

Overview

Variable severity from minor topical to life-threatening systemic. Ingestion is potentially lethal.

Toxic mechanism

Fluoride binds Ca^{2+} & Mg^{2+} → cell dysfunction & death. Systemic toxicity → $\downarrow\text{Ca}^{2+}$, $\downarrow\text{Mg}^{2+}$, $\uparrow\text{K}^{+}$ & acidosis → ventricular dysrhythmias.

Toxicokinetics

Readily abs and penetrates deep into tissues.

Clinical features

Dermal exposure: Immed painful if >50% HF, else progressive ↑pain, local pallor over 1-8h (20-50%) or up to 24h (<20%). Blistering delayed by hrs/days. Large exposure → systemic fluorosis.

Inhalational exposure: Immediate mucosal irritation, delayed dyspnoea, cough & wheeze

Ingestion: Corrosive to GIT (>20%). Vomiting, throat pain, gastritis, abdo pain.

Systemic (fluorosis): $\downarrow\text{Ca}^{2+}$, $\downarrow\text{Mg}^{2+}$ → tetany, $\uparrow\text{QT}$, $\uparrow\text{K}^{+}$, ventricular arrhythmias/cardiac arrest up to 6hrs post ingestion.

Investigations

Screening: serial ECG, paracetamol, BSL

Specific bloods: Ca^{2+} (serum ± ionised), Mg^{2+} , UEC, ABG, endoscopy if ingested once stable.

Risk assessment

Dermal exposure → severe pain & tissue injury. Inhalation → pulmonary injury. Risk of systemic fluorosis if: dermal exposure to 100% HF to 2.5% BSA, 70% HF to 8% BSA, 23% HF to 11% BSA or ingestion of ≥100ml of 6% HF by adult or any volume of higher conc HF. In a child any ingestion is potentially lethal.

Management

Resus: Systemic HF poisoning is a time-critical emergency. Ventricular dysrhythmia/arrest Mx:

- Intubation, CPR, O_2 , hyperventilation,
- **10% Calcium gluconate** 60ml or **10% calcium chloride** 20ml q5min until ROSC.
- **Sodium bicarbonate** 100mmol (child 2mmol/kg) IV
- **Magnesium sulphate** 10mmol IV
- **Glucose/insulin** for $\uparrow\text{K}^{+}$ in addition to above therapy

Supportive Care: including analgesia for pain, fluids for hypotension ± vasopressors.

Decontamination: Remove clothing. Irrigate with water. Do not induce vomiting or use charcoal.

Antidote: **Calcium chloride** or **gluconate** (see Antidotes). Use **2.5% calcium gluconate gel** topically on all dermal exposures. Refractory pain may require SC, regional (Bier's block) IV or intra-arterial injection of **2% calcium gluconate (not chloride)** with 10ml of **10% calcium gluconate** in 40ml NS over 40min. Beware extravasation.

Disposition

If minor skin exposure d/c with **2.5% calcium gluconate gel** otherwise admit for analgesia, cardiac monitoring for 8-12h.

Notes

To get **2.5% calcium gluconate gel**: add 10ml of **10% calcium gluconate** to 30g/30ml **KY jelly**. Give **calcium chloride** via a central line, **calcium gluconate** can be given peripherally.