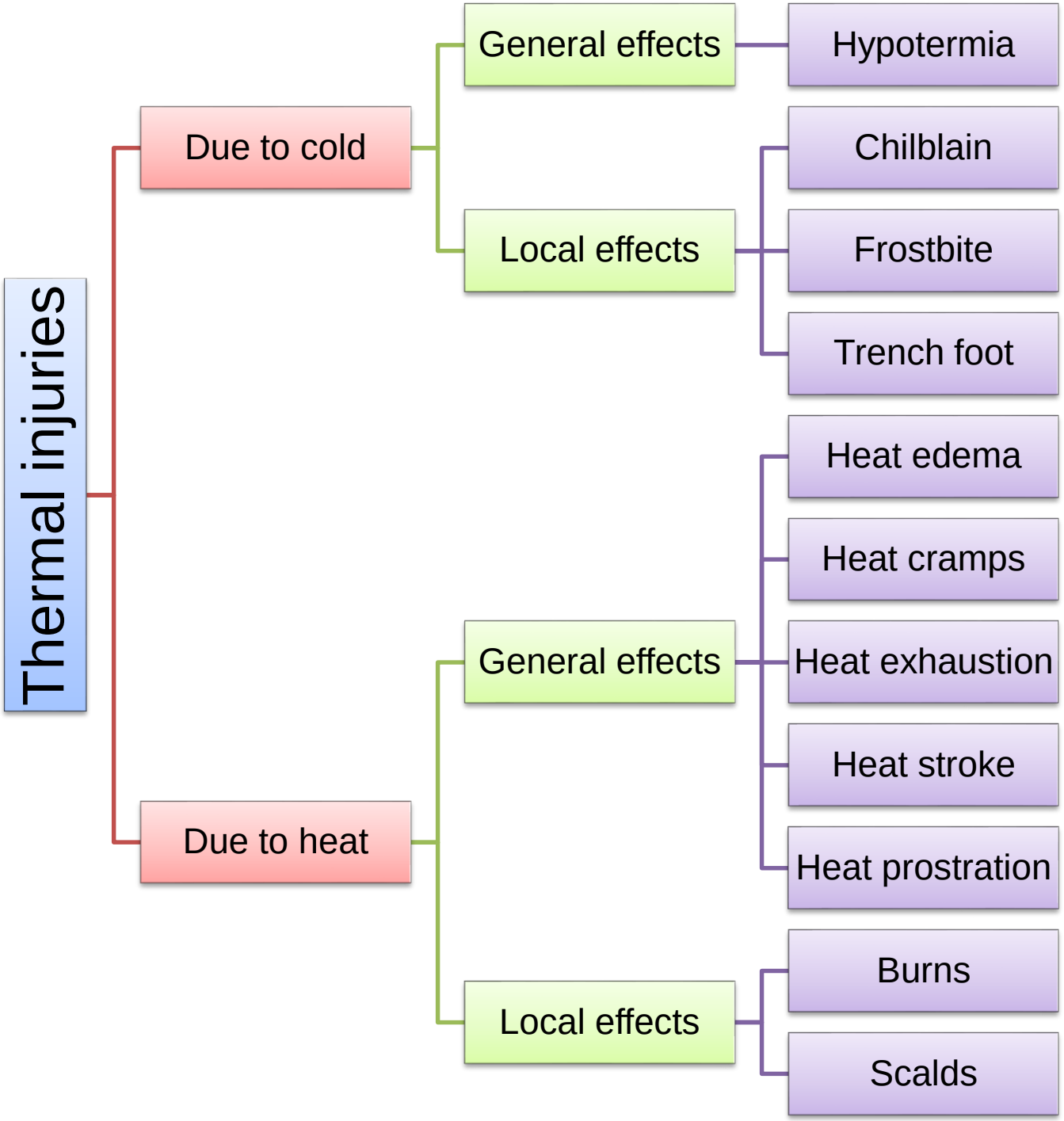
Thermal injuries

Dept. of Forensic Medicine

BURNS

- Gujarat → social problem: dowry death
- Burns is the most common mode
- Autopsy and DD most important
- Whether accidental or non accidental ?
- If non accidental
  - BNS S. 108 Abetment of suicide, S. 85 Husband/relative subject woman to cruelty, S. 103 punishment for murder


Thermal injuries
Due to cold
General effects
Hypotermia
Local effects
Chilblain
Frostbite
Trench foot
Due to heat
General effects
Heat edema
Heat cramps
Heat exhaustion
Heat stroke
Heat prostration
Local effects
Burns
Scalds

