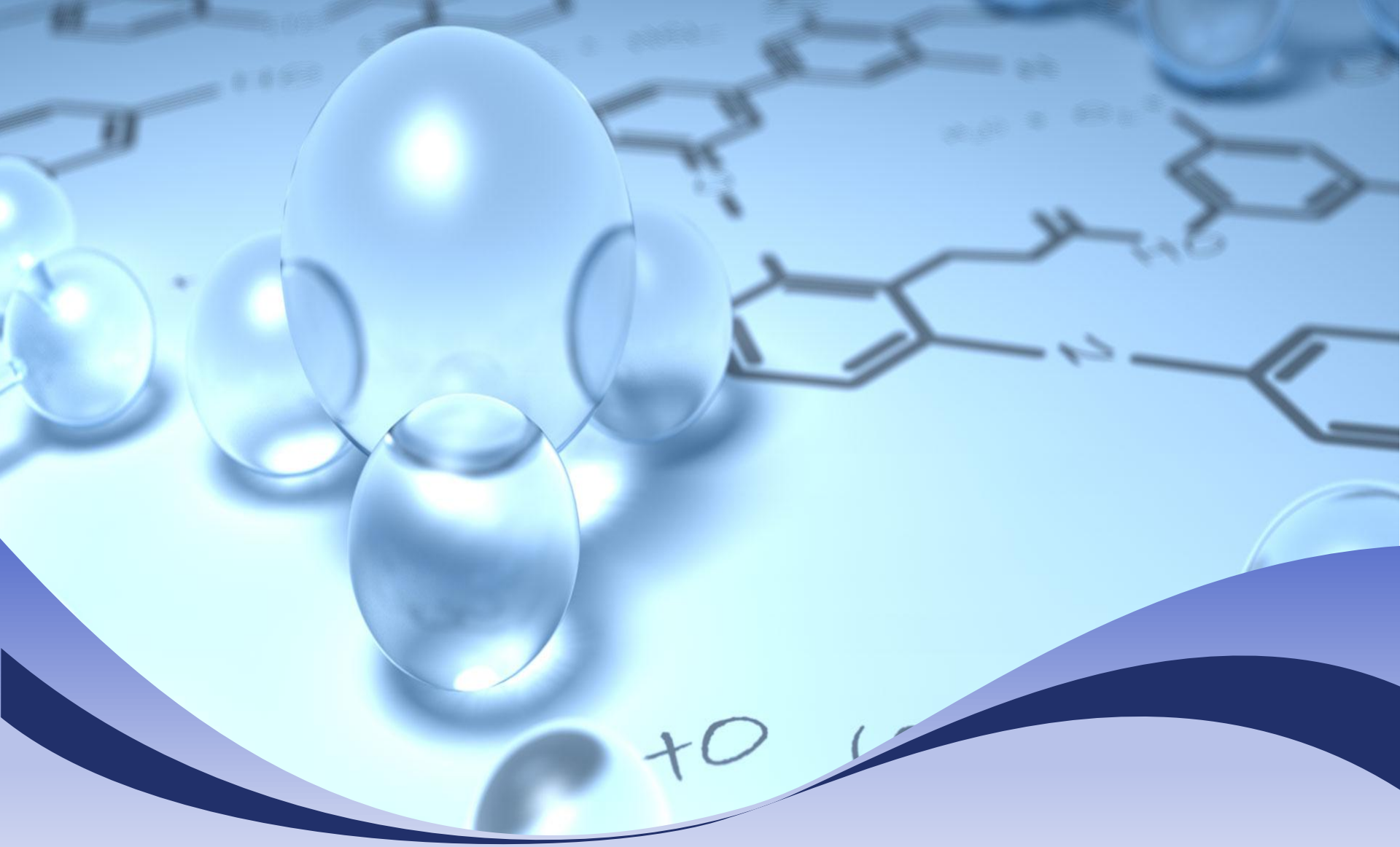

Hot Mess: Burns in the field

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WHERE ARE WE HEADING

Etiology of Burns

- 400,000 to 700,000 Burn injuries receiving medical TX
- 3500 Fire and burn deaths per year
  - 3000 Home
  - 500 (MVC, aircraft, chemicals or electricity)
- 45,000 Hospitalizations for burn injury
- 70% Men
- 68% @ Home, 10% Occupational, 7% Street

