

Burns

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Burns

Histology of skin



Layers of skin

- | | |
|--------------|----------|
| ▪ Epidermis | Ectoderm |
| ▪ Dermis | Mesoderm |
| ▪ Hypodermis | |
- 
- An orange arrow pointing downwards, positioned between the list of skin layers and the description of the epidermis.

Epidermis stratified keratinizing squamous epithelium.

Melanocytes, Langerhans cells, lymphocytes, merkel cells are present in it .

Burns

- Burns are the most devastating physical and psychological injury.
- Cell damage starts at 45°C heat, and above 50°C denaturation of all cell proteins occurs.
- The depth and appearance of burns depend on the Cause, Intensity and Duration of the Heat.
- Partial thickness burns can be confined to the epidermis (First Degree).
- Involve variable depth of the dermis (Second Degree).
- In full-thickness burns (Third degree) there is destruction of all skin elements and may be deeper tissues.

Burns

- A burn results from exposure to
 - Flames .
 - Hot liquids.
 - Contact with hot objects.
 - Exposure to caustic chemicals or radiation.
 - Contact with an electrical current.

Understanding the following will help in formulating an initial management plan for all types of burn patients.

Thermodynamics of Burn Injuries

1) Scald Burns

- Account for 30% of all burn injuries.
- This proportion is larger in pediatric patients.
- Can result from water, grease, or oil.
- Temperatures $> (51^{\circ}\text{C})$ cause burns within seconds.
- Temperatures $> (70^{\circ}\text{C})$ instantaneous full thickness burns.
- Superheated steam is likely to cause airway problems if head and neck are involved .

Thermodynamics Continued

2) Thermal Burns

- ✚ Caused by: Flame, Flash, or contact
- ✚ Flames account for 50% of burn injuries.

3) Chemical Burns

- ✚ Progressively damage the skin until inactivated or removed. In the military we can expect: Phosphorus, Napalm, or Oil.
- ✚ Accounts for 10% of burn injuries.

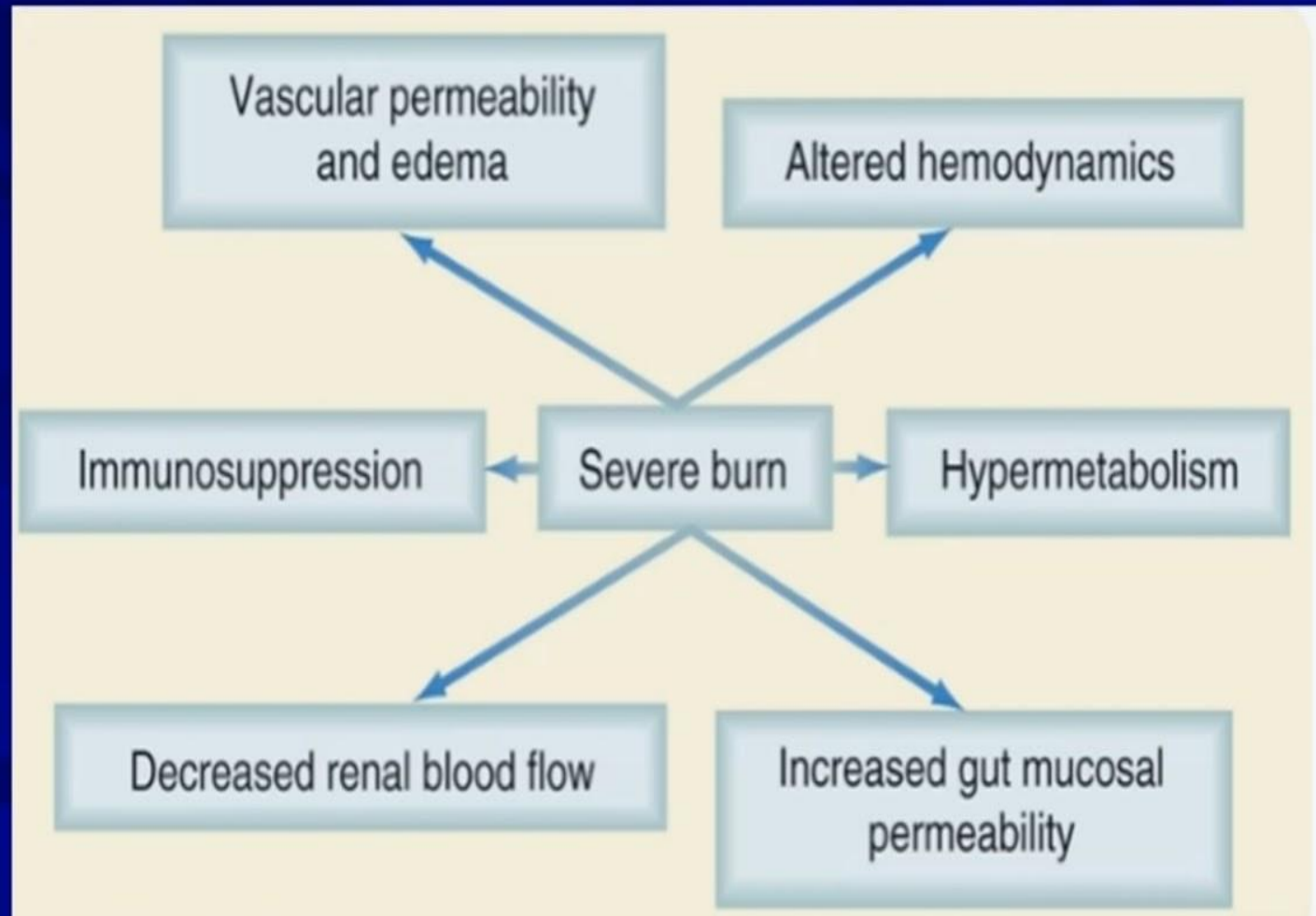
4) Electrical Burns

- ✚ Extent of burns is under-appreciated due to small entry or exit wound, internal damage may be profound.
- ✚ Accounts for 10% of burn injuries.

Pathophysiology of Burns

- Increase heat loss.
- Massive release inflammatory mediators, leading to increase capillary permeability and edema.
- Depression of all parts of immune system.
- Increase metabolic rate, and secretion of catabolic hormones.
- Curling ulcers due to decrease mucosal defense.

