Burn Education Day

ACI Statewide Burn Injury Service

Fluid Management
• Unique total body response in large thermal injury (>20% adults/>10% paeds)
• Increased capillary permeability persists for ~24 hours (starts to resolve ~8-12hrs)
How to administer fluids
Goals of resuscitation

• The maintenance of vital organ function at the least physiological cost.

• The restoration and preservation of tissue perfusion in order to avoid ischaemia.
Differences in children

- Limited physiological reserve
- Tendency to hypoglycaemia
- Greater surface area to mass ratio
- IV fluid required at lower % TBSA
- Need higher volume per kilogram
- Increased requirement = normal daily maintenance
Fluid Resuscitation

- Modified Parkland Formula:
  Area burnt x Weight x 3
- Use Hartmann’s solution.
  - Half in first 8 hours from injury.
  - Second half in next 16 hours.
  - Add maintenance + glucose for children <16yrs
- Calculation starts from TIME OF INJURY
- Revise according to urine output
Age: 18yo
Weight: 80kg
TBSA: 40%
Time of burn: 0800
Time of presentation: 0900
Fluid calculation – first 24 hours

3ml x 80kg x 40%  =

Fluid to be given in first 8 hours =

Rate =
Fluid calculation – first 24 hours

\[3\text{ml} \times 80\text{kg} \times 40\% = 9600\text{ ml}\]

Fluid to be given in first 8 hours = 4800 ml

Rate = 685 ml/hr (7hrs)
Fluid resuscitation for children

3mls x kg body weight x TBSA = total fluid for 24 hour period from the TIME of injury

+ Maintenance fluid
0.9% (normal) saline + 5% dextrose

- 4ml / kg / hr up to 10kg
- 2ml / kg / hr from 11-20kg
- 1ml / kg / hr for each kg over 20kg
Age: 2yo
Weight: 10kg
TBSA: 30%
Time of burn: 0700
Time of presentation: 0800
3ml x 10kg x 30% =

Fluid to be given in first 8 hours =

+ 

Maintenance fluid
Fluid calculation – first 24 hours

3ml x 10kg x 30% = 900ml (over 24 hrs)

Fluid to be given in first 8 hours = 450mls
   = 64ml/hr (7hrs)

+ Maintenance fluid

4ml x 10 kg

= 40 ml/hr (constant rate)
Formulae are only guides
Fluid should be administered via *Two* large cannulae (16G at least in adults) preferably inserted through non-burnt skin
Urinary Output

Adults: 0.5 ml/kg/hr (30-50 ml/hr)

Children (<16yrs): 1.0 ml/kg/hr
Urinary catheter is vital in:

- >10% TBSA Children
- >20% TBSA Adults
- Genital burns
Monitoring resuscitation

- Urinary output
- Heart rate
- Blood pressure
- Central invasive haemodynamic
- Electrolytes
- Blood gases
- pH (<7.39 - lactic acidosis?)
Extra fluid is required in:

- Inhalation injury
- Electrical injury
- Delayed resuscitation
- Dehydration
  - Fire-fighters
  - Intoxicated patients
Haemochromogogenuria

- Extensive deep burn
- Electrical injury
- Blunt trauma
- Tissue ischaemia

- Urinary excretion of
- Haemoglobin from destruction of RBCs
- Myoglobin from muscle break down
Haemochromogenuria

- Urine becomes dirty red colour
- Haemochromogens deposited in proximal renal tubules
- Acute renal failure
Haemochromogenuria

- Increase urine output to 1-2 ml/kg/hr
- Mannitol 12.5 g/l resuscitation fluid
- Sodium bicarbonate 25 meq/l
  (Alkalinise urine)
• Check immunisation status on admission

• Give tetanus prophylaxis if indicated
Inhalation Burn
Inhalation Injury

- Can be caused by heat, chemical compounds in the atmosphere or soot particles
- May increase mortality by up to 40%
Inhalation Injury

- Upper airway (supra-glottic)
- Lower airway (sub-glottic)
- Systemic intoxication (CO, HCN poisoning)
Supra-glottic Injury

• Upper airway is a good heat exchanger.
• Hot gases cause thermal injury.
• Loose mucosa allows rapid swelling.
• Obstruction in first 5 to 12 hours.
• Diagnosis on history, examination.
• Treat by EARLY intubation.
Sub-glottic Injury

- Smoke is a mixture of particles.
- Particles penetrate to different levels.
- Dissolve to give variety of chemicals (acids and alkalis).
- Cause inflammation of all airways.
- Best diagnosed by bronchoscopy.
- Onset can be days after injury.
- Merges with lung component of SIRS.
• Chiefly CO & HCN.
• Closed space injury.
• Displaces $O_2$ from Hb; blocks cytochromes
• Symptoms of headache, dyspnoea, irritability, confusion, coma, death.
• Usually combined with hypoxia.
• Treat with $O_2$.
• Usual cause of death at scene of fire.
Inhalation Injury

- Obtain adequate history
- Examine for signs of airway burn
- Give Oxygen
- Consider intubation early
- Monitor $O_2$ saturation
Escharotomy
Circumferential Burns

- Deep burns of skin form an eschar which is rigid and impervious
- Fluid leaks from damaged capillaries and progressively accumulates in limb ➔ swells
- If burn is circumferential fluid is trapped in limb which cannot swell ➔ venous occlusion ➔ arterial occlusion ➔ ischaemia

- Elevation of limb reduces swelling

- When signs of peripheral vascular compromise eschar may need to be incised to relieve pressure
  - This is an Escharotomy
Circumferential burn

Escharotomy performed

Pressure released
Be careful of:

- **Ulnar nerve** posterior to medial epicondyle
- **Common peroneal nerve** winding around head of fibula
- **Posterior tibial artery and nerve**, posterior to medial malleolus.
## Structure of EMSB

<table>
<thead>
<tr>
<th>LOOK</th>
<th>DO</th>
<th>PRIMARY SURVEY</th>
<th>CHECK FIRST AID</th>
<th>SECONDARY SURVEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>A</td>
<td>AIRWAY</td>
<td>O2</td>
<td>Spine</td>
</tr>
<tr>
<td>O</td>
<td>B</td>
<td>BREATHING</td>
<td>Haemorrhage control &amp; I.V. access</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>C</td>
<td>CIRCULATION</td>
<td>AVPU &amp; Pupils</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>D</td>
<td>DISABILITY</td>
<td>Environmental Control (&amp; Estimate TBSA)</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>E</td>
<td>EXPOSURE</td>
<td></td>
<td>Support</td>
</tr>
</tbody>
</table>

**Primary Survey**

- Check:**
  - Spine
  - O2
- AVPU & Pupils
- Environmental Control (& Estimate TBSA)

**Secondary Survey**

- **Check:** First Aid
References

- [http://www.skinhealing.com/3_1_burntreatments.shtml](http://www.skinhealing.com/3_1_burntreatments.shtml)
- [http://www.burnsurgery.org/Betaweb/Modules/skinsubstitutes/sec2.htm](http://www.burnsurgery.org/Betaweb/Modules/skinsubstitutes/sec2.htm)
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