

Burns 101

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Disclosures

- Non-Declaration Statement: I have no relevant relationships with ineligible companies to disclose within the past 24 months.

Educational Objectives

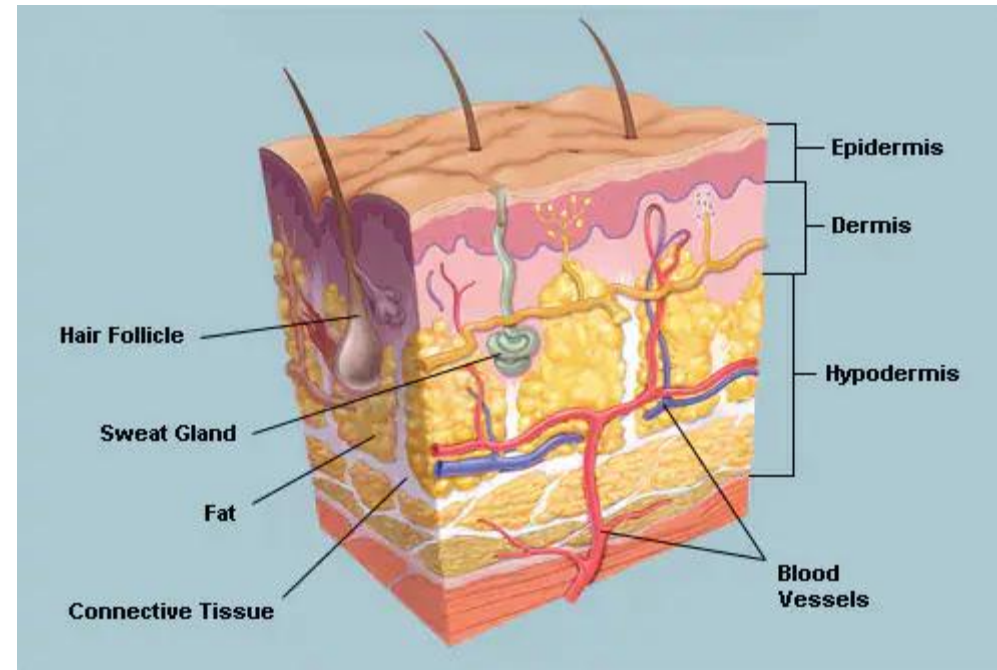
- At the conclusion of this session, participants should be able to:
 - Identify the difference between 1st, 2nd, 3rd, and 4th degree burns
 - Estimate burn resuscitation based on total burn surface area
 - Manage burns acutely upon presentation
 - Develop a wound care plan for burn patients
 - Identify which patients should be transferred to burn centers

Don't be scared! Burns are manageable!



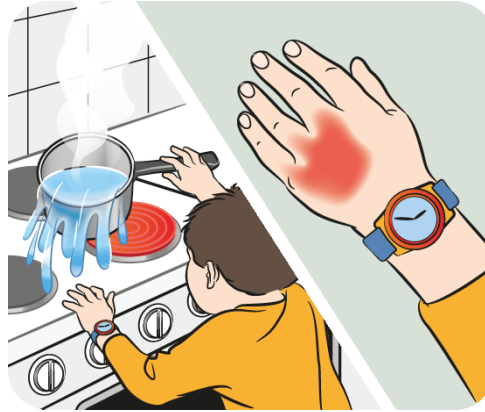
Function of Skin

- Thermoregulation
- Protection
- Secretion
- Excretion
- Absorption
- Sensation
- Vitamin D production



