BURNS

Dr. Bashar Alaraji 1st course

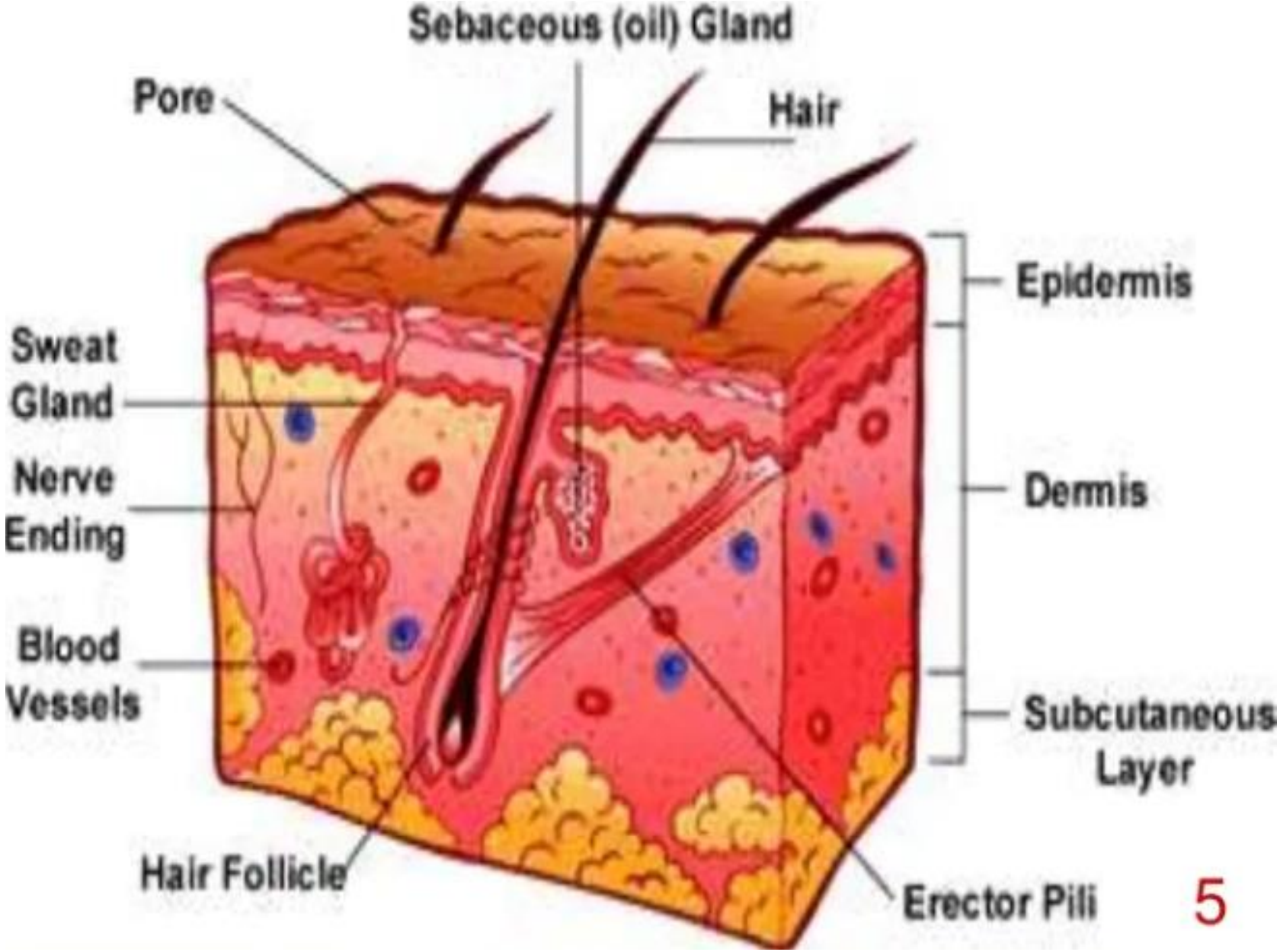
- Introduction
- Definition and Causes of burn
- Degree of burn
- Percentage of burn
- Criteria for burn admission
- Complications of burn
- First Aid of Burn
- Management of burn

Nursing care plan

Introduction

- **Skin is the largest organs of the body and has many functions:**
  - Provide a protective covering the body.
  - Prevent excessive amounts of water from leaving the body.
  - Protect organs from injury.
  - Allow cold, pain, touch, and pressure to be sensed.
  - Help control body temperature.
- **composed of three layers:**
  - Epidermis
  - Dermis
  - Hypodermis (Fat layer)

- **Epidermis**
  - Outer layer
  - Prevent most of bacteria, viruses, other foreign substance from entering the body. (when undamaged)
  - Protect the internal organs, muscles, nerves, and blood vessels against trauma.
- **Dermis**
  - Inner layer
  - A thick layer of fibrous and elastic tissue that give the skin its flexible and strength.
  - Contain Blood vessels, nerve, hair follicles, sweat and oil glands
- **Hypodermis (Fat layer)**
  - Helps insulate the body from heat and cold
  - Provide protective padding and save energy storage area


Sebaceous (oil) Gland
Pore
Hair
Epidermis
Sweat Gland
Nerve Ending
Dermis
Blood Vessels
Subcutaneous Layer
Hair Follicle
Erector Pili

Definition and Cause of Burn

Injuries to skin tissues caused by:

I. Friction
II. Thermal
III. Electricity
IV. Radiation
V. Chemicals
VI. Frostbite
VII. Inhalation

I. Friction burns

- Rubbing of the skin
- Anti-inflammatory creams

- Rubbing
- Trauma

II. Thermal burns

- Flames
- Hot liquids / objects
- Gases
- Flash

III. Electrical burns

- Accidental electrical contact
- Depend on:
  - strength of electrical voltag
  - duration of contact

IV. Radiation burns

- UV light
- X-rays
- Radiation therapy
- Radiant energy
- Skin effects from ionizing radiation depend on the amount of exposure to the area, with hair loss seen after 3 Gy, redness seen after 10 Gy, wet skin peeling after 20 Gy, and necrosis after 30 Gy.

V. Chemical burns

- Strong acids (sulfuric acid)
- Strong bases
- Detergents
- Solvents
- sulfuric acid as found in toilet cleaners, sodium hypochlorite as found in bleach, and halogenated hydrocarbons as found in paint remover

Tissue destruction may continue for up to 72 hours after a chemical injury

VI. Frostbite

Cold Injury (Frostbite)

- Usually affects fingers, toes, nose, and ears
- Numbness, pallor, severe pain, swelling, edema
- Sensory loss, Handle the tissue carefully!
- Skin appear mottled blue, yellowish-white or waxy

Interventions – Frostbite

- Warm rapidly and continuously for 15-20 minutes
- AVOID slow thawing
- Do not debrided blisters

VII. Inhalation

- Carbon monoxide poisoning (CO)
- Inhalation of hot air or noxious chemical
- Signs include
  - singed nares,
  - facial burns,
  - charred lips,
  - posterior pharynx edema,
  - hoarseness,
  - cough, or wheezing
  - Darken oral and nasal membranes

Singe: រោល
Char : ក្រៀម ខ្លោច

- ☐ **Pulmonary edema may not appear until 12 to 24 hours after the burn**
- ☐ **Decrease is surfactant production**
- ☐ **Decrease in ciliary action**

