

PATHOPHYSIOLOGY OF BURNS

I.DAVID THANKA EDISON

2 nd Yr MS PG



DEFINITION

Burns are wounds produced by various kinds of agents that cause cutaneous injury and destruction of underlying tissue.

TYPES OF BURNS

- ❖ Thermal injury
 - Scald—spillage of hot liquids
 - Flame burns
 - Flash burns due to exposure of natural gas, alcohol, combustible liquids
 - Contact burns—contact with hot metals/objects/materials
- ❖ Electrical injury
- ❖ Chemical burns—acid/alkali
- ❖ Cold injury—frost bite
- ❖ Ionising radiation
- ❖ Sun burns



Classification of Burns

I. Depending on thickness of skin involved

a. First degree:

- ❑ Epidermis is red and painful,
- ❑ No blisters,
- ❑ Heals rapidly in 5-7 days
- ❑ By epithelialization without scarring.



b. Second degree:

- ❖ Mottled, red, painful, with blisters,
- ❖ Heals in 14-21 days.
- ❖ Superficial burn heals, causing pigmentation.
- ❖ Deep burn heals, causing scarring, and pigmentation.



- Third degree:
 - Charred, painless and insensitive,
 - Thrombosis of superficial vessels.
 - It requires grafting.
 - **Eschar**
Charred, denatured, insensitive, contracted full thickness burn.
- These wound must heal by re-epithelialisation from wound edge.





- d. Fourth degree:

Involves the underlying tissues—muscles, bones.

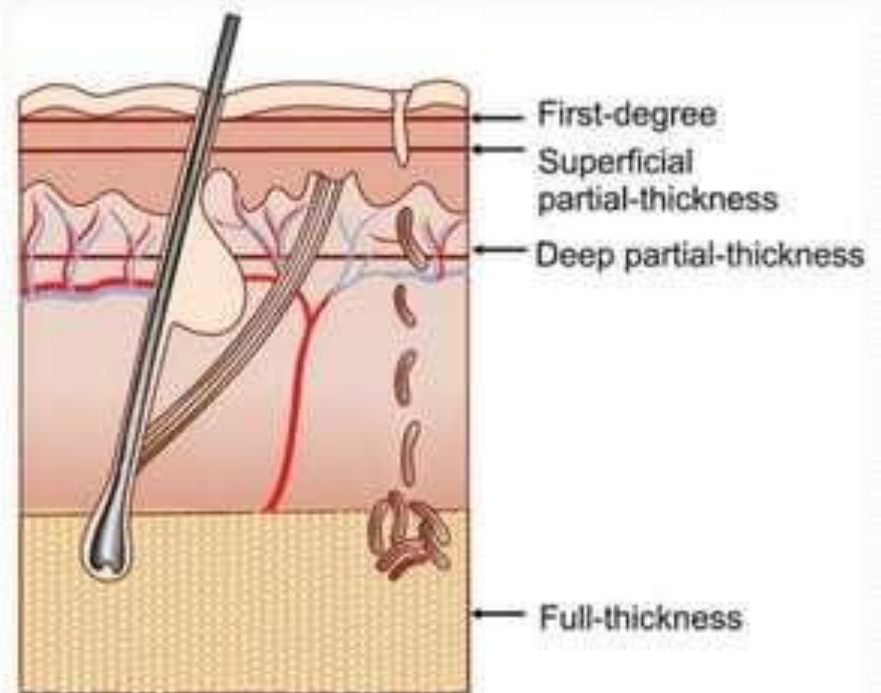
II. Depending on thickness of skin involved

- a. **Partial thickness burns:**

It is either first or second degree burn which is red and painful, often with blisters.

- b. **Full thickness burns:**

It is third degree burns which is charred, insensitive, deep involving all layers of the skin.



Depending on the Percentage of Burns

Mild (Minor):

- Partial thickness burns < 15% in adult or <10% in children.
- Full thickness burns less than 2%.
- Can be treated on outpatient basis.