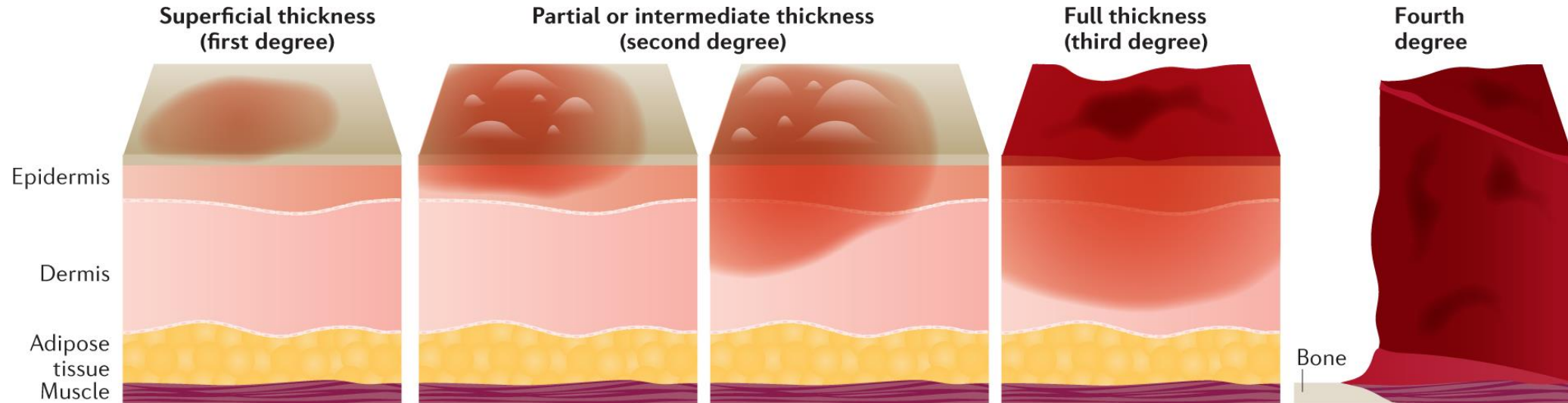
Mechanism of Burns

- Scald
 - Most common children
- Fire/Flame
 - Most common adult
- Electrical
- Chemical
- Radiation
- Contact
- Friction



Degrees of Burns

% TBSA = Total Body Surface Area **BURNED**



- Painful
- Does not blister
- Does not scar

- Superficial partial thickness burns do not require surgery, but may scar and be more painful

- Deep partial thickness burns require surgery and form more scars and are less painful

- Blisters and weeps
- With increasing depth, increased risk of infection
- With increasing depth, increased risk of scarring

- Dry
- Insensate to light touch and pin prick
- Small areas will heal with substantial scar or contracture
- Large areas require skin grafting
- High risk of infection

- Involves muscle or bone
- Leads to loss of the burned part

Degrees of Burns

1st degree (Superficial)

- **DOES NOT** blister
- 'Sunburns'
- **IS NOT** used to calculate %TBSA
- Usually does not require IVF
- Push PO fluids



Degrees of Burns

2nd degree (Superficial partial thickness)

- ALWAYS blisters and blanches
- Painful

2nd degree (Deep partial thickness)

- ALWAYS blisters
- USUALLY blanches (can be slow)
- Painful
- Can be confused for 3rd degree



Degrees of Burns

3rd degree (Full thickness)

- **DOES NOT** blister or blanch
(no blood flow, dead tissue)
- **NO** pain
- Leather, dry, waxy,
firm, white appearance



