Objectives

- Understand how the child is different from the adult in
  - Size
  - Body surface, including temperature regulation
  - Skin thickness
  - Metabolic rate
  - Psychological & developmental characteristics

- Discuss principles of management for pediatric patients with thermal, electric, or chemical burns

- Know how to recognize & report burns due to suspected child abuse
Introduction

Annually

- 2,500 children die from thermal injuries
- 10,000 suffer severe permanent disability
- Second leading cause of accidental death in children
Scald burns

- Most common thermal injuries in children less than 3 years of age
- Prevalent in child abuse

- Flame burns most common thermal injuries in children over 3 years of age
Children have greater BSA / kg of body weight

Example: 7kg child
- Wt = 10% of average 70kg adult
- BSA = 33% of the adult BSA

Larger BSA = greater environmental contact
- Relatively greater fluid needs & evaporative water loss / kg body weight

Adult BSA / wt ratio set by age 15
Children < 2 years of age have disproportionately thin skin

- Responsible for occurrence of full-thickness burns following heat exposure that would produce partial-thickness burn in older patients

- Burns that appear partial-thickness may actually be full-thickness
Temperature Regulation

- BSA--Weight ratio compromises body heat conservation
- Small muscle mass hampers shivering to generate heat
  - Infants < 6 months of age rely on metabolic temp controls & environment
  - Older children can produce heat by shivering
- Highly susceptible to development of hypothermia
Pathophysiology

Injury Depth / Exposure Time
Temperature of Burning Agent

Child
Almost instantaneous
Full Thickness Burn
Tissue Destruction: 5 Sec.
Severe Damage: 10 Sec.
Tolerated for Time

Adult
Almost instantaneous
Full Thickness Burn

160°F
140°F
130°F
111°F

Severe Damage: 30 Sec.
Tolerated for Time
Initial Evaluation

- Events leading to injury
- Past medical history
- Consider potential for abuse

- Immunization & health care history
- Allergies
Initial Evaluation

Extent of Injury Depends Upon

- Patient’s age
- Burn Depth
- BSA involved
Modified “Rule of Nines” for children < 4 years old

- Head & neck = 18%
- Each lower extremity = 15%
- Each upper extremity = 10%
- Torso = 32%

Lund & Browder chart helpful
Immediate Resuscitation

Airway

♦ Prepare for transfer to burn center

♦ Endotracheal intubation indicated in infants & children with
  • Significant respiratory distress
  • Upper airway compromise by edema
  • Large % BSA burns and large volume resuscitation

♦ Assess airway & secure prior to transport
Pediatric Airway: Special Considerations

- Anatomical airway differences from adults
  - Larynx located more cephalad
  - Angulation of glottis more acute
  - Glottis more anterior
  - Narrowest point is cricoid, not glottis

- Gauge tube size by external nares or small finger diameter
- NG tube decompression indicated
Immediate Resuscitation

Circulation

- Begin fluid resuscitation prior to transfer
- Establish large bore periperal IV access
- Administer maintenance **PLUS** resuscitation fluids
  - Maintenance: D₅LR for infants & small children
    1st 10 Kg: 100 cc/kg/24 hr
    2nd 10 Kg: 50 cc/kg/24 hr
    Each Kg above 20 Kg: 20 cc/kg/24 hr
  - Resuscitation (Ringers Lactate)
    Begin at 3-4 cc X Kg X BSA Burn
Circulation: Example

23 Kg child with 20% deep burn

- **Resuscitation (Ringer’s Lactate)**
  \[
  3 \text{ ml} \times 23 \text{ Kg} \times 20\% \text{ Burn} = 1380 \text{ mls}
  \]
  \[
  \frac{1}{2} \text{ in 1st 8 hrs post burn} = 86 \text{ cc/hr}
  \]

- **Maintenance (D}_5{LR)**
  - **1st 10 Kg**: 100 cc/kg/24hr = 1,000 cc/24 hr
  - **2nd 10 Kg**: 50 cc/kg/24hr = 500 cc/24 hr
  - **Remaining 3 Kg**: 20cc/kg/24hr = 60 cc/24 hr
  \[
  1560 \text{ cc/24 hr} = 65\text{cc/hr}
  \]

**TOTAL Hourly Fluid Rate Estimate: 86 cc/hr LR + 65 cc/hr D}_5{LR**
Immediate Resuscitation

Circulation: Monitor Response

- Sensorium
- Blood pH
- Peripheral circulation
- UOP
- Delay or underestimation of fluid needs may increase mortality
- Consult with burn center for ongoing fluid requirements
Wound Care

1) Stop the burning process
2) Remove all clothing
3) Examine the entire body surface
4) Cover burns with **dry clean linen**
5) Keep warm
6) Transfer
Escharotomy

- Extremity or torso release may be necessary

- Rarely required prior to transfer to burn center

- Consult with burn center surgeon
Non-Accidental Injury

Must suspect child abuse when

- Injury pattern not compatible with history given
- Lines of demarcation between normal & burned skin are straight ("glove" or "stocking" pattern)
- There was a delay in seeking medical attention
Consider age-related BSA / Wt ratio
Thin skin: difficult to determine severity of burn injury
Impaired capacity for thermal regulation
Labile physiologic/metabolic responses
Possibility of child abuse/neglect