

Guideline on the Management of Smoke Inhalation & Airway Injury in Burn Injured Patients

This document is intended to provide clinicians with a framework to ensure the safe management of burn injured patients who have an airway injury due to smoke inhalation.

1. Introduction

- 1.1 Loss of airway patency in a patient with burn injury can occur suddenly and without warning, particularly in children.
- 1.2 Management of the burned airway may be complex due to the presence of oedema or associated injuries to the face and neck. It is, therefore, essential to consider the potential risks to the airway in any patient with burns, even those with apparently minor injuries.

2. Key Points

- The history is important and should take into account the type of burn and exposure to hot gasses, liquids, flame or smoke. Prolonged exposure, or exposure in an enclosed space, are red flags for a likely inhalational injury. Remember, this may be the only time that a history can be taken from the patient themselves;
- Consult a senior anaesthetist at an early stage if there are any doubts or concerns;
- Always provide supplemental oxygen 15L/min via non re-breathing mask. Until COHb <5%;
- Don't forget C-spine;
- Don't forget to look for other injuries. The presence of a major burn can be distracting for medical and nursing staff as well as the patient;
- Oedema formation can increase rapidly once intravenous fluid resuscitation is commenced, particularly in those patients who are lying flat. Sit the patient up if possible;
- Have a low threshold for suspecting cyanide poisoning. Burning PVC is a particular culprit. Suspect if the patient is very acidotic or shocked in the absence of other causes. There is no quickly available test to detect cyanide poisoning, so the diagnosis is made on clinical suspicion.

SPECIALISED BURN SERVICES

The Welsh Burns Centre & Paediatric Unit

Morrison Hospital, Swansea

Tel: 01792 703 802

Switch: 01792 702222

8:00-17:00: Burns Consultant of the day

17:00-08:00: Burns Consultant on call

SWUK Paediatric Burns Centre

Bristol Royal Hospital for Children

Tel: 0117 342 7901

Switch: 0117 923 0000

(Burns on-call) Bleep 6780

Bristol Burns Unit

Southmead Hospital

Tel: 0117 414 3100/3102

Switch: 0117 950 5050

(Burns on-call) Bleep 1311

Salisbury Burns Unit

Salisbury District Hospital

Tel: 01722 345 507

Switch: 01722 336262

(Burns on-call)

Plymouth Burns Facility

Derriford Hospital, Plymouth

Tel: 01752 792274

Switch: 01752 202082

(Burns on-call)

National Burns Bed Bureau

24 hr help line to find a burns bed nationally

Tel: 01384 679 036

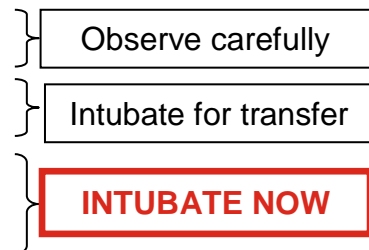
Beware! The symptoms and signs of smoke inhalation injury can get worse over the first 36 hours following injury. Reassess often.

3. Does the patient need admitting to hospital? Yes, if one or more of the following is present:

- History of exposure to smoke in an enclosed space for more than 10 minutes;
- Loss of consciousness at the scene;
- Soot in the sputum and mouth;
- Arterial $pO_2 < 8kPa$;
- $COHb > 15\%$;
- Bronchospasm;
- Painful swallowing;
- Central facial burns.

4. Does the patient need intubating? Consider if any of the following are present:

- GCS < 12 . Can be caused by trauma, drugs, alcohol, carbon monoxide;
- Impending upper airway obstruction:
 - * Burns around mouth or nose
 - * Soot in mouth or nostrils, singed nasal hairs
 - * Intra-oral burns including tongue
 - * Intra-oral swelling. No stridor
 - * Pharyngeal oedema
 - * Inspiratory stridor
 - * Difficulty swallowing secretions
- Respiratory distress;
- Ventilatory inadequacy caused by circumferential burns to chest and / or abdomen;
- Deep facial burns;
- Circumferential neck burns;
- Increasing swelling of head and neck. May be particularly obvious once fluid resuscitation commenced;
- Other serious trauma / significant associated injuries.



If in doubt, Intubate. Do not cut the ETT

5. Intubation

- Don't forget c-spine;
- Get experienced help. Anaesthetic Assistant and Senior Anaesthetist;
- Don't cut the ETT;
- Have a range of smaller tubes available;
- Suxamethonium is safe to use in the first 24 hours following burn injury;
- Post intubation give 100% oxygen until $COHb < 5\%$;
- Use lung protective ventilation: Tidal volume 6mls/kg, peak inspiratory pressure $< 30cmH_2O$.

6. Monitoring

- Regular monitoring of RR, BP, ECG and SaO_2 must be initiated;
- In addition, CXR, ABG analysis and $CoHb$ levels are mandatory in any patient with a suspected inhalational injury or major burn;
- Consider CT scan prior to transfer in any patient with a reduced GCS.

7. Treatment

7.1 Patients not requiring intubation:

- General supportive therapy;
- High flow humidified oxygen until COHb <5%;
- Chest physiotherapy;
- Nebulised salbutamol 2.5mg QDS;
- Fluids as per burn resuscitation guidelines;
- Avoid fluid overload. Aim for Urine output of 0.5mls/kg/hr in adults and 1ml/kg/hr in children;
- Start early enteral feeding;
- Sputum culture.

7.2 Patients requiring intubation:

- Humidified 100% O₂ until COHb <5%;
- Lung protective ventilation;
- Bronchoscopy within 24 hours. Video and photographic record if possible. Lavage with 0.9% saline (10ml aliquots) or 1.4% sodium bicarbonate (10ml aliquots) to remove soot;
- Continue with lavage in 10ml aliquots, with bagging and suction, hourly if tolerated, until sputum is clear of soot;
- Send first sputum sample for culture;
- Regular chest physiotherapy;
- Fluids as per burns resuscitation guidelines;
- Avoid fluid overload. Aim for Urine output of 0.5mls/kg/hr in adults and 1ml/kg/hr in children;
- Start early enteral feeding;
- Nebulised salbutamol 2.5mg QDS if wheezy.

8. Specific therapies for Cyanide Poisoning

8.1 Intravenous Hydroxocobalamin (Cyanokit) is the treatment of choice. 70mg/kg, up to maximum 5g, Iv over 15 minutes. Additional 70mg/kg may be given depending on severity of poisoning and clinical response. Total dose not to exceed 10g.

8.2 Consider CVVHDF in cases of severe persistent metabolic acidosis.

9. Documentation

9.1 Don't forget to send the following with the patient:

- Copy of notes;
- Completed Lund and Browder chart;
- All available test results;
- Details of other injuries noted during primary and secondary survey;
- Details of fluid requirements, fluid administered and urine output.

10. Recommended further reading

- 10.1 [Airway management and smoke inhalation injury in the burn patient. Cancio L C. Clin Plas Surg. 2009; 36\(4\): 555.](#)
- 10.2 [Acute inhalation injury. Miller K, Chang A. Emerg Med Clin North Am. 2003; 21\(2\): 533](#)

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