Deep 2nd

3rd



Degrees of Burn

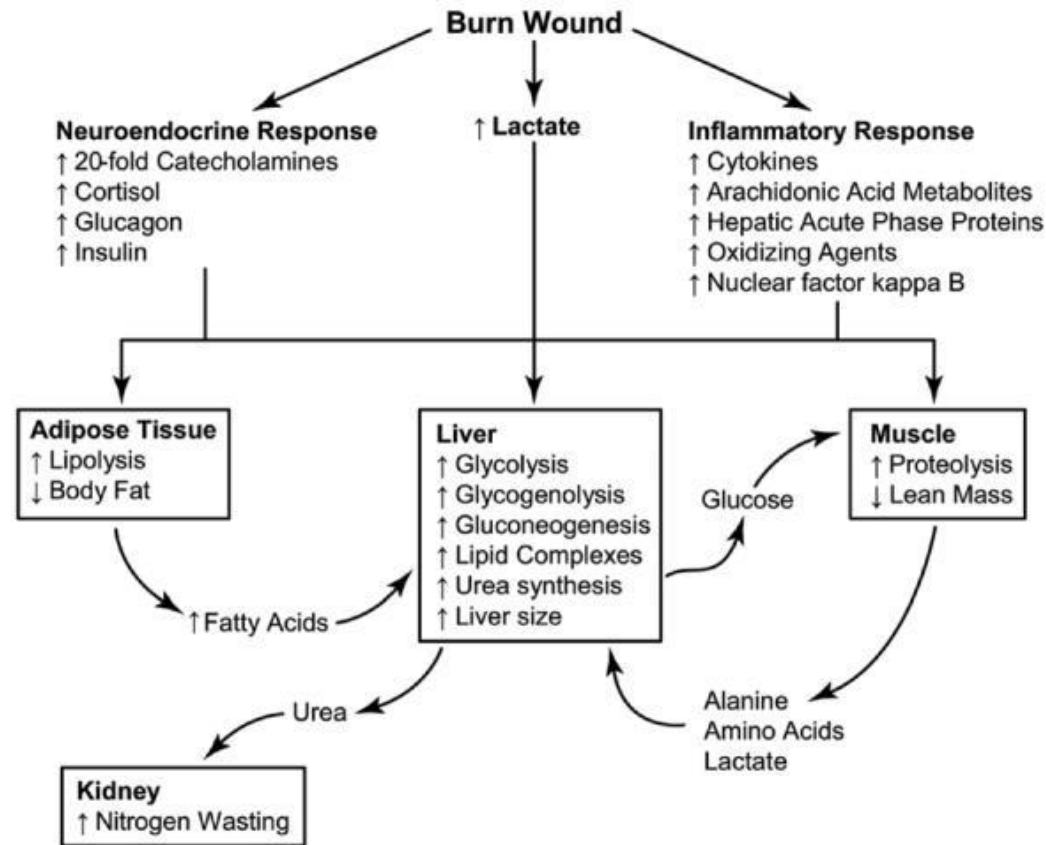
4th Degree

- To the muscle or deeper structures
- Usually electrical etiology
- Black, necrotic appearance
- Cannot salvage



Pathophysiology of Burn Shock and Edema

- Hypovolemia via intravascular fluid leaking into interstitial space causing edema (leads to compartment syndrome)
- Cardiac depression due to humoral factors and loss of preload -> decreased Cardiac Output
- Increased systemic vascular resistance
- Large release of inflammatory mediators



Diabetes

Immunocompromised
Bacterial infections
Fungal infections

Pressure injuries

Deconditioning
Nutritional deficiencies

AKI

Hepatomegaly

Immediately After the Burn; Management in the EC

Primary Assessment

Airway

- Burns to the face? Concerning for inhalation injury and airway edema
 - Humidified oxygen via nasal cannula
 - +/- intubation (nasal intubation preferred) if concern for airway obstruction. Not always indicated.

Breathing

- Smoke inhalation and carbon monoxide can impair ventilation and oxygenation
- Look for soot in airway or singed nose hairs – indicates smoke exposure or prolonged time with fire

Circulation

- Due to burn shock, blood pressure may not be accurate with large burns
- Resuscitation via Parkland or Galveston formula with LR (preferred) or another crystalloid

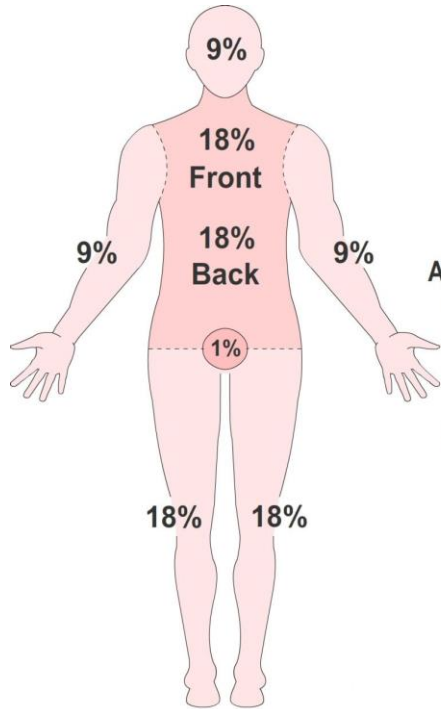
Immediately After the Burn; Management in the EC

Secondary Assessment

- **A**llergies? Antibiotics indicated with burns > 10%TBSA
- **M**edications?
- **P**ast Medical History?
- **L**ast Meal?
- **E**vents Surrounding Injury? Concerning for abuse? NAT?