Moderate:

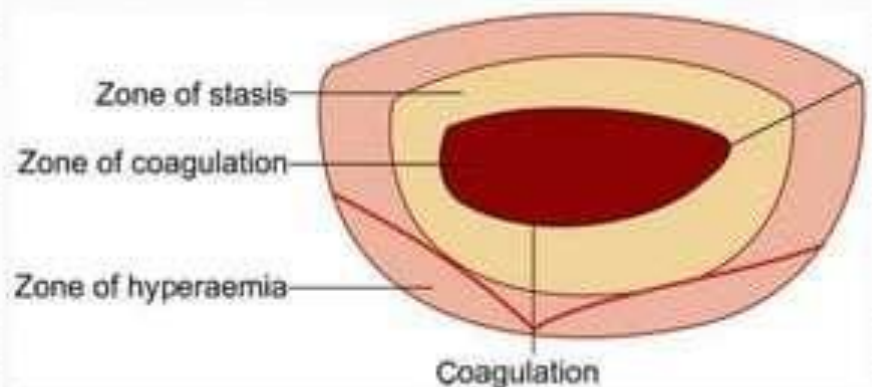
- Second degree of 15-25% burns (10-20% in children).
- Third degree between 2-10% burns.
- Burns which are not involving eyes, ears, face, hand, feet, perineum.

Major (severe):

- Second degree burns more than 25% in adults, in children more than 20%.
- All third degree burns of 10% or more.
- Burns involving eyes, ears, feet, hands, perineum.
- All inhalation and electrical burns.
- Burns with fractures or major mechanical trauma.

Jackson`s thermal wound theory

- Zone of coagulation
Centre area of wound ,where all tissues are damaged
- Zone of stasis
Surrounds the coagulation area some tissues are damaged
- Zone of hyperaemia
Unburned area surrounds the stasis but it is red due to inflammation