Systemic effects of Burn



Pathophysiology of Burns

- Classification by depth:
 - 1st Degree Burns
- Superficial burns involving epidermis.
- Local pain and erythema (sun burn or red skin).
- No blister formation.
- Spontaneous healing without treatment.
- Skin peeling may occur.



Pathophysiology of Burns

- 2nd Degree Burns

- 1. Superficial/Partial thickness

- Involves entire epidermis & superficial dermis
 - Wounds are warm & moist.
 - Blisters may/may not be present (can appear later).
 - Extremely painful.
 - Heal in 14-21 days with proper treatment.
 - Good cosmetic result.

2. Deep Partial Thickness

- Involves entire epidermis & much of dermis.
- Wounds appear waxy with blisters.
- These wounds occasionally Less Painful (Because of damage to nerve endings).
- Wounds become more painful as wounds heal, which is approximately 4 to 6 weeks.
- Scarring and contractures can complicate healing (may require skin grafts) .

Partial Thickness Burn

Second
Degree
Burn



Pathophysiology Cont'd

3rd Degree Burns (Full Thickness)

- ◆ Involves epidermis, dermis, and subcutaneous tissue
- ◆ Are caused by flash, chemical, electrical, and prolonged contact with hot surfaces.
- ◆ Wounds are painless, however surrounding tissue may be extremely painful.
- ◆ Burns appear white, cherry, red, or black.
- ◆ Deep blisters may be present.
- ◆ Skin feels leathery.
- ◆ Healing slow, formation of Escher.
- ◆ Wound contractures and scarring are common
- ◆ Skin grafting often needed.

Full Thickness Burn

FULL THICKNESS BURNS



Full thickness burns.



Pathophysiology Cont'd

4th Degree Burns

Destroy epidermis, dermis, subcutaneous tissue, and muscle, fascia, and bone

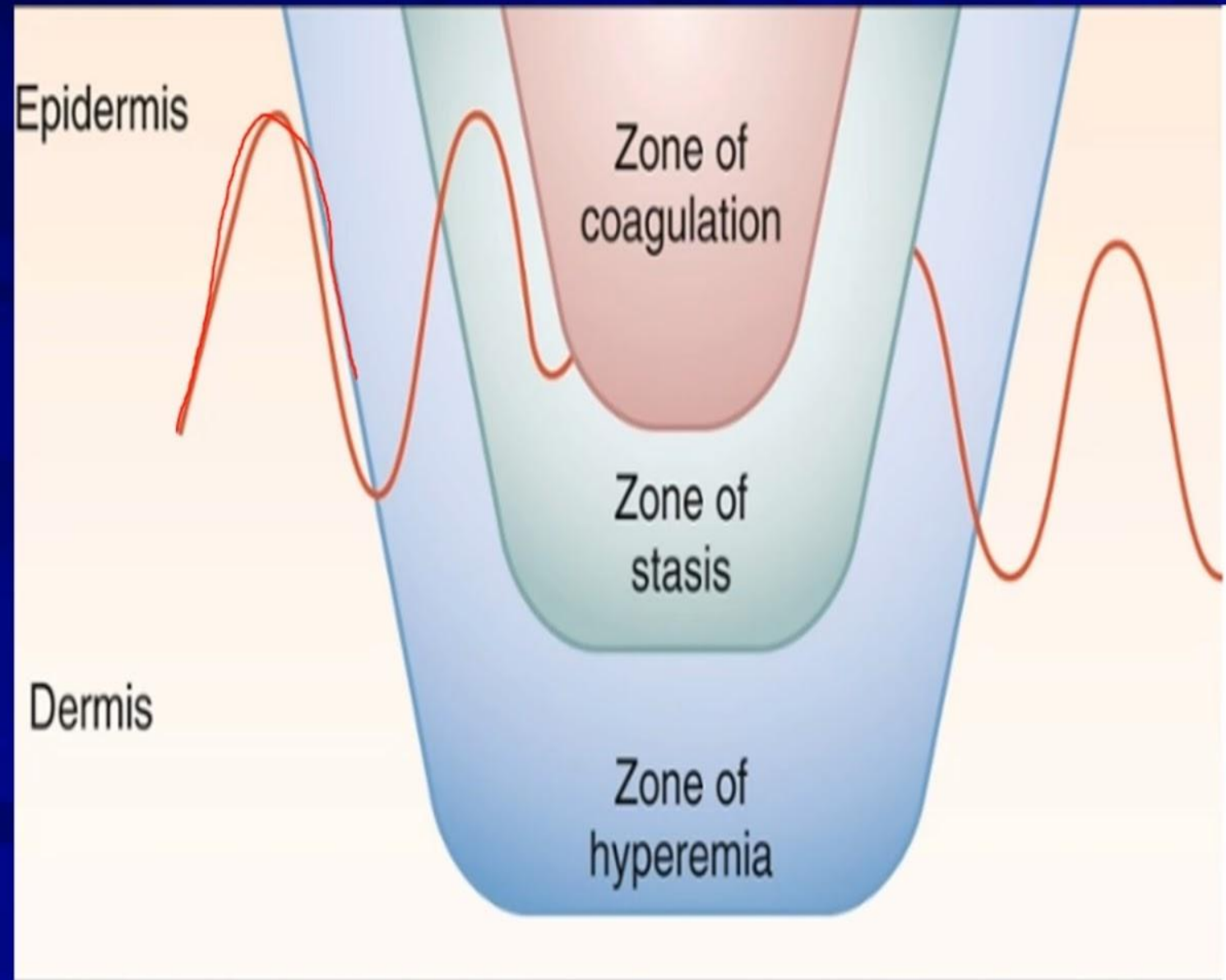
- Skin is charred.
- Great potential for Renal failure, Cardiac complications, and numerous other problems



