Foreign Bodies in the Hand: A Case Report, Review of Literature, and Guidance for Acute Management

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INTRODUCTION
Penetrating injuries of the hand and fingers are among the most common reasons patients present to the emergency department.1 Nearly one-third of the 11 million patient visits to emergency departments in the United States involve the hand or wrist.2 In more than 10% of these injuries, a retained foreign body is discovered.3 Current literature recommending the ideal method and setting to remove foreign bodies in the hand is sparse and mixed. Some authors support foreign body removal in the emergency department or primary care setting.4 Despite the failure to diagnose or treat retained foreign bodies being the fifth leading cause for claims against emergency physicians,5 some authors recommend identification and delayed or non-treatment.6

When treating patients with foreign bodies in the palmar aspect of the hand, it is important to collaborate with a hand specialist to avoid complications when exploring adjacent to at-risk neurovascular structures.

CASE REPORT
An 18-year-old man presented to the emergency department with right hand pain after sustaining a penetrating wound to the hypothenar eminence while cutting chicken wire. On physical examination, the patient endorsed tenderness to palpation over a puncture wound of the hypothenar eminence. He showed full range of motion of the right hand and wrist, and he had negative Froment's sign. The patient was able to abduct and adduct his fingers, and he had 5 of 5 strength to the abductor digiti minimi, interossei, and adductor pollicis. He was neurovascularly intact and no other injuries could be identified. Right hand radiographs confirmed the presence of a foreign body located at the volar aspect of the base of the fifth metacarpal (Figure 1A and 1B). Foreign body removal utilizing a volar incision was attempted by the emergency physician with concern of persistent symptoms or additional injury given its location. A 2-cm longitudinal incision was made along the ulnar aspect of the hypothenar eminence, which was performed under routine sterile conditions and while using a...
median and ulnar nerve block. Removal was attempted using fluoroscopic guidance and was unsuccessful. Localization with fluoroscopic guidance suggested that the foreign body was in a deep location not easily accessible from the incision made. Attempted retrieval was thus terminated.

At this point, the orthopaedic service was consulted for assistance. Due to the nerve block, neurological examination was unable to be performed at this time. Given that the foreign body was still near important neurovascular structures, the patient was indicated for formal exploration. In the operating room, antibiotics were administered; a time-out, prepping, and draping were performed; the arm was exsanguinated; and a tourniquet was insufflated. The previous incision that was made by the emergency physician was extended over Guyon’s canal. During exploration, the motor branch of the ulnar nerve was found to be sharply transected. The ulnar artery, branching superficial palmar arterial arch, ring and small finger flexor digitorum superficialis, and profundus tendons were intact. A neurolysis of the ulnar nerve and its motor branch was performed. Guyon’s canal was decompressed by releasing both the superficial palmar carpal ligament and the flexor retinaculum. The foreign body was located against the base of the fifth metacarpal and removed. A tension free, epineural primary repair of the motor branch of the ulnar nerve was performed using a 9-0 non-absorbable suture, and then it was reinforced with interrupted simple sutures (Stryker, Michigan, USA) (Figure 2). A thorough irrigation was performed, followed by skin closure.

**DISCUSSION**

Penetrating injuries to the hand are common. The appropriate treatment option and setting for these injuries remain debatable. Complications have been described, including pain, infection, inflammation, neurovascular injury, and unplanned secondary procedures. Indications for foreign body exploration and removal include neurovascular injury, tendon laceration, cosmetic deformity, functional impairment, and chronic pain. Furthermore, contraindications include inaccessibility, unacceptable risks to neurovascular structures during the retrieval process, minute size, inert material, and asymptomatic presentation. Potini et al suggest that a trained hand surgeon perform the safe removal of hand foreign bodies that are accessible or as a part of an exploration procedure to an injured structure.

It is pertinent to obtain an accurate history and physical examination, including a thorough neurovascular examination and wound assessment. To facilitate this assessment, it is important that all penetrating wounds be inspected with proper lighting, sedation, and local anesthesia. Plain radiography and ultrasound can be used to help localize foreign bodies. While plain radiographs identify only radiopaque material (e.g., metal, glass, and some plastics), sonographs can be used to identify radiolucent foreign bodies.

Understanding the palmar anatomy of the hand, specifically the anatomy of the hypothenar eminence, is essential for safe foreign body retrieval. The main trunk...
of the ulnar nerve is adjacent to the flexor carpi ulnaris, superficial to the fascia and skin at the level of the wrist, putting it at risk for penetrating injuries or aberrant explorations. The ulnar nerve and artery then enter Guyon’s canal distally, a longitudinal space bordered by the pisiform radially, the hook of the hamate ulnarly, the superficial palmar carpal ligament volarly, and the deeper flexor retinaculum and hypothenar muscles dorsally. Within Guyon’s canal, the ulnar nerve divides into the superficial and deep branches. Between the pisiform and the hook of the hamate, the deep branch passes dorsal to the origin of the hypothenar muscles. As the deep branch runs ulnar to the hook of the hamate and radial to the pisiform, an injury localized to this region could disrupt the branch to abductor digiti minimi, resulting in isolated loss of abduction of the fifth digit and an isolated abductor digit minimi palsy.

We recommend that removal of a foreign body from the palmar aspect of the hand be performed by an appropriately trained hand surgeon in the operating theatre. Adequate anesthesia and meticulous hemostasis in an operating theatre is required. An exception to this would be very superficial foreign bodies that are readily visualized through the presenting wound, and do not require imaging guidance or extension of the wound for access. Nevertheless, given the potential difficulty of foreign body removal in the palmar aspect of the hand, as well as the risk to important anatomical structures, hand service consultation is also recommended.

We report the case of iatrogenic transection of the deep branch of the ulnar nerve during hypothenar eminence wound exploration in the emergency department. This case illustrates the challenges of treating these difficult injuries. It should be the primary role of the emergency physician to carefully evaluate wounds for evidence of foreign bodies or damage to deep structures such as nerves, tendons, or arteries. Documenting and discussing these findings with appropriate consultation can limit iatrogenic injury and provide optimal patient outcomes. It is our recommendation that foreign body removal from the palmar aspect of the hand be performed by an appropriately trained hand surgeon in the operating theatre.

REFERENCES