

Introduction to Thermal Injury: Burn Care and Management of the Cold Injury Patient

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Priorities

- Airway
- Breathing
- Circulation
- Disability (Mini-Neurologic Exam)
- Exposure/Temperature Control



Airway

- Extensive facial burns
- Burns of oro/hypopharynx
- Burns of nasal hair
- Carbonaceous sputum
- Signs of airway obstruction



<http://www.emedicine.com/aaem/topic406.htm>

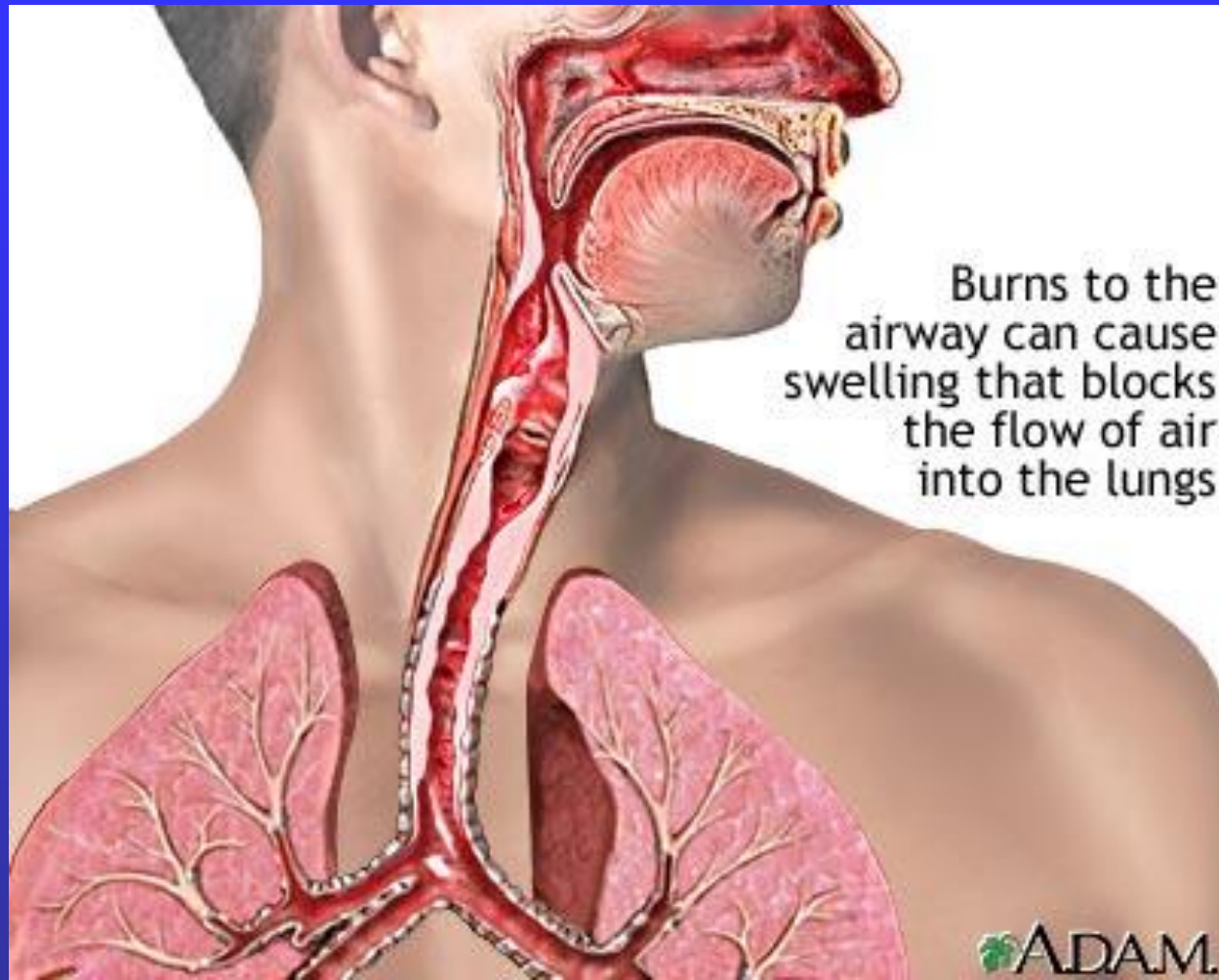
Intubation



Signs of Airway Obstruction

- Inspiratory Stridor
- Paradoxical Motion of Chest Wall
- Use of Accessory Muscles of Respiration
- Tachypnea
- Tachycardia
- Flaring of the Ala Nasae
- Sweating