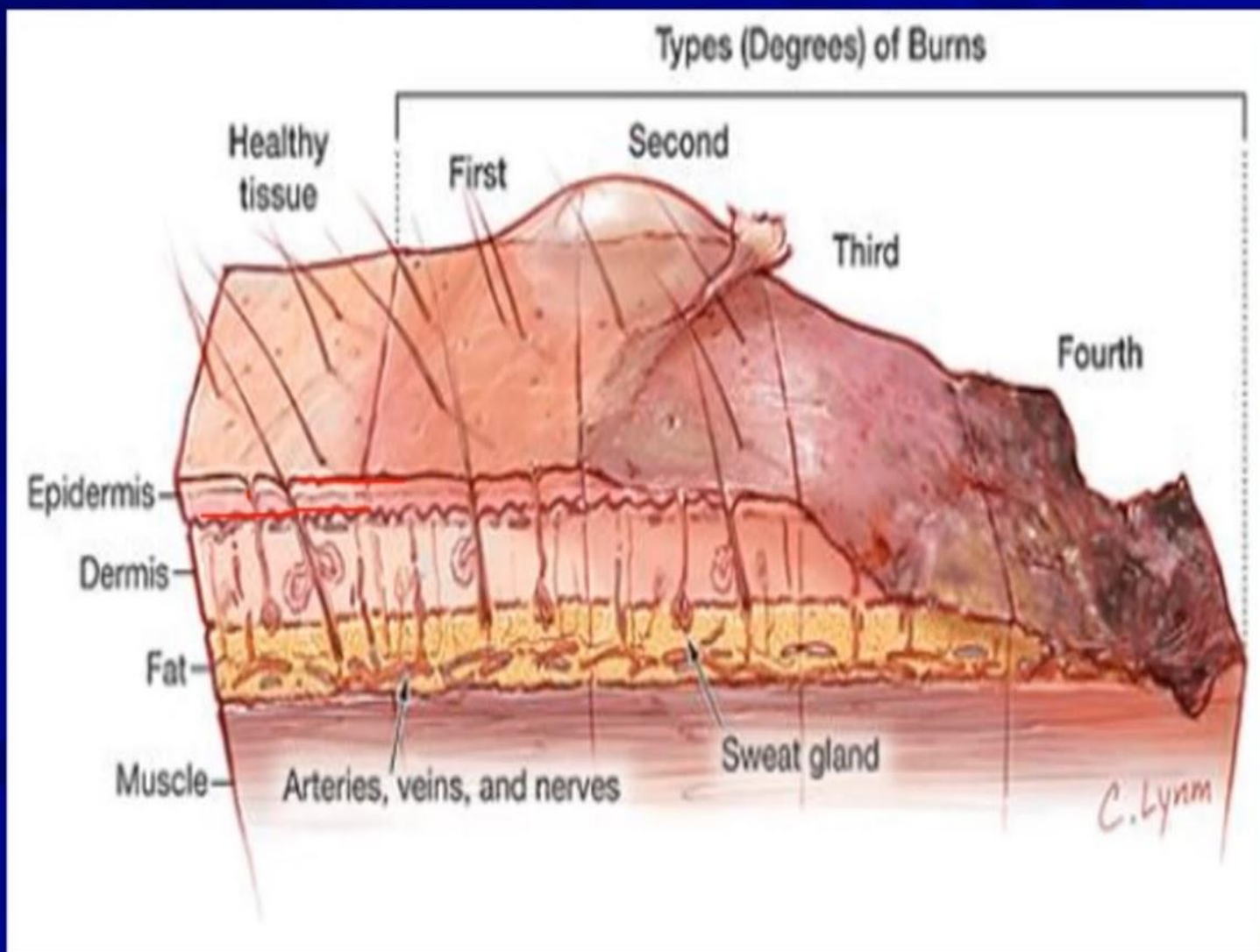
- Extensive Reconstructive Surgery is generally required

Area of Cutaneous Injury

- Zone of Coagulation :Necrotic area of burn the cells are irreversibly damaged.
- Zone of Stasis: Immediately surrounding necrotic zone , Decrease Tissue Perfusion , cells can go either way, with vascular damage and vessel leakage.
- Zone of Hyperemia: Lies beyond the 2nd zone characterized by Vasodilatation from inflammation, contain viable tissue , where healing will begin from.