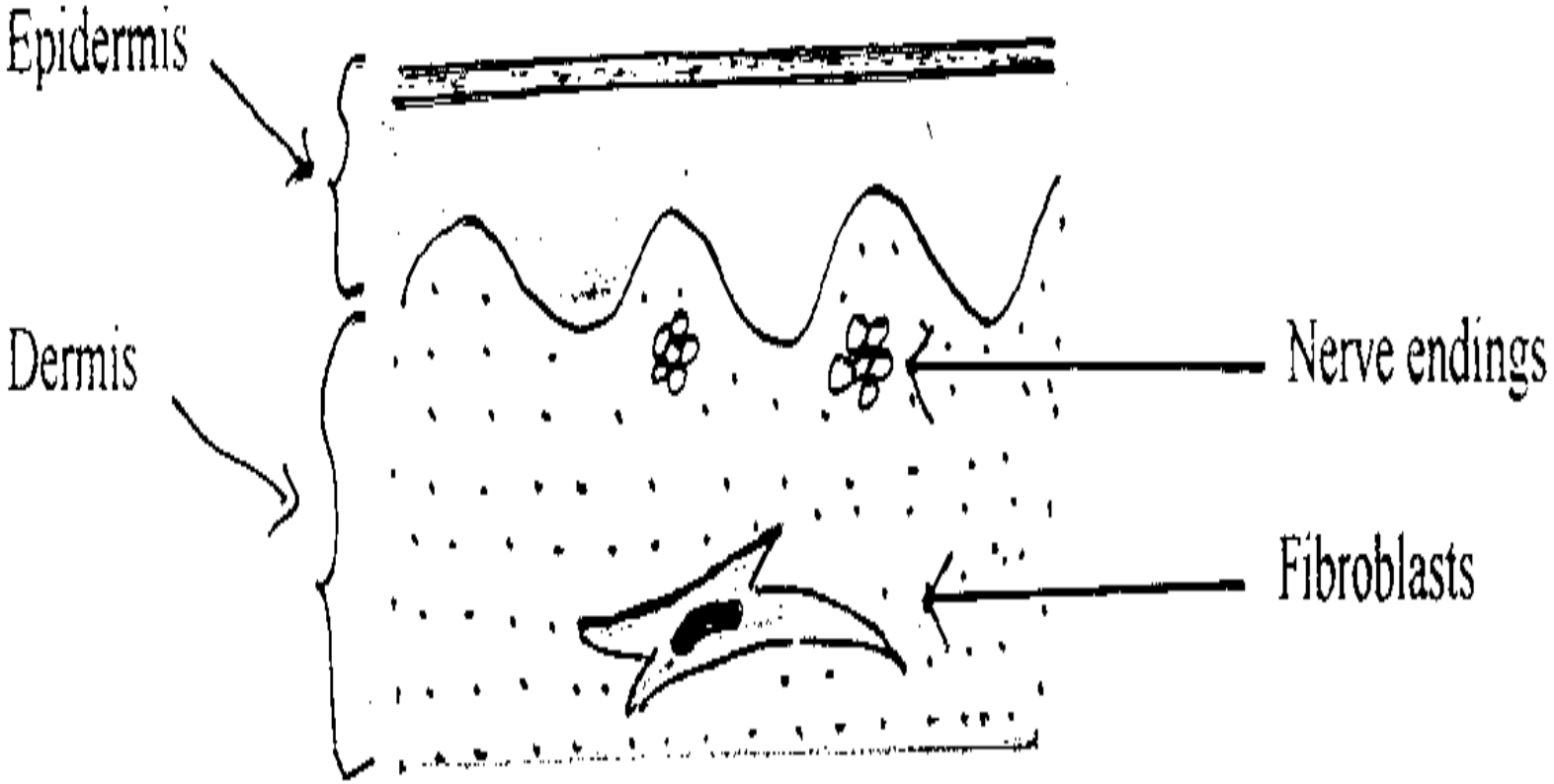
Learning objectives

- Define and classify burns
- Explain the method of assessment of size of burns accurately
- Describe the postmortem findings in case of burns
- Enumerate causes of death in case of burns
- Describe the medicolegal importance of burns

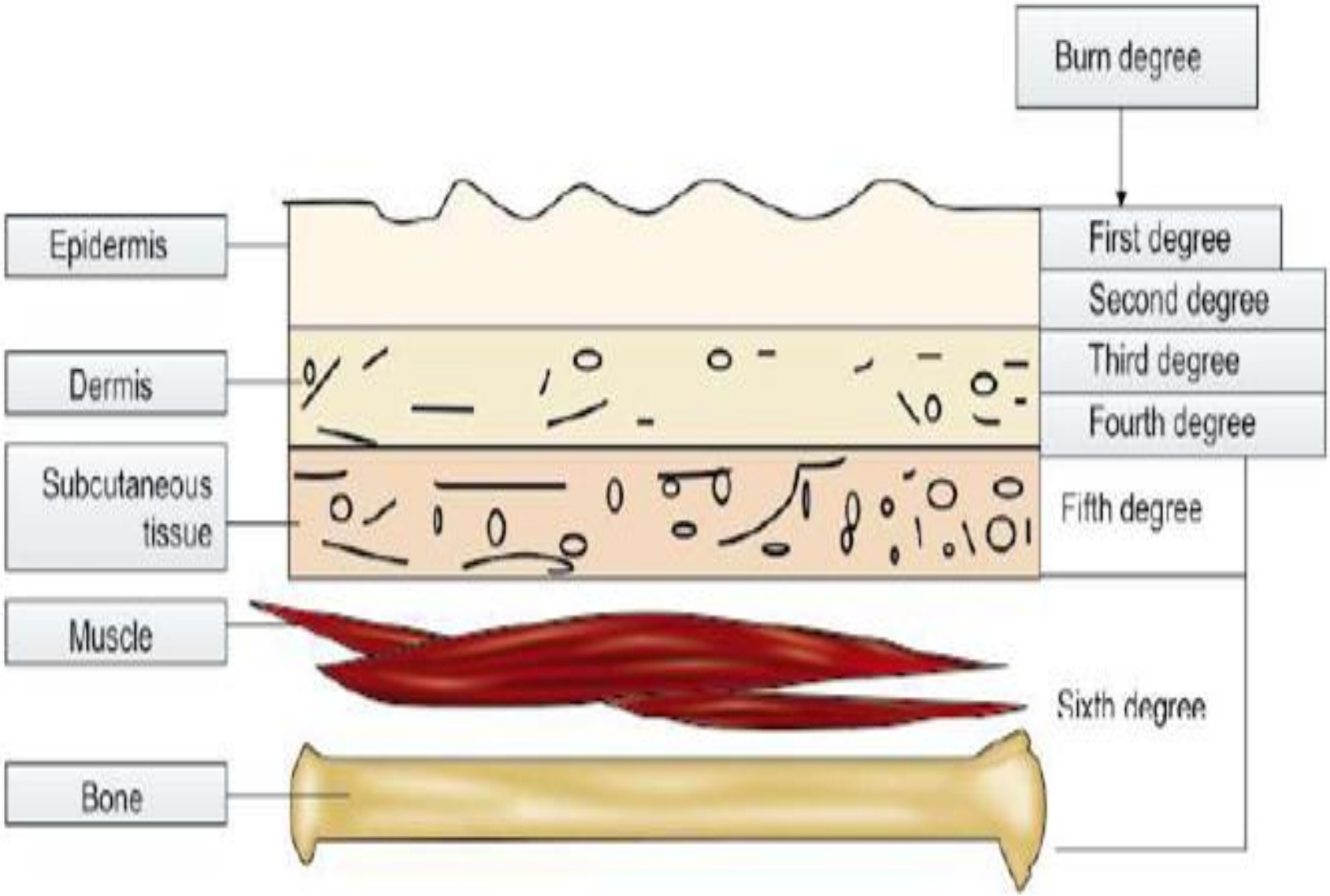
Definition & types

- Burn
  - is an injury caused by heat or
  - by a chemical or physical agent
  - having an effect similar to heat
- Contact/flame/flash/Ionizing radiation/ Chemical/Electric/microwave/scalds

