

FORENSIC & TOXICOLOGY SUMMARY

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Burn

Types of burns:

1. Contact burns: contact with hot object.
2. Flame burns: contact with flam.
3. Scald burns: contact with hot liquids.
4. Radiant heat burns: caused by heat waves; a type of electromagnetic wave.
5. Ionizing radiant burns: caused by x-ray, radium or UV rays.
6. Chemical burns: caused by acids or alkalis.

Classification of burns:

	First degree	Second degree	Third degree
Depth	Epidermis	Epidermis & dermis	Deeper to dermis
Color	Red or pink	Dark red	Whit, gray, black
Pain to stimuli	Painful & tender	Very painful	Painless
Blanching	Yes	Yes, but slow	No
Appearance	Dry	Moist	Dry/lethargy
Blisters	Not present	Present	May or may not
Healing time	3-6 days	3 weeks	Skin grafting
Scar	No	Yes	Yes
Medico-legally	Simple	Grievous	Grievous

Causes of death:

Immediate causes:

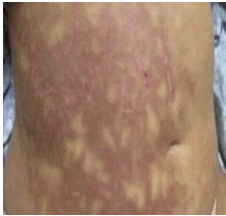
1. Primary or **neurogenic shock** due to pain or fright.
2. **Asphyxia** (CO poisoning is an important cause, COHb >50% is confirmatory).
3. Smoke-or heat-induced **laryngospasm**, respiratory arrest, Vagal reflex-induced cardiac arrest.

Delayed causes:

1. **Hypovolemic shock** (death within 24-48h); decrease cardiac output >> multi organ failure.
2. **Acute edema of glottis**, respiratory failure (death within 3 days); due inhalation injury, pneumonia, or ARDS.
3. **Toxemia** due to absorption of toxic products (death within 3-4 days).
4. **Sepsis**: (death within 4-5 days), pseudomonas, S.Aureus. **The most important.**
5. **Infective complications**; bronchitis, bronchopneumonia, enteritis.

External funding of burns:

1. Face: distorted and swollen, protruding tongue, burnt or singed hair
2. Skin: hyperemia, blisters, veins stand out, marbled skin.
3. Blisters: may be ruptured or filled with fluid.
4. Degloving/ destocking.
5. Pugilistic attitude (boxing, fencing or defense attitude), not medico-legaly significant.
6. Heat ruptures: splits in the skin due to tissue concentration >> incised or lacerated wounds.



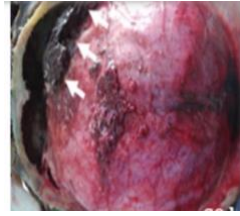
Marbled skin



Blisters



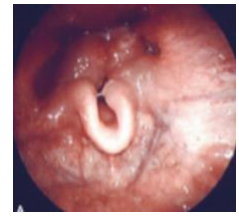
Escharotomy



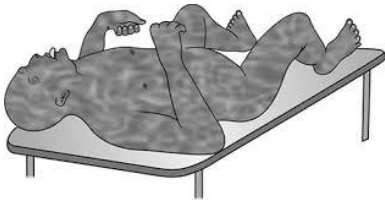
Heat hematoma



Heat rupture



Laryngospasm



Pugilistic attitude (also called heat contracture)

Happens due **heat stiffening**; due to coagulation of proteins of the muscles and dehydration which cause muscle contraction >> may lead to heat rupture (splits in the skin).

Sequelae of burns:

- ❖ Scars, keloid, marjolin's ulcers, curling ulcer, joint deformity, ankylosis.
- ❖ Corneal capacity, obliteration of external auditory meatus.

Differentiation between heat ruptures wound and lacerated wounds:

	Heat rupture	Lacerated wound
Cause	Exposure to heat	Blunt force
Site	Fatty tissue	Anywhere
Vessels and nerves	Intact	Torn
Bruising around the margins	Absent	Present

Internal findings of burns:

1. Skull: heat hematoma (resemble extradural hematoma), skull fractures.
2. Brain: congested, swollen with widening and flattening of guri and obliteration of the sulci.
3. Neck: hemorrhage in the root of the neck and tongue.
4. Larynx, trachea and bronchioles: carbon & soot particles, congested mucosa with frothy mucus secretion (**the surest sign of antemortem burns**) which is due to gases inhalation.
5. Pleural: congested and inflamed with serous effusion.
6. Lungs: congested and edematous, may be shrunken.
7. Heart: chambers full of blood with cherry red in color due to CO inhalation.
8. Spleen: enlarged and softened.
9. Liver: cloudy swelling, fatty liver, cell necrosis, jaundice may occur.
10. Kidney: nephritis, thrombosis, infection, enlarged and congested adrenals.

Remember 💡

Livor mortis will be cherry red due to CO poisoning.

Heat artifacts: any body changes occur after exposure to heat (like slit wound, blisters, EDH, pugilistic attitude).

Note: When burn surface involves 1/3rd of body surface area or more (30-50% of body surface) the result is nearly always fatal.

Differentiation between epidural hematoma (EDH) due to burns and blunt force:

	EDH due to burn	EDH due to blunt force
Cause	Intense heat	Blunt force
Site	Anywhere	Usually adjacent to Sylvian fissure
Position	Usually bilateral	Usually unilateral
Distribution	Diffuse	Localized
Characteristics	Evenly distributed or sickle-shaped; honeycomb appearance; soft, granular, foamy, friable clot; chocolate brown in color (pink, if CO is present)	Disc shaped; uniform, smooth, rubbery; reddish-purple color
Skull fracture	Eggshell fracture, elliptical or circular defect seen above temple not radiating lines	Fracture line radiating from a skull defect present in temporal area
Crossing suture lines	May cross	No
Injury to CNS	Absent	Maybe
CarboxyHb level	Absent	Present

Differentiation between antemortem and postmortem burns:

	Antemortem burns	Postmortem burns
Line of redness	Present	Absent
Vesicles	Serous fluid rich in albumin, chloride , polymorphs	Air, if fluid is present, it contains little albumin
Base of vesicles	Red & inflamed	Dry, hard, yellow
Soot in URT	May be present	Absent
Inflammation & repair	Present along with pus and slough	Absent
Healing	Present	Absent
Carboxyhemoglobin	Present	Absent
Enzyme reaction	Increase at periphery of burn	No such increase

Scaled burns

Result from application of liquid $>60^{\circ}\text{C}$, involving only the superficial layers of skin.

Types:

1. Immersion burns: accidental, homicide or deliberating (like child abuse).
2. Splash or spill burns: usually accidental.
3. Steam burns: by superheated steam.



Classification (3 degrees):

1. Erythema caused by vasoparalysis.
2. Vesication and blister formation caused by increased capillary permeability.
3. Necrosis of the dermis when deeper layers of the skin are involved.