Classification by Depth



Degrees of Burns

First degree

Superficial
second degree

Deep
second degree

Third degree

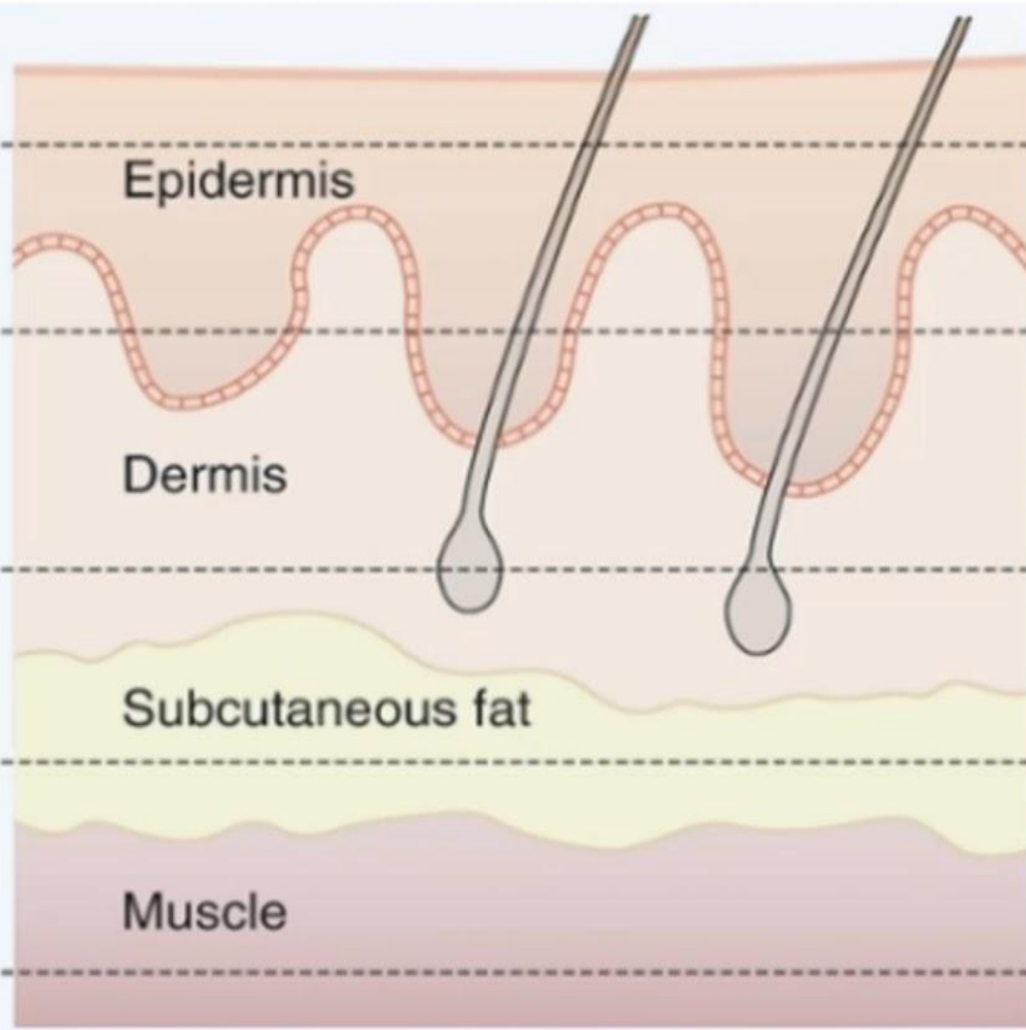
Fourth degree

Epidermis

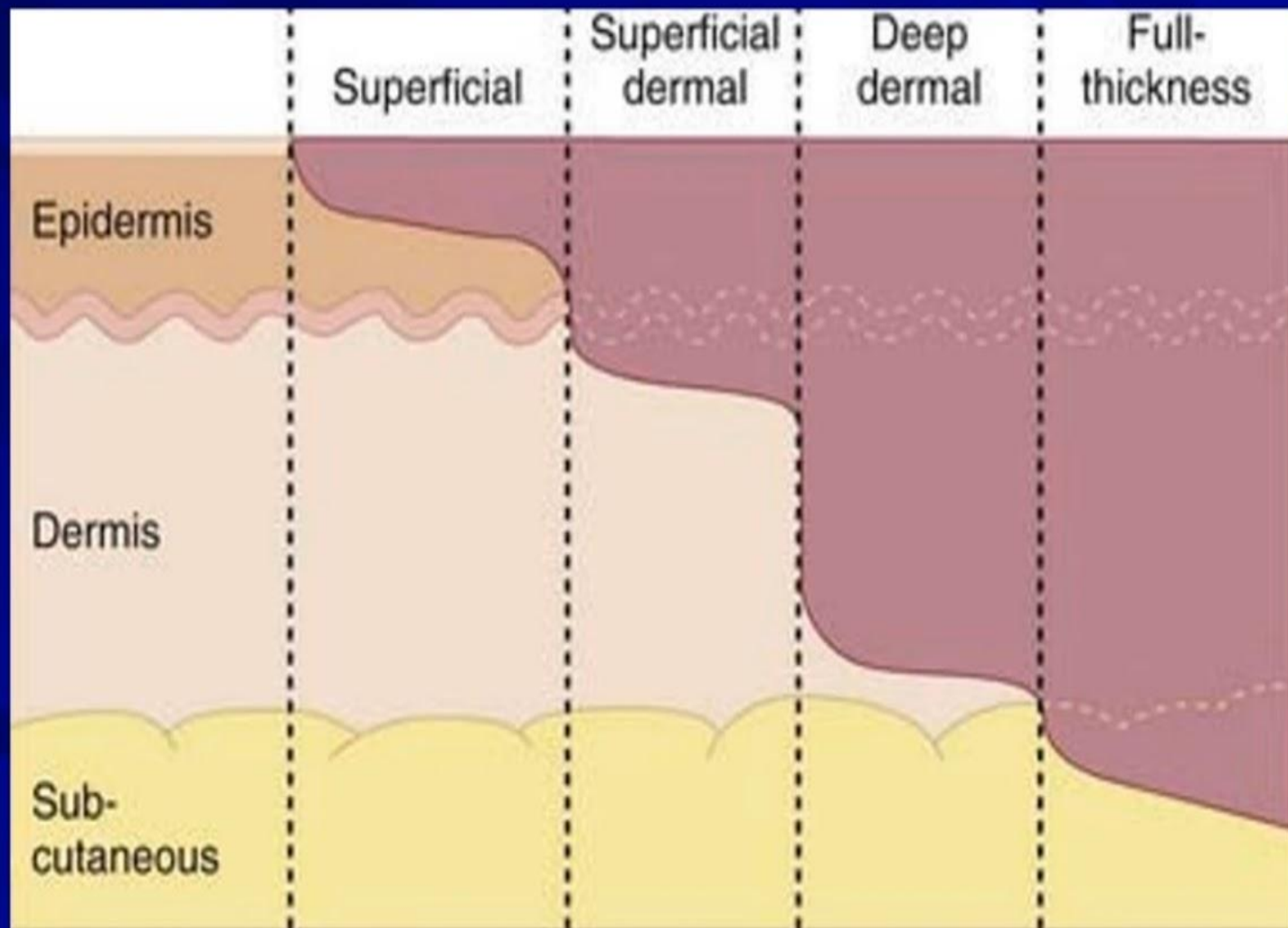
Dermis

Subcutaneous fat

Muscle



Classification by Depth



Burn Severity Classification

- 1) Minor Burns
 - Second-degree burns of less than 15% BSA in adults or 10% BSA in children & elderly.
 - Less than 2% full-thickness burns.
- 2) Moderate Burns
 - Second-degree burns of 15%-25% BSA in adults or 10%-20% BSA in children or elderly
 - Less than 10% BSA full-thickness burns.
- 3) Major Severe Burns
 - Second degree burns of greater than 25% BSA in adults or greater than 20% in children or elderly.

■ Clinical Picture:

The clinical report should include the Depth and Extent of the burn, and the presence of local or systemic complications.

First Degree

Burns appear as hyper esthetic erythema, which blanch on pressure redness.



Superficial Partial Thickness



- ▶ Blanches on pressure, Pulled Hair Retained.
- ▶ Blisters, bullae intensely painful, often underestimated.
- ▶ Usually heals without grafting in 10-14 days.

Mixed Superficial and Deep Partial Thickness



- ▶ Deeper areas will need excision and grafting.
- ▶ No capillary refill in deeper areas.