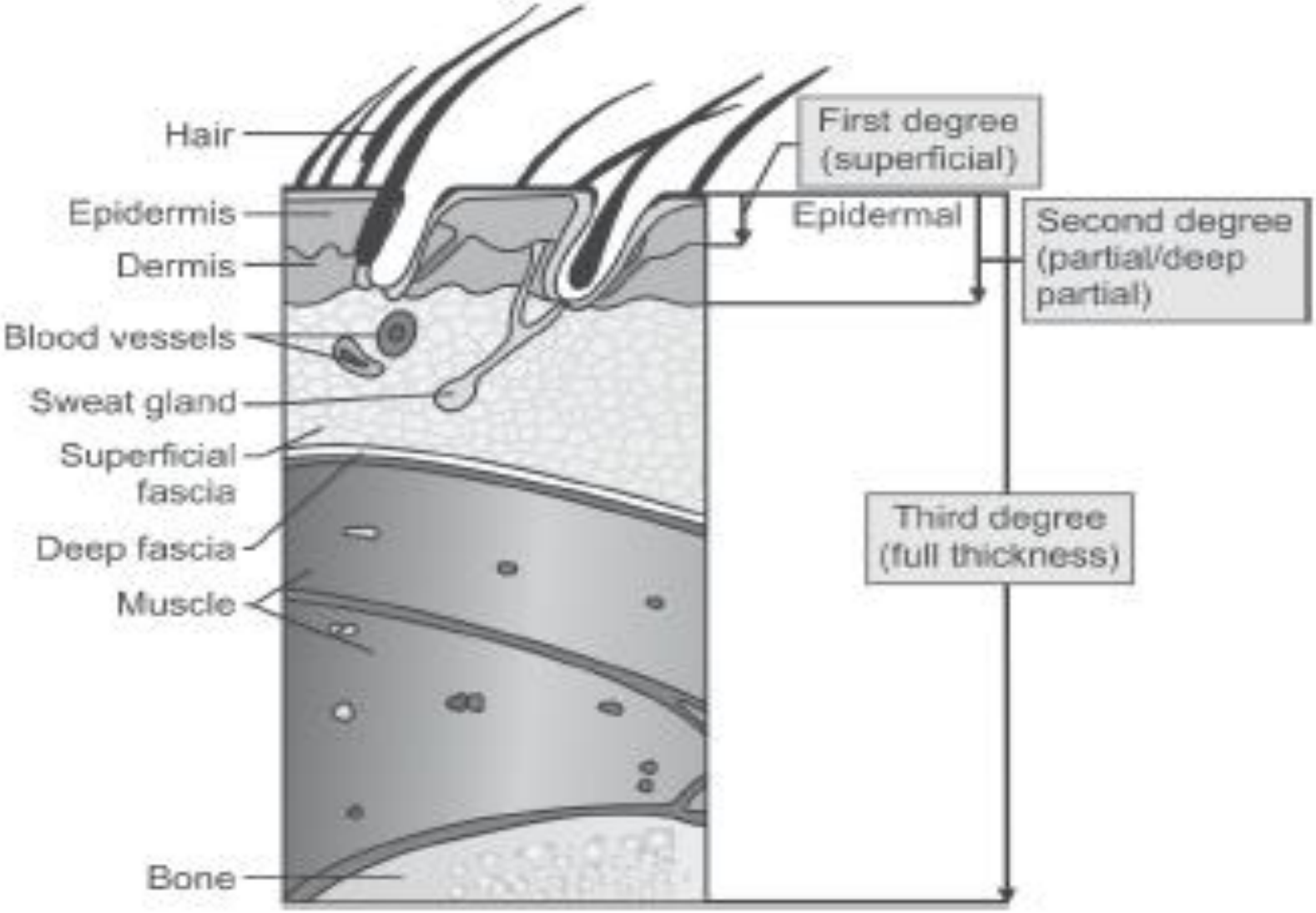
Anatomy of Skin



Dupytren‘s Classfiication



Wilson's Classificaiton



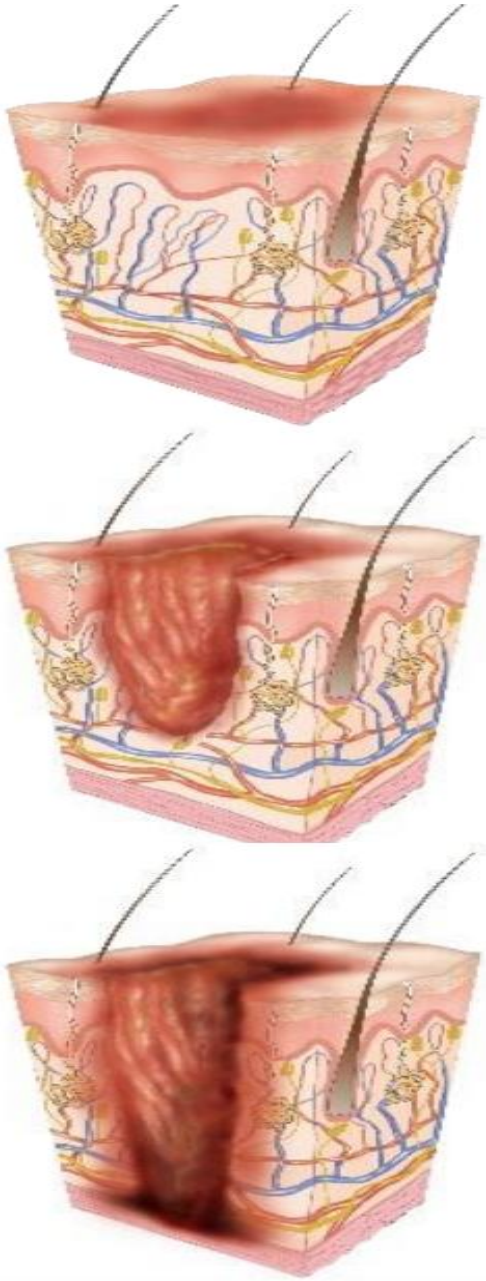
Degree of damage	Dupuytren's	Wilson's
Erythema	1st degree	Epidermal
Vesication with blister formation	2nd degree	Epidermal
Destruction of superficial skin	3rd degree	Dermo-epidermal
Destruction of whole skin including dermis	4th degree	Dermo-epidermal
Destruction of deep fascia, muscles	5th degree	Deep
Complete charring involving vessels, nerves and bones	6th degree	Deep