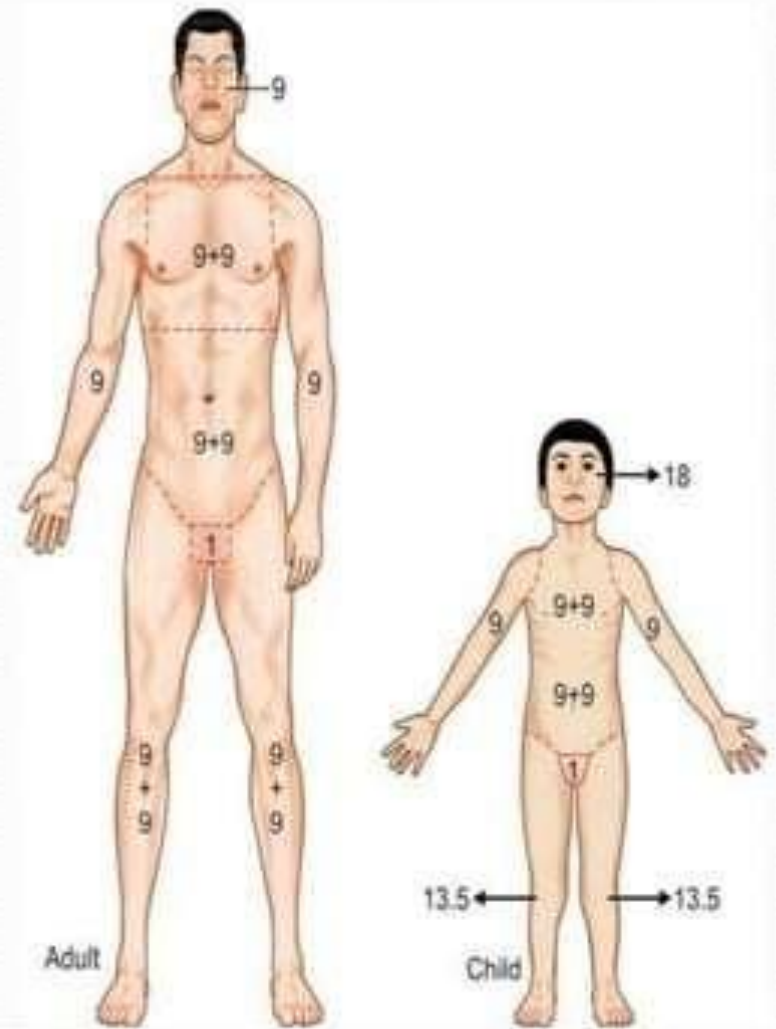




ASSESSMENT OF BURNS

Wallace's rules of nine

It is used for early assesment

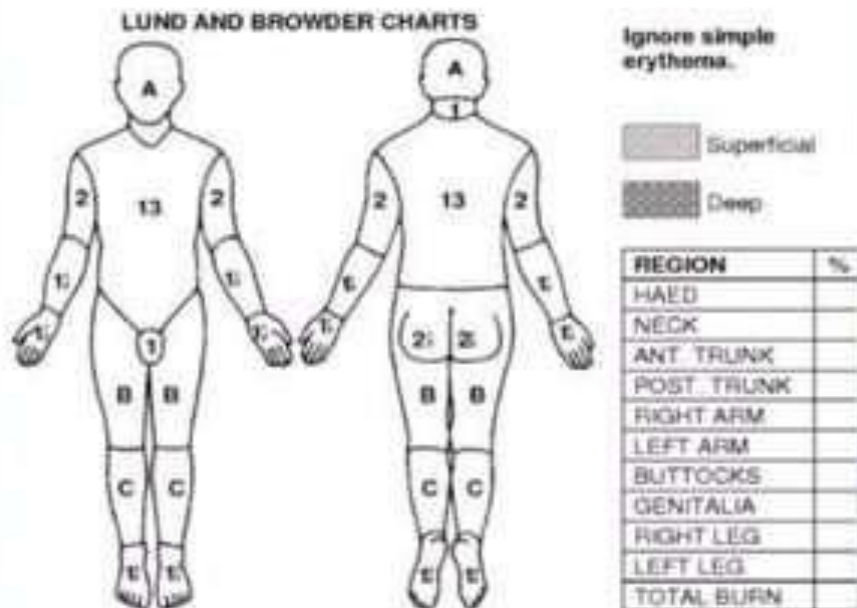


The Lund and Browder chart

- Better method *for* assessing the burns wound.
- Here each part of the body is individually assessed

A BURN CHART

NAME _____ WARD _____ NUMBER _____ DATE _____
 AGE _____



RELATIVE PERCENTAGE OF BODY SURFACE AREA AFFECTED BY AGE

AREA	AGE 0	1	5	10	15	ADULT
A = 1/2 OF HEAD	8 1/2	8 1/2	6 1/2	5 1/2	4 1/2	3 1/2
B = 1/2 OF THIGH	2 3/4	3 1/4	4	4 1/2	4 1/2	4 3/4
C = 1/2 OF ONE LOWER LEG	2 1/2	2 1/2	2 3/4	3	3 1/4	3 1/2

Rule of palm

- Patient's entire hand area is 1%.
- Clean piece of paper is cut to the size of hand and through that percentage of burns is assessed.

Rule of Palms



CLINICAL FEATURES

- History of burn.
- Pain, burning, anxious status, tachycardia, tachypnoea.
- In severe degrees features of shock.

Tolerable temperature to human skin is 40°C for brief period.



PATHOPHYSIOLOGY

Pathophysiology

Heat causes coagulation necrosis of skin and subcutaneous tissue



Release of vasoactive peptides



Altered capillary permeability



Loss of fluid → **Severe hypovolaemia**



Decreased cardiac output → Decreased myocardial function



Decreased renal blood flow (Renal failure) → Oliguria



Altered pulmonary resistance causing pulmonary edema



Infection



Systemic inflammatory response syndrome (SIRS)



Multiorgan dysfunction syndrome (MODS).

Massive edema

Injury to basement membrane



Altered pressure gradient



Edema

Renal

- ❑ Diminished blood flow and cardiac output leads to decreased renal blood flow and GFR
- ❑ Toxins released from the wound along with sepsis causes acute tubular necrosis.
- ❑ Myoglobin released from muscles (in case of electric injury or often from eschar) is most injurious to kidneys.
- ❑ Earlier resuscitation decreases renal failure and improves associated mortality

LUNGS

- ❑ Altered ventilation-perfusion ratio.
- ❑ Pulmonary oedema due to burn injury, fluid overload,
- ❑ ARDS.
- ❑ Aspiration.
- ❑ Septicaemia.