Burns

Second degree

is characterized by
Blisters and Bullae,
with intact pain
sensation.



Burns

Third degree: Burns are usually whitish or light brown, with visible thrombosis of sub dermal veins. They are dry, tough, insensitive, inelastic, and do not blanch on pressure.

The extent of burns in adults are estimated by applying the **“Rule of Nine”**, The Head and Neck, and each Upper Limb comprises 9% of the body surface area.

The front of the trunk, the back of the trunk and each lower limb are 18% each.

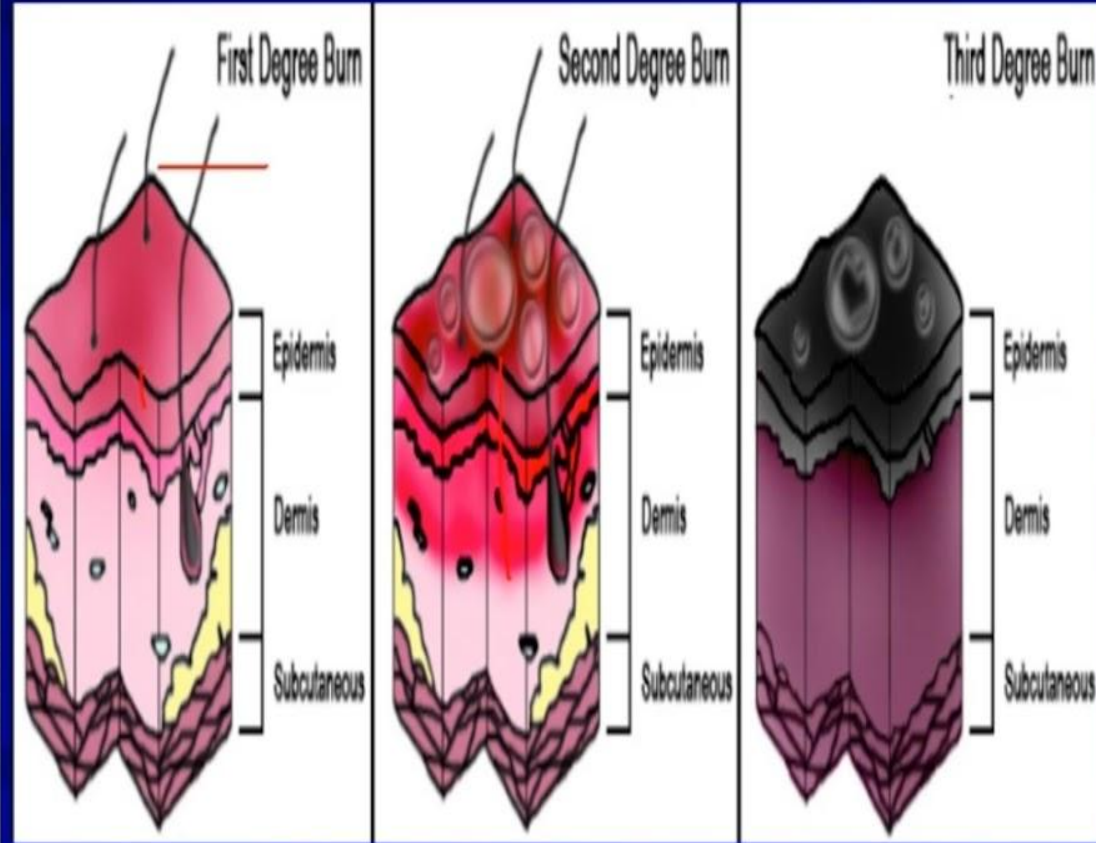


Full Thickness Burn



- ▶ Thick, leathery, painless – No Capillary Refill
- ▶ Needs Excision and Grafting

