



Short Report

Hydrofluoric Acid Burn of the Hand – A Rare Emergency

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ARTICLE INFO

Article history:

Received 6 March 2012

Accepted 16 July 2012

Keywords:

Hydrofluoric acid

Burns

Vasospasm

Digital subtraction angiography

Calcium gluconate

ABSTRACT

Introduction: We report on successful endovascular treatment of a hydrofluoric acid burn to the hand. **Report:** A worker complained of severe pain in the fingers D II to D V after injury with 60% hydrofluoric acid. A digital subtraction angiography showed vasospasm of the common palmar digital artery. We selectively applied 20% calcium gluconate intra-arterially. After treatment all arteries were perfused. Alprostadil, acetylsalicylic acid and clopidogrel were administered in conjunction. Pain symptoms improved and sensory and motor functions were restored. **Discussion:** Immediate angiography and intra-arterial application of calcium gluconate are recommended to treat hydrofluoric acid burn to a limb.

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Introduction

Hydrofluoric acid is the aqueous solution of hydrogen fluoride (HF) and is mainly used in the glass and metal industry. Burns from hydrofluoric acid are extremely rare and mostly occur during workplace exposure. We report on successful treatment of a patient with a hydrofluoric acid burn to the hand.

Report

A 40-year-old patient was referred to our clinic 5 hours after a hydrofluoric acid burn to the right hand. The man had been working with 60% hydrofluoric acid, when he noticed a small hole in his protection glove. He immediately washed his hands with soap and water. About 30 minutes later the patient reported severe burning pain in the fingers D II to DV.

On admission the fingertip D II was slightly red and the motor activity of this finger was reduced. Sensitivity was decreased in the D II and D IV fingertips. There was no doppler signal from digital arteries on the ulnar side of D III and radial side of D IV. Due to inexperience with hydrofluoric acid burns a telephone consultation with the local poison center was initiated. The recommendation

was immediate intra-arterial application of calcium gluconate. Accordingly, a selective digital subtraction angiography (DSA) of the right arm was conducted. Vasospasm of the common palmar digital artery supplying D III and D IV was identified as the cause of ischemia (Fig. 1).

Through the placed angiography catheter 10 ml of 20% calcium gluconate in 40 ml 0.9% NaCl over 4 hours was intra-arterially applied. In the following control DSA all palmar digital arteries were again perfused (Fig. 2). Simultaneously, a week-long vasoactive therapy with alprostadil in two daily doses of 40 mg i.v. over 3 hours was initiated. To inhibit platelet aggregation 100 mg acetylsalicylic acid and 75 mg of clopidogrel were administered orally each day.

Pain decreased and sensory impairment and limited motor skills abated. Except for a purplish-black discoloration of the nail matrix D II no further externally visible damage was apparent. On day 9 the patient was discharged.

Discussion

Due to low dissociation and high lipid solubility hydrofluoric acid exhibits a particularly strong capacity to penetrate human tissue and is absorbed quickly.

The severity of the burn is determined by the acid concentration, the contaminated surface area and the exposure time.

The clinical presentation includes local corrosion of the affected organ, such as skin erythema with subsequent ulceration and necrosis, hemorrhagic gastritis and esophagitis or conjunctivitis. Due to the formation of insoluble salts with calcium and

DOI of original article: 10.1016/j.ejvs.2012.07.013.

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Figure 1. The common palmar digital artery of D III ulnar side and D IV radial side brakes off shortly after its origin.



Figure 2. The control DSA after treatment shows the common palmar digital artery and proper palmar digital arteries perfused again.

magnesium massive systemic electrolyte imbalance, which is difficult to counterbalance, may occur. Ventricular arrhythmia, ventricular fibrillation and death may result.¹ This course is described in one patient whereby only 2.5% of the skin surface, about two and a half hand palms, was contaminated.²

Treatment depends on the extent of contamination. Continuous monitoring of electrolytes is important and the possible need for extensive calcium substitution should be considered. Positive experience with hemodialysis employment in severe systemic cases has been reported.³

For burns to extremities intra-arterial infusion of calcium gluconate is strongly recommended. Infusion leads to a much higher local concentration in the area of the defect than dermal application or subcutaneous infiltration, which have shown little success in the past.⁴ The loss of nearly all fingers has been reported for topical treatment after a burn by 60 % hydrofluoric acid through a perforated protection glove.⁵ In the present case elimination of vasospasm and pain was achieved and the extent of tissue necrosis was minimized. This shows that even the experienced surgeon should not shy from contacting a poison center when confronted with treating exposure to a rare poison or toxic material. In this way, the likelihood of severe health impairment can be reduced.

Funding

None.

Conflicts of interest

The authors confirm that potential conflicts of interest do not exist.

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