The ABC’s of Pediatric Burns

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Disclosures

• I have no relevant financial disclosures

• I have no known conflicts of interest

• Viewer Discretion: This presentation contains graphic photographs of burns

UF Pediatric Surgery

• The Division of Pediatric Surgery provides comprehensive surgical and perioperative care to UF Health patients from birth to 18+ years including:
  – 24/7 Pediatric Trauma coverage (patients aged 0-16 years as defined by the state)
  – Emergent and life-saving Extracorporeal Membrane
    Oxygenation (ECMO) support in non-cardiac pediatric patients
    * Provide back-up ECMO support for UF Congenital Heart Center
  – Surgical support (including ECMO) for UF Health Shands
    Children’s Hospital Level-3 NICU
    * Our Congenital Diaphragmatic Hernia program led by Dr. David Keys
      is nationally recognized with survival rates exceeding national averages
  – Comprehensive Pediatric Burn Care
  – Cutting edge minimally invasive procedures
  – Numerous elective procedures from minor outpatient procedures to major operations
The ABC’s of Pediatric Burns

Superficial (1st Degree)

Superficial Partial-thickness (2nd Degree)

Deep Partial-thickness (2nd Degree)
Full Thickness (3rd Degree)

4th Degree (bone & tendon)

Approaching the Burn

• Stop the burn process
• Primary Survey
  – ACS ATLS Protocol (ABC’s)
• Initial Resuscitation
• Secondary Survey
• Initial Debridement and Wound Care
• Skin Grafting
Stop the Burn

Primary Survey

- Airway
  - Inhalation injury, airway edema
- Breathing
  - Ventilation
- Circulation
  - Shock, vascular compromise
- Disability/Neuro
- Environment

Initial Resuscitation

- IV access
  - 2 large bore IVs, interosseous
- Foley catheter
- IV Fluids
  - Parkland Formula
  - Significant fluid demands
Resuscitation

- Parkland Formula
  - >15% TBSA
  - 4ml/kg/%TBSA
    - e.g. 60kg * 45% burns * 4ml/kg/%TBSA
      = 10,800 mL
  - ½ in first 8h; remainder over 16h
- Transition to definitive care
- Nutrition
  - Galveston formula

Secondary Survey

- Systematic head-to-toe
- Formal evaluation of burn extent
  - Total Body Surface Area percentage (TBSA%)
  - “Rule of 9’s”
  - Lund & Browder Chart
  - Using patient’s palm of hand (smaller children)
- Labs, Imaging, etc.

TBSA % - “Rule of Nines”

Inhalation injury

- Breathing super heated air, as well as smoke
- Burns to the airway
- Debris in distal airway (‘soot’)
- Carbon Monoxide (indoor burn) and other gases
- Bronchoscopy and washouts
  - Bronchodilators
  - Aerosolized heparin

Initial Debridement & Wound Care

- Cleansing & debridement
- Topical antimicrobial agents
- Dressings
  - Compresses
  - Biosynthetics
  - Biologics
Excision & Grafting

- Follows fluid resuscitation
- Excision
  - Sharp / Hydrosurgery – to healthy bleeding tissue

Grafting

- Allograft
- Xenograft
- Autograft
  - Split thickness
  - Full thickness
  - Sheet graft
- Cultured Epithelial Autograft (CEA)
  - Compassionate use only (FDA)
  - “Experimental”

### TABLE 10-2
Criteria for Referral to a Burn Center

1. Partial thickness burn > 30% total body surface area (TBSA)
2. Burns of face, hands, feet, genitalia, perineum, or major joints
3. Third-degree burns in any age group
4. Electrical burns, including lightning injury
5. Chemical burns
6. Inhalation injury
7. Burn injury complicated with preexisting medical disorders that could complicate management, including respiratory or renal failure
8. Any patient with burns and concurrent trauma (such as fractures) in which the burn injury is the greatest risk or morbidity or mortality in such cases
9. If the triage assesses the greater morbidity risk, the patient’s condition may be stabilized initially in a trauma center before transfer to a burn center. Please consult your burn center.
10. Parenteral nutrition necessary in such situations and should be in concert with the regional medical center and burn center
11. Burn injury in patients who will require special social, emotional, or rehabilitative intervention

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UF Pediatric Burn Care

- Pediatric Surgery provides comprehensive burn care to pediatric patients as part of UF Health's Level 1 Trauma Center and ABA verified Burn Center
  - Care for burn wounds up to 50% TBSA
  - Use cutting edge technology such as Cultured Epithelial Autograft (cultured skin cells)
  - Collaborate with Burn Center nursing staff, physical and occupational therapy and social work to provide pediatric centered care
  - Work closely with law enforcement, Child Protective Services and DCF to protect children that have suffered intentional burn injuries

Patient T

- 14 yo male, unrestrained backseat passenger in single vehicle crash
  - Patient came into contact with high voltage live wire during escape
  - No LOC / other significant injuries
  - Initially estimated burn ~25% TSBA
    - Following Burn ICU debridement =45% TSBA
    - Burns to:
      - Bilateral UE
      - Torso / groins / genitals
      - Bilateral LE (with circumferential burns to LLE
      - Full thickness burns (3rd & 4th degree [foot])
Initial Management

- ATLS® Protocol
- Fluid resuscitation
  - Parkland formula
    - $4 \times (\text{wt} \text{ (kg)}) \times \text{TSBA} = \text{Fluid req 1st 24h}$
    - Calculated from time of burn
    - $\frac{1}{3}$ given over 1st 8h; remaining over 16h
    - This is in addition to maintenance IVF
- Initial burn debridement in BICU
- Cardiac and renal function monitoring
- Nutritional support / beta-blockade
Hospital Course (briefly!)

- 4 month hospitalization (5/19 – 9/14)
  - Rehab ~2 weeks (9/14 – 9/27)
- Underwent 10 operations
  - Debridement & allografting
    - 5/21, 5/24, 5/27, 6/2*
  - Left below knee amputation (BKA) – 6/8
  - Additional debridement & grafting
    - 7/1* & 7/11
    - 7/31 – final debridement & autograft harvesting
  - Cultured Epithelial Autograft (CEA) placement
    - 8/1 – 48 sheets (2880cm² or ~9 ft²)
    - Final operation 8/16 (EUA, staple removal)

Hospital Course (cont’d)

- Average OR case length: ~3.5 hours
- Received ~25 units of PRBC
- Daily burn wound dressings to 45% TSBA
- Multiple Pseudomonas colonizations
- Burn ICU closure
- 14 days of strict bed-rest following CEA placement
- Prolonged feeding tube
- Narcotic dependence
- Hours of PT / OT
Summary

• Scald burns/Thermal burns are very common in the pediatric population
• Determination of depth is critical
• Initial Resuscitation and Wound Care
• Pediatric patients require specialized care for burn wounds
• UF Health Shands Children's Hospital provides comprehensive burn care to children

Questions

Go GATORS!!!!