  15% Other

Source: American burn Association national Burn Repository 2011

Types of Burns

- Skin cells or other tissues are destroyed:
  - Hot liquids (Scalds)
  - Hot Solids (Contact burns)
  - Flames
  - Radiation/Radioactivity
  - Electricity
  - Friction
  - Contact with chemicals-
  - Frostbite

History

- Circumstances of the burn
- Actions that may have led to other injuries:
  - Jumping out of a building
  - Explosions
  - Chemicals
  - MVC
  - Falls after electrocution, etc

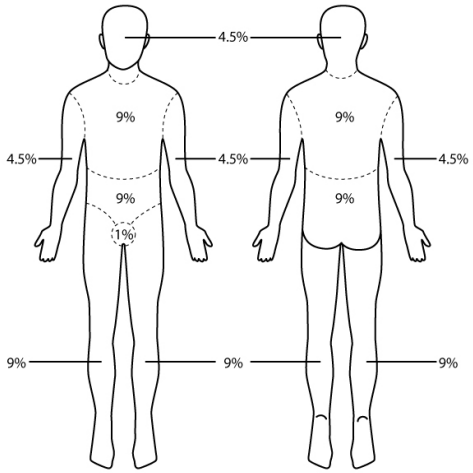
Burn Severity

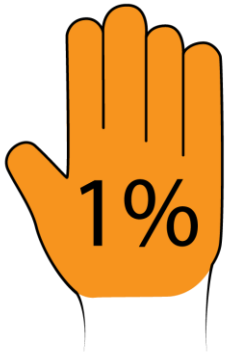
- Extent
- Depth
- Location
- Age
- General Health
- Cause (Burning Agent)

TBSA Calculation Activity

TBSA

- Rule of Nines
- Lund & Browder
- Palmar Method





Area	Age					
	Birth to 1 year	1-4 years	5-9 years	10-14 years	15 years	Adult
Head	19	17	13	11	9	7
Neck	2	2	2	2	2	3
Anterior trunk	13	13	13	13	13	13
Posterior trunk	13	13	13	13	13	13
Right buttock	2.5	2.5	2.5	2.5	2.5	2.5
Left buttock	2.5	2.5	2.5	2.5	2.5	2.5
Genitals	1	1	1	1	1	1
Right upper arm	4	4	4	4	4	4
Left upper arm	4	4	4	4	4	4
Right lower arm	3	3	3	3	3	3
Left lower arm	3	3	3	3	3	3
Right hand	2.5	2.5	2.5	2.5	2.5	2.5
Left hand	2.5	2.5	2.5	2.5	2.5	2.5
Right thigh	5.5	6.5	8	8.5	9	9.5
Left thigh	5.5	6.5	8	8.5	9	9.5
Right lower leg	5	5	5	6	6.5	7
Left lower leg	5	5	5	6	6.5	7
Right foot	3.5	3.5	3.5	3.5	3.5	3.5
Left foot	3.5	3.5	3.5	3.5	3.5	3.5

