BURNS

...more than just another soft tissue injury

Burn Epidemiology

• 2,500,000/year
• 100,000 hospitalized
• 12,000 deaths

Second leading cause of trauma deaths after motor vehicle accidents.

Skin Form & Function

• Largest body organ
• More than just a passive covering
• Functions:
  • Sensation
  • Protection
  • Temperature regulation
  • Fluid retention

Anatomy and Burn Classifications

Epidermis

• Outer layer
• Top consists of dead, hardened cells
• Lower epidermal layers form stratum corneum and contain protective pigments

Dermis

• Elastic connective tissue
• Contains specialized structures
  • Nerve endings
  • Blood vessels
  • Sweat glands
  • Sebaceous (oil) glands
  • Hair follicles
Subcutaneous/Muscle
• Fat (protective layer)
• Muscle for support, movement, coordination
• Depth of burn?

Major Concerns
• Loss of fluids
• Inability to maintain body temperature
• Loss of flexibility
• Infection

Superficial Burns
• Superficial (First degree)
  • Involves only epidermis
  • Red
  • Painful
  • Blanches under pressure
  • Possible swelling, no blisters
  • Heal in ~7 days

Partial Thickness Burns
• Partial Thickness (Second degree)
  • Extends through epidermis into dermis
  • Salmon pink
  • Moist, shiny
  • Painful
  • Blisters may be present
  • Heal in ~7 to 21 days

Partial Thickness Burns
• Burns that blister are second degree.
• But all second degree burns don’t blister.

Full Thickness Burns
• Full Thickness (Third degree)
  • Through epidermis, dermis into underlying structures
  • Thick, dry
  • Pearly gray or charred black
  • May bleed from vessel damage
  • Painless
  • Require grafting
Burn Depth

- Often cannot be accurately determined in acute stage
- Infection may convert to higher degree
- When in doubt, over-estimate
Burn Extent: Rule of Nines

Burn Extent: Rule of Thumb

"Rule of Palm"
- Patient’s palm equals 1% of his body surface area

Burn Severity
- Depth
- Extent
- Location
- Cause
- Patient Age
- Associated Factors

Critical Burns
- Full-thickness burns involving hands, feet, face, upper airway, genitalia, or circumferential burns of other areas
- Full-thickness burns covering more than 10% of total body surface area
- Partial-thickness burns covering more than 30% of total body surface area (book says 25%)
- Burns associated with respiratory injury

Critical Burns, continued
- Burns complicated by fractures
- Burns on patients younger than 5 years old or older than 55 years old that would be classified as moderate on young adults

Moderate Burns
- Full-thickness burns involving 2% to 10% of total body surface area excluding hands, feet, face, upper airway, or genitalia
- Partial-thickness burns covering 15% to 30% of total body surface area
- Superficial burns covering more than 50% of total body surface area
- Age: <5 or >55 = 10% to 20%
**Minor Burns**

- Full-thickness burns involving less than 2% of the total body surface area
- Partial-thickness burns covering less than 15% of the total body surface area (10% < 5 or > 55)
- Superficial burns covering less than 50% of the total body surface area

**Associated Factors**

- Patient Age
  - < 5 years old
  - > 55 years old
- Burn Location
  - Circumferential burns of chest, extremities

**Stop Burning Process!**

- Remove patient from source of injury
- Remove clothing unless stuck to burn
- Cut around clothing stuck to burn, leave in place

**Initial Assessment**

- Scene Safety
- BSI
- Determine MOI/Severity
- Number of Patients
- Additional Resources

**Assess Airway/Breathing**

- Start oxygen if:
  - Moderate or critical burn
  - Decreased level of consciousness
  - Signs of respiratory involvement
  - Burn occurred in closed space
  - History of CO or smoke exposure
  - Assist ventilations as needed
Assess Circulation

- Check for shock signs /symptoms

  Early shock seldom results from effects of burn itself.
  Early shock = Another injury until proven otherwise

Obtain History

- How long ago?
- What has been done?
- What caused burn?
- Burned in closed space?
- Loss of consciousness?
- Allergies/medications?
- Past medical history?