Epidermis

Dermis

Subcutaneous

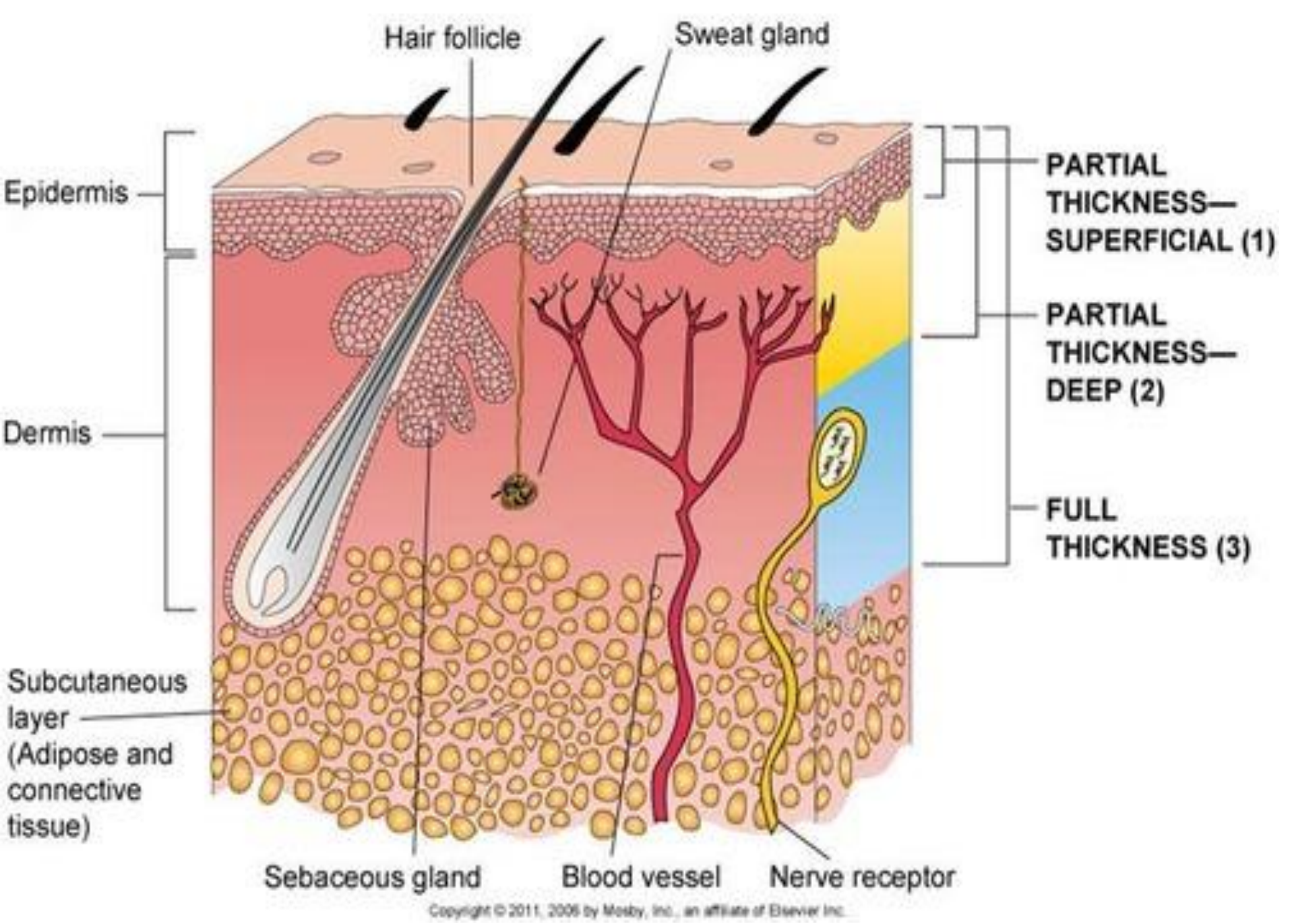
Muscle



Superficial
(First degree burn)

Partial Thickness
(Second degree burn)

Full Thickness
(Third degree burn)

