Burn Education Day

ACI Statewide Burn Injury Service

Acknowledgement

- ‘We would like to acknowledge the traditional owners’ of the lands and pay our respects to elders both past and present, and all Aboriginal people’s from whatever Aboriginal nation you may come from’
The information in these lectures has been obtained from the *Emergency Management of Severe Burns* (EMSB) course manual 17th ed. published by the Australian and New Zealand Burn Association (ANZBA) Feb 2013, and NSW Specialist Burn Clinicians.
Aims of Education Day

- To initiate appropriate early care of a burnt patient.
- To know when & how to transfer a burnt patient.
- To understand the principles of physical & emotional rehabilitation of a burnt patient.
Epidemiology
Burns Incidence

- 1% Australia and New Zealand per year
- 286,000 people per year
- 50% Restriction Daily Living Activities
- 10% Hospital
- 10% Severe Burns
Burns – The Cost

- Severe burn care is expensive
  - $700k for a 70% TBSA burn
- Rehabilitation
- Time off work
- Loss of earning power
- Loss of lifestyle
Adult Burns

ANZBA Statistics

- Flame 44%
- Scald 28%
- Contact 13%
- Chemical 5%
- Friction 5%
- Electrical 2%
- Other 3%
Places of Burn - Adults

ANZBA Statistics

- Home 56%
- Work 17%
- Roadway 11%
- Outdoors 11%
- Institutions 3%
- Other 2%
## Children’s Burns

### ANZBA Statistics

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scald</td>
<td>55%</td>
</tr>
<tr>
<td>Contact</td>
<td>21%</td>
</tr>
<tr>
<td>Flame</td>
<td>13%</td>
</tr>
<tr>
<td>Friction</td>
<td>8%</td>
</tr>
<tr>
<td>Electrical</td>
<td>1%</td>
</tr>
<tr>
<td>Chemical</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
</tr>
</tbody>
</table>

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## Place of Burns - Children

<table>
<thead>
<tr>
<th>Location</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>82%</td>
</tr>
<tr>
<td>Outdoors</td>
<td>12%</td>
</tr>
<tr>
<td>Roadway</td>
<td>3%</td>
</tr>
<tr>
<td>Work</td>
<td>1%</td>
</tr>
<tr>
<td>Institutions/School</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
</tr>
</tbody>
</table>

**ANZBA Statistics**

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Where does it happen?

- 82% House/Home
- Mainly kitchen and bathroom
Response to Burn

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Structure of Skin

Dead cells
Keratinocytes
Basal epidermal cells
Basement membrane

Epidermis
Papillary
Dermis
Reticular
Fat layer

Nerve
Basal epidermal cells
Functions of the Skin

- Temperature regulation
- Sensory interface
- Immune response/protection from bacterial invasion
- Control of fluid loss
- Metabolic function
- Psycho-social function

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Jackson’s Burn Wound Model
Jackson’s Burn Wound Model

Zone of Coagulation
Jackson’s Burn Wound Model

Zone of Coagulation

Zone of Stasis
Jackson’s Burn Wound Model

- Zone of Coagulation
- Zone of Stasis
- Zone of Hyperaemia
Severity of Burn

- Depth = time & temperature

- Severity of **local** injury determined by depth

- However, depth is not the most important predictor of severity
Systemic injury

- For all burns, tissue damage initiates an inflammatory response

- Cytokine release, pathological cascade

- If large enough causes a systemic inflammatory response
Body Response to Burn Injury

- Proportional to area burnt
- Clinically significant >20% TBSA adult/
- Affects all major organ systems:
  - Heart and blood vessels
  - Lungs (Pulmonary oedema and ARDS)
  - Gut (Paralytic ileus /bacterial translocation)
  - Immune system
  - Neuro-humeral regulation
  - Kidney (Oliguria and renal failure)
  - Bone mineralisation & growth
Abnormal Capillary Exchange

- Caused by inflammatory mediators

- These produce –
  - Vasodilatation
  - Increase in capillary permeability
  - Lowering of intercellular pressure
Circulatory Effects

- Increase in capillary permeability
- Loss of fluid from circulation
- Loss of albumin from circulation
- Oedema formation

- HYPOVOLAEMIA IS AN EARLY THREAT TO LIFE

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Metabolic Effects of Burn

- Secretion of stress hormones
- Neural response via sympathetic nervous system and hypothalamus
- Suppression of anabolic hormones and development of massive catabolic response
- Depression of immune response

- Tachycardia
- Hyperthermia
- Protein wasting
- Susceptibility to infection

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First Aid
First Aid

- Stop the burning
  - Stop! Drop! Cover (face) & Roll!
- Remove all clothing
- If electrical - turn off power and remove from electrical circuit
- If chemical - irrigate copiously with water
First Aid

- Cool the burn
  - ASAP
  - Any fluid 8° - 25°C
  - Continue ~20 minutes
  - If chemical - irrigate copiously with water
  - Avoid hypothermia
First Aid - Effects

- Reduces progression in the Zone of Stasis so reduces depth of burn
- Excellent pain relief
First Aid

With First Aid

No First Aid
Cooling alternatives?
The gold standard for burns first aid is 20 minutes of cool clean running water.

