Hydrofluoric acid burns: A case report

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Hydrofluoric (HF) acid is one of the strongest inorganic acids. It is used widely in industry and the home. HF burns are characterized by intense pain, progressive tissue damage and significant systemic effects. Pain may be prolonged because the fluoride ion remains active despite irrigation of the burn. Subcutaneous infiltration of calcium gluconate is the local treatment of choice. We present a case of hydrofluoric acid burn from rust remover that was effectively treated by topical calcium gluconate baths. A calcium gluconate solution can be prepared with material available in most hospitals and may be readily administered in this fashion. Early recognition and appropriate treatment of hydrofluoric acid burns will provide symptomatic relief and minimize tissue damage.

Key Words: Calcium gluconate, Hydrofluoric acid burn

CASE PRESENTATION

A 40-year-old male carpet layer presented to the emergency room 48 h after a HF acid burn. The patient had been using a rust removing agent containing 5% HF. He had not been wearing protective gloves because he was not aware of the potential damaging effect of HF acid. Earlier presentation at a local hospital had resulted only in treatment of symptoms with an ice and water bath.

Depletion of tissue calcium is also thought to result in cellular release of potassium from the local nerve endings, leading to severe pain. The onset and severity of both pain and tissue damage have been shown to correlate with the concentration and amount of acid, duration of contact and location of injury (3). Solutions of up to 20% HF acid may not produce erythema and pain until 24 h or more after exposure, while concentrations of 20% to 50% often produce symptoms 1 to 8 h after initial exposure (4).

The hands, specifically the subungual regions, are particularly susceptible. HF acid rapidly penetrates the subungual matrix because of the lack of stratum corneum and can destroy large portions of soft tissue and bone of the distal phalanx (5). HF easily penetrates through microscopic holes found in many protective gloves.

We present a case that illustrates both the clinical aspects and the treatment of a HF acid hand burn 48 h after the injury using a calcium gluconate bath as a form of noninvasive treatment.
small fingers. Examination revealed a slight pale discoloration, which extended from the metacarpophalangeal joints to the fingertips.

A 2.5% calcium gluconate bath was prepared by diluting readily available 10% calcium gluconate injection solution. Immersion of the patient’s hand resulted in prompt pain resolution. The patient continued to soak for approximately 1 h and was sent home with a 2.5% calcium gluconate gel. The patient soaked his hand in a surgical glove for several hours later that evening and twice during the next day.

The patient was seen in a follow-up clinic, two days after initial presentation. Bullous changes of the skin and tissue damage, particularly around the small fingernail, were evident (Figure 1). The patient’s hand was debrided and dressed until it healed. On follow-up nine months after the initial injury, all fingers and subungual areas were normal except for the small finger, where soft tissue-irregularity persisted.

**DISCUSSION**

The most common HF burn seen by emergency physicians results from the household use of commercial rust removal solutions or gels that contain the acid in a diluted form (less than 12%) (6), as was seen in this patient. Recommendations for initial care of HF acid dermal burns include immediate irrigation of the area with copious amounts of tepid water to dilute and remove residual acid from the skin. Following this, treatment with a calcium gluconate (7) subcutaneous injection, intra arterial infusion or topical application has proven effective, depending on the severity and location of the burn (8).

Calcium gluconate has received little attention as a topical agent. It offers the advantage of treating the same surface area that was exposed to the acid. Calcium gluconate for topical application can be prepared in two ways. A 2.5% gel may be made by adding 3.5 g of calcium gluconate powder to 141.75 g of water-soluble surgical lubricant. However, not all hospital pharmacies or emergency departments stock calcium gluconate powder or are equipped to measure and prepare a gel with the speed required to treat a HF burn. Alternatively, calcium gluconate injection solution is commonly stocked in most hospitals and allows for easy bath preparation. Patients can comfortably soak the injured area until the pain has completely subsided.

Recognition and prompt therapy will minimize the acute discomfort and long term morbidity of HF acid burns.

**REFERENCES**