High-pressure plastic injection injury of the hand: case report

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Abstract
Occupational high-pressure injection injuries are not common but can be devastating, especially to the hand. Most of the time, full recovery does not occur. We present a case of high-pressure injection injury to the hand in a patient who worked in a shoe-making factory. As far as we know, this massive involvement of a limb in a high-pressure plastic injection injury has never been reported in the literature. Better controls are required to prevent injection injuries and when they do occur, a high index of suspicion is required with immediate referral for surgical review.

Key words
High pressure; injection injury; occupational hand injury; plastic.

Introduction
High-pressure injection injuries are an infrequent cause of morbidity. They most commonly occur due to work-related industrial accidents in which a high pressure or hydraulic gun is being used. Substances that have been injected accidentally into the tissues under pressure include oil, paint, benzene, grease and gasoline [1–5]. Although the injected materials have the potential to run through tissue planes and cause diffuse destruction, the entry wounds are often small and benign in appearance [4,5].

We present the case of a devastating high-pressure plastic injection injury to the hand and forearm of a young worker, with the plastic forming a cast within the tissue planes in the shape of a dorsal splint. As far as we know, this massive involvement of a limb in a high-pressure plastic injection injury has never been previously reported in the literature.

Case report
A 21-year-old left-handed factory worker presented to the emergency department 6 h after a work-related injury to his right hand in a shoe-making factory. He was injured during injection of high-pressure heated plastic into the shoe templates with a hydraulic gun. The material was an injectable thermoplastic (polyvinyl chloride). There were no other associated injuries. The patient had normal vital signs and was found to have circumferential oedema and necrosis all around the back of his hand and forearm (Figure 1). The entry point of the injection was in the second web space of his hand. The lateral x-ray of the hand and forearm showed that the injected material had formed a cast within the soft tissues in the shape of a dorsal splint (Figure 2).

The patient had severe pain in his forearm and he could not move his fingers. He was immediately transferred to the operating room and an incision was made directly on the necrotized skin and the moulded plastic in the shape of a dorsal splint was removed from his hand and forearm (Figure 3). The dorsum of his forearm looked as if it had been scalded. The muscles on the dorsum of the forearm were pale and no contractions were detected with electrocautery stimulation.

The dorsal compartment of the forearm was completely destroyed and debridement included removal of the dorsal compartment completely. For coverage of the defect of the hand, an inguinal flap was designed and the dorsum of the hand was covered by this axially based flap. For coverage of the dorsum of the forearm after thorough debridement, a split thickness skin graft was used. The next proposed stage of surgery was a free transfer of a gracilis flap for the function of the posterior compartment of the forearm, but the patient did not accept further surgery due to family problems. Unfortunately, his right hand remained almost useless with stiff fingers.

Discussion
The first published case of high-pressure hand injuries was an injury caused by fuel injection systems in 1937.
Most of these injuries are seen in the non-dominant index finger of young working men [3]. Notably, we found injury of the right index finger of a left-handed working man consistent with previous studies. Some factors contribute to the severity of the injury, including the volume of material and its inherent toxicity, the location of injection and the pressure under which it is delivered [7]. The devastating nature of high-pressure injection injuries has been reported previously and, although this is a reminder of that, it is the plastic material and unique clinical features (resulting from the hardened plastic cast within the tissue planes) that are unique to this case.

Injected substances lacerate the skin at the point of contact and course through tissue planes causing acute and chronic inflammatory reactions as well as ischaemia and infection as was observed in this case. Initially, the injury may appear benign, even when massive subcutaneous tissue damage has occurred. The usual course witnessed 1–2 h after injury is of increasing oedema followed by discoloration and numbness of the distal part. Injection injuries are surgical emergencies even in the face of a normal appearing limb. The overall incidence of amputation for high-pressure injection injuries is ~48% [8], with patients undergoing decompression in <10 h after injury showing a lower amputation rate [9].

Physicians who fail to recognize the likely severity of the underlying injury may inadvertently send the patient home on analgesia without surgical evaluation. There is a general consensus that treatment of high-pressure injection injuries of all causes should include broad-spectrum antibiotics, tetanus prophylaxis, analgesics, elevation, immobilization and surgical evaluation [2–5]. Injuries warranting aggressive treatment to save the limb or digit should be sent immediately to the operating room for surgical exploration, debridement and wound lavage [10]. The wound may be left open or loosely sutured. Treatment with steroids is controversial, however, glucocorticoids are recommended to reduce inflammation and fibrosis [2].

The final results of high-pressure injection injuries are generally unfavourable. Even for those patients who have escaped amputation, most have stiff hands and fingers. We believe better workplace controls are required to prevent injection injuries and, when they do occur, a high index of suspicion is required with immediate referral for surgical review.

Conflicts of interest

None declared.

References