Isolated Laceration to the Deep Motor Branch of the Ulnar Nerve by a Retained Foreign Body

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Abstract

This report describes an isolated laceration to the deep motor branch of the ulnar nerve by a retained foreign body. The patient sustained a laceration on the ulnar, volar aspect of his palm after a fall on gravel. He presented to the emergency room with motor deficits but a normal sensory examination. No foreign bodies were identified on initial wound exploration or review of plain radiographs, and the patient's wound was sutured closed without diagnosing the nerve injury or the retained foreign body. Confusion over the patient's intact sensory examination and lack of awareness of the complex distal anatomy of the ulnar nerve contributed to the misdiagnosed nerve lesion. Isolated injuries of the deep motor branch are very rare, but increased awareness and understanding of the complex ulnar nerve distal anatomy will help avoid future delays in diagnosis and treatment.

Nerve damage in the hand from foreign bodies occurs in 2% of cases and the digital nerves are usually affected.[1] Only 2 cases of ulnar nerve damage in the hand from foreign bodies have been reported.[2,3] In both instances, combined sensory and motor ulnar deficits occurred following the implantation of retained foreign bodies in or near Guyon's canal.[2,3] We report the first case of an isolated ulnar deep motor branch injury from an implanted foreign body in a patient who presented with an intact sensory examination. The nerve injury was initially misdiagnosed because of confusion over the intact sensory examination, underscoring the importance of reviewing the complex distal anatomy of the ulnar nerve.

In the hand, the ulnar nerve enters Guyon's canal and divides into superficial and deep motor branches near the distal border of the pisiform. The superficial branch innervates the palmaris brevis and continues distally to divide into the fourth common digital nerve and the ulnar proper digital nerve to the small finger, providing sensation to the small finger and the ulnar half of the ring finger. The deep motor branch curves radially around the hook of the hamate and supplies the hypothenar muscles, interossei, third and fourth lumbricals, adductor pollicis, and the medial head of flexor pollicis brevis.[4]

Guyon's canal has been divided into 3 clinically relevant zones to improve understanding of distal ulnar nerve injuries. Zone 1 is the area proximal to the bifurcation of the nerve, zone 2 is the area of the deep motor branch, and zone 3 is the area of the superficial branch. Thus, lesions in zone 1 result in both motor and sensory losses, lesions in zone 2, isolated motor losses, and lesions in zone 3, predominantly sensory losses. The most common causes of zone 2 pathology are ganglia and hamate hook fractures.[5] The deep motor branch runs immediately deep and radial to the superficial branch in Guyon's canal, so one would not expect foreign bodies to cause pure zone 2 injuries. To our knowledge, this is the first reported case of an isolated zone 2 injury from an implanted foreign body.

The patient's mother provided written informed consent for print and electronic publication of this case report.

Case Report

An 11-year-old male fell on gravel and sustained a 3 cm laceration on the ulnar, volar aspect of his palm. His wound was irrigated and closed at an outside emergency room and no foreign bodies were identified on plain radiographs. One week after the injury, the patient presented for suture removal with a claw hand posture but no ulnar sensory deficits. Given the negative radiographs and the intact sensory examination, neither a retained foreign body nor a nerve injury was suspected, and the patient was managed conservatively with observation.

Six weeks later, his ulnar motor palsy had not improved and he was referred to a hand specialist. He had first

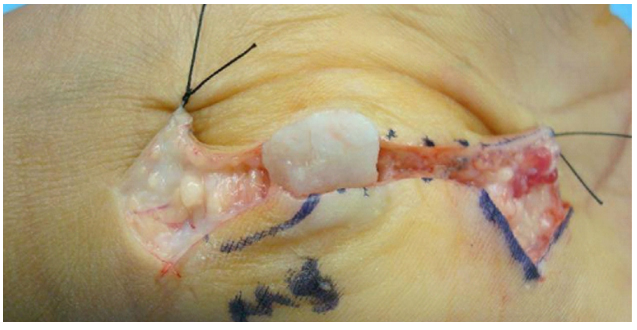

Figure 1. The 1.5 x 1 cm piece of quartz depicted in this photograph was identified immediately deep to the superficial subcutaneous tissues underlying the patient's volar scar.