Degree of Burn

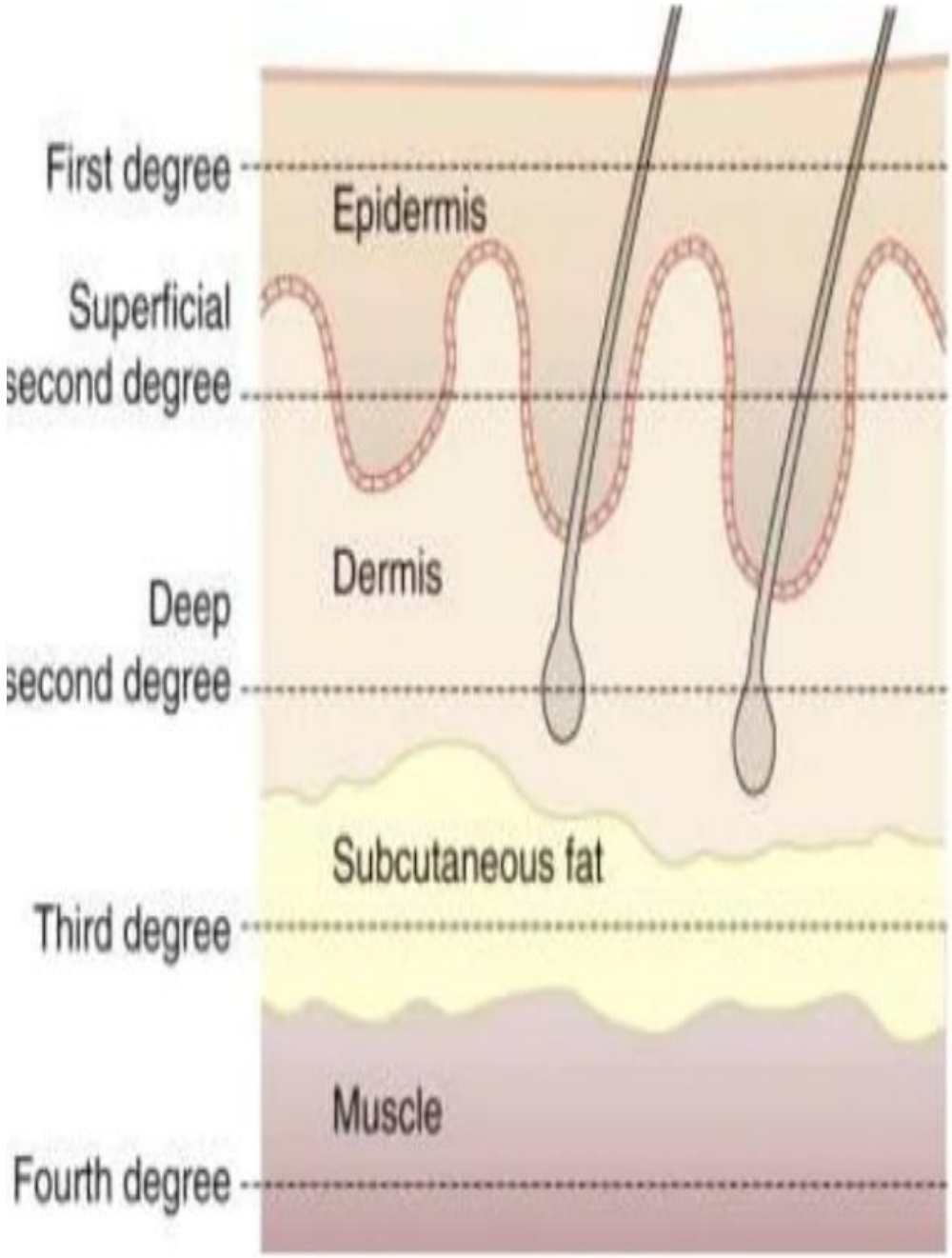
Every aspect of burn treatment depends on assessment of the depth and extent of burn.

i. First degree burn → superficial

ii. Second degree burn → superficial partial thickness

iii. Third degree burn → deep partial thickness

iv. Fourth degree burn → Full thickness ,subcutaneous tissue, muscles, bones



First Degree

Second Degree

Third Degree

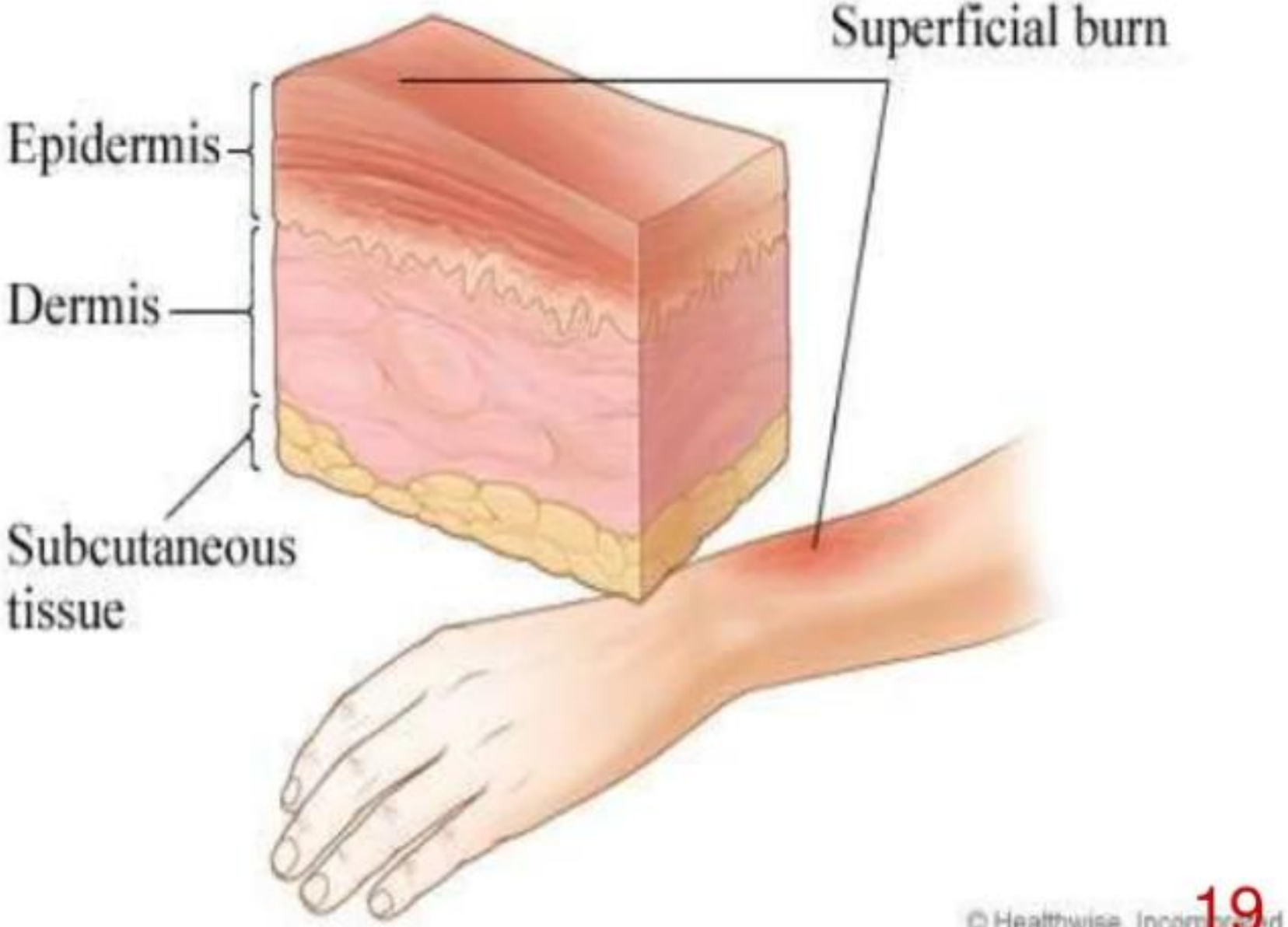
Fourth Degree

i. First-degree of burns
(Superficial)

- Epidermis a portion of the dermis may be injured
- symptoms
  - Redness
  - Mild pain
  - Dry skin
  - No blisters
  - Mild swelling
  - Involves minimal tissue damage
  - Minimal fluid lose (can dehydration in young child.)
  - Not serious unless large areas involve