Burns to the
airway can cause
swelling that blocks
the flow of air
into the lungs

ADAM.



Inhalation Injury

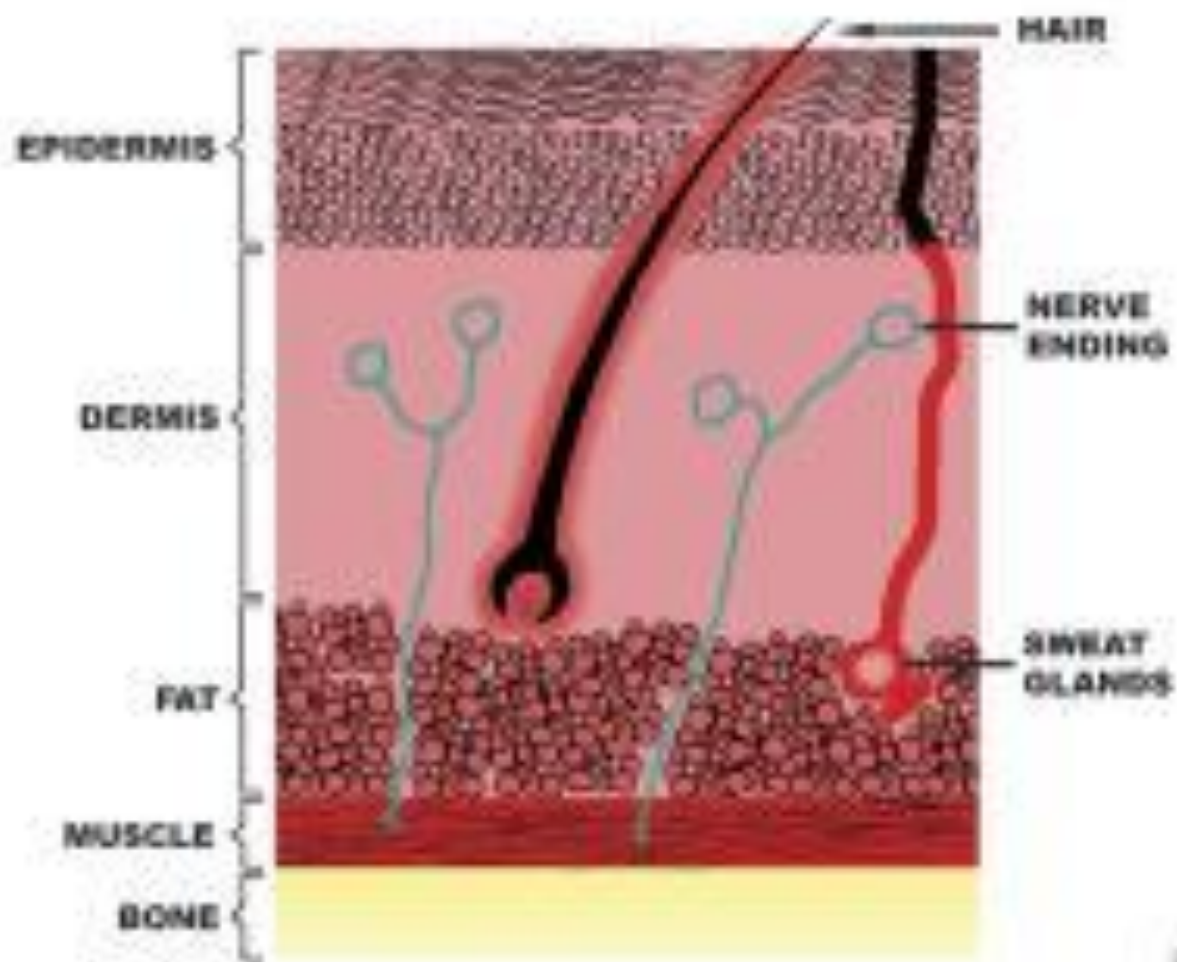
- Measure Carboxyhemoglobin level
- Consider diagnostic bronchoscopy
- V/Q Scan – an accurate test but rarely done
- Observe carefully—resembles clinical picture of chlorine and phosgene gas weapons
- Deterioration often occurs over the course of 24-72 hours



