Burn Management in the Emergency Room

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Objectives

• Identify basic burns that can be cared for in the ED

• Apply up to date care of uncomplicated burns

• Explain features of complicated burns in need of referral to a pediatric burn unit
Let’s Talk Numbers...

• 1990-2006:
  – ~120,856 burns/year treated in US emergency departments in patients <20 years of age
• Males = 58.6%
• Age <6 years = 57.7%
• Occurred in the home = 91.7%
• Thermal burns = 59.5%
• Home discharge = 93.7%
Superficial Burns (1st°)

- Involve only the epidermal layer
- No blisters
- Painful, dry, red
- Blanch
- Heal without scarring
- Most common: sunburns
Partial-Thickness: Superficial

(2nd°)

- Involve epidermis and portion of dermis
- Blister
- Painful, red, weeping
- Blanch
- Superficial → partial-thickness over 1-3 days
- Heal in 1-3 weeks with usually no scarring
Partial-Thickness: Deep (2nd°)

- Extend deeper into the dermis
- Painful to pressure only
- Blisters present
- Wet or waxy appearance
- Mottled, non-blanching
- Hypertrophic scarring common
- Functional impairment high if involves a joint
Full Thickness ($3^{rd}$°)

- Through dermis and often to subcutaneous layer
- Burn eschar typically intact
- Minimal to no pain
- Waxy white, leathery gray, charred black
- Dry skin and inelastic without blanching
- Contracture risk high
Day #1
After Debridement (Day #1)
Day #3
Day #5
4th Degree

• Deep, potentially life-threatening
• Extend through all skin layers to fascia, muscle, and/or bone
Percent Body Surface Area

- Accurate estimate essential for management
- Early transfer when major burn criteria met
- TBSA
  - Total body surface area
  - Superficial burn not included in assessment
  - Presume higher severity of burn when difficult to tell
- Multiple assessment methods
“Rule of Nines”

- More useful in adults
- Less accurate
### Lund-Browder Chart

<table>
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<tr>
<th>AREA</th>
<th>0-1</th>
<th>1-4</th>
<th>5-9</th>
<th>10-15</th>
<th>Adult</th>
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Palm Method

• Quick assessment using surface area of palm
• Palm + fingers = ~1% body surface area
• Include what is open or blisters (no 1st degree)
## Burn Severity Criteria*

<table>
<thead>
<tr>
<th>Burn Type</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
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<tbody>
<tr>
<td><strong>Criteria</strong></td>
<td>&lt;10 % TBSA burn</td>
<td>10 -20 % partial-thickness TBSA burn</td>
<td>&gt;20 % partial thickness TBSA burn</td>
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<tr>
<td></td>
<td>&lt;2 % full-thickness burn</td>
<td>2 -10% full-thickness burn</td>
<td>&gt;10 % full-thickness TBSA burn</td>
</tr>
<tr>
<td></td>
<td>No concern for child abuse</td>
<td>High voltage injury without exit wounds</td>
<td>High voltage burn</td>
</tr>
<tr>
<td></td>
<td>Social circumstances are adequate for home care</td>
<td>&lt;10% TBSA burns to hands, feet, face, and perineum –admission to discretion of burn unit</td>
<td>Known inhalation injury</td>
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<tr>
<td></td>
<td></td>
<td>Suspected inhalation injury</td>
<td>Any significant burn to face, eyes, ears, genitalia, or joints</td>
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<td></td>
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<td>Circumferential burn</td>
<td>Significant associated injuries (fracture or other major trauma)</td>
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<td></td>
<td></td>
<td>Suspected abuse or non-optimal home environment</td>
<td>All burns in patient with chronic underlying disease</td>
</tr>
<tr>
<td><strong>Disposition</strong></td>
<td><strong>Outpatient</strong></td>
<td><strong>Admit to hospital</strong></td>
<td><strong>Refer to burn center</strong></td>
</tr>
</tbody>
</table>