Generally heals on its own without scarring in 3–5days

example – sunburn ,UV light

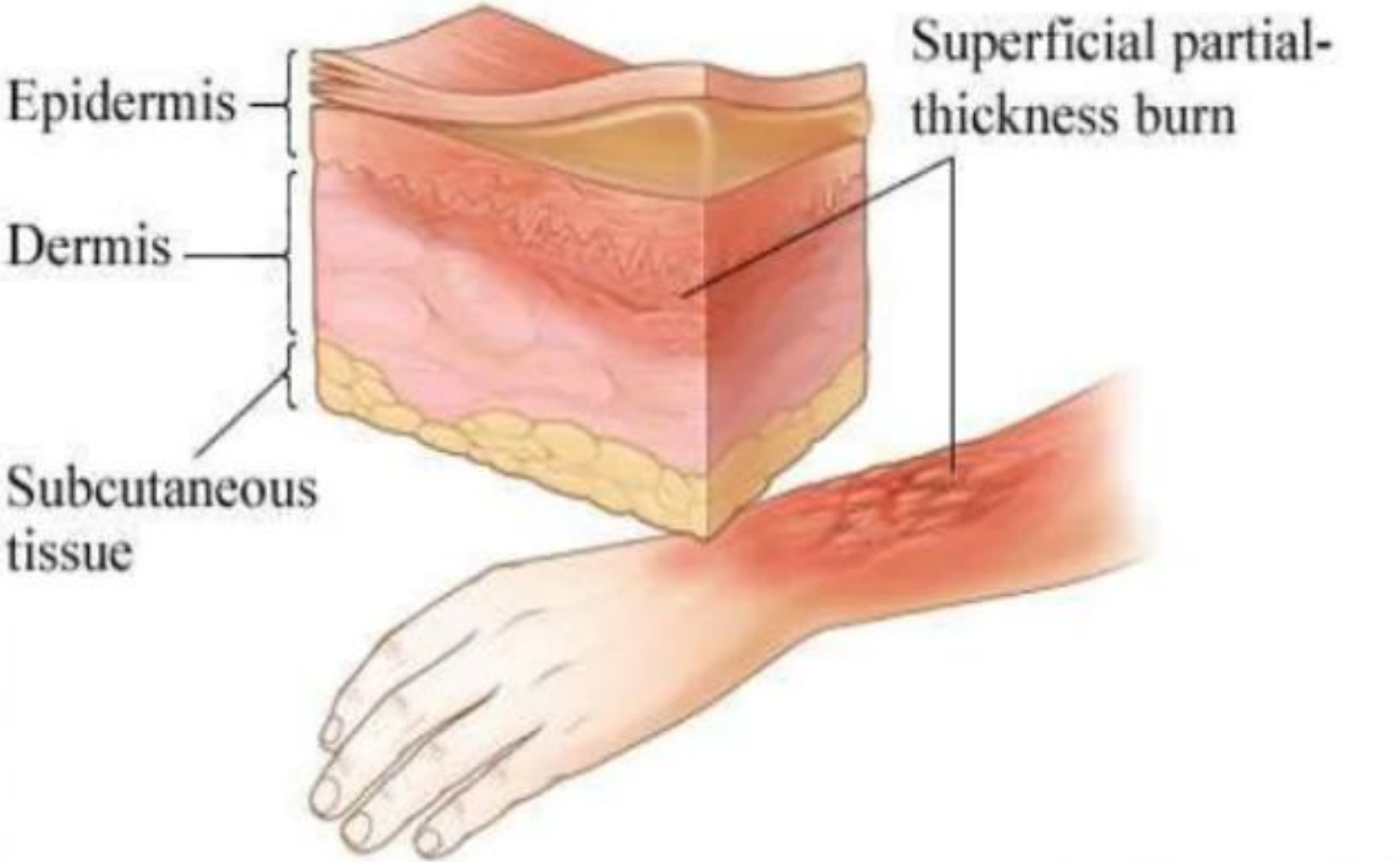

Superficial burn
Epidermis
Dermis
Subcutaneous tissue
© Healthwise, Incorporated

ii. Second-degree of burns
(Superficial partial thickness)

- Involves epidermis and part of dermis
- decreased blood flow in tissue can convert to a full-thickness burn
- symptoms
  - Blisters
  - Redness, shiny, wet
  - deep redness
  - very painful

Spontaneous re-epithelialization in 2–3 weeks

- Example – contact with hot objects or flame, tar burn

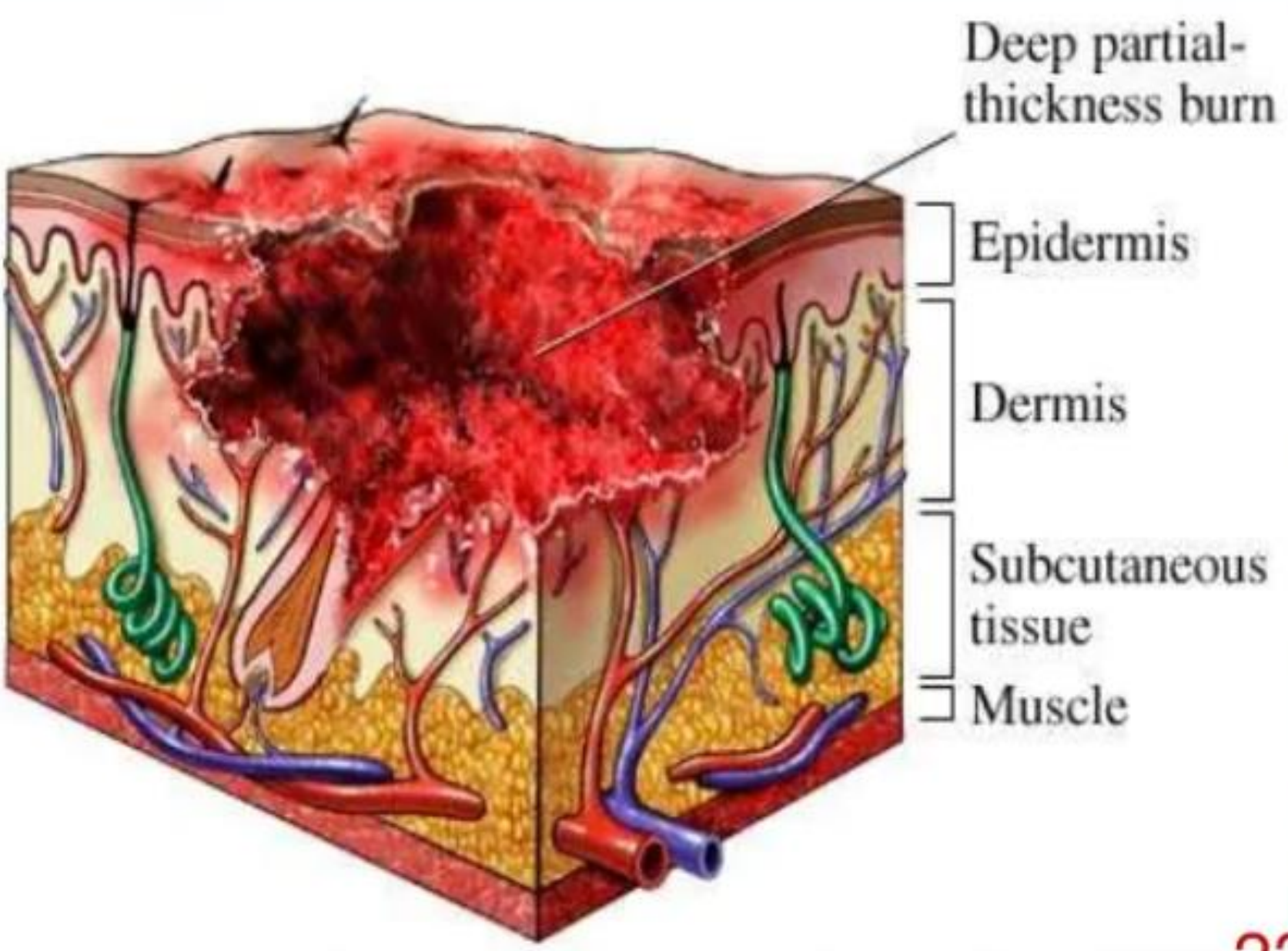


iii. Third-degree of Burn
(deep partial thickness)

- Epidermis and entire dermis
- Symptoms
  - Dry skin ,Swelling
  - White, black, brown or yellow skin
  - Little to no pain
  - Requires removal of eschars

- Can result in disruption of nails, hair, sebaceous glands
- May cause scarring: skin grafting usually required