Circulation

- Pulse/Blood Pressure Assessment
- Stop external bleeding
- Vascular Access/Type and Crossmatch
- Assess Depth and Extent of Burn
- Calculate estimated fluid requirements

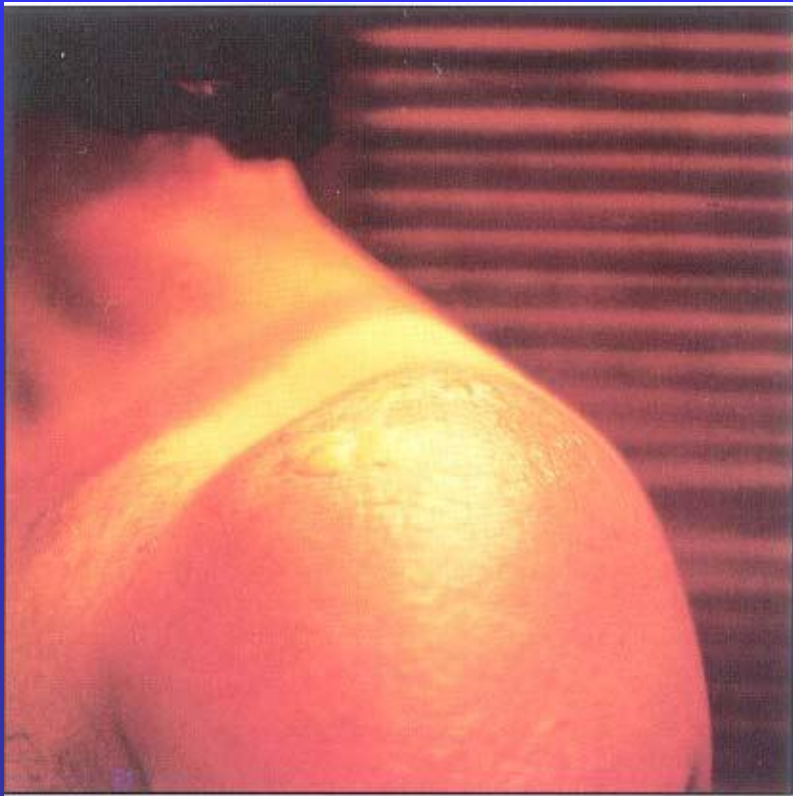


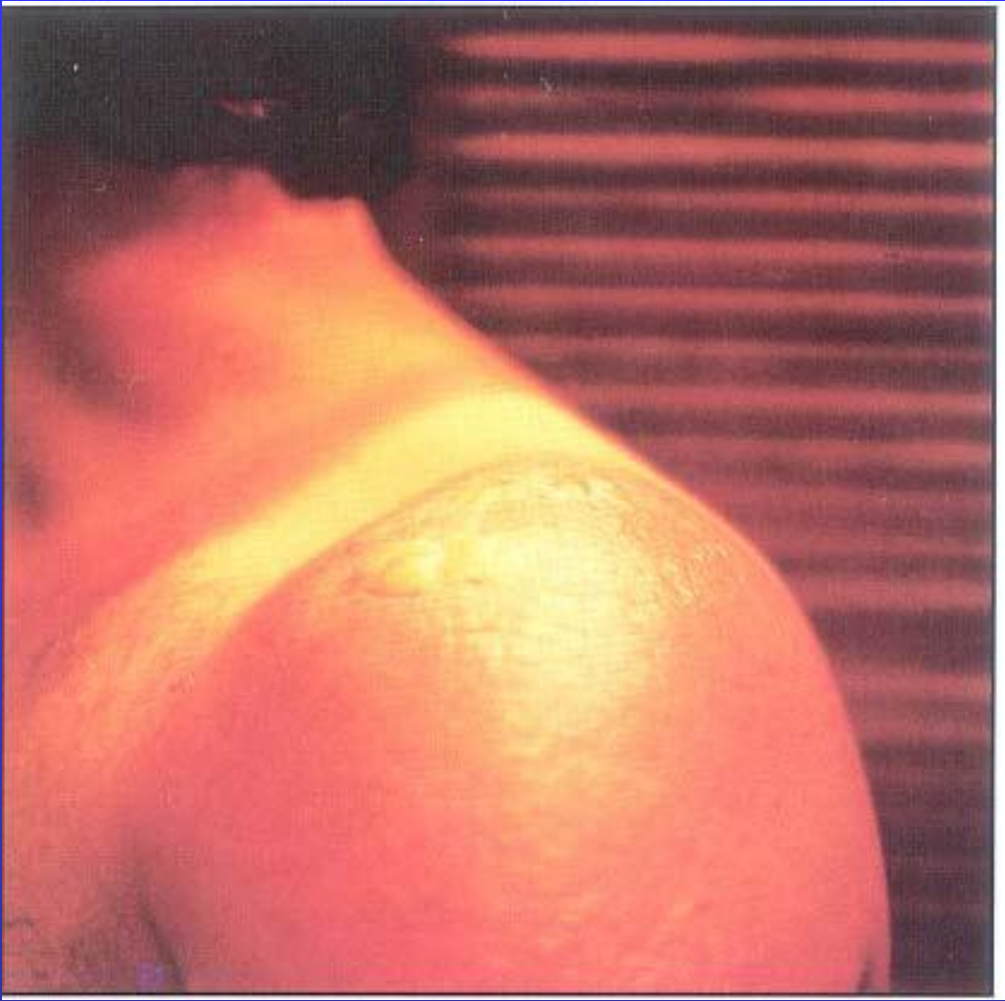