Rapid Physical Exam

- Check for other injuries
- Rapidly estimate burned, unburned areas
- Remove constricting bands

Treat Burn Wound

- DO NOT apply ointments or creams
- Superficial Burn:
  - Cool, moist dressings
  - Protect from exposure to air
- Partial/Full Thickness Degree Burns:
  - Cover with dry dressing (commercial burn sheets are acceptable)

Pediatric Considerations

- Thin skin, increased severity
- Large surface to volume ratio
- Poor immune response
- Small airways, limited respiratory reserve capacity
- Consider possibility of abuse

Burns in Infants and Children

- Critical Burns:
  - Full-thickness burns covering > 20% of BSA
  - Burns involving hands, feet, face, upper airway, genitalia
- Moderate Burns:
  - Partial-thickness burns 10%-20% of BSA
- Minor Burns:
  - Partial-thickness burns < 10% of BSA
Geriatric Considerations

- Thin skin, poorly circulation
- Underlying disease processes
  - Pulmonary
  - Peripheral vascular
- Decreased cardiac reserve
- Decreased immune response
- % Mortality = BSA burned (Age + %)

Concerns:

- Hypoxia
- Carbon monoxide toxicity
- Upper airway burn
- Lower airway burn

Carbon Monoxide Poisoning

- Product of incomplete combustion
- Colorless, odorless, tasteless
- Binds to hemoglobin 200x stronger than oxygen
- Headache, nausea, vomiting, “roaring” in ears
- Exposure makes SpO2 useless!

Upper Airway Burn

- True Thermal Burn
- Danger Signs
  - Neck, face burns
  - Singing of nasal hairs, eyebrows
  - Tachypnea, hoarseness, drooling
  - Red, dry oral/nasal mucosa

Lower Airway Burns

- Chemical Injury
- Danger Signs:
  - Loss of consciousness
  - Burned in a closed space
  - Tachypnea (+/-)
  - Cough
  - Rales, wheezes, rhonchi
  - Carbonaceous sputum
Concerns:
- Damage to skin
- Absorption of chemical; systemic toxic effects
- EMS personnel exposure
- Hazmat incident?

Management
- Remove chemical from skin
- Liquids
  - Flush with water
- Dry chemicals
  - Brush away
  - Flush what remains with water

Chemical Burns
- Occur whenever a toxic substance contacts the body
- Eyes are most vulnerable.
- Fumes can cause burns.
- To prevent exposure, wear appropriate gloves and eye protection.

Care for Chemical Burns
- Remove the chemical from the patient.
- If it is a powder chemical, brush off first.
- Remove all contaminated clothing.

Care for Chemical Burns, cont'd
- Flush burned area with large amounts of water for about 15 to 20 minutes.
- Transport quickly.
Specific Chemical Burns

- Phenol
  - Not water soluble
  - Flush with alcohol
- Sodium/Potassium/Magnesium
  - Explode on water contact
  - Cover with oil

Specific Chemical Burns

- Tar
  - Use cold packs to solidify tar
  - Do NOT try to remove
  - Tar can be dissolved with organic solvents later

Chemical Burns to the Eye

- Hold open eyelid while flooding eye with cold water.
- Continue flushing en route to hospital.
- Do not use other chemicals

Electrical Burns

Current kills, not voltage!

Considerations:

- Intensity of current
- Duration of contact
- Kind of current (AC or DC)
- Width of current path
- Types of tissues exposed (resistance)

Electrical Burns

- Non-conductive injuries:
  - Arc burns
  - Ignition of clothing
- Conductive injuries:
  - “Tip of iceberg”
  - Entrance/exit wounds may be small
  - Massive tissue damage between entrance/exit
Electrical Entrance/Exit Wounds

Other Complications
- Cardiac arrest/arrhythmias
- Respiratory arrest
- Spinal fractures
- Long bone fractures
- Internal organ damage

Electrical Burn Management
- Make sure power is off before touching patient.
- Check ABCS
- Two wounds to bandage.
- Transport patient and be prepared to administer CPR.

ALS Indicators
- Possible airway involvement including singed facial hair, soot in mouth/nose, or hoarseness
- Burns with injuries: shock, fractures, or respiratory problems
- Partial or full thickness burns to the face
- Partial or full thickness burns > 20% BSA
- Severe pain (ALS pain control)