

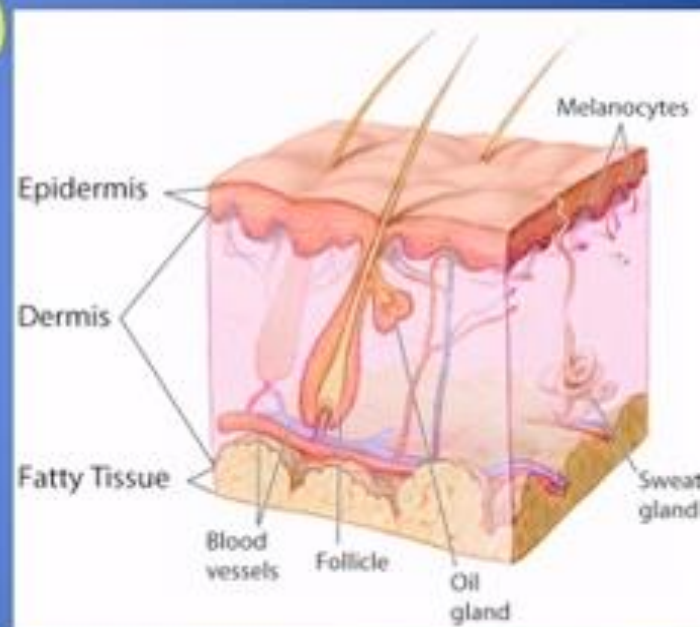
# Burn review

By

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# A&P of Skin

- Epidermis – outer layer (nonvascular)
  - Provides protection
  - Varies in thickness (ie palm vs cheek)
- Dermis – second layer
  - Has collagen, capillaries, nerve endings, sweat/oil glands, hair follicles
- Subcutaneous tissue – third layer
  - Attached to dermis by collagen fibers
  - Contains fat, nerves, lymphatics and cushions muscles, tendons, bones, internal organs



# A&P of Burn Injury

- Immediate release of catecholamines and other mediators
  - Increased BP and HR, vasoconstriction, disrupted blood flow
- Increased capillary permeability
  - Edema anywhere including lungs, third spacing, low Na, hypovolemia, massive fluid shifts, HR high, CO low
- Decreased perfusion to GI system
  - Paralytic ileus, abd distension, Curling's ulcer



# A&P of Burn Injury

- Myoglobin and K released from cell damage
  - ATN (kidney damage), high K
- Inflammatory response, destroyed skin
  - Immunosuppression, risk of infection/sepsis, loss of ability to sweat
- Increased demand on the metabolic system
  - Massive catabolism and increased need for calories, increased body temp, increased oxygen demand
- RBCs hemolyzing causing hemoconcentration
  - High Hct, high Hgb, increased blood viscosity

# Types of Burns

- Thermal



- Chemical



- Smoke Inhalation

- CO poisoning
- Upper Airway
- Lower Airway



- Electrical





# Thermal Burns

- Most common burn injury
- Flame, flash, scald, contact with hot objects
- Can require escharotomy



Figure 5. This figure demonstrates medial and lateral midaxial escharotomies. Note the physician in the upper left hand corner, preparing to clean the wounds, which is done after the emergent escharotomies are performed.



Figure 6. This figure demonstrates a medial midaxial escharotomy of the leg, which is in very close proximity to the ideal medial fasciotomy incision, should one need to be performed.

# Chemical Burns

- Acids, alkalis, organic compounds
- Alkalis are worse than acids
- Can also cause systemic symptoms
- Remove any dry chemical particles from the skin with a dry brush
- Dilute with water to stop causing tissue destruction
- Don't use neutralizing agents unless you have identified the specific chemical
- White phosphorus (used in meth) embeds in the skin and ignites when exposed to air





# Smoke Inhalation Injuries

- Suspect for any burns of the head, neck, chest or a burn that occurred in an enclosed space
- Suspect if singed nasal hairs, hoarseness, coughing, airway redness, sore throat, carbon in sputum
- Major predictor of mortality in burn patients
- Lower airway injury is more likely from chemical exposure, can lead to pulmonary edema and ARDS
- Administer 100% humidified oxygen by mask, perform frequent respiratory assessment



# Carbon Monoxide Poisoning

- Displaces oxygen on the Hgb molecule causing carboxyhemoglobinemia and hypoxia
- “Cherry red” skin, headache, n/v, unconsciousness or change in LOC
- Burns don't cause unconsciousness
- Give 100% humidified oxygen



Day 1



Day 8



# Electrical Burns

- Current produces heat causing extensive tissue damage, also damage to nerves and vessels
- Sparks can ignite clothing
- Can cause muscle contractions so strong that bones are broken and falls are caused (always assume they have C-spine injury)
- Most damage is below the skin (iceberg effect)
- Can cause cardiac and renal problems
- Need EKG/cardiac monitoring ASAP