- Control pain and prevent hypothermia

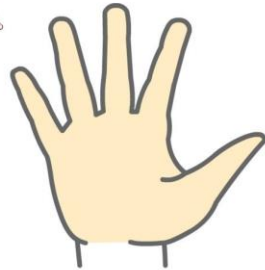
%TBSA Calculation



Rule of Nines

Measure 2nd and 3rd Degree Burns

A Patients hand ~ 1% of the total body surface area



DO NOT USE 1st DEGREE BURNS FOR %TBSA CALCULATION

Burn Estimate and Diagram

Age vs Area

Areas treated at SHC

Area	Birth 1 yr.	1-4 yrs.	5-9 yrs.	10-14 yrs.	15 yrs.	Adult	Initial TBSA			Potential Donor site	Final TBSA			Graft size
							2°	3°	Total		2°	3°	Total	
Head	19	17	13	11	9	7								
Neck	2	2	2	2	2	2								
Ant. trunk	13	13	13	13	13	13								
Post. trunk	13	13	13	13	13	13								
R. Buttock	2.5	2.5	2.5	2.5	2.5	2.5								
L. Buttock	2.5	2.5	2.5	2.5	2.5	2.5								
Genitalia	1	1	1	1	1	1								
R. U. arm	4	4	4	4	4	4								
L.U. arm	4	4	4	4	4	4								
R.L. arm	3	3	3	3	3	3								
L.L. arm	3	3	3	3	3	3								
R. hand	2.5	2.5	2.5	2.5	2.5	2.5								
L. hand	2.5	2.5	2.5	2.5	2.5	2.5								
R. thigh	5.5	6.5	8	8.5	9	9.5								
L. thigh	5.5	6.5	8	8.5	9	9.5								
R. leg	5	5	5.5	6	6.5	7								
L. leg	5	5	5.5	6	6.5	7								
R. foot	3.5	3.5	3.5	3.5	3.5	3.5								
L. foot	3.5	3.5	3.5	3.5	3.5	3.5								

Total:

Shriners Burn Diagram/Lund & Browder more accurate with children- stratifies based on age

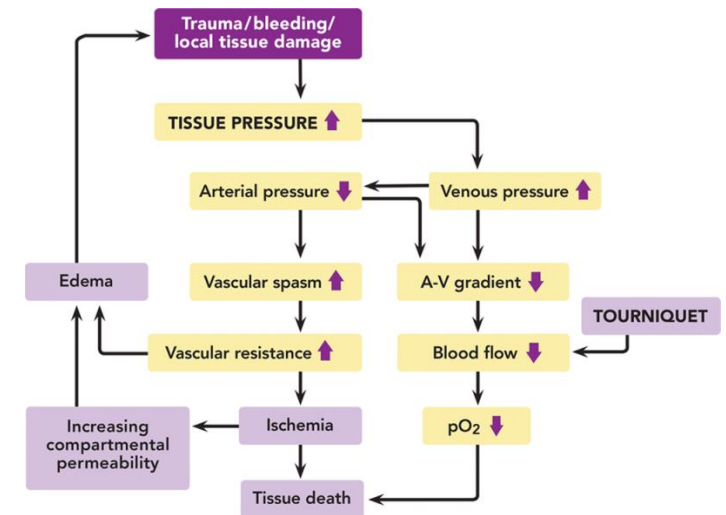
Fluids

- Must replace fluid loss from hypovolemia, shock and edema when burn >10% TBSA
- LR preferred over other fluids
- Adults: **Parkland Formula**
 - **%TBSA x weight (kg) x 4mL**
 - Give ½ over 1st 8 hours, then other ½ over next 16 hours
- Children: **Galveston Formula**
 - **(5000 mL x %TBSA) + (2000 mL x Total Body Surface Area in m²)**
 - Give ½ over 1st 8 hours, then other ½ over next 16 hours
- **DO NOT** include 1st degree burns in %TBSA calculation!
- Monitor UOP! Titrate fluids based on UOP. Aim for 0.5 mL/kg/hr for adults and 0.5 - 1.0 mL/kg/hr for children
- **Watch out for compartment syndrome!**

Compartment Syndrome - EMERGENCY

Can have one or all symptoms. There is no order to which the symptoms occur.

