Burns & Scalds

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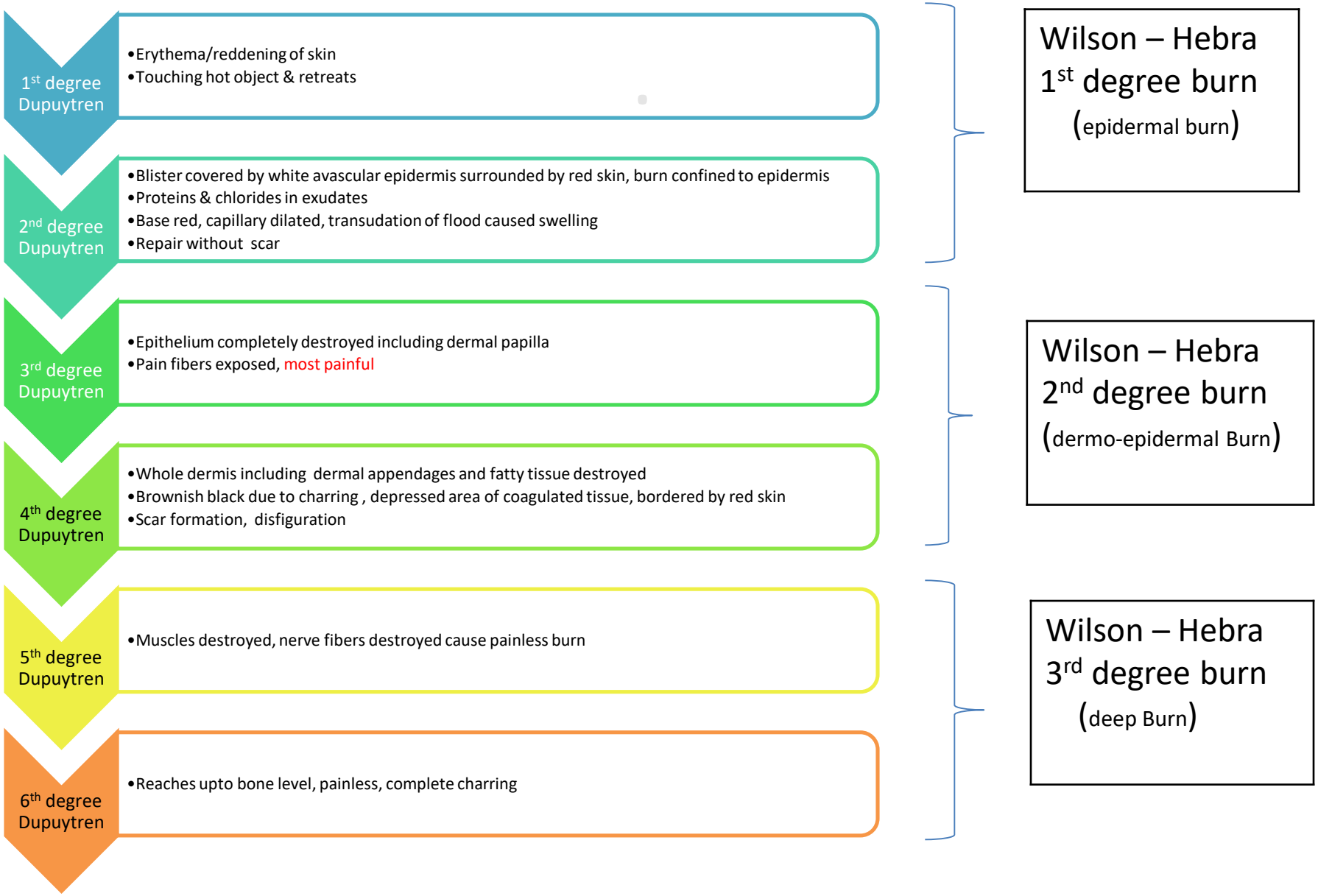
- **Burn** is an injury caused by application of heat/chemical to the external or internal body surfaces causing tissue damage. Application may be-

- Direct/external – flame, heated body etc.
- Indirect/internal – corrosives, X-rays etc.
- Minimum temperature to cause burn - **44^0C**
- Between **44^0C - 51^0C** - 1^0C – ½ ED
- At - **65^0C** – 2s ED, at **>75^0C** - instantaneous


1st degree Dupuytren
•Erythema/reddening of skin
•Touching hot object & retreats
2nd degree Dupuytren
•Blister covered by white avascular epidermis surrounded by red skin, burn confined to epidermis
•Proteins & chlorides in exudates
•Base red, capillary dilated, transudation of flood caused swelling
•Repair without scar
3rd degree Dupuytren
•Epithelium completely destroyed including dermal papilla
•Pain fibers exposed, most painful
4th degree Dupuytren
•Whole dermis including dermal appendages and fatty tissue destroyed
•Brownish black due to charring , depressed area of coagulated tissue, bordered by red skin
•Scar formation, disfiguration
5th degree Dupuytren
•Muscles destroyed, nerve fibers destroyed cause painless burn
6th degree Dupuytren
•Reaches upto bone level, painless, complete charring
Wilson – Hebra 1st degree burn (epidermal burn)
Wilson – Hebra 2nd degree burn (dermo-epidermal Burn)
Wilson – Hebra 3rd degree burn (deep Burn)