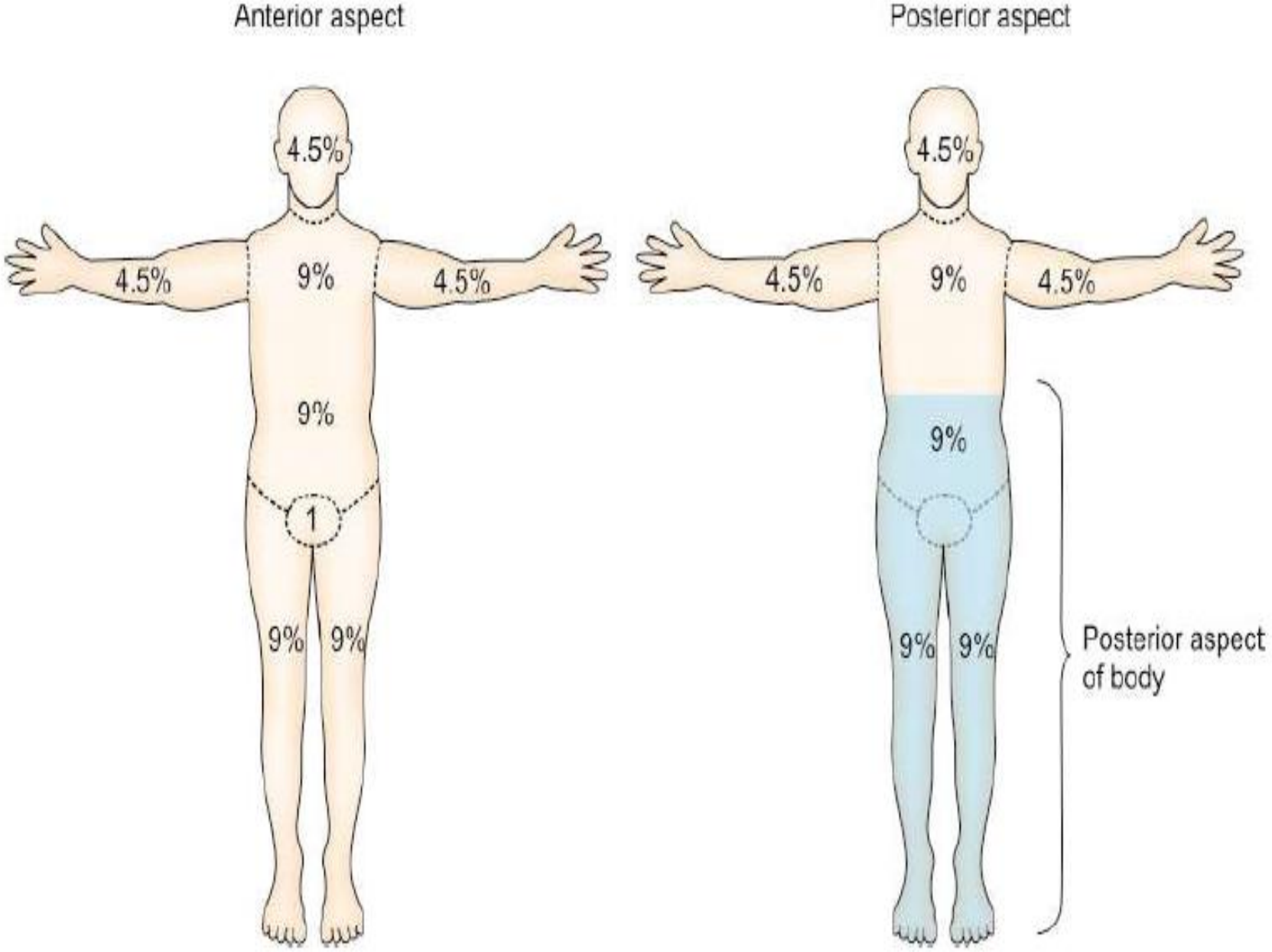


1. Degree of burns
   - More than 650 ˚C Is generated
   - Cremation > 1000 ˚C → body into ashes
2. Duration of exposure
3. Percentage of burns → more than 50% fatal
4. Prognosis → poor if head, neck or trunk involved
5. Age → extremes of age group
6. Gender → females
7. State of Health → pre-existing illness

Assessment of size of burns

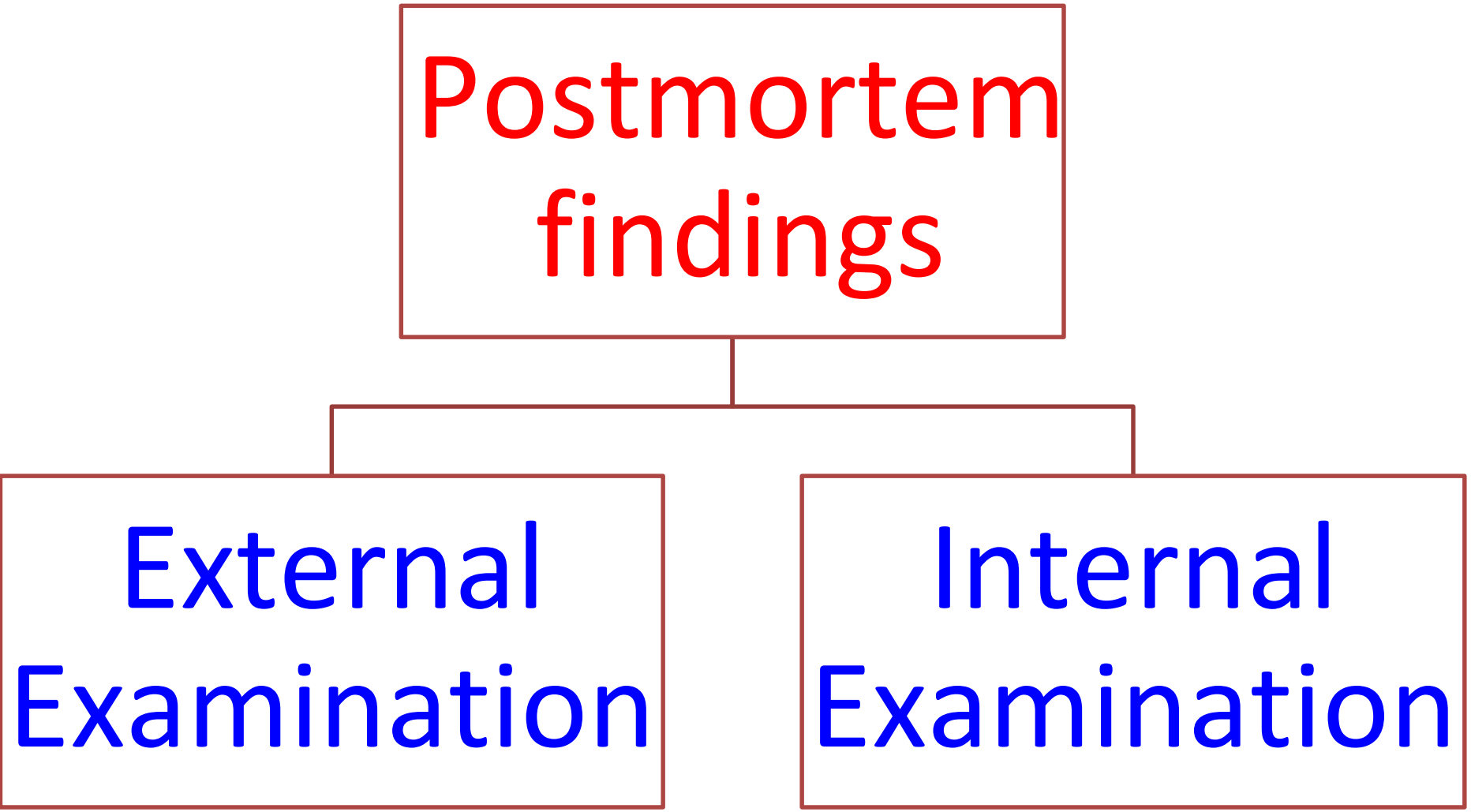
- Wallace Rule of Nines
  - To assess TBSA affected by burns
  - 1/3rd TBSA involvement → fatal
- Lund and Browder method
- Rule of palms
  - Very small or very large area involved

- Fluid resuscitation **(Baxter/Barclay/Brooke)**


Anterior aspect
Posterior aspect
4.5%
4.5%
9%
4.5%
9%
1
9%
9%
4.5%
4.5%
9%
4.5%
9%
9%
9%
Posterior aspect of body

AGE OF BURNS

Features	Age
Redness	Immediate
Vesication	1 to 2 hours
Exudates begins to dry	12 to 24 hours
Dry brown crust formation and pus formation	48 to 72 hours
Superficial slough separates	4^{th} to 6^{th} day
Deep slough separates	15^{th} day
Granulation tissue begins to cover	> 15 days
Formation of cicatrix and deformity	Several weeks


Postmortem findings
External Examination
Internal Examination

EVIDENCE / SIGNS OF ANTE MORTEM BURNS

External Examination

Clothes

- Smell of kerosene, petrol etc
- Blackening
- Partial or complete destruction of clothes