*Children’s Mercy Hospitals & Clinics*
Initial Management

- Stop the burning process
- Stabilize ABC's
- Observe and treat associate injuries
- Begin fluid resuscitation
- Referral Criteria
- Treatment of Minor Burns
Management: All Burn Severities

• Initial assessments
  – Vitals
  – %TBSA
  – Concern of inhalation injury

• Keep patient warm

• Dry/sterile dressings and/or sheet

• Pain medications

• Tetanus status & Allergies
Management: Major Burns

• General management + call for transfer
• IV pain medication
  – Morphine (if not hypotensive) 0.1mg/kg
• IV Fluid resuscitation
  – >10% of partial- or full-thickness burn
  – 20ml/kg Lactated Ringer’s over 30 minutes
  – Parkland Formula:
    • 4cc/kg/% TBSA
    • ½ volume given over 1st 8 hours & 2nd ½ given over the next 16 hours
    • Add maintenance fluid needs
Management: Minor or Moderate

• General management

• Pain control
  – Roxicet 0.1-0.15mg/kg
  – Fentanyl IN 2mcg/kg

• Debridement
  – Goal: clean wound to reduce bacterial colonization and remove dead/necrotic tissue to promote good healing
  – Multiple approaches

• Dressings
Management: Minor or Moderate

- Topical
- Non-adherent
- Dry dressing
Debridement

• Pain medication 20-30 minutes pre-procedure

• Child life or personnel to help with distraction

• Supplies
  – Warm water or saline
  – Liquid Soap
  – 4x4s (LOTS!)
  – Topical ointment: polysporin or SSD
  – Non-adherent guaze +/-
  – Dry dressing
Debridement

• Remove any blisters except:
  – Small ones on palms or soles

• Apply gentle pressure over burn area with wet/soapy 4x4s
  – Is painful
  – Helps to do counts of 10-20 with patient
  – May also need to use dry 4x4s to gain traction

• Apply topical ointment and dressings
Pre-Debridement

Post-Debridement
Abusive Burns

• Scalding as hot water immersion, most commonly reported mechanism
• Abusive burns more severe and complicated
• Typically < 6 yrs, on average 2 to 4 yrs
• Youngest child in sibship at greatest risk
• Abusive burn victims more likely to have signs abuse/neglect and/or CPS reports
• 14 – 19% children with suspicious burns have + skeletal survey
Patterns of Abusive Burns

- Scald
  - Uniformity of burn depth – restrained
  - Bilateral symmetry without splash marks - immersion
- Dry contact
  - Silhouette of object
- Cigarette or cigar
  - Circular pattern
Abusive Immersion Burns

- Spare flexor creases – restrained or withdraw reflex
- Spare soles of feet or point of contact with cooler surface
- Linear or clear demarcation between burned and unburned (glove and stocking)
- Uniformity of burn depth
- Absence of splash
- Hands, feet, genitalia, buttocks
Immersion Burn
Accidental Scald Burn

- Splash marks
- Hot water splash >140F results in burn
- Burn less intense as liquid runs down and dissipates heat
- Flexor creases spared due to withdraw reflex
- Distribution and margins are asymmetric
- Pattern influenced by clothing and type liquid
Burn Injuries

Common Kitchen Accidents
Child versus Adult Skin

- Children's skin thinner (>5 yr approximate adult thickness)
- Inverse relationship thickness, temperature and time necessary to induce burning
- >130° F (54° C) children burn in a quarter of the time it takes adult skin to burn
Thermal Contact Burns

Cigarette burns are usually inflicted on palms, soles, and buttocks.