% Total Body Surface Area

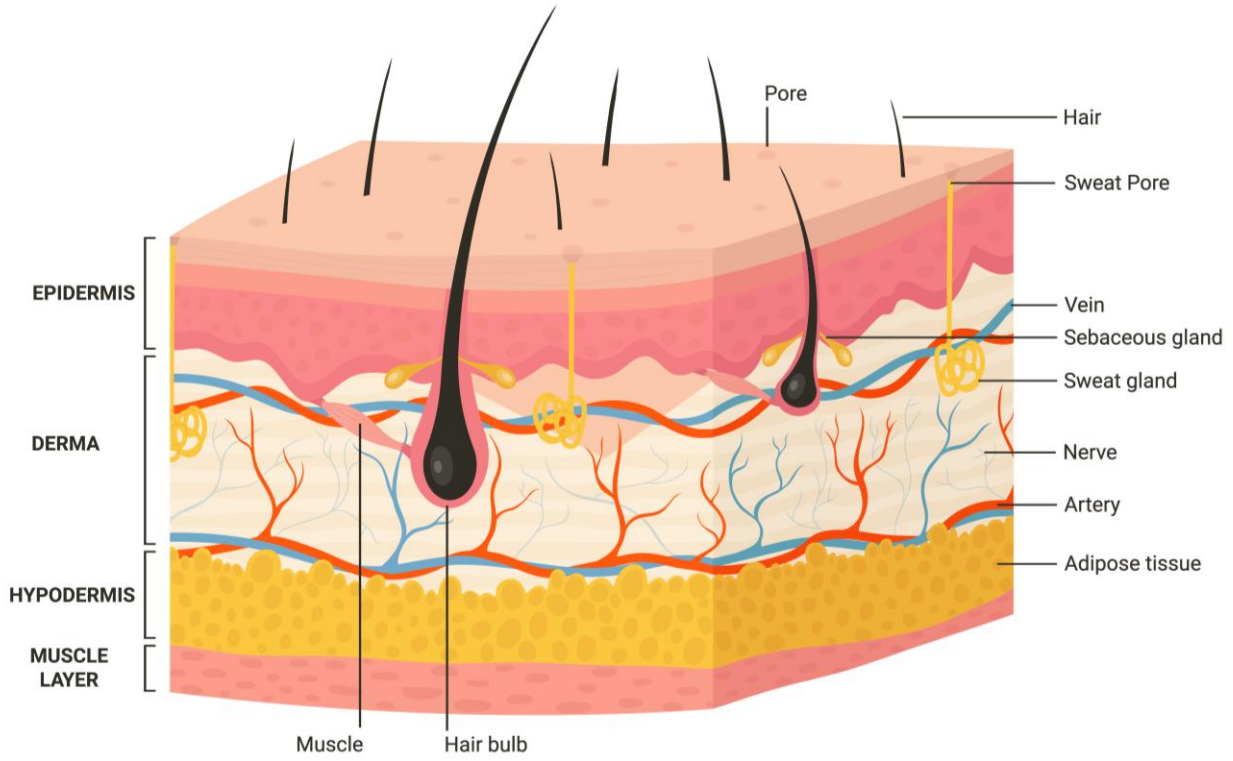
Burn Depth

Superficial (first degree) burns

Superficial partial thickness (second degree) burns

Deep partial thickness (second degree) burns

Full thickness (third degree) burns



Depth of burn	Appearance
Superficial (first-degree)	• Soft, dry, red, intact skin that blanches with pressure • No blistering or sloughing
Superficial partial thickness (second-degree)	• Moist, weeping, red or pink edematous skin that blanches with pressure • Some blisters
Deep partial thickness (second-degree)	• Wet, waxy, red to pale skin that does not blanch • Multiple blisters
Full thickness (third-degree)	• Waxy white to leathery gray to charred skin that is dry and firm with hair absent • No blanching
Full thickness (fourth-degree)	• Burn extends into the fascia and/or muscle

Classification of Burns: Superficial (first-degree)

- 1st Degree - Superficial
  - Red, dry and painful
  - Slough the next day
  - Low risk for infection
  - Heals in 3-6 Days
  - Topical ABX are not needed

First Degree Burn

First Degree (Superficial)

Classification of Burns

- 2nd Degree – Partial / Deep partial thickness
  - Red, wet and very painful
  - Variable in depth, ability to heal, and preponderance to scar

Second Degree

Classification of Burns

3rd Degree – Full Thickness

- Leathery, dry and waxy
- Will need debridement
- Will NOT heal without grafting
- Burn Center
- Scarring
- Contractures

Classification of Burns
4th Degree – Full Thickness

- The tissue beneath the skin is burned/destroyed
- Muscle
- Fat
- Bone
- Ligaments
- Tendons

INHALATION INJURY

- How do we assess severity?

- What are some risk factor?

  Where they trapped in a enclosed space?

  Period of time?

  Did they loose consciousness?

  Diagnosis cant be made in the field

Story: What is the mechanism?

- ✓ Pouring lighter fluid on grill?
  Smoking while wearing nasal cannula?
    Rarely need advanced airway despite “singed nasal hairs”

- ✓ Trapped in car on fire or structure: May have airway injury from prolonged heat/smoke.

- ✓ Pt had gas poured on them and then set on fire?

Primary Survey

- Airway: Oxygen
- Breathing: Any stridor, retractions, respiratory distress or obv burns to face/chest/neck

  Does the patient need assistance?
- Circulation: Stop bleeding
  - Where do you look for blood?
- Disability
- Expose
- Fluids

Airway: BLS & ALS

- 10-20% of Burn Patients
- 60-70% of patients who die in burn centers
- Inhalation Injury (ABG)
- Most experienced person should ET
- Attach tube securely (extubation can be fatal)
  - Umbilical or trach tape to secure

How long to wait?