10/11



First Degree Burn





Second Degree Burn Partial Thickness Burn



Wet, Sensate, Hair Follicles Present, Painful



Deep Partial Thickness Burn



Third Degree Burn



3rd degree burn

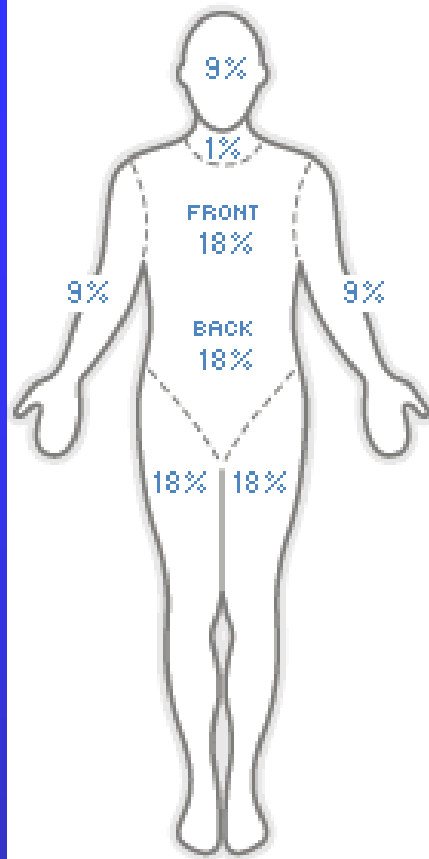


ADAM.