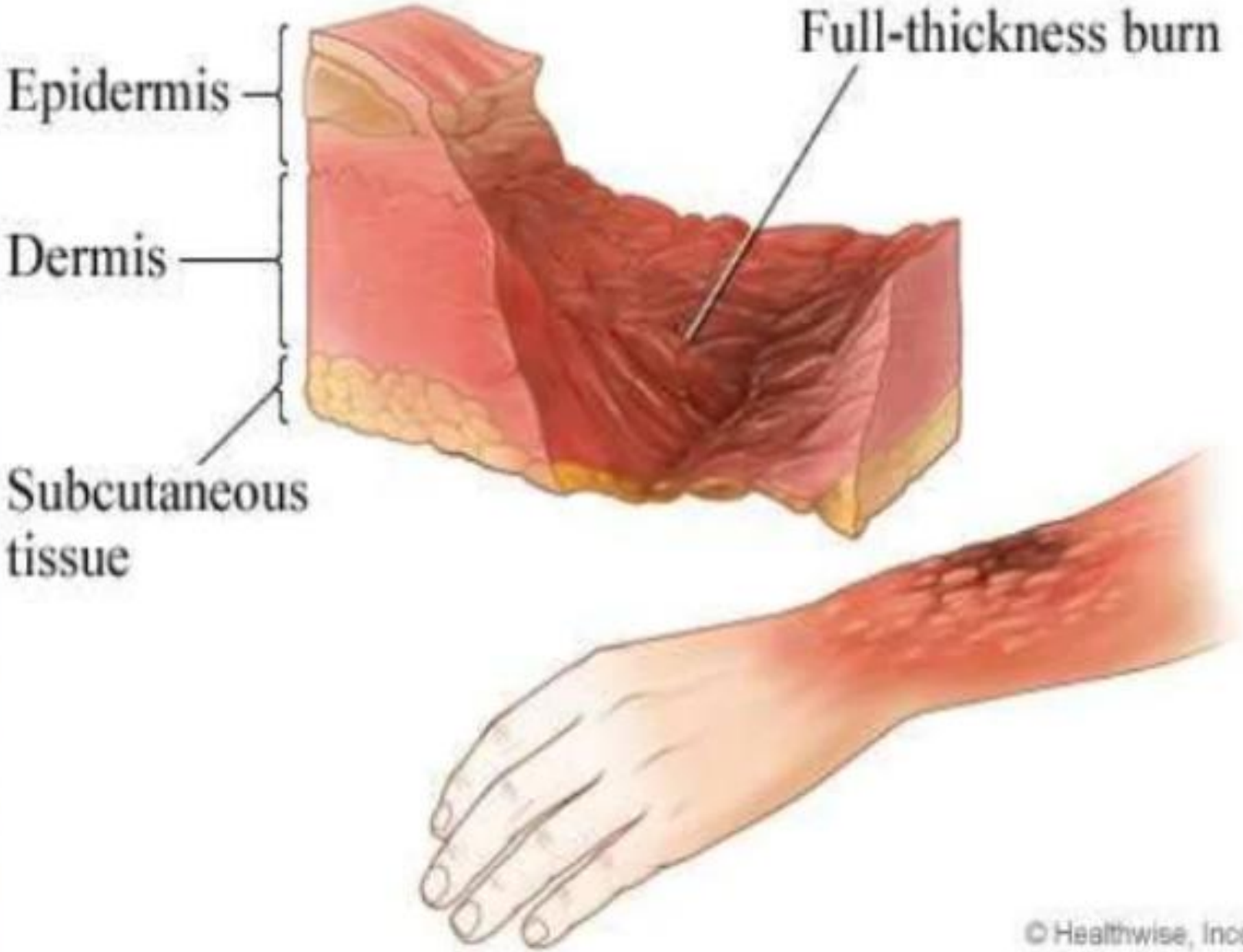
Example – electrical or chemical sources, flames …


Deep partial-thickness burn
Epidermis
Dermis
Subcutaneous tissue
Muscle

iv. Fourth-degree of burns (full thickness)

- Injury involve all layers of the skin and underlying tissue (tendons and bone).
- Need immediately hospitalization
- Symptoms
  - Black, white skin
  - No sensation
  - Dry, or hard skin
  - Pain may be intense or absent depending on nerve ending involvement
  - Causes scarring; skin grafting required

Example - flames , electrical or chemical sources…etc



Depth of burn	Characteristics	Cause
First degree burn	… Erythema … Pain … Absence of blisters	… Sunburn
Second degree (Partial thickness)	… Red or mottled … Flash burns	… Contact with hot liquids
Third degree (Full Thickness)	… Dark and leathery … Dry	… Fire … Electricity or lightning … Prolonged exposure to hot liquids/ objects

- **The following factors are considered in determining the depth of the burn:**
  - How the injury occurred
  - Causative agent, such as flame or scalding liquid
  - Temperature of the burning agent
  - Duration of contact with the agent
  - Thickness of the skin

Post Burn Metabolic Phenomena

- Two Distinct phase of metabolic changes observed in post burns.
- The first phase occurs within the first 48 hours of injury and has been called the ebb phase.
- Characterized by decrease in cardiac output, oxygen consumption, and metabolic rate, as well as impaired glucose tolerance associated with its hyperglycemic state.
- These metabolic variables gradually increase within the first 5 days postinjury to a plateau phase (the flow phase).

Post Burn Squela

- Cardiac out put increases by 1.5 times
- Liver size increases by 225%
- Muscle protein is degraded much faster than it is synthesized.
- The net protein loss causes loss of lean body mass and severe muscle wasting.

  10% loss – Immune Dysfunction

  20% loss – Decrease wound healing

  30% loss – Increased risk of Pneumonia & Pressure sores

  40% loss – Death

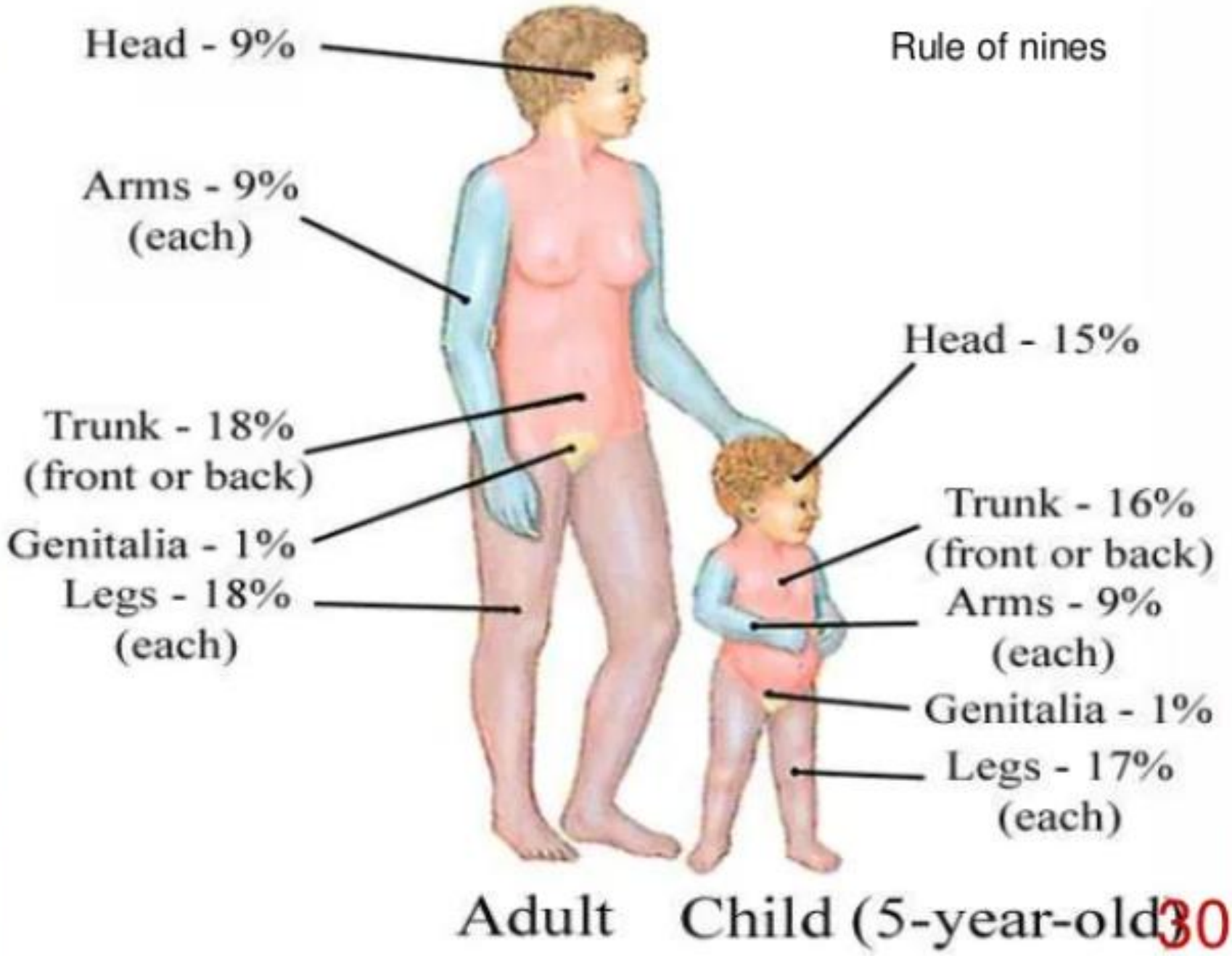
- Renal – Drecresed GFR and Renal blood flow and can lead to ATN if left untreated
- The gastrointestinal response to burn is highlighted by mucosal atrophy, changes in digestive absorption, and increased intestinal permeability.
- Burns cause a global depression in immune function.
- Great risk for a number of infectious complications, including bacterial wound infection, pneumonia, and fungal and viral infections.