- **Paresthesia** – most common first presenting symptom
- **Pain OUT OF PROPORTION** - most common first presenting symptom
- **Pain with passive or active movement**
- Pallor
- Paralysis
- Poikilothermia (cold)
- Pulselessness (late finding), use doppler
- Leads to limb ischemia. If not treated in time = amputation



Can occur on ANY part of the body! Fingers, toes, abdomen, eyes in addition to extremities.

Common for patients with burns. Can result from normal burn resuscitation via interstitial fluid leakage

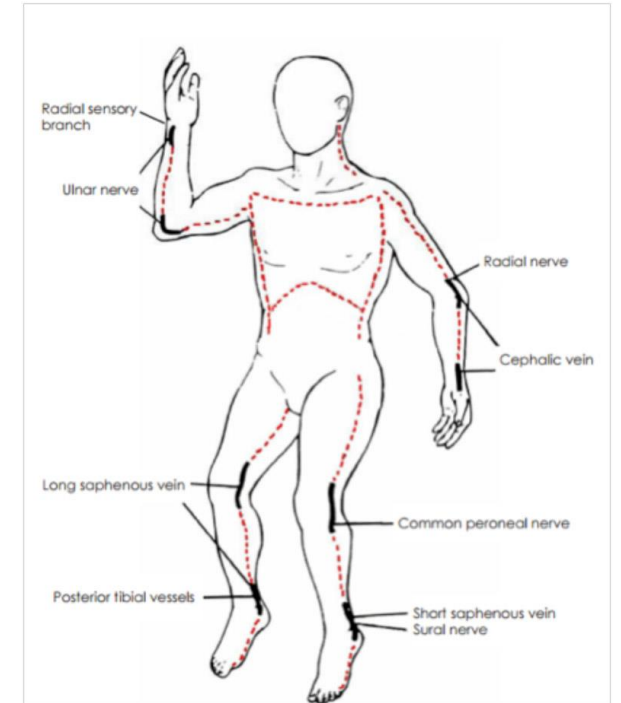
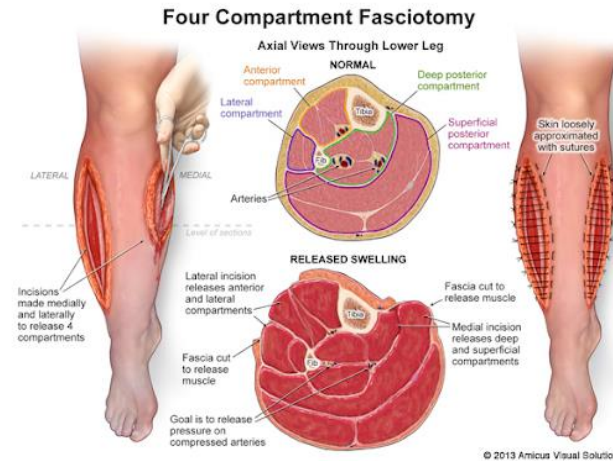
Escharotomy

- Through epidermis and dermis
- Can be done prophylactically
- 3rd degree burns
- Circumferential burns



Fasciotomy

- Through fascia
- Can be done prophylactically
- Prevents and treats compartment syndrome (limb ischemia)



Indication for Transfer to Burn Center

- Partial thickness burns **>10% TBSA**
- Burns that involve the face, hands, feet, genitalia, perineum, or major joints
- Third degree burns in any age group
- Electrical burns, including lightning injury
- Chemical burns
- Inhalation injury
- Burn injury in patients with preexisting medical disorders that could complicate management, prolong recovery, or affect mortality
- Any patient with burns and concomitant trauma (such as fractures) in which the burn injury poses the greatest risk of morbidity or mortality. In such cases, if the trauma poses the greater immediate risk, the patient may be initially stabilized in a trauma center before being transferred to a burn unit.

