Purpose
To outline the pre-hospital and inter-hospital assessment and management of patients with major burns.

Procedure
Management of Severe Burns

For Review
Aug 2015

1. Introduction
1.1. Major Burns, whilst uncommon injuries, pose significant clinical challenges in the pre-hospital environment as well as during inter-hospital retrievals. The NSW Burns Transfer Guidelines give specific criteria for consideration of medical inter-hospital retrieval following major burns.[1]

2. Scope
3.1. Clinical Crew

3. Process
3.1. Scene Safety
4.1.1. In pre-hospital missions, **ensure the scene is safe before you access the patient.** If possible identify and directly communicate with the scene Fire Commander.

4.1.3. If immediate first aid has not being applied then the burnt area should be immersed in cool running water. Most patients with large areas of major burns have already had vigorous first aid applied when we arrive and are shivering and at risk of hypothermia.

4.1.4. Such patients should have wet dressings removed and their injured skin protected from air currents and further injury. **Polyethylene film eg"Glad Wrap™" is the preferred dressing.**[1,2]

4.1.5. **Keep the patient warm** with blankets and environmental heating where possible.

4.2. Assessment

4.2.1. Percentage of Burnt Surface Area (BSA) can be calculated using the "Wallace Rule of 9's", a Lund and Browder Chart or using "Palm of patient's hand (including fingers) = 1%".[1, 2] Remember that superficial burns with erythema only are not included in these calculations[1, 2]. **It is essential to log roll the patient to assess the entire body surface for burns.**

4.3. Airway Burns

4.3.1. Airway burns can rapidly progress to airway obstruction and airways at risk after thermal injury should be anticipated and treated early[2].

4.3.2. Inhalational injury is a serious consequence of major burns and is much more common when combustion or explosion occurs in enclosed spaces[4].

4.3.3. Clinical indicators suggesting upper airway thermal burn include[5]:

- **mechanism - confined area explosions/combustion**
- **full thickness neck or facial burns**
- **burns to oropharynx**
- **dysphonia or stridor**

4.3.4. Clinical indicators of inhalational injury[4] :

- **carbonaceous sputum**
- **respiratory distress**
- **hypoxia**

4.3.5 Always consider concomitant trauma particularly following explosions, electrical injuries or falls from height.

4.3.6 Consider inhalational asphyxiants such as carbon monoxide or cyanide poisoning in patients with unexplained coma or shock, especially with normal SpO2.

4.4. Indications for Intubation

4.4.1**. Signs or symptoms suggesting thermal burn to airway.**

4.4.2. Signs or symptoms suggesting inhalational injury.

4.4.3. Agitated, combative or patients with decreased level of consciousness.

4.4.4. Major burns (≥40%) on humanitarian grounds.

4.4.5. ***Decision making should take into account the time/distance required for transfer as well as the volume of intravenous fluids administered prior to the arrival of the team.***

4.5. Management

Dressings

4.5.1. Polyethylene film is the ideal out-of-hospital burns dressing for major burns involving large areas as it protects the skin, reduces pain due to air currents, reduces fluid loss and allows repeated wound inspection.[1,2]

4.5.2. Hydrogel dressings are appropriate for small areas only.

4.5.3. Soft Paraffin is an alternative dressing for facial burns.[1]

4.6. Analgesia

4.6.1 IV access through burnt skin can be difficult. Consider early intra-osseous (IO) access.

4.6.2. Despite severe and life-threatening injuries most patients with major burns are fully alert and conscious. **Adequate analgesia and/or sedation is mandatory.**

4.6.3. Intranasal fentanyl and intramuscular/intranasal ketamine may be useful adjuncts before obtaining intravascular or intrasosseous access.

4.6.4. Once IV/IO access is obtained, analgesia is best facilitated by a combination of IV opioids (fentanyl / morphine) with ketamine[6] in small titrated boluses. Large doses of these agents may be needed, and an infusion is usually the best way to provide a steady level of analgesia. The intubated, paralyzed patient[6] must be carefully and serially examined for signs of pain and awareness (lacrimation, pupillary mydriasis, tachycardia or hypertension).