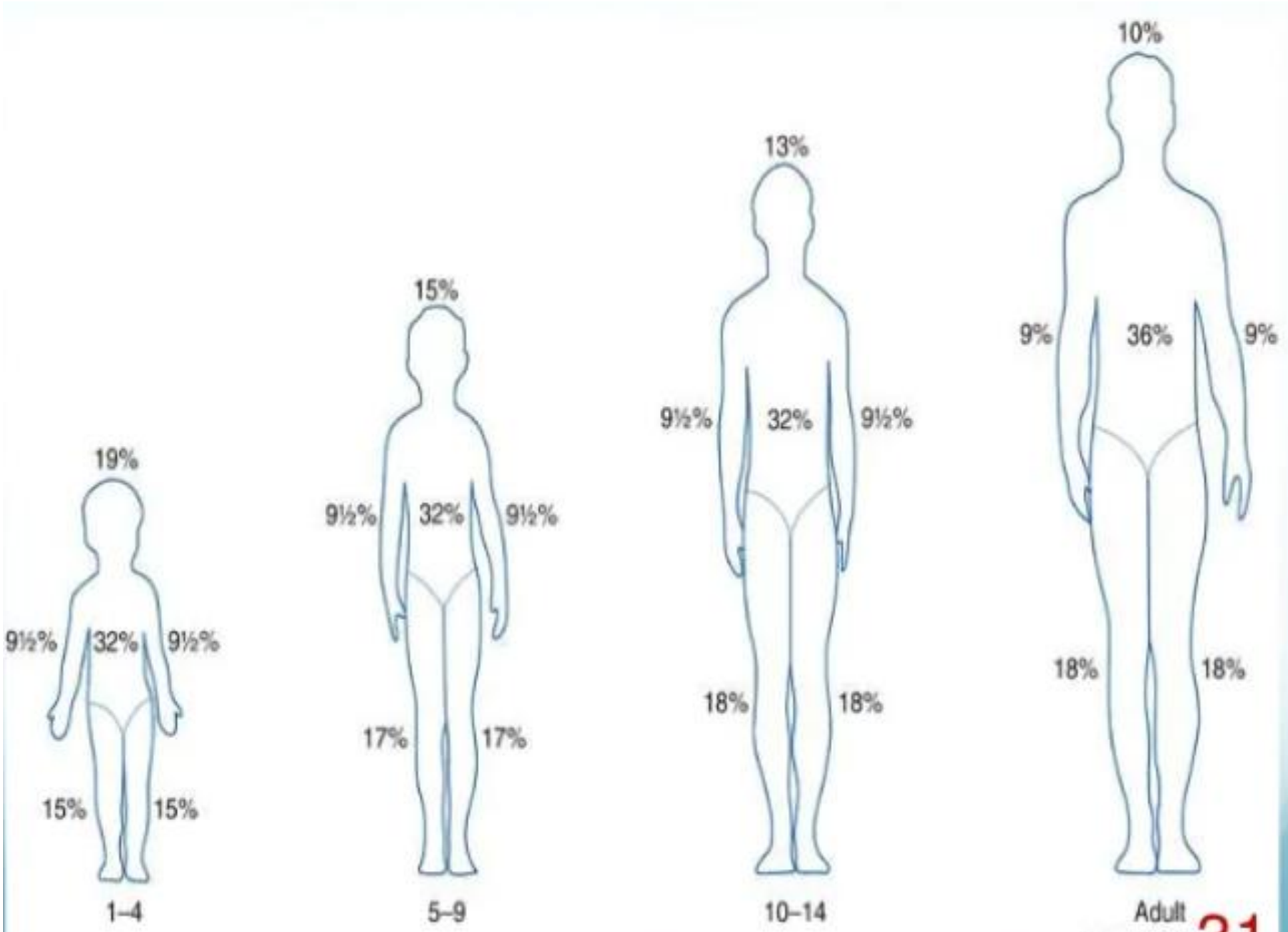
Percentage of Burn

- **Various methods are used to estimate the TBSA (total body surface area) affected by burns; among them are:**
  - The rule of nines,
  - The Lund and Browder method, and
  - The palm method.

RULE OF NINES

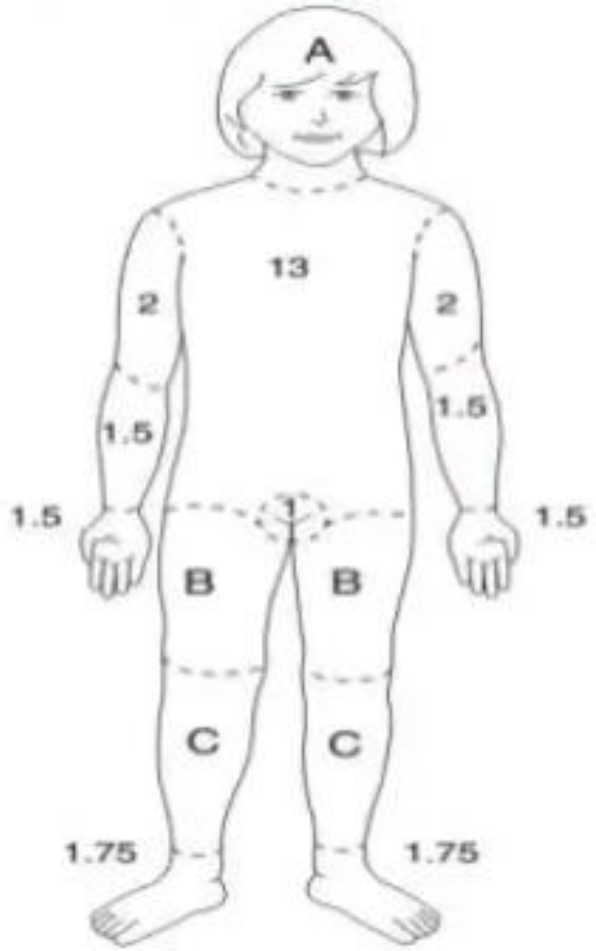
- An estimation of the TBSA involved in a burn is simplified by using the **rule of nines**.
- The rule of nines is a quick way to calculate the extent of burns.
- The system assigns percentages in multiples of nine to major body surfaces.
- Note that the ' rule of 9s ' cannot be applied to a child who is less than 14 years old .

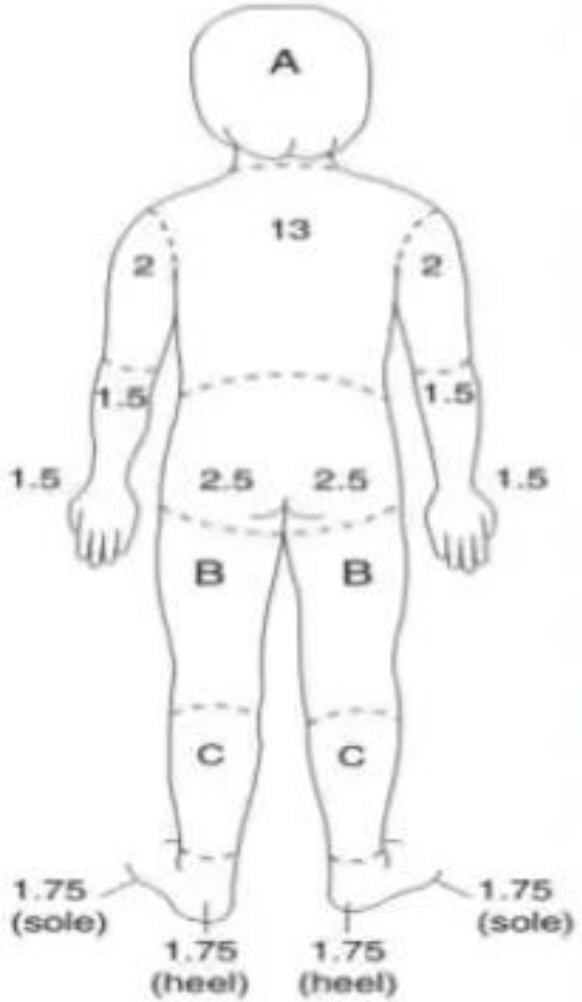

Rule of nines
Head - 9%
Arms - 9% (each)
Trunk - 18% (front or back)
Genitalia - 1%
Legs - 18% (each)
Head - 15%
Trunk - 16% (front or back)
Arms - 9% (each)
Genitalia - 1%
Legs - 17% (each)
Adult
Child (5-year-old)


19%
9½%
32%
9½%
15%
15%
1–4
15%
9½%
32%
9½%
17%
17%
5–9
13%
9½%
32%
9½%
18%
18%
10–14
10%
9%
36%
9%
18%
18%
Adult
(Rule of nines)