American Burn Association Centers

- Specialized burn centers certified in providing all aspects of burn care from acute care, rehabilitation, and reconstructive to patients
- Includes a specialized team and services such as:
 - Burn Surgeons (requires fellowship burn training)
 - Burn Plastic and Reconstructive Surgeons
 - Anesthesiology
 - Psychology/Psychiatry
 - PT/OT
 - Pharmacists
 - ICU level care with Pediatric Surgery/Surgical Critical Care or Pediatric Critical Care Medicine trained Doctors
 - 24/7 Medical Staff
 - 24/7 Emergency Department
 - Dietitian
 - Respiratory Therapist
 - Child Life
 - Social Work
 - Infection Control
 - Ambulatory Care
 - Multidisciplinary Care

ABA Recognized Burn Centers in Texas

American Burn Association (ABA) verified burn centers in Texas (6 total)

Lubbock

- Timothy J. Harnar Burn Center

Dallas

- Parkland Health & Hospital System, Regional Burn Center

Houston

- Memorial Hermann-TMC, Texas Trauma Institute, John S. Dunn Sr. Burn Center

Galveston

- Shriners Hospitals for Children
- University of Texas Medical Branch

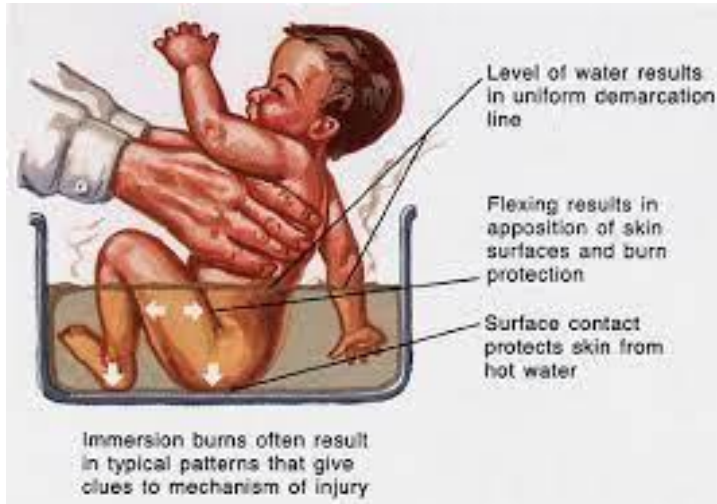
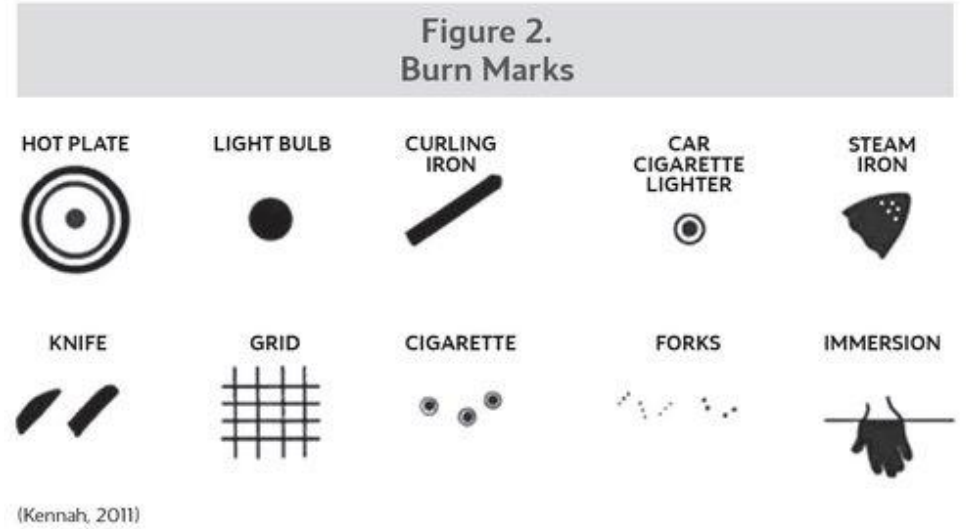
San Antonio

- US Army Institute of Surgical Research



Signs of abuse

- Burn patterns never lie!
- Uniform demarcations
- Both extremities (held down)
- Circular – cigarette burns



Management: Outpatient vs Inpatient

Burns **LESS THAN 10% TBSA** usually can be managed outpatient

Anything **MORE THAN 10% TBSA** should be stabilized and referred to a burn center

- **Outpatient <10%TBSA**

- 1' Topical Abx:
 - Bacitracin, Polysporin
- Systemic Abx (larger burns, still less than <10%TBSA):
 - Bactrim & Rifampin
- Mepitel AG
- Mepilex AG
- Suprathel
- Silvadene and Silver Sulfadiazine not recommended
 - Impairs wound healing