Body

- Smell of Kerosene, petrol etc
- Blackening
- Degloving & Destocking

EVIDENCE / SIGNS OF ANTE MORTEM BURNS

External Examination

Line of Redness	• At the junction of healthy and burnt tissue
Blisters	• Red inflamed base • Contains serous fluid rich in protein and chlorides
Vital Reaction	• Present

- Tongue in side mouth
- Forth, often pink stained due to mucous by irritation of smoke in airway
- Crow's feet
- Petechial hemorrhage on lids/conjunctiva
- Sometimes marbled skin and parchment like skin
- PM lividity ???
- Singeing of hair, heat ruptures (fatty tissue)
- Pugilistic / boxing / fencing / defence attitude

Internal examination

- Soot (carbon) particles- Interspersed in midst of frothy mucoidsecretions in nasopharynx, pharynx, larynx, trachea and lower bronchial tree. (May be absent ?)
- Cherry / bright red colour of blood- due to CoHb formation
- Congestion and oedema of internal organs/cooked
- Heat hematoma (not a vital sign)
- Hemorrhage in root of the tongue and neck
- Curling's ulcer

External Signs of ante-mortem burns

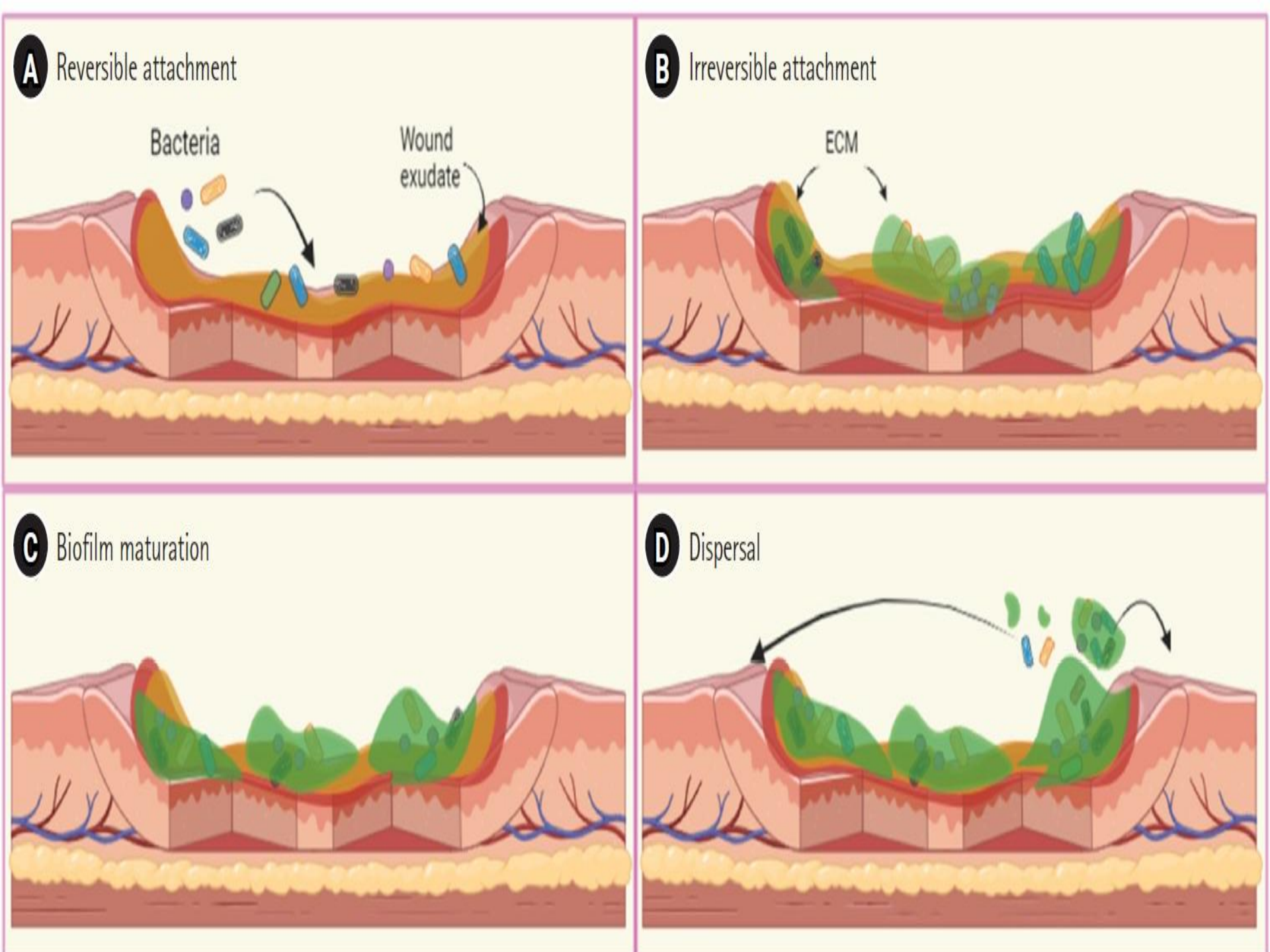
Partial DESTOCKING EFFECT due to pealing of epidermis exposing dermis with hemo-concentration effect.

Also note vene section mark at inner aspect of ankle

Infected Healing burns in patchy manner:

Healthy area

Burnt area


A
Reversible attachment
Bacteria
Wound exudate
B
Irreversible attachment
ECM
C
Biofilm maturation
D
Dispersal