Dry, Insensate

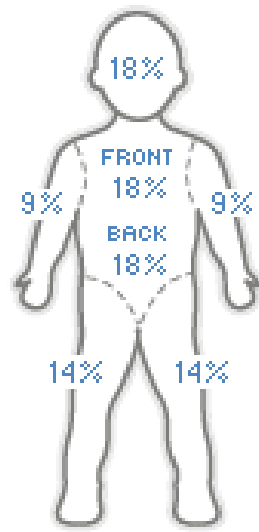






ADULT BODY PART	% OF TOTAL BSA
ARM	9%
HEAD	9%
NECK	1%
LEG	18%
ANTERIOR TRUNK	18%
POSTERIOR TRUNK	18%

Estimation of burn size using the Rule of Nines



CHILD BODY PART	% OF TOTAL BSA
ARM	9%
HEAD AND NECK	18%
LEG	14%
ANTERIOR TRUNK	18%
POSTERIOR TRUNK	18%



Parkland Formula

4cc /kg/ % burn



Fluid Resuscitation— Unfortunately an Art Form not a Science

- Urine Output
- CVP
- Hct
- Serum Sodium
- Serum and Urine Glucose and Osmolality
- Base Deficit (may be influenced by topical antibiotics)



Disability (Mini Neuro Exam)

- Glasgow Coma Scale
- Pupils
- Moves all 4 extremities??



Exposure/Environment

- Disrobe to assess Burn
- Keep Warm—Baer Hugger



When and Where to Transport Patient

- Each hospital is different--. 15 % BSA best treated initially
 - In burn unit if one exists
 - In OR
 - The ER is not the best place for prolonged treatment and resuscitation

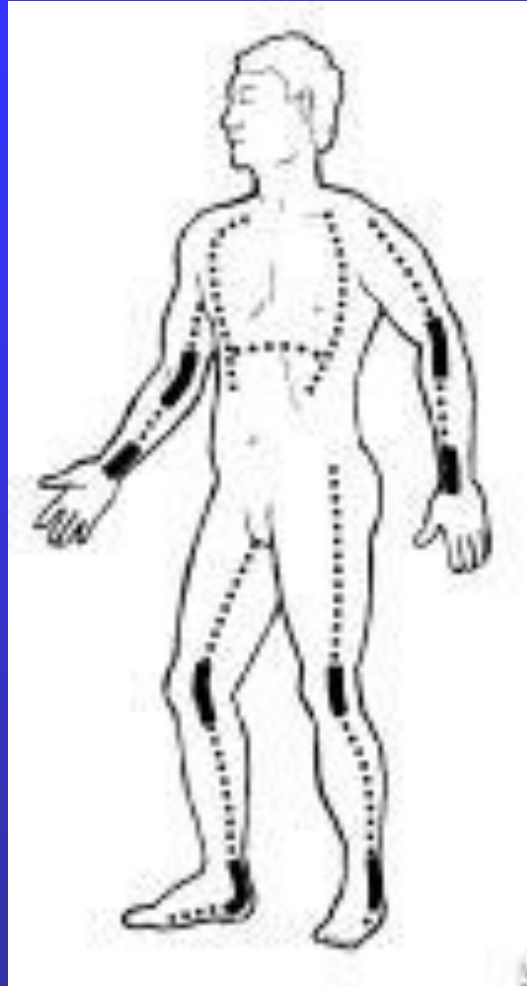


OR Procedures

- Intubation
- Vascular Access including CVP
- Foley
- Flexible Fiberoptic Bronchoscopy
- Burn Wound Assessment and debridement
- Escharotomy if necessary
- Topical Antibiotics and Dressings









Wound Care

- Initial Debridement in OR– Warm Saline and Hibiclens (Sterile Soap)
- Topical Antibiotics
 - Sulfamylon: bacteriocidal, causes metabolic acidosis, painful
 - Silver sulfadiazine: bacteriostatic, causes leukopenia, painless
 - General approach: Sulfamylon during day, Silver sulfadiazine at night