# Classification of Burns

- Depth (degree – 1<sup>st</sup>, 2<sup>nd</sup>, full thickness, etc.)
- Extent in percent of TBSA (rule of 9s)
- Location
- Patient Risk Factors



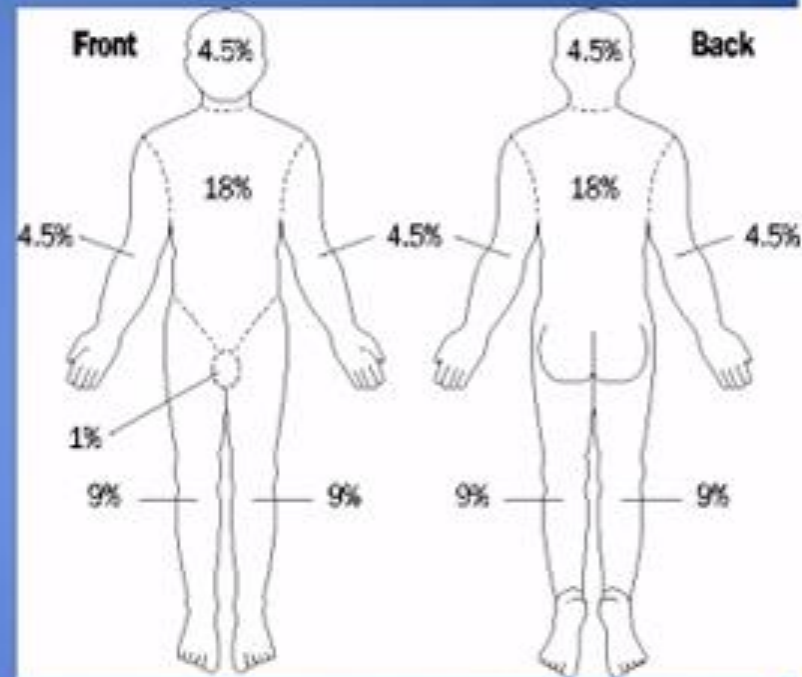
# Burn Depth

- Partial-thickness, superficial (1<sup>st</sup> degree)
  - No blisters, red, pink, dry, painful; only epidermis, heals in 5 days
- Partial-thickness, deep (2<sup>nd</sup> degree)
  - Blisters, red, shiny, wet, severe pain, some edema; includes part of dermis, heals in 1-2 weeks
- Full-thickness (3<sup>rd</sup> & 4<sup>th</sup> degree)
  - Lots of color variation – dry, waxy white, leathery, hard, no pain; all of epidermis and dermis
  - Can not grow new skin, requires skin grafts



# Extent of Burn

- Primarily for adults
- Add posterior and anterior sides of the body separately
- Perineum is 1%, each hand is 1%, each arm is 4.5%, head is 4.5%, each leg is 9%, torso is 18%
- Don't include 1<sup>st</sup> degree burns when calculating
- Can be revised after edema resolves