- **Inpatient >10%TBSA**

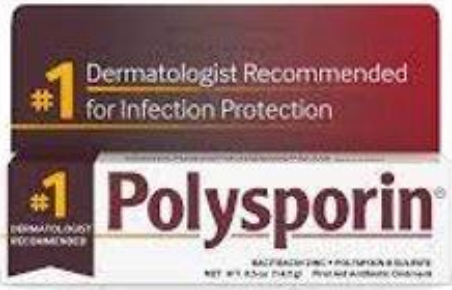
- Systemic Abx:
 - Vancomycin & Meropenem
- In addition to outpatient dressings & topical antibiotics:
 - Grafting: *Xeno-, allo-, autograft*
 - Wound Vac
 - Acticoat
- Consider Transfer to burn center

Treatment



Treatment

Outpatient and Small:



Pseudoeschar

- A thick gelatinous yellow or tan film that forms with silver sulfadiazine cream combining with wound exudate.

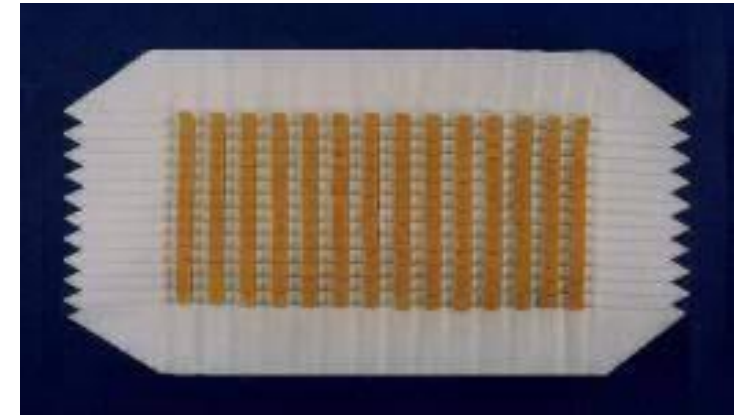
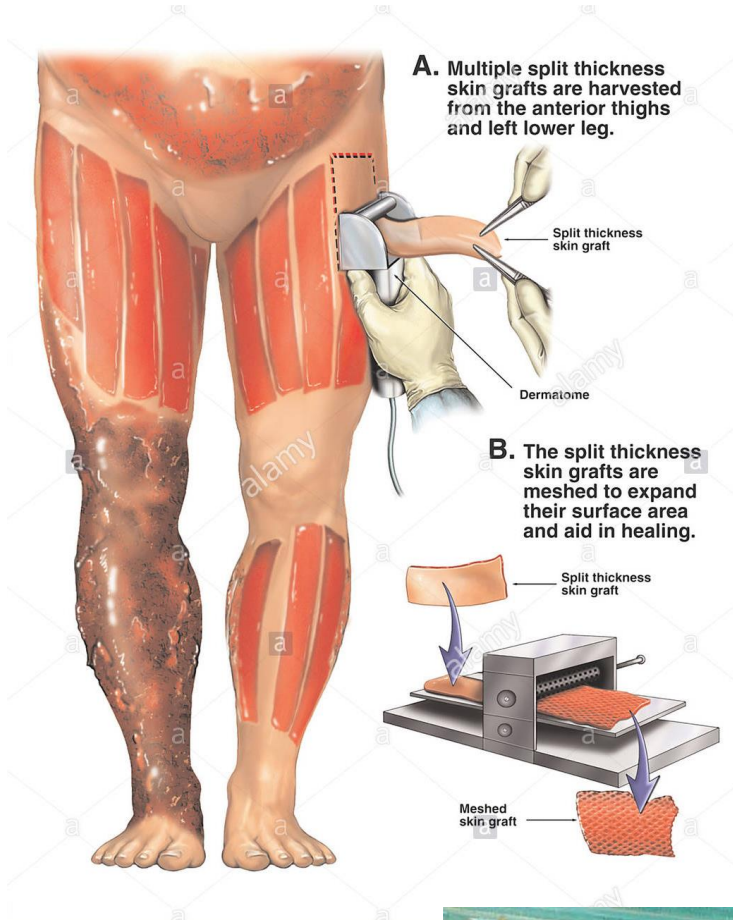