LUND AND BROWDER METHOD

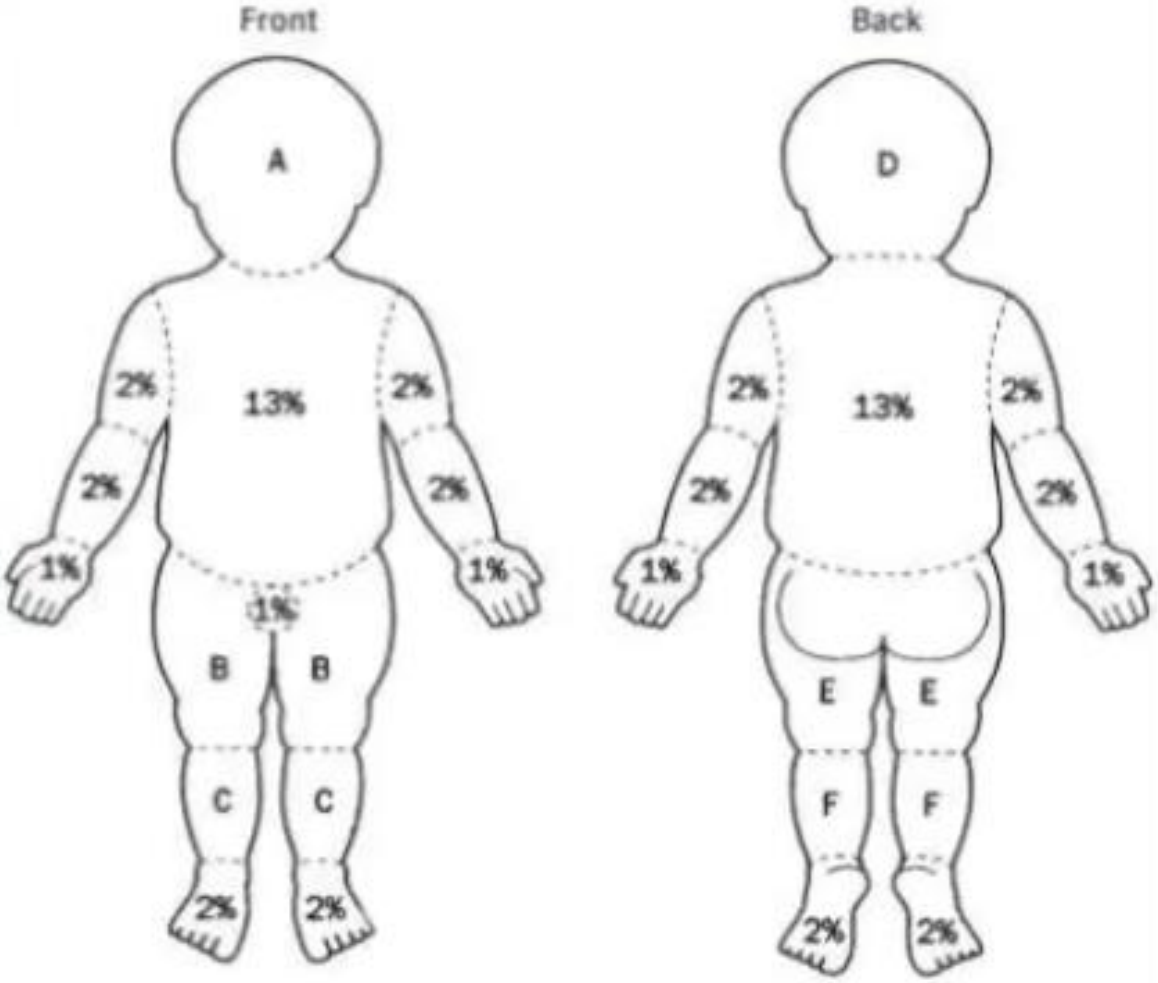
- A more precise method of estimating the extent of a burn is the Lund and Browder method,
- It recognizes that the percentage of TBSA of various anatomic parts, especially the head and legs, and changes with growth.
- By dividing the body into very small areas and providing an estimate of the proportion of TBSA accounted for by such body parts, one can obtain a reliable estimate of the TBSA burned.
- The initial evaluation is made on the patient's arrival at the hospital and is revised on the second and third post-burn days because the demarcation usually is not clear until then.





	< 1 yr	1 yr	5 yr	10 yr	15 yr	Adult
A Front or back of Head	9.5	8.5	6.5	5.5	4.5	3.5
B Front or back of Thigh	2.75	3.25	4	4.25	4.5	4.75
C Front or back of Leg	2.5	2.5	2.75	3	3.25	3.5

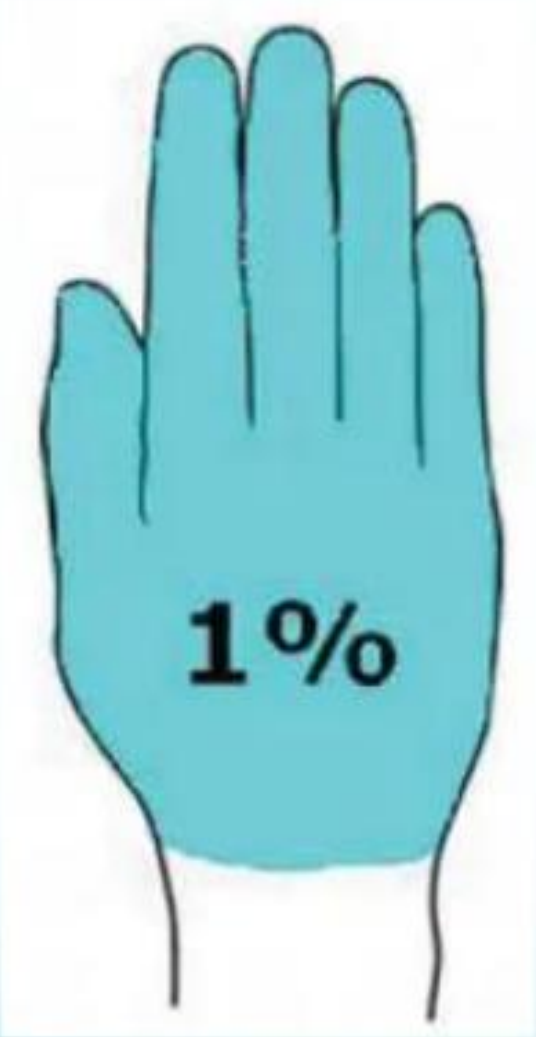
- Hospital care for children WHO,

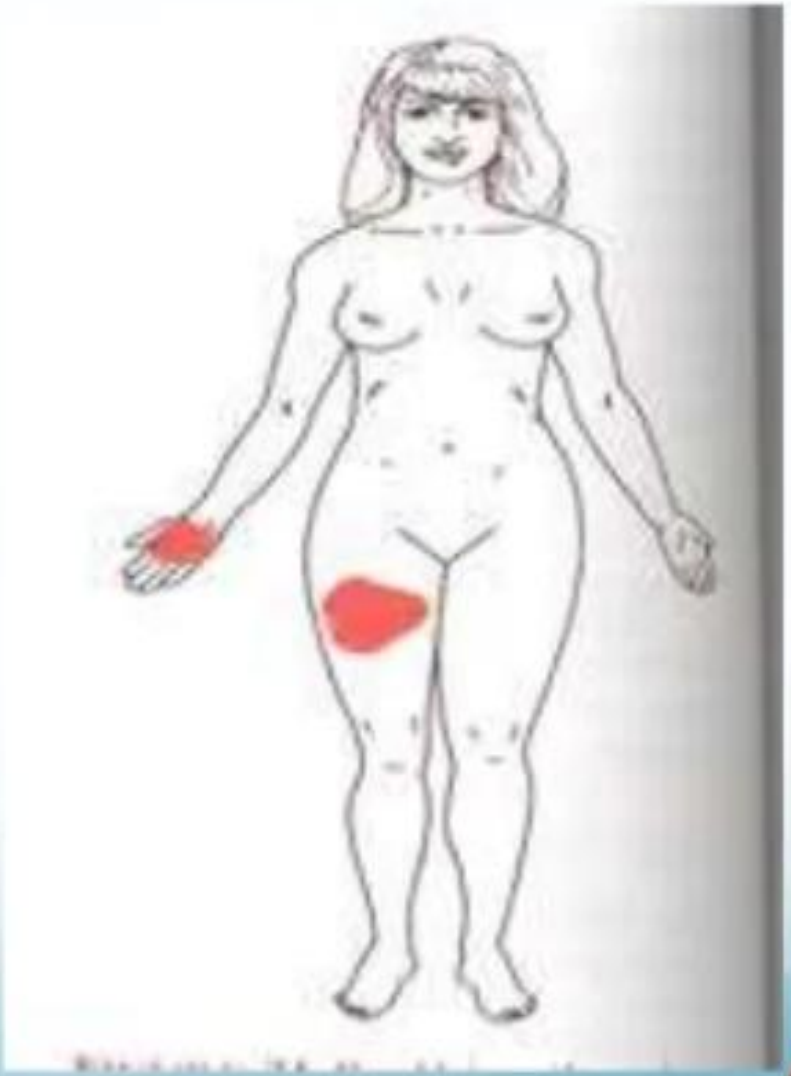


Area	By age in years			
	0	1	5	10
Head (A/D)	10%	9%	7%	6%
Thigh (B/E)	3%	3%	4%	5%
Leg (C/F)	2%	3%	3%	3%

PALM METHOD

- In patients with scattered burns, a method to estimate the percentage of burn is the palm method.
- The size of the patient's palm is approximately 1% of TBSA. (from crease of wrist to the top of extended fingers is approximately 1% of TBSA.