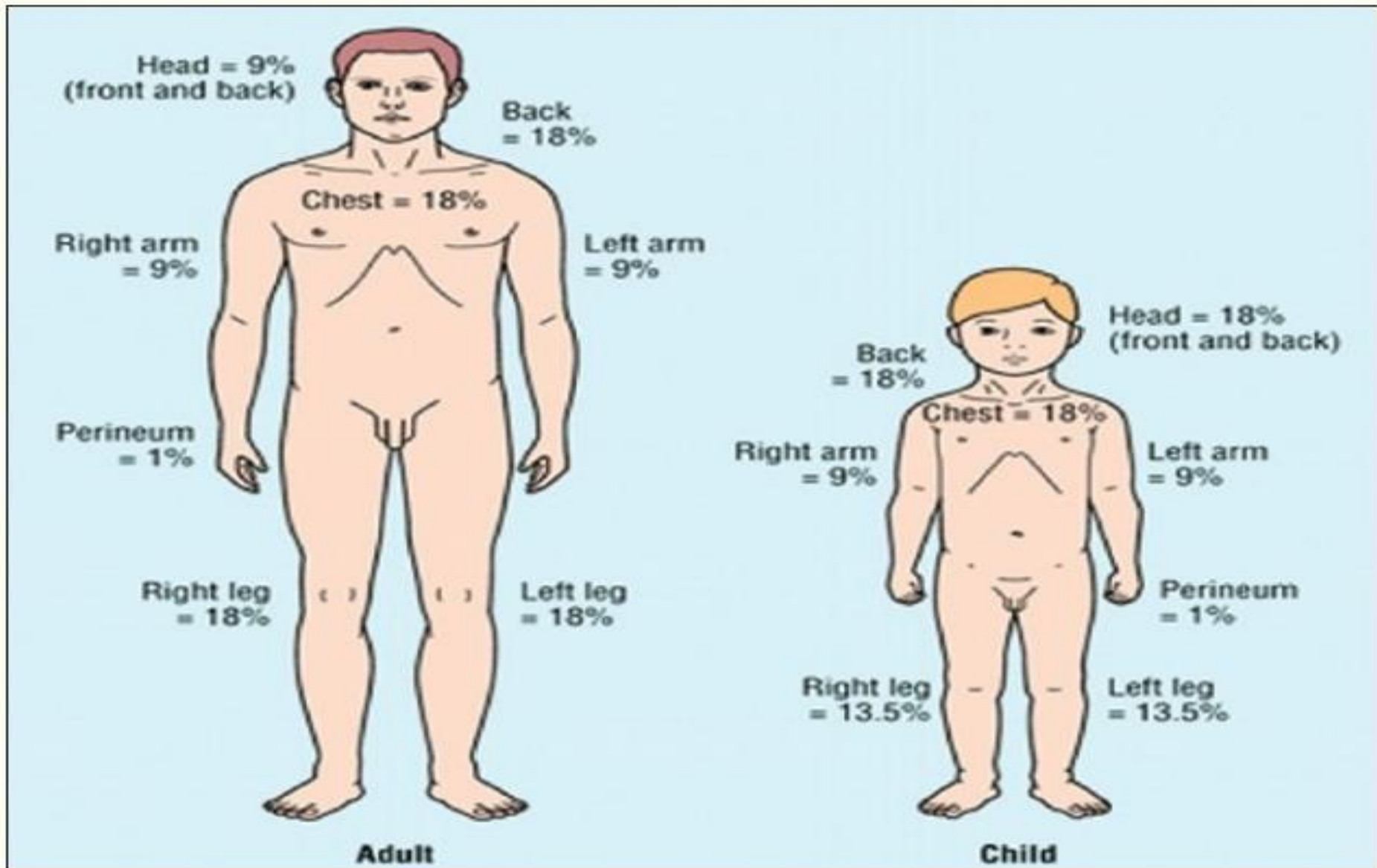


Figure 1

Comparative proportions of total body surface area distribution between adults and children



# Location of Burns

- Burns to eyes, face, hands, feet, and perineum are always considered serious
- Circumferential burns to chest/back or extremities are serious



# Other Risk Factors Increasing Burn Classification

- Older adults
- Any preexisting CV, respiratory or renal disease, diabetes, peripheral vascular disease
- Alcoholism or drug abuse
- Malnutrition
- Any additional injuries besides the burn



# Phases of Burn Injury

- Emergent – resuscitative care, resolve immediate life-threatening problems, usu. lasts 48-72 hrs
  - Goal is to secure airway, maintain temp, and prevent hypovolemic shock
  - Shock is most common cause of death
- Acute – diuresis until wound closure, can take weeks to months
  - Goals are to prevent infection, wound care, pain control, optimal nutrition and PT
  - Infection is most common cause of death
- Rehab – restorative; overlaps with the acute phase and continues after discharge; as early as 2 weeks or up to 7-8 months
  - Begins when wounds are healed and pt is able to do self care
  - Goals are to achieve maximal function, have psychological adjustment, and gain independence



# Burn Care Goals

- Prevent infection
- Restore fluid balance
- Thermoregulation
- Adequate pain control
- Restore skin integrity
- Adequate nutrition
- Provide emotional support

# Pre-Hospital Care

- Stop the burning process (irrigate with water)
- If large, focus on ABCs
- Prevent hypothermia
- Never use ice (will vasoconstrict)
- Remove as much burned clothing as possible
- Remove rings, watches
- Identify chemicals
- Give 100% humidified oxygen
- EKG if electrical burn

# Cardiovascular Care

## Emergent Phase

- CV-dysrhythmias, hypovolemic shock, circulation impairment, sludging, VTE, heart failure
- Tx – escharotomy if necessary to prevent circulatory impairment, fluid replacement, baseline EKG

## Acute Phase

- Same complications as emergent phase



# Respiratory Care

## Emergent Phase

- Cx – edema/obstruction/constriction, pulmonary edema, resp infection
- Tx – CXR, ABGs, frequent assessment, early intubation, escharotomy if necessary, fiberoptic bronchoscopy, 100% humidified oxygen if not intubated, high Fowlers, TCDB hourly, chest PT, sx