On arrival

One Hour Later

Breathing:

- Inhalation Injury
  - Pt inhales superheated gasses, steam, hot liquids of products of incomplete combustion
  - History: Closed space? Facial injury, Singed nasal hair, Wheezing, Pharyngeal edema, Hoarseness
  - Mucosal injury
    - Cilia damage, sloughing, carbonaceous debris

Inhalation Injury

- “Honeymoon Period” 24-72 Hours before respiratory distress develops.
- Burn center: Bronchoscopy/Fiberoptic Laryngoscopy
- Chest Xray not helpful

Inhalation Injury

- Co2 Poisoning
  - Hemoglobin Affinity 200x that of Oxygen
  - Symptoms include (CO (%))
    - Mild HA and confusion (5-10)
    - Severe HA, Flushing and Vision Changes (11-20)
    - Disorientation, N/V (21-30)
    - Irritability, Dizziness (31-40)
    - Tachypnea, Tachycardia (41-50)
    - Coma, SZ Death (>50)

Inhalation Injury

- Treatment:
  - Remove patient from CO source
  - Administer 100% Oxygen
    - Displaces quickly 30-60 min 100% O2
  - Leave patient on oxygen…..

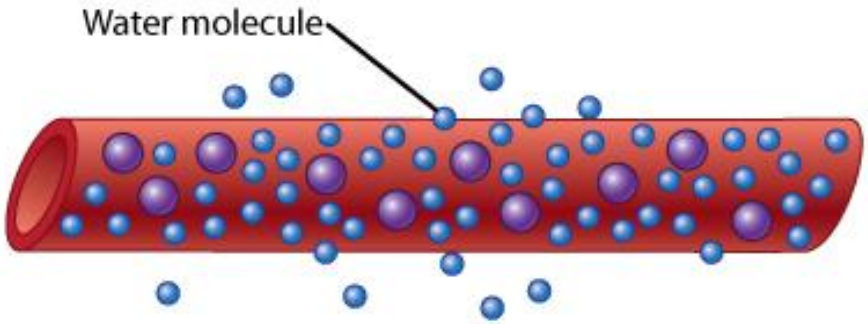
Circulation

- Place IV in any site
  - Earlier the better
  - Unburned area preferred, but NOT required
- IVF of Choice?

Capillary Leak Syndrome

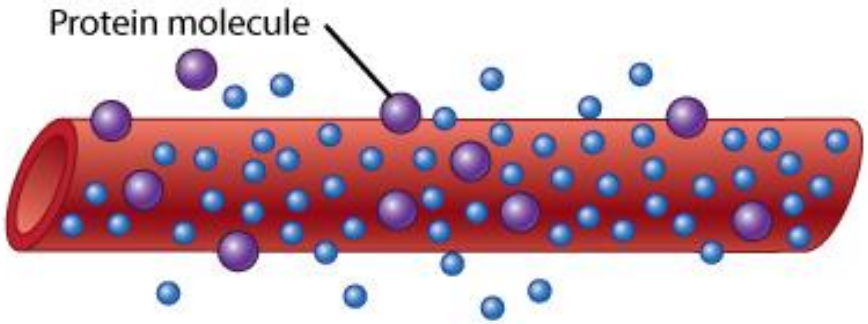
- Sometimes referred to as “third spacing”
- Occurs most often in burns greater than 20%
- Can persist for approximately 6–12 hours

NORMAL BLOOD CAPILLARY



Water is the smallest molecule that can pass through the pores of the capillary.

POSTBURN BLOOD CAPILLARY



Permeability is increased, which allows larger molecules, such as proteins, to easily pass through the pores of the capillary.

- LR is fluid of choice
  - Lactate is converted in the liver and acts as buffer
- Small children at risk for hypoglycemia
- Newborns + Infants at risk for volume overload
- Consult with burn center for rate

Many Formulas for Resuscitation

Consult burn center for guidance

500ml/hr Adults
250ml/hr Peds (6-12)

- 2-4ml/kg/TBSA

- First ½ is given in first 8 Hours
  - Capillary leak most significant during this time
  - Second ½ is given in remaining 16 hours

Intubate the Urethrea

- Best indicator of adequate hydration is…….
  - URINE OUTPUT

  Adults: 0.5ml/kg/hr

  Children 1-2ml/kg/hr

Disability

- Electrical injury
  - EKG and Troponin
  - High Voltage vs. Low voltage
  - Consult with Burn Center for fluid
- Trauma or no trauma
- Electrical injuries need to go to burn center?

Environment/Expose

- Stop the burning
- See all the skin
- How much surface area is burned?

