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Ulnar nerve palsy following a closed fracture of shaft of radius and ulna in a child

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Abstract

Ulnar nerve palsy is a rare condition after closed fractures of the radius and ulna. It can present as neuropraxia mostly, but nerve entrapment and laceration should also be kept in mind. The authors present a case of a 14-year-old boy who developed ulnar nerve palsy following a left radius and ulna midshaft fracture with significant angulation and displacement. Intra-operatively, the ulnar nerve was found trapped on a spike of the ulna. At 20 weeks follow up, the patient had a complete recovery from the ulnar nerve palsy. It is important to evaluate the patient properly before any procedure or manipulation and manage according to the type of lesion.

Keywords: Ulnar Nerve Palsy, Fracture Radius, Fracture Ulna

Introduction

The authors present a case of a surgically treated displaced closed midshaft radius and ulna fracture which was complicated by ulnar nerve palsy. The ulnar nerve was found to be entrapped on the ulnar spike and was released. Ulnar nerve damage leading to neuropathy is an uncommon complication of closed forearm fractures. It is important to note the neurological status of the limb at any given setting when suspecting nerve entrapment. In most cases, the cause of the ulnar nerve palsy will be due to the contusion caused by the initial trauma. Never the less, watchful waiting at a time where the initial neurological assessment is inconclusive due to severe pain may be less than optimal. Reverting to surgical intervention may be a promising outcome for the patient's well-being.

Case Report

The authors present a case of a 14-year-old boy who presented to the Emergency Department with pain, swelling, deformity and limited movement of his left hand and forearm, following a fall down a flight of stairs. Plain radiographs showed a fracture of the shaft of radius and ulna with complete displacement, shortening and volar angulation. (Figure 1a, b)

Due to severe pain during initial presentation, neurological assessment of the left upper limb was inconclusive. A posterior splint was applied and was admitted for surgical intervention and exploration the following day.

Pre-operatively, after receiving analgesia, a neurological assessment revealed absent sensation over the little finger and ulnar half of the ring finger and associated ulnar claw hand.

The patient underwent open reduction and internal fixation of the fracture with two 6-hole limited contact 3.5-mm dynamic compression plates (Figure 1 c, d) using conventional approaches. Intra-operatively we found the flexor carpi ulnaris along with the ulnar nerve trapped on a large spike of the ulna. The nerve was released without any injury. (Figure 2)

Post-operative assessment revealed paresthesia over the ulnar nerve distribution persisted with slight improvement in the range of motion of the fingers. Patient was discharged on the 1st post-operative day with further follow up in the outpatient clinics.

The first follow up was on post-op day 12. Examination revealed ring and little finger claw hand with absent sensation over ulnar nerve distribution. Patient was sent for physiotherapy and nerve conduction studies of the ulnar nerve.

At 6 weeks follow up, the ulnar claw hand was still present along with the absent sensation. There was also wasting of the interosseous muscles of the left hand. (Figure 3a, b). Nerve conduction studies revealed absent sensory potential in left ulnar sensory nerve.

The motor conduction study showed delayed distal latency with markedly reduced amplitude and reduced nerve conduction velocity below and above the elbow.

Follow up at 8 weeks revealed no improvement of symptoms. Patient was advised to continue physiotherapy and exercises.

At 20 weeks the patient had regained full sensation over the ulnar nerve distribution with recovery of the ulnar claw hand. (Figure 4) He gained normal power of the intrinsic muscles of the hand and was performing daily life activities with his left hand. Repeat nerve conduction studies showed improvement in amplitude and conduction of the ulnar nerve.

Discussion

Ulnar nerve palsy is the second most common neuropathy in the upper extremity-the first being that of the median nerve [1] However, as common as the incidence is, it is a rare complication of closed fractures of the forearm. A review done by the authors revealed only 9 reported cases in the literature, excluding this current one.

The ulnar nerve originates from the medial cord of the brachial plexus from the C8-T1 nerve roots. In the hand, motor branches supply the hypothenar muscles, dorsal and palmar interossei, 3rd and 4th lumbricals, adductor pollicis and the deep head of flexor pollicis brevis (FPB). In the forearm, the motor branches supply the flexor carpi ulnaris (FCU) and medial half of the flexor digitorum profundus (FDP). Sensory branches supply cutaneous innervation to the little finger and ulnar half of ring finger [2].

In the forearm, the ulnar nerve lies between the flexor carpi ulnaris (FCU) and flexor digitorum profundus (FDP) where it is protected from external forces. However, as it runs to the distal third of the forearm, it lies close to the ulna which makes it susceptible to direct injury from an angulated and displaced fracture [3].

Ulnar nerve injury in closed forearm fractures is seen in high energy mechanism of trauma with angulated and displaced fracture ends. This may lead to contusion of the nerve, tissue edema and fibrosis leading to compression of the nerve and/or entrapment of the nerve in a bony spike [3].