Philosophy of Burn Wound Care

- Resuscitate patient for 48-72 hours
- Excise burn beginning post burn day 2 or 3
- Debride burn for no longer than 30-45 minutes
- Cover wound with cadaver split thickness skin
- Attempt to remove entire burn within 7-10 days
- Remove heterograft and cover wound with autograft



Goal is Prevention of Burn Wound Sepsis



<http://www.emedicine.com/plastic/topic510.htm#section~bibliography>



Special Wound Problems

- Face
- Ears
- Nose
- Axillae
- Hands





<http://www.emedicine.com/plastic/topic510.htm#section~bibliography>



Special Problems

Electrical burns

Stevens-Johnson Syndrome

Streptococcal Toxic Necrolysis

Necrotizing Soft Tissue Infections



Summary

- ABCDE
- Remove patient from the ER ASAP
- Airway control and fluid resuscitation critical
- Initial Wound Care—Debridement, escharotomy if necessary, tropical antibiotics
- Excise burn and close wound with heterograft within 1st week



Cold Injury

- Local Cold Injury
- Systemic Cold Injury



Local Cold Injury

- Frost Nip
 - White insensate areas, usually on fingertips. Respond to warming, no permanent damage
- Chilblains
 - Red swollen patches of skin exposed to cold with burning and/or itching sensation
- Immersion (Trench) Foot
 - Prolonged exposure to moisture and cold (non-freezing)
 - Foot: red, swollen, numb, bleeds easily, blisters



Frostbite



- Frozen Soft tissue
 - 1^o erythema, edema, numbness
 - 2^o same plus blisters
 - 3^o same bloody blisters
 - 4^o full thickness injury to muscles, tendons, bone
- Treatment: immersion in warm water. Do not allow refreezing
- CONSERVATIVE debridement

<http://www.emedicine.com/emerg/topic209.htm>

(photo courtesy K. Kilgore, MD)



Systemic Cold Injury--Hypothermia

- Urban Environment
 - Young-Middle Age: THINK
 - Alcoholism
 - Drug Use
 - Severe Infection
 - Necrotizing Soft Tissue Infection
 - Pneumonia
 - Urosepsis
 - DKA
 - Older Patient: THINK
 - DKA
 - Urosepsis
 - Pneumonia
 - Biliary Sepsis
 - Stroke



Consider

- Hypothyroidism
- Hypoadrenalism

*Unusual but TREATABLE causes
Of Hypothermia*



Systemic Cold Injury--Hypothermia

- Rural Environment or Winter Urban Environment: THINK
 - Exposure
 - Land
 - Water
 - Rule out
 - Sepsis
 - Associated Injury



Symptoms and Signs of Hypothermia

- Mild (Temp 32-35⁰C)
 - Confusion
 - Lethargy
 - Shivering
- Moderate(Temp 29-32⁰C)
 - Delirium—Coma
 - Osborne Waves on EKG
 - Cardiac Arrhythmias



Symptoms and Signs of Hypothermia

- Severe Hypothermia ($< 29^{\circ}\text{C}$)
 - Unresponsive
 - Rigid
 - Pupils dilated
 - Pulseless
 - Ventricular Fibrillation



Basic Principles of Hypothermia Treatment

- *The BEST treatment of Hypothermia is PREVENTION*
- *THE PATIENT IS NOT DEAD UNTIL S/HE IS WARM AND DEAD*
- *Patients require volume infusion as they warm*



Rewarming Techniques

- Passive
 - Children
 - Hat
 - Wrap extremities in wool cast padding
 - Baer hugger
 - Warming lights (take care to avoid cutaneous burns)
 - Adults
 - Baer hugger



Rewarming Techniques

- Active Rewarming Techniques
 - Warm iv fluids
 - Heated nebulizer in oxygen or ventilator circuit
 - Irrigate n-g tube with warm saline
 - Irrigate pleural space with warm saline
 - Cardiopulmonary bypass with heat exchanger
- Watch for extremity compartment syndrome with femoral cannulation



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- *Patients require volume infusion as they warm*
- *Passive vs Active Warming Techniques*

