High-pressure injection injuries to the hand

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Objective

High-pressure injection (HPI) injuries to the digit usually present as small benign wounds, which often mask the severe underlying trauma. These injuries require early recognition and prompt review by senior surgical teams as they represent surgical emergencies. The most commonly injected materials in HPI injury to the hand include paint, automotive grease, solvents, and diesel oil.

Methods

Case 1

A 31 yo young suffered an injury during injection of high-pressure heated plastic (polyvinyl chloride) with a hydraulic gun.

Initial evaluation at 4 hours revealed a small entry point on the volar 4th MPJ, edema in Pirogov-Parona (P-P) and on the hand dorsum and 3 mm exist point on dorsum of 4th MPJ, pain, paresthesia and positive Kanavel sign.

A 45 yo mechanic, at 5 h from injury with 3 small wounds –on the volar side of P1 3rd finger and two palmar with 3rd digit ischemia and high tissue infiltration with engine oil.

Exploration from hand up to the proximal forearm, infiltrated tissue excisions, resection of the sinovial sheet down to P-P. CDNVB of the 3rd digit revealed lesions in continuity (ribbon sign) with microthrombosis with indication of amputation at 3rd MPJ level, fasciotomies of intermetacarpal spaces.

Revision at 48 and 72 h, closure of wounds on 5th day.

Good evolution and early functional reeducation allowed return to work at 3 months.

Results

There are some important factors to be addressed in HPI injuries like the chemical properties of the substance injected, nature of the injected fluid, volume, viscosity, systemic toxicity and pressure of injection determine the extent of tissue damage. High volume, low viscosity substances produce the most severe inflammatory response with diffusion along anatomical structure and even ischemia, sometimes far from entry point. Site of injection dictates the damage of structures and latency time from accident to treatment increase risk of amputation and damage to hand function. Appropriate broad-spectrum antibiotic coverage is mandatory. Surgical treatment must be performed immediately, with decompression and debridement under plexus block anesthesia. Foreign material and necrotic tissue must be early debrided with wide microsurgical exploration. Usually the wound cannot be closed by first intention and some reconstructive procedures may be necessary.

Conclusions

HPI injury causes only a small lesion in the skin but with severe damage to the underlying tissue. The severity of the lesion is determined by: the entrance level and the physical-chemical properties of the injected substance (type, viscosity, volume), the pressure of injection. In cases of digital acute ischemia amputation remains an option in emergency.