1%



Fluid Management

- Fluid resuscitation is required for burns covering:
  - > 15% for adults
  - > 10% for children
- Use Ringer's lactate or normal saline with 5% glucose
- For maintenance fluid use Ringer's lactate with 5% glucose or half-normal saline with 5% glucose
- Parkland's formula is suitable starting
- Oral supplementation may start 48 hr after as homogenized milk or soy-based products given by bolus or constant infusion via NGT

The goal of fluid resuscitation is to anticipate prevent hypovolaemic shock.

Parkland's formula

- For adult:
  - fluid given in the first 24h= Weight(kg) x TBSA % x 4ml
  - Rate:
    - ½ in the first 8h
    - ¼ in the second 8 hrs
    - ¼ in the third 8 hrs

Parkland's formula

- For children:
  - fluid given in the first 24h= Weight(kg) x TBSA % x 4ml
  - Rate:
    - ½ in the first 8h
    - ¼ in the second 8 hrs
    - ¼ in the third 8 hrs
  - Add maintenance fluid as follows:
    - 100ml /kg for first 10 kg of weight
    - 50ml / kg for next 10kg of weight
    - 20ml /kg for remaining 10kg after

Keep urine out put 2ml /kg/h or more

Assess circulation

Normotensive

hypotensive

Parkland Formula:
Crystalloid at 4mL/kg/d x TBSA
Plus maintenance rate
1/2 over first 8 hours
1/2 over next 16 hours

20ml/kg bolus
Repeat if still hypotension

Urine output < 1mL/kg/hr → 20ml /kg bolus of Crystalloid

Urine output=1–3mL/kg/hr → Continue Parkland formula

Urine output > 3mL/kg/hr → Decrease rate to 2/3 Parkland formula

At the end of 24 hours, colloid infusion is begun at a rate of 0.5 ml x(total burn surface area (%))x(body weight (kg)), and maintenance crystalloid (usually dextrose-saline) is continued at a rate of 1.5 ml x(burn area)x(body weight). The end point to aim for is a urine output of 0.5-1.0 ml/kg/hour in adults and 1.0-1.5 ml/kg/hour in children.

Complications

- Infection
- Peripheral vascular resistance and hypovolemia
- Acute tubular necrosis
- Cardiac arrhythmias
- Cardiac arrest
- Electrolytes disturbance
- Shock

Extent of burn injury

- **Minor burn injury**
  - Second-degree
    - less than 15% TBSA in adults
    - less than 10% TBSA in children
  - Third-degree
    - less than 2% TBSA not involving special care areas (eyes, ears, face, hands, feet, perineum, joints)
  - Excludes electrical injury, inhalation injury, concurrent trauma, all poor-risk patients (e.g, extremes of age, concurrent disease)

- **Moderate, Uncomplicated Burn Injury**
  - Second-degree burns of 15%–25% TBSA in adults and10%–20% in children
  - Third-degree burns of less than 10% TBSA not involving special care areas
  - Excludes electrical injury, inhalation injury, concurrent trauma, all poor-risk patients

(e g, extremes of age, concurrent disease)

- **Major Burn Injury**
  - Second-degree burns exceeding 25% TBSA in adults or 20% in children
  - All third-degree burns exceeding 10% TBSA
  - All burns involving eyes, ears, face, hands, feet, perineum, joints
  - All inhalation injury, electrical injury, concurrent trauma, all poor-risk patients

Management of burns

Management of burns is consist of
prehospital care
&
hospital care

Management of burns

Prehospital care

- **Stop the burning process**

Stop,drop and roll is a good method of extinguishing Fire

- **Cool the burn wound**

This provide analgesia and slow the delayed micro--vascular damage which occure after a burn injury Cooling should be for minimum 10 mintues and up to One hour to avoid hypothermia

- **Give oxygen**

Give oxygen especialy if there is altered level concious_ -ness level

Management of burns

- **Elevate**
- Sitting a patient up with a burned airway may prove life Saving
- Elevation of burned limbs reduce swelling and discomfort
- **Check for other injuries**
- A standard ABC check followed by a secondary survey
- Patients burned in explosions may have head and spine injuries And other life threatening problems

Management of burns

❖Indications for admission in burns

- Susected airway or inhalational injury
- Any burn require fluide resusciation
- Any burn in extreme of ages
- All electrical and chemical burns
- Any burn which require surgery
- Burn of any significance to hands,face,feet or perineum
- Suspicious of non accidental injury

Management of burns

Hospital care

- Admit the patient
- Airway control
- Breathing and ventilation
- Circulation
- Disability
- Exposure with environment control
- Fluid resuscitation
- Assess the %age,degree and type of burn
- Keep the patient in clean environment
- Sedation and proper analgesia

Management of burns

A.AIRWAY CONTROL

- Burned airway creates problems by swelling and can completely Occlude the airway
- Secure airway with an endotracheal tube until swelling subsided which is Usually 48 hours
- Delayed diagnosis of airway burn make difficult to intubate the Patient in presence of lyrangeal oedema so **cricothyroidectomy** Should be done
- Early intubation of suspected airway burn is the treatment of Choice in such patients

Management of burns

B.BREATHING

- A progressive increase in respiratory rate and effort ,anxiety
- Rising pulse and confusion with decreasing o2 saturation
- These symptoms take 24 hours to 5 days to appear
- Treatment starts as soon as possible including

✓Physiotherapy
✓Nebulisers
✓Warm humidified oxygen

Management of burns

Fluide resuscitation

- Iv volume must be maintained following a burn in order to provide sufficient circulation to perfuse not only the organs but also the peripheral tissues,especially damaged skin
- Iv resuscitation is appropriate for any child with a burn greater Then 10% and 15%for TBSA for adults
- If oral resuscitation is to be commenced then water is given Should not be salt free
- It is appropriate to give oral rehydration with a solution such as **DIORALYTE***
- Most common fluid used is **ringer lactate**

Management of burns

- Fluid volume is relatively constant in proportion to the area Of body burned therefore there are formulate that calculate The approximate volume of fluid needed for the pt of a given Body weight with a given %age of the body burned

▪Formulas to calculate the fluid replacement

- **1.parkland regime (commonly used)**

4ML/%burn/kg body weight/24 hours

4*50*60=12000ml in 24 hours

Half this volume is given in the frist 8 hours

Second half is given in the subsequent 16 hours

Others

1. **Evan,s formula**
2. **Muir and barclay**
3. **Modified brook formula**

Management (cont...)

Fluids used

- **Crystalloid resuscitation**

➢ **Ringer lactate** is the most commonly used crystalloid

➢ These are as effective as colloids for maintaining intra--vascular volume

➢ Less expensive

➢ **In children**

➢ **Dextrose saline** given for maintanaince

➢ 100ml/kg for 24 hours for frist 10kg

➢ 50ml/kg for 24 hours for next 10kg

➢ 20ml/kg for 24 hours for each kg above 20kg body weight

Management (cont...)

hypertonic saline

- it produces hyperosmolarity and hypernatremia

- Reduces shift of intracellular water to extracellular space

- **Advantages**

Include less tissue oedema and a resultant decrease in Escharotomies and intubations

Management (cont...)

Colloid resuscitation

- Plasma proteins are responsible for the inward oncotic Pressure that counteracts the outward capillary hydrostatic Pressure.
- Without proteins there will be oedema
- Proteins should be given after frist 12 hours of burn before
- This time proteins will leak out of cells
- Given through **muir and barclay formula**
- **0.5*%age bsa burn*weight=one portion**
- Periods of 4/4/4, 6/6, 12 hours respectively
- One portion to b given in each period

Management (cont...)

Treating the burn wound

Dressings

- Paraffine guaze
- Hydrocolloids (duoderm)
- Biological dressings
  - synthetic (biobrane)
  - natural (amniotic membrane)
- Full-thickness and deep dermal burns need antibacterial dressings to delay colonisation prior to surgery

Open method

- Silver sulfadiazine application without dressings commonly Used in burns of face,head and neck.