Examples

Partial Thickness Burn (2nd degree)

Full Thickness (3rd Degree)

Its getting Hot in Here!

- Keeping patient warm takes priority
- Loss of skin makes skin control difficult
- Wet dressings always cool the patient
- Dry and clean for transfer
- Keep ambient temp as warm as possible
- Cover all exposed areas
- Hypothermia can allow for worsening Coagulopathy

- NG/OG Tube
  - Protect against aspiration
  - If patient has been bagged, gastric distention may be worse

Pain Management

- Give IV Meds
- NO PO, IM or SQ meds
- Careful when giving Narc/benzo’s

Other meds

- Tetanus prophylaxis
- Never give systemic ABX
  - Can build antimicrobial resistances
  - May need later as patients may have prolonged LOS 1-2 days/% of burn

  - All other meds can wait

Wound Care/Dressings

- Clean vs. Sterile
  - Dry vs. Wet
  - Lint Free
    - Saran Wrap?
- Hold the creams, ointments, butter, etc
  - What goes on must come off…..
  - Nothing unless burn center directs
  - No immersion in Ice

Compartment Syndromes

- A complication of fluid resuscitation, massive tissue edema and loss of skin elasticity
  - Most often with Circumferential burns
  - Can occur at any time during acute resuscitation

Compartment Syndrome

- Arms/Legs: Risk of tissue loss
- Chest/Thoracic: Unable to ventilate
- Abdominal: Can lead to edema of the bowels, ascites and circumferential burns to abd act to prevent perfusion of tissues via decreased venous return and ultimately diminished cardiac output

Figure 4. This figure demonstrates appropriate chest escharotomy. Notice the amount chest wall expansion following escharotomy, i.e. the skin gap seen at the sight of escharotomy.

The “Other” burns

Case Study

- 28 y/o male presents to the ER with a hot tar burn to the right hand.
  - Accidently spilled the tar while carrying tar up a ladder to the roof
- He placed his hand in bucket of cold water initially
- Co-worker brought patient to the ER

Case Study

- Assessment revealed a 2nd degree burn to the right hand, presenting with open blisters partially covered in tar.
- Hand was rinsed with cool water for 15 minutes.
  - Pain decreased, tar unchanged

Tar Burn

After 5 minutes

After 5 Minutes

After 15 minutes __?__ was applied

Butter on a Burn???

Mineral Oil/Vegetable Oil

Don’t pull/peal off Tar

3 Days after butter and Silver Sulfadiazine

Chemicals

- Scene safe
- Identify the substance without delaying care or transport
- Remove clothing, brush off any powder, start irrigating with water for 20 minutes
- No zebras….water on everything except known Calcium Oxide (Dry Lime) or elemental metals.
- If not sure, contact poison control
- Hydrofluoric acid: Calcium gluconate
- Burn center

Frostbite

- Frostnip: Localized paresthesia, goes away with rewarming
- Frostbite: Cold induced injury from freezing tissues

Frostbite: Risk factors

- Substance use
- Homelessness
- Mental health
- History of PVD, Diabetes, tobacco
- Previous cold exposure

Frostbite: 2 Phases of Injury

- Freezing of tissue: Peripheral vasoconstriction, Tissue anoxia due to ischemia, Ice crystals form in tissue causing microvascular occlusion
- Re-perfusion injury
  - Rewarming: Inflammatory response in endothelial damage
  - Vascular stasis: Hypercoagulability
  - Micro emboli and thrombus formation
  - tPA after re-warming

Frostbite: Classification

- 1st Degree: Hyperemia, numbness, mild edema, no blisters
- 2nd Degree: Serosanguinous blisters
  - Partial thickness injury
  - Debride
- 3rd Degree
  - Hemorrhagic blisters
  - Damage into
- 4th Degree
  - Full thickness injury involving bone, tendon muscle
  - May not see blistering

Treatment

- Time is critical
- Rewarm ASAP when practical
  - Temp 100-104 for 25/30 minutes
- If over 24 hours then local wound care
- More options for injuries less than 24 hours
  - TPA for deeper injuries

Frostbite: Treatment tPA

- For best results warm ischemia time less than 8 hours (<24 hours)
- Patient presents with frozen tissue
- Decreased blood flow in limbs and/or digits after rewarming
- Contact burn center (Burn app)
- Clinical exam to r/o any traumatic injuries

Case Study

Pre-tPA

2 Days post tPA

Case Study

2 Weeks tPA

5 Weeks post tPA

Summary & Questions