Classification of Burns by Depth



Classification of Burns by depth

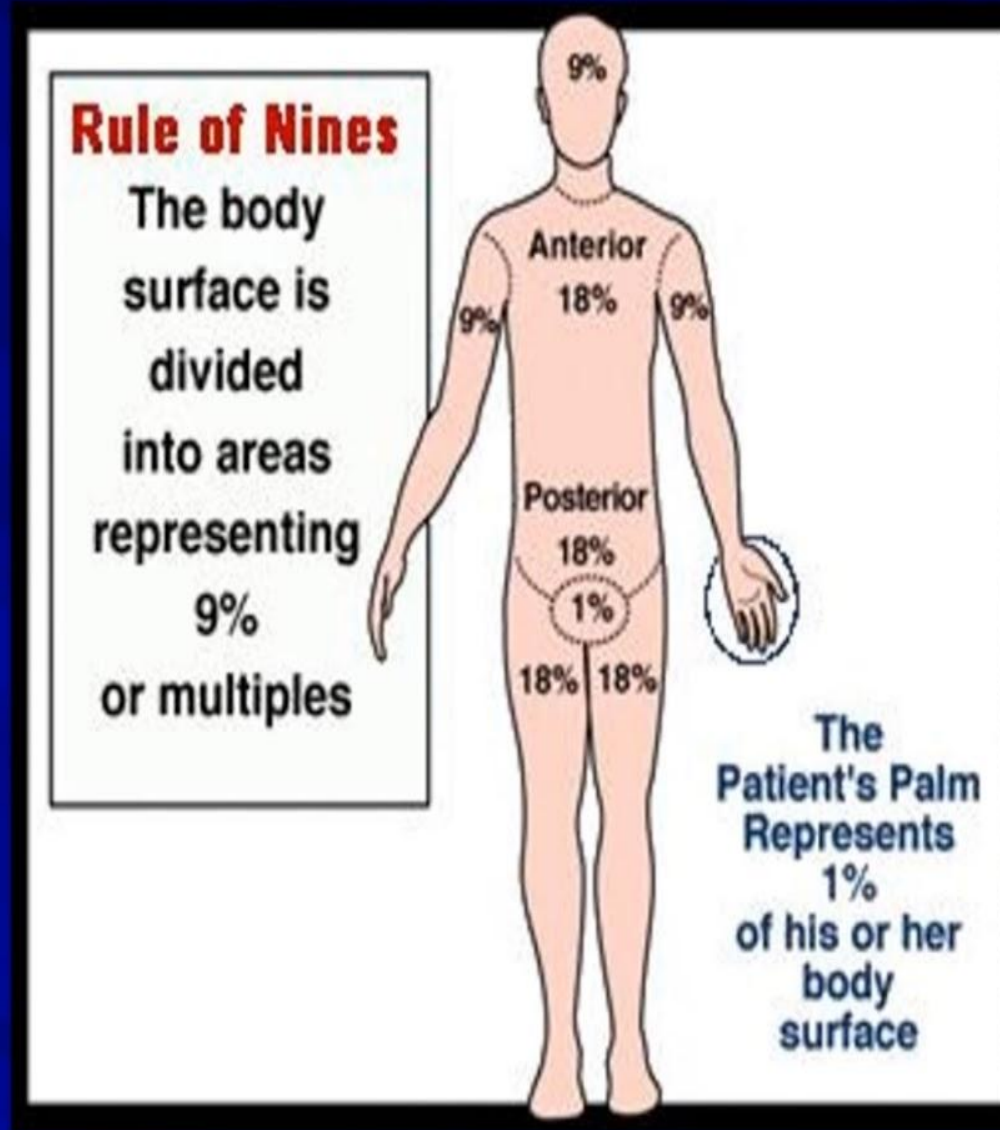


Body Surface Area Estimation

■ Rule of Nines

– Adult

■ Palm Rule.

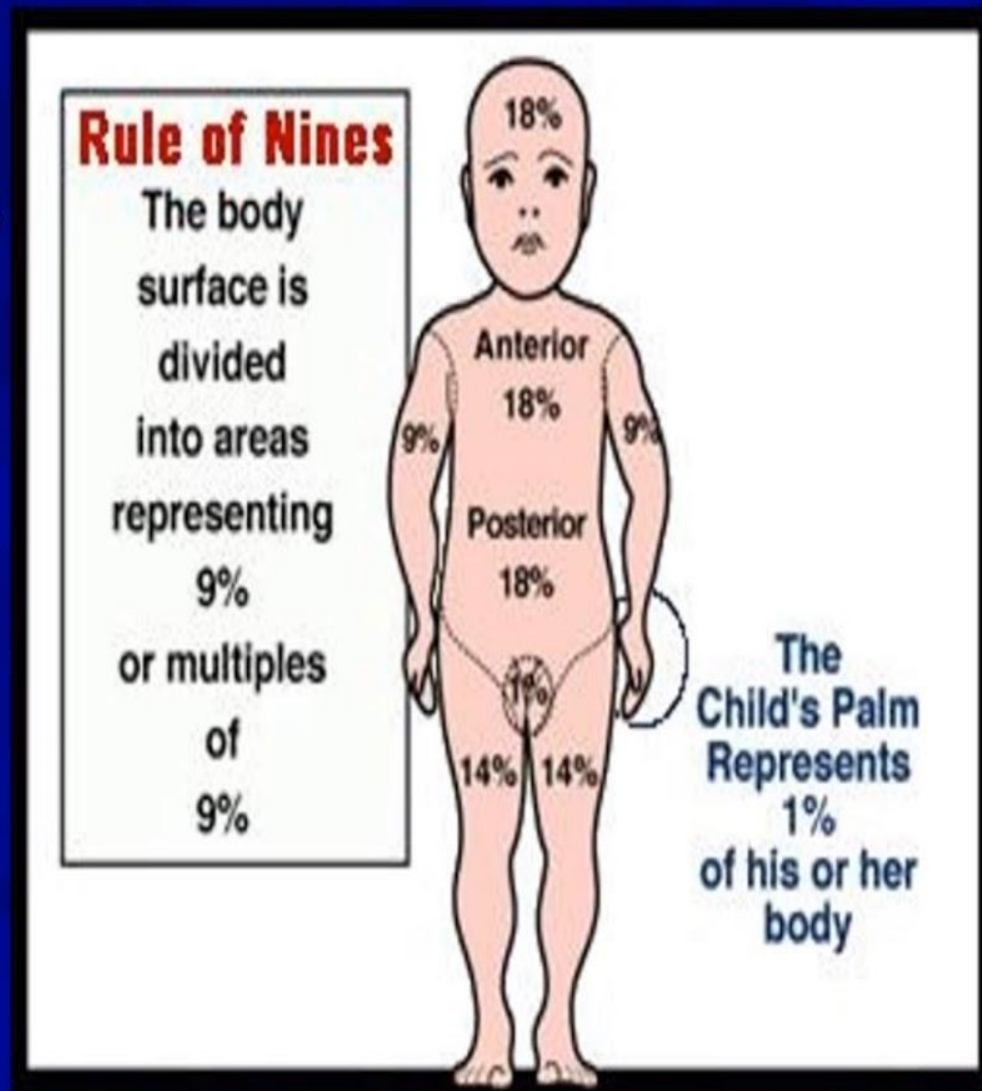


□ Erythema alone (SunBurn) is not included in % TBSA.

Body Surface Area Estimation

■ Rule of Nines
– Peds

■ Palm Rule



Determination of Burn Depth

■ Appearance

- Erythema and Blanching on pressure, Blisters PT.
- Dead White, Leathery skin, thrombosed veins FT.

■ Sensation

- Painful burns are PT.

■ Mechanisms

- Scalds from liquid not boiling PT.
- Boiling FT, flame burn mix, Electrical deep.

First aid treatment of burns

- Arrest Burning Process, Extinguish flames by water, Remove clothes, lay patient flat.
- Ensure adequate Airway, away from smoke.
- Avoid Contamination, cover burn with a clean sheet ,avoid house hold remedies.
- Transfer patient quickly to hospital.
- Protect Your Self !!

Which burn patients are referred to designated burn center

- **Partial thickness burn > 10% TBSA**
- **Full thickness burns.**
- **Burns involving the face Hands Feet ,Genetalia, Perineum and Major Joints.**
- **Electrical burns.**
- **Chemical burns.**
- **Inhalation injury.**
- **Concomitant Trauma .**
- **Burns with Comorbidities .**

ER Management - 2



Plastic Wrap

- Easy to apply
- Sterile
- Reduces Pain
- Reduces Heat Loss
- Can be left up to 72 hours



History is vital...



Early Burn “Shock” is due to Other Trauma

□ Look for it !