Closed method

- Dressing done to soothen and to protect the wound
- To reduce the pain
- As an absorbent

Management (cont...)

Treating the burn wound (cont.....

Tangential excision

- Can be done within 48 hours with skin grafting in patients with less Then 25% burn
- Usually done in deep dermal burns
- Dead dermis is removed layer by layer Untill fresh bleeding occurs
- Later skin grafting done

Treating the burn wound (cont.....

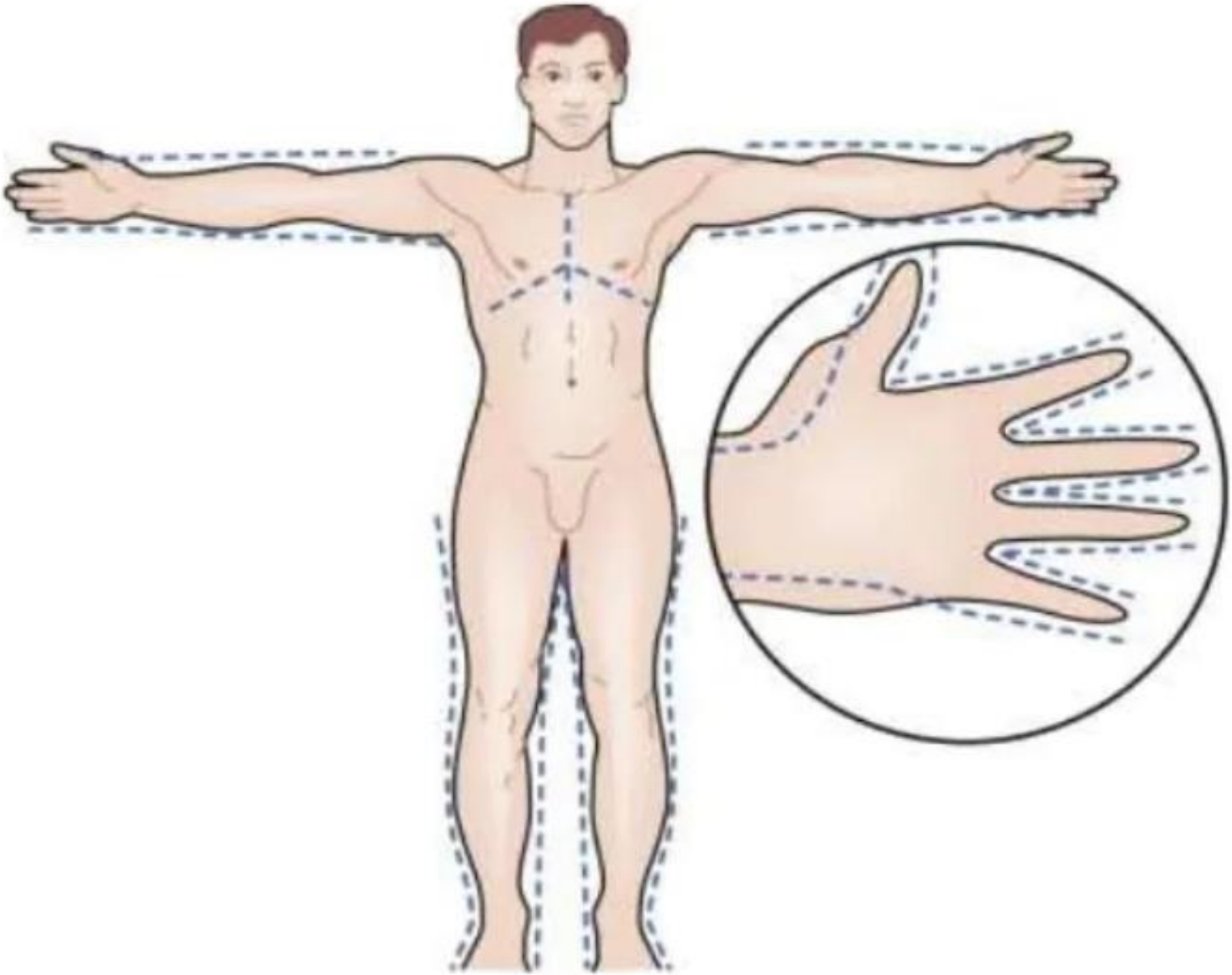
Treating the burn wound (cont.....

escharotomy

- Circumferential full-thickness burns to the limbs require emergency Surgery
- The tourniquet effect of this injury is easily treated by incising the whole length of full-thickness burns.
- This should be done in the mid-axial line, avoiding major Nerves
- The burn needs to be cleaned and the size and depth need to be
- Full thickness burns and deep partial-thickness burns that will requireoperative treatment will need to be dressed with an antibacterialdressing to delay the onset of colonisation of the wound

A full-thickness burn to the upper limb with a mid-axial escharotomy.

The soot and debris have been washed off.



Additional aspects of treating burn patient

- **Analgesia**
- Oral form of paracetamol and nsaids in superficial burns
- Iv opiates for large burns
- Im should not be given in over 10% of TBSA as absorption is Unpredictable
- Short acting analgesia given before dressing
- **Energy balance**
- Feeding should start within 6 hrs of injury to reduce gut mucosal damag
- Burns patients need extra feeding

A nasogastric tube should be used in all patients with burns over 15% of TBSA and 10% in case of children

- Burn injuries are catabolic in the acute episode.
- Removing the burn and achieving healing stops the catabolic drive

Additional aspects of treating burn patient

control of infection

- Patients with major burns are immunocompromised,
- pathogenic and opportunistic bacteria and fungi enter via the burn wound,cathetars and iv lines
- They have compromised local defences in the lungs and gut due to oedema
- Sterile precautions must be rigorous
- Swabs should be taken regularly
- A rise in white blood cell count, thrombocytosis and increased catabolism are warnings of infection

Nursing care

Physiotherapy

Psychological support

SURGERY FOR THE ACUTE BURN

- Any deep partial-thickness and full-thickness burns except those that are less than about 4 cm2, need surgery
- A topical solution of 1:500 000 adrenaline also helps to reduce bleeding,
- **deep dermal burns**, the top layer of dead dermis is shaved off until punctate bleeding is observed and the dermis can be seen to be free of any small thrombosed vessels
- **Full-thickness** burns require full-thickness excision of the Skin
- Postoperative management of these patients obviously requires careful evaluation of fluid balance and levels of haemoglobin.

Delayed reconstruction and scar management

- is common for large Full thickness burns
- Eyelids must be treated before exposure keratitis arises
- Transposition flaps and Z-plasties with or without tissue expansion are useful
- Full-thickness grafts and free flaps may be needed for large or difficult areas
- Hypertrophy is treated with pressure garments to be worn for 6-18 months
- Smaller areas of hypertrophy, silicone patches will speed
- scar maturation,as will intralesional injection of steroid.
- Pharmacological treatment of itch is important

Burns Referral

- Patients with the following criteria should be referred to a designated burn center:
- 1. Partial-thickness burns more than 10% of the TBSA
- 2. Burns involving the face, hands, feet, genitalia, perineum, and/or major joints
- 3. Any full-thickness burn
- 4. Electrical burns, including lightning injury
- 5. Chemical burns
- 6. Inhalation injury
- 7. Burns in patients with preexisting medical disorders that could complicate management, prolong recovery, or affect outcome

- 8. Any patient with burns and concomitant trauma (e.g., fractures) in which the burn injury poses the greater immediate risk of morbidity and mortality. In these 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. Physician judgment is necessary in these cases and should be in conjunction with the regional medical control plan and triage protocols.
- 9. Burned children in hospitals without qualified personnel or equipment to care for children
- 10. Burns in patients who will require special social, emotional, or long-term rehabilitative intervention.

Causes of death in burns

a. Hypovolaemia and shock

b. Renal failure

c. Pulmonary oedema and ARDS

d. Septicaemia

e. Multiorgan failure

Take Home message

- The treatment of burns is complex.
- Minor injuries can be treated in the community by knowledgeable physicians.
- Moderate and severe injuries, however, require treatment in dedicated facilities.
- Burn injury treatment depends on the depth and total body surface area affected.
- Early systemic response would be dampening of all responses and followed hypermetabolism.

- Early fluid resuscitation with adequate fluids and addressing inhalation injury saves lots of life.
- Addressing wound comes second after initial resuscitation with adequate covering of wound.
- Main aim of wound care to protect body from infection and hypothermia.
- Early wound excision and grafting prevents wound contracture.
- Electrical burns- High voltage burns addressed in multidimentional way.
- Chemical burns – Alkali and Acids treated differently.

Thank you