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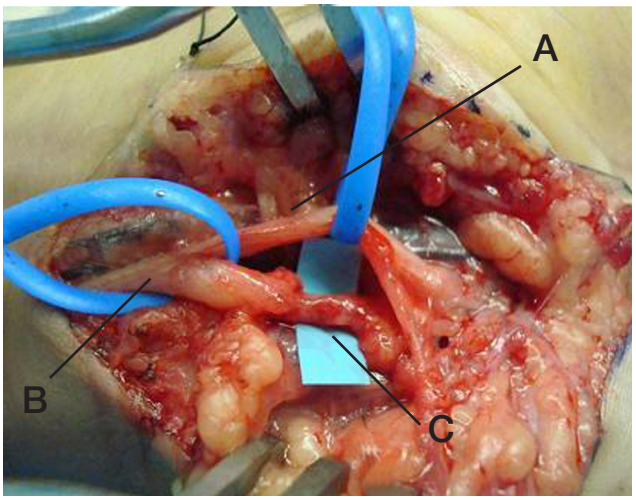

Figure 2. The division of the ulnar nerve (A) into the superficial branch (B) and the deep motor branch (C) is depicted in the photograph. Consistent with the patient's normal ulnar sensory examination, the superficial branch in zone 3 was intact (ie, retracted superiorly by the vessel loop).

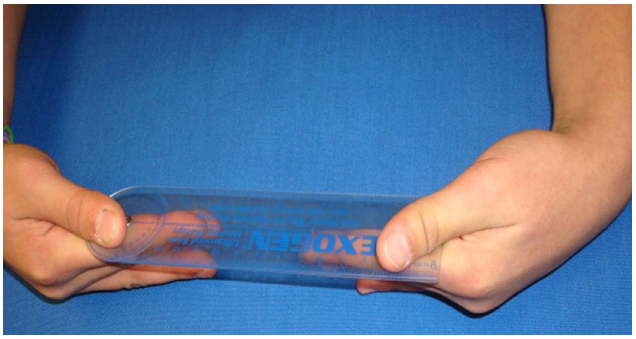

Figure 3. Clinical photograph 6 months after primary nerve repair demonstrating a negative Froment's sign with resolution of the ulnar nerve motor palsy.

dorsal interosseous atrophy and was unable to cross his fingers. He was unable to hold a piece of paper between his thumb and index finger, indicating a positive Froment sign with a palsy of the ulnar motor branch to the adductor pollicis. He also had a positive Wartenberg sign, with little finger abduction due to the unopposed ulnar insertion of the extensor digiti quinti. His neurologic examination was not consistent with a complete ulnar motor palsy, as he had no hypothenar atrophy and his abductor digiti minimi strength was 5/5. His sensation was intact with 2-point discrimination of 4 mm throughout. In addition, a firm, well-circumscribed mass was palpable in the subcutaneous tissues deep to his scar.

The clinical impression was that he had an isolated ulnar nerve motor deficit just distal to the abductor digiti minimi branch. A zone 2 injury from either compression or laceration of the deep motor branch of the ulnar nerve was suspected. Because of the palpable mass, possible etiologies included a retained foreign body or a displaced hamate hook fracture. A computed tomography (CT) scan demonstrated a retained foreign body and the patient was taken to the operating room for removal of a 1.5 x 1 cm piece of quartz (Figure 1) and nerve exploration.

Exploration revealed a large neuroma of the deep motor branch in zone 2, just distal to the branch to the abductor digiti minimi. Consistent with the clinical examination, the superficial branch in zone 3 was intact (Figure 2). The neuroma was resected, and the motor branch was mobilized proximally to achieve length for a primary nerve repair. Six months later, the patient's claw hand posture and motor deficits had resolved (Figure 3).

Discussion

This case report highlights 2 clinical points. First, it emphasizes the importance of understanding the ulnar nerve distal anatomy. Foreign body implantation has not been previously reported as a cause of isolated deep motor branch injury and confusion over the intact sensory examination in this case led to the delayed diagnosis. While this injury pattern is rare, improved awareness of the complex ulnar nerve anatomy will help avoid delayed diagnoses in the future.

The second clinical point is the importance of obtaining appropriate imaging studies when foreign bodies are suspected, but not well visualized, on plain radiographs. The patient in this report had a large piece of retained quartz in his hand for 6 weeks. Plain radiographs miss 15% of foreign bodies.[1] When stone, wood, or glass is suspected, but plain radiographs are non-diagnostic, either ultrasound or CT should be performed.[6-9] In this case, a hamate hook fracture was in the differential, so a CT scan was chosen over ultrasound as the imaging modality of choice.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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This paper will be judged for the Resident Writer's Award.