Factors Affecting Prognosis of Burn

- Body surface area involved
- Depth of burn injury
- Site of burn injury
- Age of Victim
- Sex of victim
- Intensity of Heat
- Duration of Exposure:

Rule of Nine (For Adults)	Rule of Five (For Children)
❑ Head and neck – 9% ❑ Front of chest - 9% ❑ Back of chest -9% ❑ Front of abdomen – 9% ❑ Back of abdomen – 9% ❑ Right upper limb – 9% ❑ Left upper limb – 9% ❑ Front of RLL – 9% ❑ Back of RLL – 9% ❑ Front of LLL – 9% ❑ Back of LLL – 9% ❑ Genitalia – 1%	❑ Head & neck -20% (5%x4) ❑ Abdomen -20% (5%x4) ❑ Chest -20% (5%x4) ❑ Upper Limb -20% (5%x4) ❑ Lower Limb -20% (5%x4) ❑ Palm (1% of body surface area) rule is more handy in scattered burn injuries. ❑ About 50% involvement of total body surface area is expected to be fatal in India.

Causes of Death in Burn Injuries

Immediate Cause	Early Causes	Late/Delayed Causes
• Neurogenic Shock • Suffocation • Injuries	• Hypovolumic Shock • Pulmonary edema • Electrolyte imbalance	• Toxemia • Septicemia • Renal Failure • Gastro-intestinal Ulceration • Anemia • Hypoproteinemia

Pugilistic attitude vs. Rigor mortis

Feature	Pugilistic attitude	Rigor mortis
Cause	Intense cooking of muscle & its proteins	Actino-myosin complex
Contracture of muscle	Very pronounced	Minimal
Degree of stiffness	High	Moderate
Time of formation	AM or PM	PM only
Role of heat	$>50^0$C, well established at 75^0C	Accelerate RM
External appearance	Sign of burning	No specific features

AM Burns vs. PM Burns

Trait	AM Burns	PM Burns
Line of redness	Present	Absent
Blisters	• Base is red & inflamed • Exudates rich in proteins & chlorides • Show hyperemia around	• Base is pale, dry & hard • Blister contains air • No hyperemia around • Blister may be due to **putrefaction** contain transudates or in form of air sacs containing pink red serous fluid
Vital reaction	Inflammatory reaction	No
Enzymes	Present in periphery	No
carboxyHb	Present	Absent

PM Findings

- **External findings** - The body must be carefully examined; as remnant of clothing (especially synthetic) may got stuck on body parts where they are tightly placed. They should be removed carefully and examined for presence of any inflammable substance like Kerosene, petrol etc. Even if no smell is perceivable, they should be preserved and sent to concerned Forensic Science Laboratory as they can be chemically identified. While preserving the clothing, an extra precaution is to be taken by putting them into glass containers first and then sealing them before handing over to police official

❑Internal Findings –

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- The nasal and oral cavities may show presence of carbon soot and are inflamed. Soot are often mixed with mucus and adhered on wall of lumen of respiratory tract as below as lumen of bronchioles. Mucosa over tongue and larynx may be edematous & shows blistering.
- Due to presence of excessive amount of CO2 and CO which produces asphyxiant effects, the tissues may assume bright red coloration owing to excessive amount of carboxyhaemoglobin. The blood in the vessels is bright pink/red, thick and more fluid.
- All the organs are usually congested. Lungs may be deeply congested and edematous. In few cases, there may be blood tinged discharge through nostrils which occurs due to excessive secretion in lungs and rupture of capillaries. The mucosa of upper GIT is invariably reddened and may show ulcer formation (As described earlier; Curling's and Dupuytren's Ulcer).
- Heat hematoma

- **Scald** is an injury caused by hot liquid or vapors.
- Water – **55^0C – 25s -** full thickness scalds
- Sticky liquids cause more severe scalds than non sticky.
- Types – immersion, splash and steam
- Cause of death – shock, fluid & electrolyte disturbance, secondary infection
- Degree - erythema, blister, necrosis of dermis
- Mostly accidental in nature

Feature	Burns	Scalds	Chemical Burns
Cause	Flame/ heated body	Liquid (>6o^{0}C)/ steam	Chemicals (corrosives)
Site	At or above contact	At or below contact	At or below contact
Sharply defined Edges	May or may not	Usually present	Usually present
Splashing & Trickling	Absent	Present	Present
Skin	Dry, wrinkled/ charred	Sodden and bleached	Destroyed
Vesicle	At circumference of burnt area	Over the burnt area	Depend on chemical
Red line	Present	Present	Absent
Color	Black	Bleached	Distinct
Charring	Present	Absent	May be present
Singeing	Present	Absent	Absent
Ulceration	Absent	Absent	Present
Healing	Scar in deep burn	Scar present	Scar present
Clothes	Burnt	Wet only	Characteristic stain
SOC	Source of flame	Hot liquid	Source of chemicals

Sources and suggested reading:

- Textbook of Forensic Medicine and Toxicology, Anil Aggrawal, APC publication
- Review of Forensic Medicine and Toxicology, Gautam Biswas, JAYPEE publication
- The Essentials of Forensic Medicine and Toxicology, Dr. K S Narayan Reddy and Dr. O P Murthy, The Health Science Publisher
- Textbook of Forensic Medicine and Toxicology, P C Dikshit, PEEPEE publications
- Research papers
- E-PG Pathshala/inflibnet


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