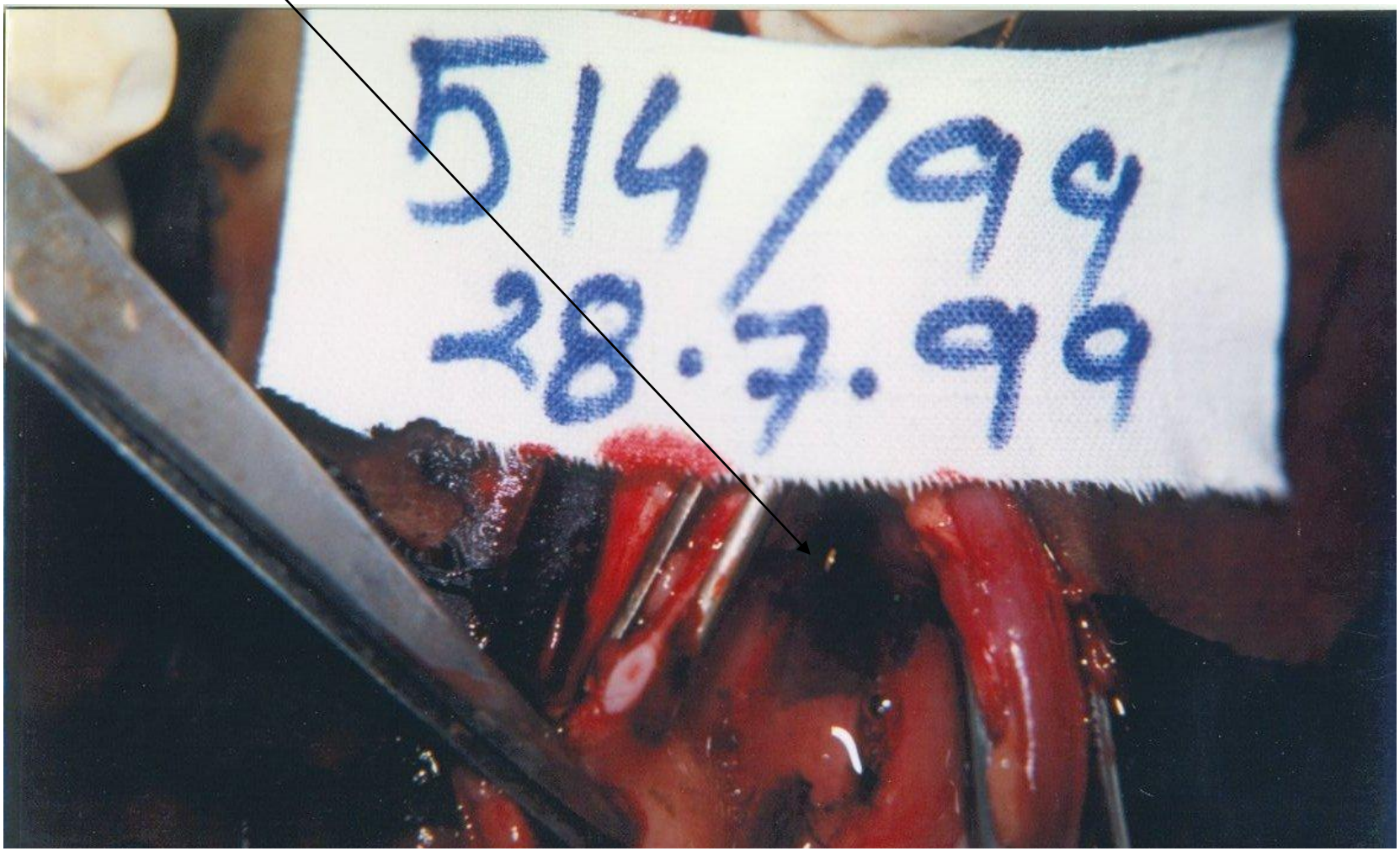
Infected burns:

Pus formation

Granulation tissue

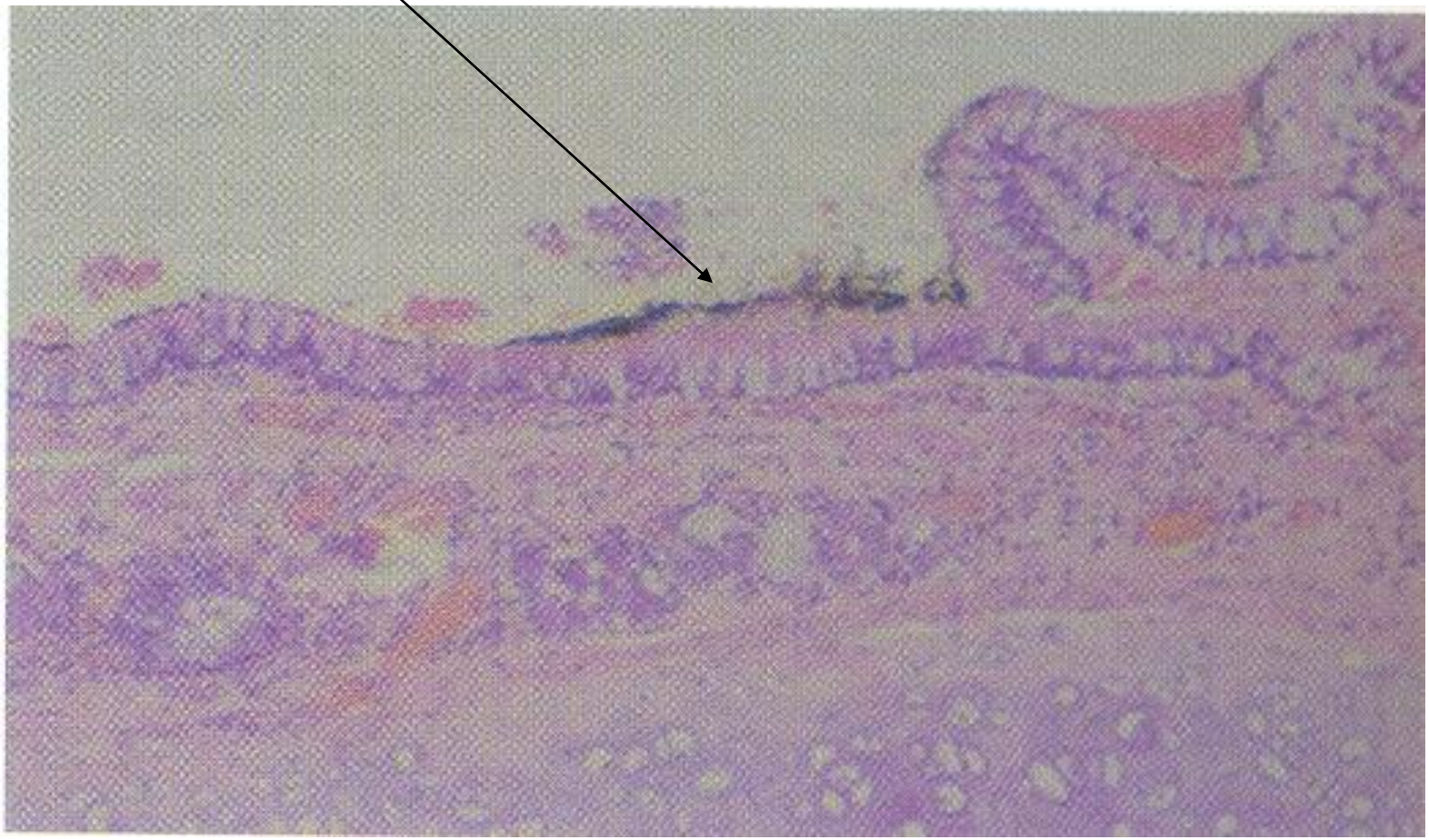
Healthy area

Soot particles in trachea



Soot particles on mucosal lining of air passage

(Histology section stained with H&E)



Investigations

a. Histopathological examination of skin:

b. CoHb Levels:

- Blood to be collected and sealed with liquid paraffin. Analysis done at FSL. (In smokers level up to 10% is found.)
- Level above 35-40% are conclusive for ante mortem burns.

c. Enzyme Histo Chemistry: Positive.