A Burn Patient is a Trauma Patient

A - AIRWAY :and C-Spine protection

B - BREATHING

C - CIRCULATION :and Hemorrhage Control

D - DISABILITY

E - EXPOSURE :and hypothermia prevention

Same priorities in adults, children and pregnant women

Burns

■ Treatment:

A) Indications of Hospital admission:

1. Second degree burns > 15% of the body surface area in adults, and > 10% in children which need I.V. fluid therapy.
2. Third degree burns.
3. Most burns of the Head and Face, Hands, feet and perineum.
4. Electric burns, severe chemical burns and burns with inhalation injuries.
5. Burns in poor-risk patients and extremes of ages.

Who to Transfer

- ☞ All full thickness Burns
- ☞ Children with > 10% TBSA
- ☞ Adults with > 15% TBSA
- ☞ Electrical Burns
- ☞ Inhalational Burns
- ☞ Special Area Burns – face, hands, feet, perineum
- ☞ When you aren't sure or can't manage.

Burns

B) General Treatment:

- Suffocation, Co poisoning, laryngeal edema and inhalation of hot, irritant or toxic gases have the utmost priority so Endo tracheal intubations Indicated.
- Strong Analgesia and Sedation: Morphia is ideal unless contraindicated.
- Intravenous Fluids: Started immediately and continued for 48 Hours .
- The amount is calculated from one of specialized proposed formulae.
- A simple one is 4ml/kg body weight/ 1% burnt surface area. If shock is anticipated, at least, the vital signs and urine output and monitored.
- In extensive burns, a naso-gastric tube NG Tube is inserted for GIT decompression and rest.
- Insert Foley catheter

Airway

- History / Explosion
- Facial burns
- Singeing of eyebrows / vibrissae
- Carbon deposit
- Carbonaceous sputum
- Hoarseness / Stridor
- Expiratory Rhonchi



Always give Oxygen!