Treatment

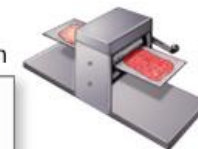
For large burns to be transferred to burn center:



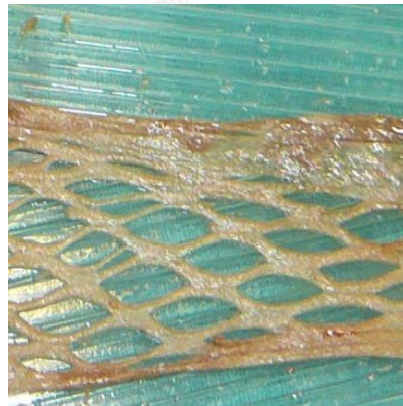
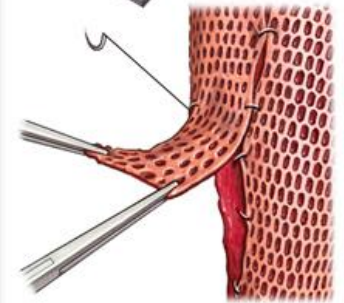
Grafting



Graft taken from patient's healthy skin



Skin is meshed to cover a large wound



Healing Time

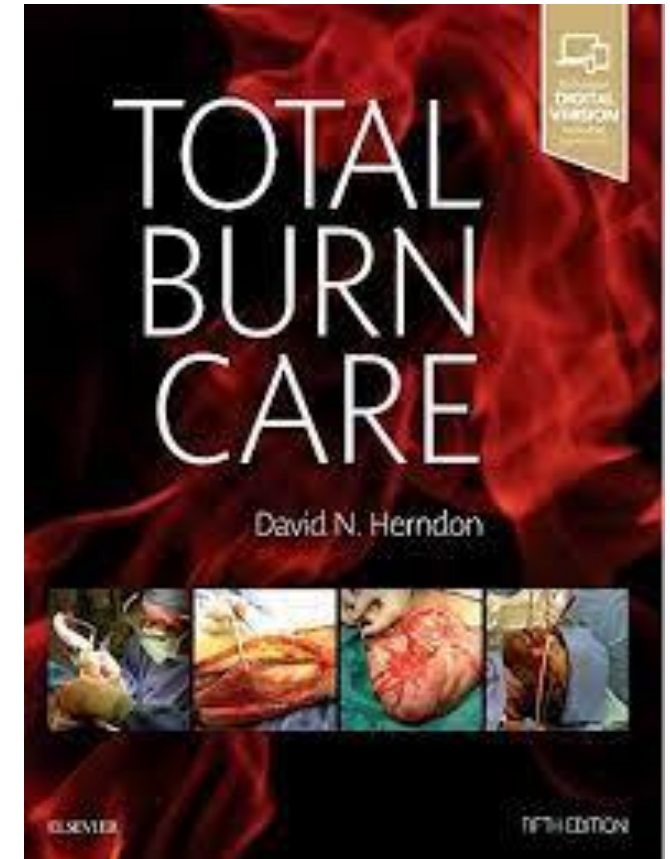
- 1st degree
 - Days
 - 2nd degree
 - 7-14 days, up to one month
 - 3rd degree
 - Months up to a year
 - 4th degree
 - Months up to a year
- Typical healing time is 1-2 days per %TBSA burned.
 - The deeper the burn, the longer the healing time.
 - Infection, deconditioning, comorbidities, nutritional deficiencies, etc. can prolong healing

Take Home Points

- 2nd degree burns ALWAYS blister, are painful and blanch.
- Silver sulfadiazine causes pseudoeschar to burn wounds. Should be avoided as this is an infection risk. Bacitracin can be used instead.
- Burn resuscitation and airway management should be started sooner than later. DO NOT use 1st degree burns to calculate %TBSA.
- Source control and infection are important to prevent infections and aid in healing time
- Any question or concern regarding ANY phase of burn healing – contact an ABA burn center

References

- Herndon, D. N. (2018). *Total burn care (fifth edition)*. Elsevier.
- Wound Certification Prep Course, 2021
- <https://ameriburn.org/quality-care/verification/verification-criteria/verification-criteria-effective-october-1-2019/>



Questions?

Contact Info

Please feel free to reach out!

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