4.7. RSI

4.7.1. If signs of an airway thermal injury or inhalation injury suggest the need for rapid sequence intubation then this should be done early, before anatomical distortion makes orotracheal intubation difficult or impossible[3].

4.7.2. Provided that there is no mechanism of injury to suggest trauma consider pre-oxygenation with the patient sitting up and using a pillow or folded towel to raise the occiput.

4.7.3. The largest tracheal tube possible should be inserted to facilitate pulmonary toileting in ICU[3]. (Smaller ETT's however should be readily available in case of difficulty with RSI).

4.7.4**. Preparation for a difficult airway should be thorough and include preparation for a surgical airway.** In full thickness burns limiting neck movement or mouth opening then a primary surgical airway may be considered as the primary means of securing the airway.

4.8. Escharotomy

4.8.1. **Escharotomies may be necessary on patients with circumferential full thickness (or near circumferential full thickness) burns to the chest, neck, limbs or digits**[7].

4.8.2. Consider performing escharotomy of the torso if there is difficulty ventilating the patient with significant full thickness chest wall burns. They should be performed in the midclavicular or anterior axillary line as well as midline longitudinally and joined with horizontal incisions to allow adequate chest excursion. The incisions must be deep enough to "release" burnt tissue – this usually means a deep enough incision to cause bleeding (=vascularised tissue). Significant bleeding is a common consequence of effective torso escharotomy.

4.8.3. Limb or digit escharotomy should be performed when distal perfusion is impaired or threatened due to circumferential full thickness (or near circumferential full thickness) burns unresponsive to simple elevation. If needed, incisions should be made laterally avoiding neurovascular bundles and be deep enough to release the tissues. They are rarely necessary within 4-6hrs following a burn injury regardless of the severity of burn injury[7].

4.8.4. If there is doubt about the need for escharotomy in an inter-hospital retrieval then discussion with the receiving Burns Centre should be requested via MRU. In the pre-hospital setting the SRC (Senior Retrieval Consultant) should be contacted to assist in difficult decision-making.

4.8.5. There is no role for prophylactic antibiotics[7]/steroids.

4.9 Fluid Resuscitation

4.9.1. **Pre-hospital**

4.9.2 If burn >15% BSA (adults) or 10% BSA (children) then initiate fluid therapy pre-hospital[2]. Shock (due to a combination of fluid shifts, systemic inflammatory response and impaired cardiac output) peaks at about 12hrs. Over-resuscitation should be avoided in the first few hours[9].

4.9.3. **Inter-hospital**

4.9.4. If burn >15% BSA (adults) or 10% BSA (children) then initiate fluid therapy using the Modified Parkland Formula (3-4mL/kg X %BSA burned, over 24hrs with half given in first 8hrs using Ringer's Lactate/Hartman's solution). This is in addition to normal maintenance requirements.

4.9.5. This volume should be increased by 50%[9] if significant inhalational injury is present. Individual patient's fluid needs can vary greatly and a useful end point to aim for is a stabilization of deteriorating vital signs and an hourly urine output of > 0.5-1mL/kg/hr in adults (> 0.5-2mL/kg/hr in paediatric patients).[1,3,9]

5. Disposition

5.1. As noted in the Pre-Hospital Trauma Triage HOP, patients with major burns should be triaged to one of the two Adult Burns Centres, RNSH or Concord Hospital. If the patient has a mechanism of injury suggestive of trauma then they should be primarily transported to RNSH.

5.2. Paediatric (<16yo) major burns should be transported to The Children's Hospital at Westmead.

6. References

1. Burn Transfer Guidelines - NSW Severe Burn Injury Service - 2nd Edition. Document Number GL2008_012 09-Jul-2008 NSW Health

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