## Acute Phase

- Same complications as emergent phase, but also pneumonia

# Neuro Care

## **Emergent Phase**

- Should not have any neuro symptoms unless they have other injuries

## **Acute Phase**

- Cx – odd behaviors
- Tx – may need psych services

# Musculoskeletal Care

## Emergent Phase

- Assess for other injuries
- Start ROM
- Positioning is critical

## Acute Phase

- Cx – Limited ROM, contractures
- Tx – stretch and move as much as possible, splints, ROM 3 times/day, ambulation, pressure garments, surgical release of contractures as needed



# Fluids & Electrolytes Care

## Emergent Phase

- Tx – 2 large-bore IV lines, arterial line, warmed LR using the Parkland formula, hourly urine output (30-50 mL/hr), also watch MAP and BP, warm room, covers, no diuretics (instead adjust IV fluids)

## Acute Phase

- Watch electrolytes closely as the body tries to achieve homeostasis

# Parkland Formula

- Fluid needs in 1st 24 hrs -  $4 \text{ mL} \times \text{kg} \times \% \text{ TBSA burn}$
- LR only (crystalloids)
- Give  $\frac{1}{2}$  of total volume (for 24 hrs) in 1<sup>st</sup> 8 hrs, give the  $\frac{1}{2}$  of total volume (for 24 hrs) in the next 16 hrs
- Calculate hours from time of injury (not time of arrival)
- Example - 75 kg person with a 20% TBSA burn
  - $4 \times 75 \times 20 = 6000 \text{ mL}$  (3000 in 1st 8 hrs, 3000 in next 16 hrs)

# GI/Nutritional Care

## Emergent Phase

- Cx – paralytic ileus, Curling's ulcer
- Feed early (w/in hrs of injury) and aggressively
- Enteral preferred
- NG if paralytic ileus or intubated
- High protein, high calorie
- Supplements
- Prophylactic tx to prevent stress ulcers
- Test for occult blood

## Acute Phase

- Cx – paralytic ileus, diarrhea, constipation, Curling's ulcer, hyperglycemia
- Tx – daily weight, feed, give antacids/H2 blockers/PPIs, IV insulin, need 5000+ calories/day, need increased protein, TPN is last resort



# Skin/Wound Care

## Emergent Phase

- Not a priority until after airway, circulation, and fluid replacement unless they have circumferential injuries that are limb-threatening
- Clean and gently debride to remove necrotic skin
- Elevate burned extremities

## Acute Phase

- Cx – infection, sepsis
- Hand hygiene!!
- No shared equipment
- Shower daily with tap water
- Twice a day dressing change – clean and debride
- Remove dsg with nonsterile gloves and clean, use sterile gloves to apply ointments and sterile dsgs
- Use PPE (hats, masks, gloves, gowns)
- Keep room warm (85 degrees)
- Keep the wound covered

# Special Skin Care

- Face – can get very swollen, limit pressure, may need eye ointment and tears
- Ears – limit pressure, no pillows, elevate using rolled towel under the shoulders
- Head/neck – no pillows, use rolled towel
- Hands/arms – extend, elevate, splints to keep in functional position
- Perineum – keep as dry and clean as possible, Foley
- PT must begin immediately with early ROM



# Procedures

- Excision and grafting – usu. done day 1 or 2 in the OR, will cover the wounds
  - Cx – bleeding (tx – topical thrombin or epinephrine)
  - Donated skin site will create a new open wound (allograft)
  - Grafts are very fragile
- Escharotomy – no pain, no anesthesia but give sedation and analgesia, subcu tissue only
- Fasciotomy – deeper incision into the fascia, painful



# Medications

- Analgesics/sedatives – IV only (no IM or oral), need opioids
- Tetanus immunization for everyone
- Antimicrobials – not systemic unless they have positive cultures, use topically, also silver sulfadiazine (watch for Sulfa allergy)
- VTE prophylaxis
- Stress ulcer prophylaxis

# Pain Management

- Continuous pain and treatment-induced pain
- Medications first
  - PCA
  - Opioids (morphine, Dilaudid, Fentanyl)
  - Slow-release opioids if no IV (ie. MS Contin)
  - Around the clock oral analgesics
  - Add anxiolytics (ie. Ativan, Versed)
  - Pre-medicate before dressing changes
- Add non-pharmacologic strategies
- Give the patient as much control as possible

# Rehab Phase

- Cx – skin/joint contractures, hypertrophic scarring
- Protect new skin from sunburn
- Custom-fitted pressure garments
  - Only wear over healed wounds
  - Leave on at all times except during bathing
    - 23 hrs/day for 12-24 months
- Encourage self care, promote what they can do instead of what they can't, keep morale up
- Help them adjust psychologically



thanks