

BURNS MANAGEMENT IN ED

Chemical burns

Chemical burns

- Chemical burns are notoriously harder to manage due to the on going burning process.
- Medical staff should be cautious that they do not come in contact with the chemical as they can burn themselves.
 - Goggles
 - Aprons
 - Gloves
- Corrosive chemicals cause tissue destruction.
- Saline or water should be applied for **>30mins**
- Litmus paper can be applied to skin to test pH.
- If the chemical is in power form, remove with a brush as water will activate the chemical.

Pathology

- Damage to tissue is affected by:
 - Type of agent
 - Strength and concentration of the agent
 - Quantity of the agent
 - Duration of contact
 - Extent of skin penetration
 - Mechanism of action
- The further deviation from “neutral” (pH of 7) the stronger the acid or base is therefore the greater potential for tissue damage.
- **Acid (pH<7)**- this causes coagulative necrosis by denaturing proteins and forms a clot which slows the penetration of the acid to deeper tissue.
- **Alkali (pH>7)**- this causes liquifactive necrosis that denatures proteins and liquefies fat. Alkalis cause less immediate damage but can cause long term tissue damage as the chemical penetrate into deeper tissue.
- Other than direct damage, acids and alkalis can cause heat reactions.

Common acids

Acid	Products	Notes
Sulphuric acid	Toilet cleaners Drain cleaners Metal cleaners Car battery fluid Fertiliser manufacturing	Hygroscopic acid can cause dehydration of tissues
Hydrochloric acid	Toilet cleaners Metal cleaners Swimming pool cleaners Dye manufacturing Metal refining	
Hydrofluoric acid	Rust removers Alloy wheel cleaners Glass etching	Is a weak acid and in dilute forms does not cause significant damage. Can cause hypocalcaemia which is life threatening- <i>place calcium gluconate soaked gauze to wound or inject into site.</i>
Carbolic and picric acid	Deodorants Sanitisers Disinfectants	
Cresols	Degreasing agents	Irritating to skin and can cause systemic toxicity.

Common bases

Bases	Products	Notes
Sodium hydroxide and potassium hydroxide	Drain cleaners Oven cleaners	In high concentrations can be corrosive
Sodium and calcium hypochlorite	Disinfectants Household bleach Pool chlorinating solution Deodorants	
Calcium hydroxide	Cement	

Systemic affects

- **Hypocalcaemia**
 - Oxalic acid
 - Hydrofluoric acid
 - Phosphorous burns
- ***Liver and/or kidney damage***
 - Tannic acid
 - Formic acid
 - Picric acid
 - Phosphorous
 - Petrol
- ***Inhalation injuries***
 - Strong acids
 - Ammonia

Generic treatment

- Removal of chemical is the priority
 - Remove contaminated clothes
 - Brush off dry chemicals
- Burn should be washed for no less than **30mins**
 - The water should run off the patient and not pool under them during this process
- Some alkalis may need **1 hour** of irrigation
- Litmus paper can be used to test the pH of the skin post irrigation to test for effectiveness.
- Elemental sodium, potassium and lithium should be flushed with mineral oil NOT WATER due to the violent reaction with water.
- Depth of the burn is difficult to assess in the first few days, therefore, assess by appearance, capillary refill and sensation.
- Fluid resuscitation may be needed.

Hydrofluoric acid

- Very corrosive
- Expose to 2% of body surface area can be fatal.
- Causes necrosis of the tissue by binding calcium => hypocalcaemia => arrhythmias
- Injury depends on concentration of acid, amount of skin if comes in contact with and duration of contact.
- Water irrigation for **30mins**
- Calcium gluconate is the main treatment in multiple forms:
 - Topical form (2.5%)
 - Injected into site (2.5-5%) (30G needles to be used)
 - Intra-arterial infusion
 - Beirs block

Cement burns

- Wet cement has a pH of 12.9.
- Symptoms of pain and burning can occur hours later.
- Irrigation with water for **30 minutes**.

Petrol burns

- The hydrocarbon component of petrol can cause endothelial cell damage which can lead to injury to the lungs, liver, spleen and kidneys.
- Petrol dissolves lipid compounds which causes increased permeability of membranes and fluid loss.
- Ignition
 - Thermal burns caused by petrol require more fluid resuscitation, surgical intervention and therefore increased hospital stays.
 - Treat with cool running water for **20 minutes**.
- Immersion or prolonged skin contact
 - Causes dermal skin injuries.
 - Can cause systemic damage and lung damage if inhaled.
 - Remove chemical and cool wound with **30 minutes** of irrigation.

Bitumen

- Product of petrol refining
- Bitumen is liquid at 150 degrees and semi-solid at room temperatures.
- These burns are thermal rather than chemical.
- Cool burns with **20 minutes** of running water.
- Remove loose clothing.
- Do not remove bitumen from the skin, only remove bitumen with paraffin oil

Phosphorous burns

- White phosphorous ignites when exposed to air and is extinguished with water.
- If phosphorous is embedded into the skin it will continue to burn.
- **>20 minutes** of running water.
- Particles should be removed manually.
- These burns can have increased mortality due to hypotension and tubular necrosis.