If clean running water is not available, immersion in cool water, application of wet towels or hydrogel or other wet dressings may be useful alternatives for the provision of first aid and analgesia.

The patient must be kept warm during cooling of the burn wound.

After first aid, patients with large burns should be wrapped in dressings that minimize evaporative heat loss by excluding air from the wound and the outer surface of the dressing.

For transfer to hospital, plastic cling films are suitable if dressings are not available.
Risks of First Aid

- Hot water in tap
- Dirty water
- Hypothermia
- Vasoconstriction
Early Management
On arrival to hospital
Primary Survey

Airway & C-spine
Breathing & \( \text{O}_2 \)
Circulation & haemorrhage control
Disability
Exposure & environment
Airway & C-spine

- Upper (supraglottic) airway is subject to thermal injury
  - Burns in a confined space (room, car)
  - Burns above the clavicle
- Onset hours after injury
- Stabilise C-spine
When to Consider Intubation

- Head and neck burns
- Soot in mouth, stridor, wheezing, breathing difficult, laryngeal tug, hoarse voice
- Facial or neck swelling
- Large surface area burn >40%
- Burn in an enclosed space e.g. house, car
- Inhalation of gases
Intubation

If in doubt - intubate

- <1 hour post burn injury
- 6 hours post burn
- Swelling, oedema
Would you intubate this child?
Tongue is larger in proportion to mouth
Pharynx is smaller
Epiglottis is larger and floppier
Larynx is more anterior and superior
Narrowest at cricoid
Trachea narrow and less rigid
Normal

**Increased resistance due to edema increasing wall thickness by 1 mm**

**Infant**
- 4 mm (Normal)
- 2 mm (Edema)
  - 50% reduction in lumen
  - Infant has additional resistance due to narrow lumen

**Adult**
- 8 mm (Normal)
- 6 mm (Edema)
  - 25% reduction in lumen
Airway compromise

12 hrs post burn

36 hrs post burn
obstructed → intubated
Breathing & O2

- Check air entry – look, feel, listen
- Give $O_2$: monitor with oximetry
- Lung injury due to smoke inhalation
- Lung effects of burns start days after injury
- Early lung problems are likely to be due to associated injuries
Circulation

- Monitor vital signs
- Apply capillary blanching test centrally and in limbs – normal return is 2 secs.
  - Longer indicate hypovolaemia or need for escharotomy on that limb; check another limb
- Inspect for any obvious bleeding – stop with direct pressure or appropriate management.
Circulation

- Insertion of IV access
  - 2 IV cannulas inserted
  - Preferably through unburned skin
  - Sometimes an IO cannula is required
- Bloods
Disability: Neurological Status

- Establish level of consciousness:
  - A - Alert
  - V - Response to Vocal stimuli
  - P - Responds to Painful stimuli
  - U - Unresponsive

- Pupillary response

- Restlessness, confusion, aggression and altered states of consciousness may be due to hypovolaemia or hypoxia as well as drugs, alcohol, etc.
Exposure with Environmental Control

- Remove all clothing and jewellery
- Keep patient warm
- Log roll and examine posterior surfaces for burns and other injuries
- Remove wet sheets
TBSA Assessment

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Surface Area Assessment

Rule Of Nine’s

- Head & Neck = 9%
- Arms (2 x 9) = 18%
- Trunk (front) = 18%
- Trunk (back) = 18%
- Legs (2 x 18) = 36%
- Perineum = 1%

100%
Paediatric Rule of Nines

- For every year of life take 1% from the head and add ½% to each leg
- At 9 yrs old body proportions same as adult
Surface Area Assessment

Palmar Method

- Palm and fingers of the patient = 1% TBSA
- Useful for small and scattered burns
27% TBSA
22.5% TBSA
Child

8% TBSA
52 year old
Electrical burn

2.5% TBSA
cutaneous burns

(But remember where the current has travelled)
What is the TBSA %?
What is the TBSA %?

- **Adult**
  - Front 18%
  - Back 18%
  - 9%
  - 1%
  - 18% 18%

- **Child**
  - Front 18%
  - Back 18%
  - 9%
  - 18% 18%

13% TBSA
Do you need to stand up and stretch?
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