Burn Education Day

ACI Statewide Burn Injury Service

‘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 18th ed. published by the Australian and New Zealand Burn Association (ANZBA) 2018, and NSW Specialist Burn Clinicians.
• 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 life style
### Adult Burns

<table>
<thead>
<tr>
<th>ANZBA Statistics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flame</td>
<td>44%</td>
</tr>
<tr>
<td>Scald</td>
<td>28%</td>
</tr>
<tr>
<td>Contact</td>
<td>13%</td>
</tr>
<tr>
<td>Chemical</td>
<td>5%</td>
</tr>
<tr>
<td>Friction</td>
<td>5%</td>
</tr>
<tr>
<td>Electrical</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>3%</td>
</tr>
</tbody>
</table>
PlACES OF BURN - ADULTS

ANZBA Statistics

- Home: 56%
- Work: 17%
- Roadway: 11%
- Outdoors: 11%
- Institutions: 3%
- Other: 2%
ANZBA Statistics

- Scald 55 %
- Contact 21 %
- Flame 13 %
- Friction 8 %
- Electrical 1 %
- Chemical 1 %
- Other 1 %
Place of Burns - Children

ANZBA Statistics

- Home 82 %
- Outdoors 12 %
- Roadway 3 %
- Work 1 %
- Institutions/School 1 %
- Other 1 %
Where does it happen?

- 82% House/Home
- Mainly kitchen and bathroom
Response to Burn
Structure of Skin
Functions of the Skin

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

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

HYPOVOLAEMIA IS AN EARLY THREAT TO LIFE
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
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
Cool the burn

- ASAP
- Any fluid 8º - 25ºC
- Continue ~20 minutes
- Effective within 3hrs post burn
- If chemical - irrigate copiously with water
- Avoid hypothermia
First Aid

With First Aid

No First Aid
Never use ice as this can make the burn worse by decreasing blood flow.

Toothpaste does not cool a burn and can increase pain.

Hydrogels do not cool a burn wound adequately.

Creams do not cool a burn.

Honey does not cool a burn.

Butter or margarine do not provide adequate cooling.
PLEASE NOTE: usual recommendations for burn first aid (20 minutes of cool running water) is contraindicated in cold burns.

Rapid re-warming in bath of water between 40 - 42°C for 15-30 minutes:

- Aims to minimise tissue loss and reduce chemical irritation.
- Active motion whilst rewarming is recommended.
- Avoid massaging affected area during rewarming.
Early Management
Primary Survey

Airway & C-spine
Breathing & O₂
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?

Photo courtesy of CHW
Increased resistance due to edema increasing wall thickness by 1 mm

Infant

4 mm → 2 mm
50% reduction in lumen

Infant has additional resistance due to narrow lumen

Adult

8 mm → 6 mm
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 O₂: 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; >2 secs indicate hypovolaemia or need for escharotomy on that limb; check another limb
- Inspect for any obvious bleeding – stop with direct pressure or appropriate management.
Insertion of IV access

- 2 IV cannulas inserted
- Preferably through unburned skin
- Sometimes an IO cannula is required

Bloods
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, hypoxia or CO poisoning 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
Burn Depths
Burn Wound Healing = re-epithelisation

Burn Depth Classification

- Epidermis
- Dermis: - capillaries, - nerves
- Fat

Epidermal
Superficial Dermal
Mid Dermal
Deep Dermal
Full Thickness
## Burn Depth Assessment

<table>
<thead>
<tr>
<th>Depth</th>
<th>Colour</th>
<th>Blisters</th>
<th>Cap Refill</th>
<th>Sensation</th>
<th>Healing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Epidermal</strong></td>
<td>Red</td>
<td>No</td>
<td>Present</td>
<td>Present</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Superficial</strong></td>
<td>Pale Pink</td>
<td>Small</td>
<td>Present</td>
<td>Painful</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Dermal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mid-dermal</strong></td>
<td>Dark Pink</td>
<td>Present</td>
<td>Sluggish</td>
<td>+/-</td>
<td>Usually</td>
</tr>
<tr>
<td><strong>Deep</strong></td>
<td>Blotchy Red</td>
<td>+/-</td>
<td>Absent</td>
<td>Absent</td>
<td>No</td>
</tr>
<tr>
<td><strong>Dermal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Full</strong></td>
<td>White</td>
<td>No</td>
<td>Absent</td>
<td>Absent</td>
<td>No</td>
</tr>
<tr>
<td><strong>thickness</strong></td>
<td></td>
<td></td>
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Epidermal Burn

- Skin intact, red, brisk capillary refill
- Erythema not included in % TBSA assessment
- Heal spontaneously within 3-7 days with moisturiser or protective dressing
Superficial Dermal Burn

- Blisters present or denuded
- Pink, brisk capillary refill
- Should heal within 7-14 days with minimal dressing requirements
Mid Dermal Burn

- Heterogeneous, variable depths
- Dark pink, sluggish capillary refill
- Should heal within 14 -21 days
- Deeper areas or over a joint may need surgical intervention and referral
Deep Dermal Burn

- Heterogeneous, variable depths
- Blotchy red/white
- Sluggish to absent capillary refill
- Surgical intervention
- Refer to specialist unit
Full Thickness Burn

- Outer skin, and some underlying tissue dead
- White, brown, red, black
- No capillary refill
- Surgical intervention and long-term scar management required
Full Thickness Burn
Burns are Dynamic

- The first impression may not be the most accurate

Day 1

Day 2

Day 5
Burn Size

TBSA Assessment
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
TBSA Skill Station
Adult

27% TBSA
What is the TBSA %?

- Adult

- Child

13% TBSA
ACI Statewide Burn Injury Service