GIT

- burns → mucosal atrophy →
decreased absorption & increased
intestinal permeability →
increased bacterial translocation →
septicemia

GIT

- ❑ *Acute gastric dilatation which occurs in 2-4 days.*
- ❑ Paralytic ileus.
- ❑ Curling's ulcer.
- ❑ Acute acalculous cholecystitis, acute pancreatitis
- ❑ Abdominal Compartment syndrome

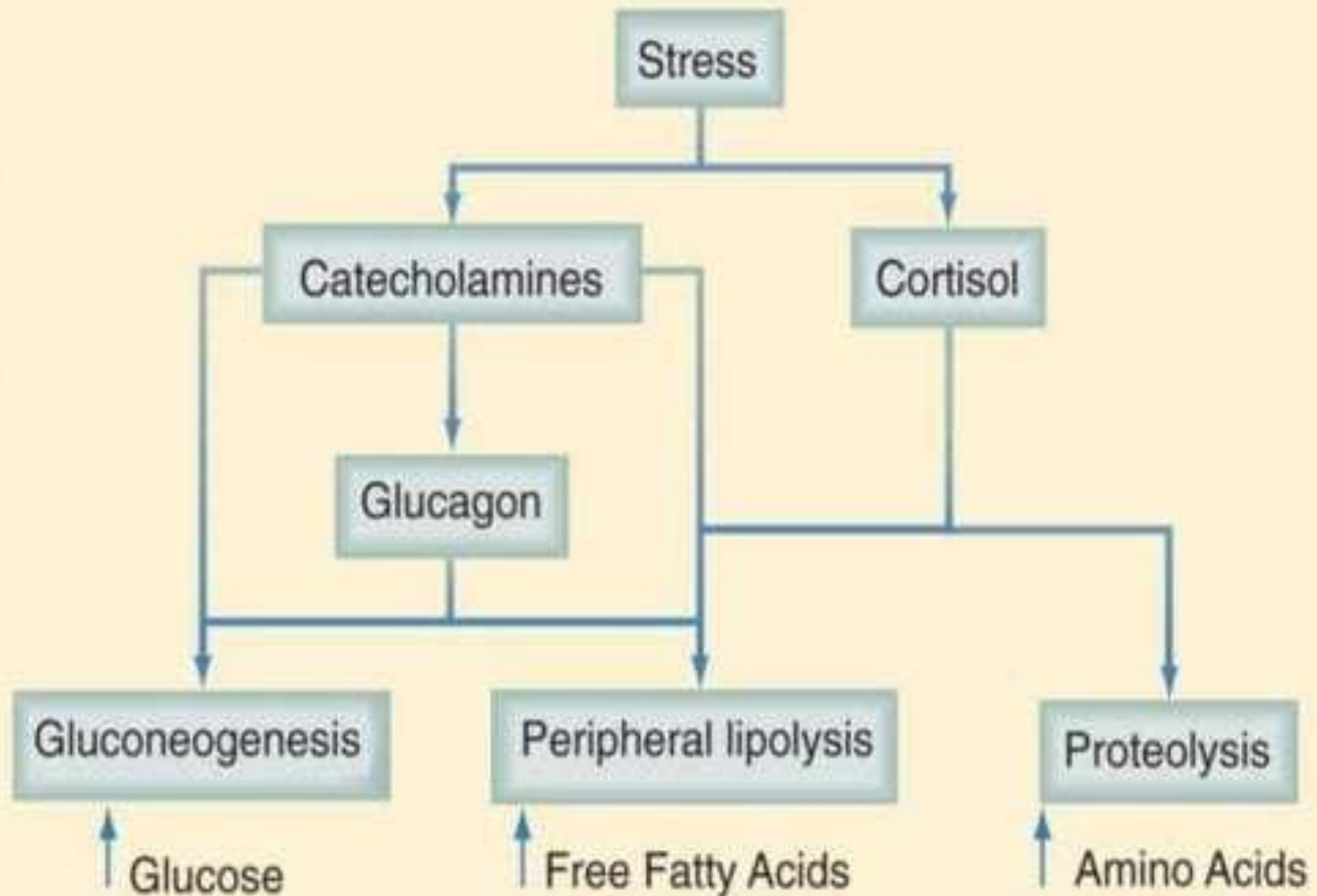
IMMUNE SYSTEM

- Decreased function of T and B lymphocytes and macrophages → increased infection rate