Airway

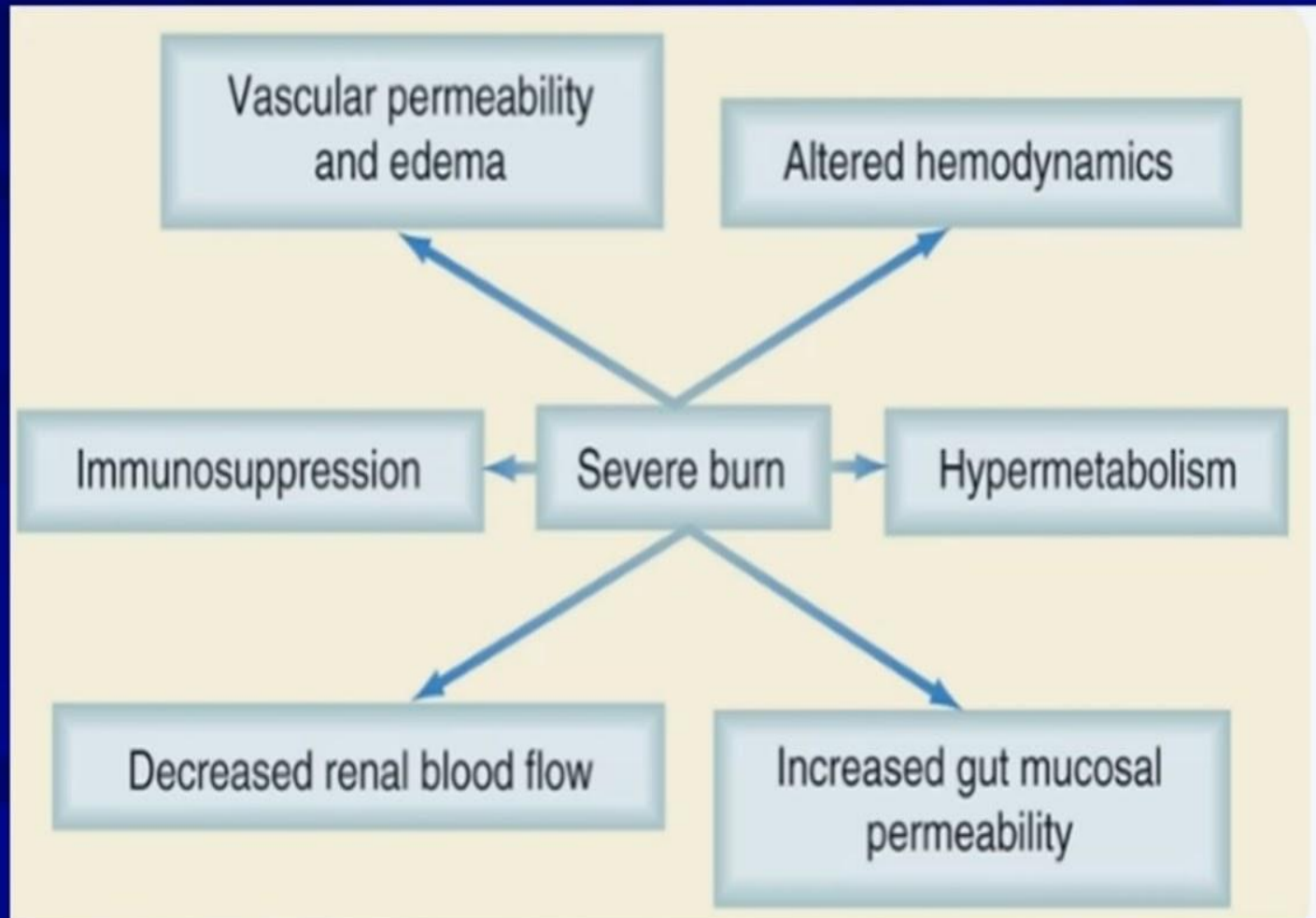
Think - Early Endotracheal Intubation



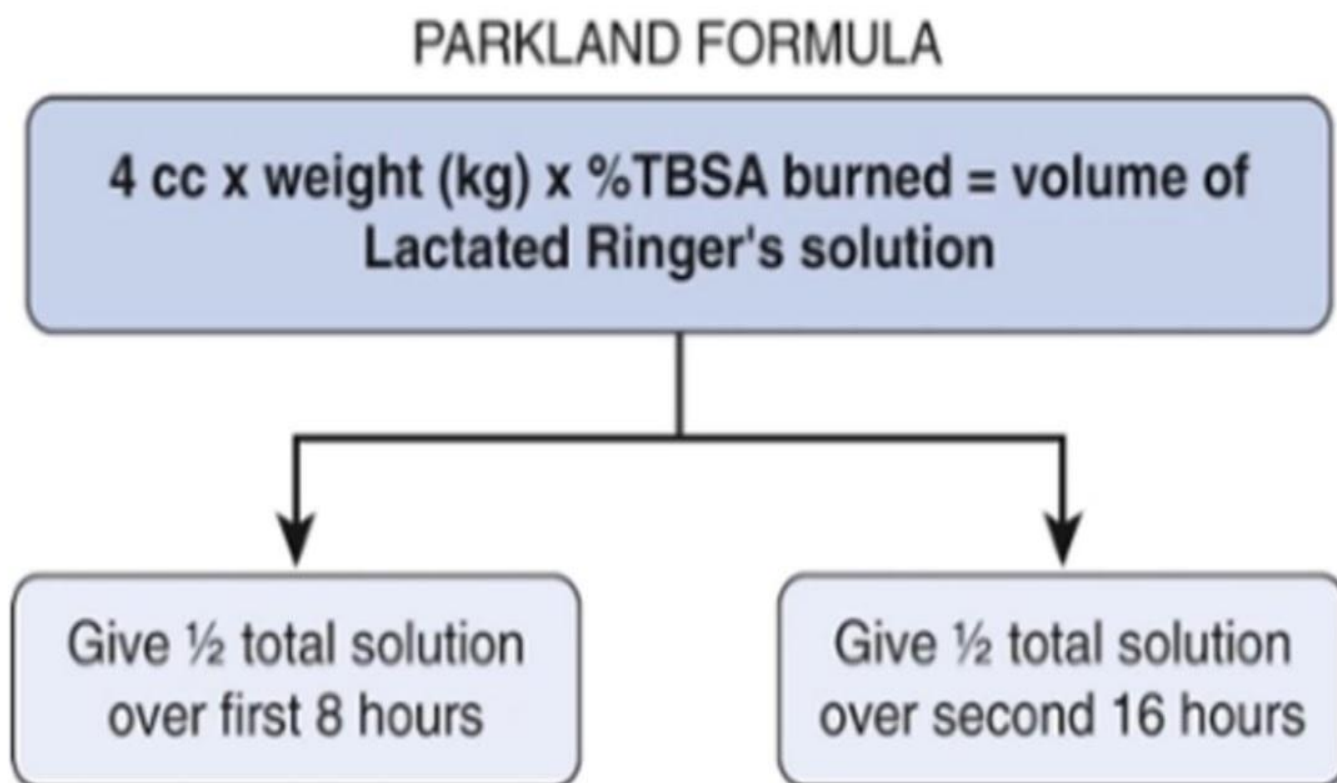
► **Airway obstruction
from swelling**

Cricothyroidotomy

Systemic effects of burn



Parkland formula



Parkland formula. *TBSA*, Total body surface area.

Burns

- Prophylactic Antibiotic: may be indicated, as well as, Anti Tetanus Prophylaxis.
- Prophylactic low molecular weight heparin : to prevent deep vein thrombosis.
- A proton pump inhibitor: or an H2 receptors blocker is routinely prescribed against acute gastro-duodenal “stress” ulcers and the peculiar acute duodenal “Curling” Ulcer.
- Vitamins and Antioxidants: to improve immunity and healing, Iron is given in deep and large burns to correct hemolytic jaundice and anemia.
- Enteral and parenteral High Calories: to meet the much increased basal metabolic rate, to revert the -ve nitrogen balance and to promote healing.
- Beta-blockers ?? , Anabolic steroids.

Burns

C) Local treatment:

1. The aim of local treatment is to Protect the Burn Against infection until a partial thickness burn regenerates within 1- 3 weeks and a deep one is grafted.
2. Initial care starts by washing with Cold Saline.
3. Cooling may save border-line cells if applied within an hour. Blisters are evacuated.
4. A Topical, better water-soluble, antiseptic preparation is used, and the region is wrapped in a sterile dressing with plenty cotton wool and light crepe bandage.

Burns

- Protection is continued by dressing the burn which is between twice per day to a maximum once every 2 days (Closed or Occlusive Method).
- For burns of the face, trunk, buttocks and perineum, (Open or Exposure Method).
- Deep dermal burn deserve special attention as any degree of infection can destroy remnants of the epithelium (skin Appendages) converting them into full-thickness third degree.

Burns

- Topical chemotherapeutics and antibiotics **silver nitrate 0.5% silver sulphadiazine 1%** or both .
- Topically effective antibiotics are **aminoglycosides** (gentamycin, neomycin, framycetin etc.) bacitracin, polymixin, furamycin and **fucidin** .
- It is advisable to use more than one antimicrobial agent alternately to decrease the side effects of each, and to avoid development of resistant bacterial strains.

Burns

4. Local application of Proteolytic enzymes or hypertonic, hygroscopic preparations to enhance separation of sloughs is suitable only for limited areas .
5. Non-infected burns are covered with sheets of Vaseline gauze or one of the recently introduced materials (Duoderm, Kaltostat) .

Eschar



Granulation tissue



Escharotomy

- Beware of circumferential burns (and dressings)
- Check distal circulation in limbs
- Assess need for escharotomy as an emergency



Escharotomy



Escharotomy



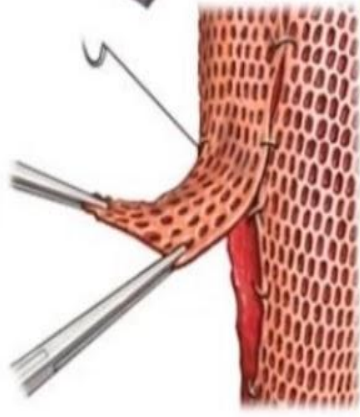
Burns

- 7. Late treatment is directed towards contracted, hypertrophied and keloidal scars and disfigurements.
- It is usually better to delay plastic surgery for some months after healing.

Graft taken from
patient's healthy skin



Skin is meshed
to cover a
large wound



Skin grafts



