CASE REPORT

Surgical removal of radiographically occult polyurethane foam presenting as recurrent inflammation of the hand—A case report

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Introduction

Work-related pressure injection injuries of the hand have potentially devastating consequences. We report a case of pressure injection injury to a finger with chronic, relapsing inflammation caused by the presence of multiple radiographically occult foreign bodies consisting of polyurethane foam.

Case report

A 23-year-old right-handed male plumber presented with injection injury of the left index finger, which occurred during waterproofing work using polyurethane foam materials at a pressure of 55–85 lb/in.². He was admitted to a hospital with erythema, mild swelling and pain in the index finger. His symptoms subsided after treatment with intravenous antibiotics and wound dressing for 3 weeks, including 2 weeks as an in-patient. A purulent discharge developed 6 weeks after the initial trauma.

The man subsequently presented our hospital with continuing pain, erythema and mild swelling of the finger. On physical examination, a sinus 1–2 mm in diameter, draining a purulent discharge, was found on the dorsum of the proximal phalanx of the finger, with slight limitation of motion and inability to straighten the interphalangeal joint. However, there was no distal circulatory or nervous impairment.

Plain radiographs showed only soft-tissue swelling (Fig. 1). Laboratory evaluation showed that the erythrocyte sedimentation rate and serum C-reactive protein were elevated. Blood glucose was normal, and blood culture and bacterial culture from the wound were negative. In order to identify the foreign body in the finger, we recommended magnetic resonance imaging (MRI). However, the injured man refused this because of the cost, preferring 2 weeks of conservative treatment with oral antibiotics and immobilisation with a short arm splint. This resulted in temporary resolution of the symptoms and laboratory findings, but the purulent discharge recurred at the same site 1 week later. We decided to perform exploration and incisional drainage of the wound.

A zigzag incision was made on the dorsum of the finger from the proximal to the middle interphalangeal joint under regional block with 1% lidocaine. We found many solid cylindrical polyurethane bodies, 1-mm thick, between the subcutaneous tissue and the flexor and extensor tendon complex at the proximal phalanx (Fig. 2). The polyurethane materials were removed, and debridement and copious irrigation were carried out.

The swelling, purulent discharge and other symptoms improved after surgery. There were no functional limitations.
of the finger or other complications 2 years postoperatively. There was no difference in pinching and grasping power between the affected and non-affected hand (Fig. 3).

Discussion

The misleading features in the current case were the man’s lack of any sensation of the presence of a foreign body, and the radiographically occult presentation of the polyurethane foam. This material has little foreign body reaction; it has been used in the covering of breast implants and is biodegradable in living tissue. Low-grade inflammation after the polyurethane foam injection could have reduced any foreign body sensation there was. Wager et al. reported pneumonitis caused by the presence of polyurethane foam, which was not suggested radiographically. These factors contributed to the delay in exact diagnosis and surgery.

Figure 1 Preoperative radiograph reveals increased soft-tissue density in the index finger of the left hand without showing a foreign body.

Figure 2 (a) A dorsal skin incision exposed solid polyurethane. (b) Several pieces of polyurethane foam removed from the injured hand.

In high-pressure injection trauma, the surgeon must recognise the anatomical complexity of the hand and proceed with caution. In a published review of such injuries, the typical patient is a young man with injury to the

Figure 3 The injured hand showed no functional impairment at 2 years postoperatively.
non-dominant index finger.\textsuperscript{1,3,6,7} Damage to the finger is more troublesome than to the palm of the hand because of the limited space available for expansion.\textsuperscript{10} The injected materials, which would course volar to or enter inside the tendon sheath, would not actually penetrate the sheath which is more resistant than other soft-tissue planes (such as the neurovascular bundle).\textsuperscript{5} In our case, foreign materials were injected into the space between the subcutaneous tissue and the flexor–extensor tendon, resulting in little foreign body sensation and few soft-tissue complications because of the greater space for expansion.

The outcome of high-pressure injection injuries of the hand is affected by various factors, such as the pressure of the gun and the amount and nature of injected material. Pressures greater than 7000 lb/in.\textsuperscript{2} are reported to cause damage that has a 100% amputation rate.\textsuperscript{8} Greater injection volume is also known to lead to worse outcome.\textsuperscript{2} Another factor with major influence on outcome is the nature of the injected material. It has been noted by many authors that injuries with paints have worse outcome than those with oil or grease.\textsuperscript{1,4,5} Trauma involving water, air or low-volume vaccines may be amenable to non-operative treatment.\textsuperscript{2} In our case, the injection pressure was not very high (55–85 lb/in.\textsuperscript{2}), there was little injected material and this material was polyurethane, which is not an irritant. After removal of the foreign bodies, the clinical result was excellent.

References