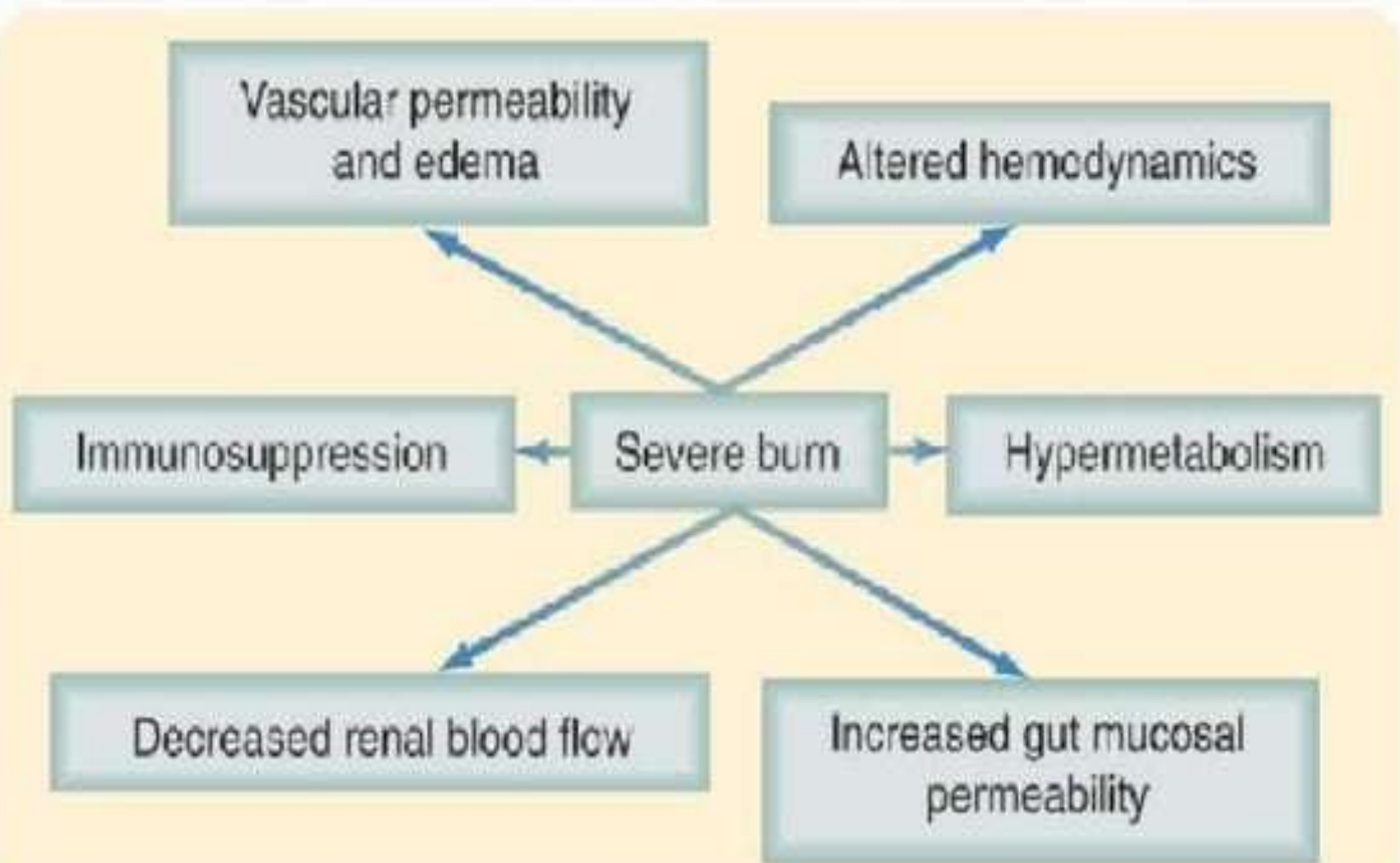
Metabolic

- ❑ Hypermetabolic rate (BMR).
- ❑ Negative nitrogen balance.
- ❑ Electrolyte imbalance.
- ❑ Deficiencies of vitamins and essential elements.
- ❑ Metabolic acidosis due to hypoxia and lactic acid.

HYPERMETABOLISM



SUMMARY OF PATHOPHYSIOLOGY



Infections

- Streptococci (Beta haemolytic—most common)
- *Pseudomonas*
- *Staphylococci*
- Other gram-negative organisms
- *Candida albicans*

Causes of death

- ❑ Hypovolaemia (refractory and uncontrolled) and shock
- ❑ Renal failure
- ❑ Pulmonary oedema and ARDS
- ❑ Septicaemia
- ❑ Multiorgan failure
- ❑ Acute airway block in head and neck burns

THANK YOU