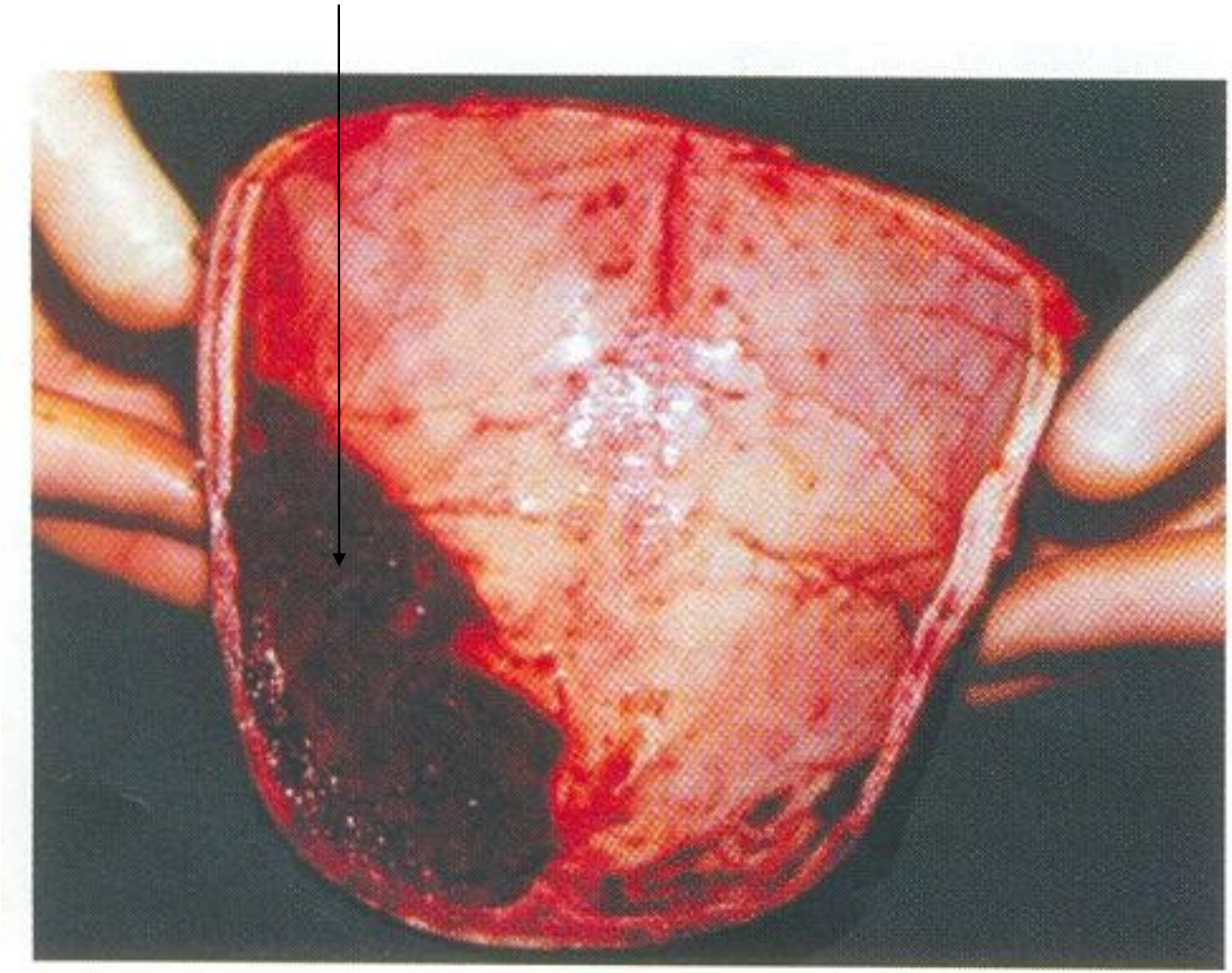
Deep Post mortem burns with PUGILISTIC ATTITUDE

Heat rupture at left inguinal region

Heat Fracture:

Deep burns of head , Skull vault defect in right parieto-occipital area

Heat hematoma(Extra dural)



CAUSES OF DEATH FROM BURNS

A. Immediate(more common)

1. Primary shock: Neurogenic shock due to pain
2. Secondary shock: Fluid loss- Hypovolemic shock
3. Asphyxia: Produced due to combustion- CO, CO2. (COHb> 50%)
4. Falling of structures in case of fire in building
5. Heat induced laryngospasm

B. Delayed(Less common)

5. Infection & septicaemia: 36-72 hrs, Gram Negative organisms
6. Toxaemia: Due to absorption of toxic products from burnt tissue-
7. Inflammatory changes- Meningitis, Pericarditis, bronchitis, peritonitis
8. Other medical causes.

MANNER AND CIRCUMSTANCES

1. Scene of crime in spot deaths
2. Dying declaration in hospitalised deaths/cases
3. Smell and type of inflammable fluid used
4. Pattern and percentage of burns
5. Association with other cause - poisoning, injury

Interpretation
(Mechanical injuries)

- Suicidal, Homicidal, Accidental?
- If dead body: antemortem or postmortem.
- Whether abrasions/contusions?
- Whether wounds: incised, lacerated, stab?
- Firearm injuries: rifled/smooth bore?
- Thermal injuries: Burns, Chemicals etc.
- Others like electrical current, lightening.

Assignment

- Difference between ante and postmortem burns
- Difference between Heat hemoatoma and EDH due to blunt force
- Difference between heat rupture and lacerated wound
- Describe the postmortem findings in case of burns (External and internal)
- Short note on Rule of nine (with schematic diagram)