Abuse must be suspected if burn is in configuration of common household utensil or appliance, especially if burn is located where injury could not be accidental.
Cigarette Burn Scars
Cigar Burn
Accidental Contact Burns

Indistinct margins

Do not occur in multiples

Usually on parts of body not clothed (hands, feet, face)
Single Clothing Iron Burn
Chemical Burns

- Alkali agents cause deeper penetration and more extensive burns than acid.
- Adult drug use is a risk factor for caustic ingestions, burns.
- Ask about exposures to chemicals in garages, kitchens, and bathrooms.
Accidental Chemical Burns

Laxative use:
- Active ingredient: Senna
- Anthraquinone Laxative
Chemical Burn due to Diarrhea
Skin Condition Mimicking a Burn

- Phytophotodermatitis
  - Psoralens in juice on exposure to sun
  - Phototoxic reaction
Phytophotodermatitis
Skin Infection that Can Mimic Burn

Impetigo
Skin Conditions Mimicking Burns

Diaper Dermatitis
Folk Medicine
Popular Health Practices in Some Cultures

Coining or Spooning

Cupping
Mimics

- Toxic Epidermal Necrolysis
- Stevens Johnson Syndrome
- Staphylococcal Scalded Skin Syndrome
- Blistering distal dactylytis
- Epidermolysis bullosa
- Bullous impetigo
- Focal pyoderma
- VZV scaring
- Ammoniacal diaper dermatitis
- Cultural practices
Clues

- Prior accidental burns
- History does not match burn pattern
- Burn history not consistent with child’s development
- Delay in seeking care
- Certain patterns
- Burns localized to genitalia, perineum, buttocks, bilateral lower extremities, hands
- Presence of additional or older injuries
History of the Burn

• Where is the burn?
• What produced the burn?
  – $H_2O =$ water heater temp?, water use history?, flowing or pooled water?, where did it come from?
  – Chemical= what is the chemical?, where is it?, how long was the contact time?
  – Explanation of the burn injury- history taken from caretakers individually
History of the Burn

• Date & time burn occurred
• Location of the child at the time the burn occurred
• Presence or absence of clothing/ diapers
• Witnesses?
• Time from burn until presentation for care
• Parent and child reaction to the burn
• Developmental level of the child
• Prior injury or accidents
• Family composition and home environment
Examination of the Child

- Exam by Child Abuse Pediatrician
- Head to Toe evaluation
- Photographs of the injury with multiple different views and positions
- Work up for other injuries – skeletal survey for children < 2 yrs
- 14 – 19% children with suspicious burns have + skeletal survey
Burn Scene Investigation by Law Enforcement

- Help us gather information about the scene to aid in the forensic interpretation of the burn injury
- Supplies: Scientific thermometer for liquids, measuring tape, stop watch and camera
- Burn Worksheet
- Doll may be helpful for re-enactment
Accident or Neglect?

- How foreseeable and preventable was the accident?
- What is the severity of the injury?
- How do the caretaker’s actions compare to the standard in the community?
- What is the overall level of concern about the child’s welfare?
- What is the potential for the child to be injured again?
# Duration of Exposure Required to Produce Full-thickness Burns

<table>
<thead>
<tr>
<th>Water temperature</th>
<th>Duration of Exposure</th>
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<tbody>
<tr>
<td>120°F</td>
<td>10 minutes</td>
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<tr>
<td>130°F</td>
<td>10 seconds</td>
</tr>
<tr>
<td>140°F</td>
<td>1 second</td>
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<tr>
<td>150°F</td>
<td>0.5 seconds</td>
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Burn Prevention

• Smoke alarms
• Water heaters set to 120 degrees F
• Assistance with utility bills
• Proper use of space heaters
• Flame resistant sleepwear
• Proper handling, supervision of clothing and curling irons
• Appropriate supervision of children in the kitchen, bathroom
Management: Not sure what to do

- Call Burn Unit
  - 816-234-3520
  - Ask for a Burn Nurse

- Email pictures if you are able
  - Remember obtain consent

- Describe the injury
  - % TBSA
  - Area of injury
  - When it occurred
  - What caused it

- Your management & follow-up plans
  - Any other considerations?
  - Provider should call for Burn Unit follow-up appointment
CMH Burn Unit
References


References


• Google images