN guideline**).

Analgesia (**refer to management of pain in children**)

If the burn area is small, cooling and **paracetamol** (**refer to paracetamol protocol for dosages and information**) may be all that is required.

Significant burns or scalds may require **Entonox** (*refer to Entonox protocol for administration and information*) if the child is able to co-operate, or **oral morphine sulphate** (*refer to oral morphine sulphate protocol for dosages and information*). Intravenous analgesia (**morphine sulphate**) (*refer to morphine sulphate protocol for dosages and information*) is appropriate for larger burns and should be given early.

Burns to face, hands, perineum, must be taken directly to a specialist Burns Unit with paediatric expertise, if available.

Key Points – Burns and Scalds in Children

- Warm the child and cool the burn.
- Do not cool the burn for more than 10 minutes.
- Burnt children require early effective analgesia.
- Always remember child abuse.
- Remember they may have other injuries.
- Treat other injuries as normal.

REFERENCES

- ¹ Cooke MW, Ferner RE. Chemical burns causing systemic toxicity. *Arch Emerg Med* 1993;10(4):368-71.

METHODOLOGY

Refer to methodology section.