Suganama *et al.* suggested that ulnar nerve palsy seen at initial presentation is most likely due to contusion of the nerve, or damage to the nerve by a bony spike. However, those patients that present with symptoms post-reduction, do so due to entrapment of the nerve at the reduced fracture site [3].

Initial examination on presentation is important to distinguish between ulnar nerve injury due to initial mechanism of trauma or iatrogenic injury due to intra-operative technique.

Of the 9 cases reported in the literature, Neiman *et al* reported 2 cases which made a full recovery of the ulnar nerve at 20 weeks with no surgical intervention [4]. 3 of the remaining 7 cases had early exploration and nerve repair performed due to a laceration of the nerve [5, 6, 10]. Out of the 5 cases that had neurolysis, Suganuma *et al* and Hirasawa *et al* performed neurolysis at 9 weeks and 12 weeks respectively, recommending that nerve exploration should be done if no improvement is seen approximately 10 weeks post-operatively [3, 7].

In 1974, Omer *et al* studied 917 nerve injuries in the upper limbs. They concluded that 85% of neuropathies, with nerves intact, caused by fracture dislocations recovered spontaneously within 16 weeks of injury [6].

It is difficult to propose one set of guidelines for the treatment of ulnar nerve palsy. Some authors advocate for early exploration, while others recommend the wait and watch principle. Even though most cases are a neuropraxia, Amit *et al* suggests performing an MRI scan to rule out complete transection or entrapment of the nerve [7, 8, 9].

In conclusion, ulnar nerve injury in closed midshaft forearm fractures is a rare case due to the ulnar nerve being protected by the FCU and FDP. The case presented has been the only one seen in our center. At 20 weeks follow up it is clear that this was a case of neuropraxia which was able to resolve spontaneously.

Authors Disclosure Statement and Acknowledgements

The authors report no conflict of interest in relation to this case report.

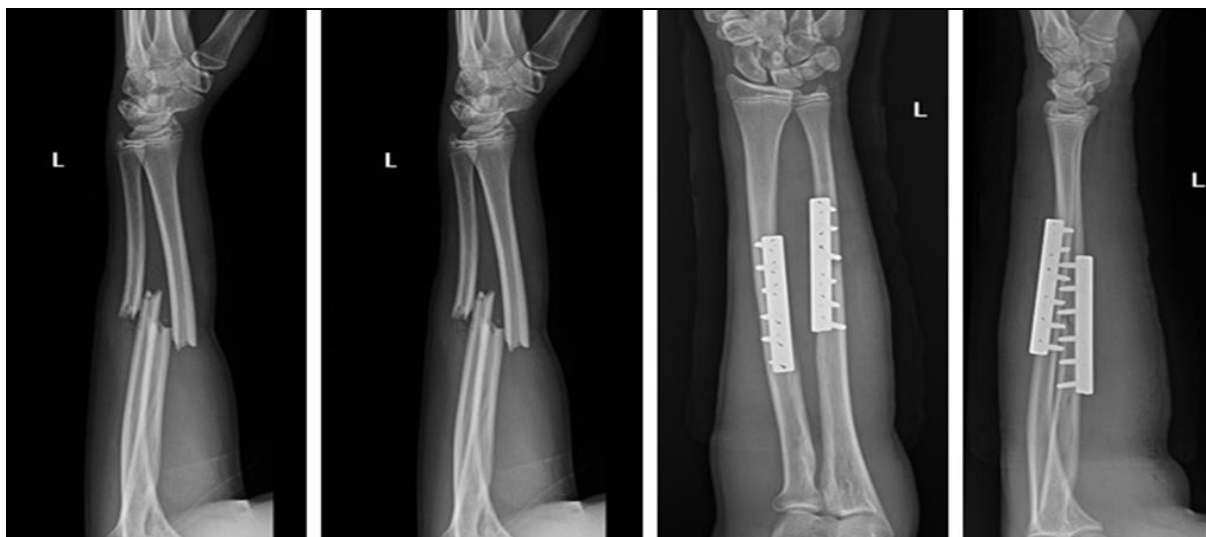


Fig 1: Preoperative (a, b) and postoperative (c, d) radiographs of the fracture radius and ulna

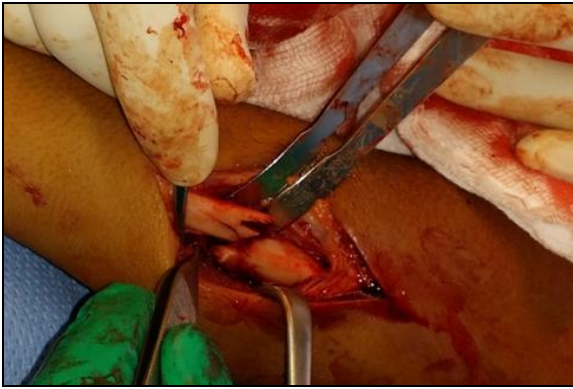


Fig 2: Intraoperative image showing Flexor Carpi Ulnaris containing ulnar nerve on spike of fractured ulna



Fig 3(a, b): Photograph showing left ulnar claw hand with wasting of interosseous muscles



Fig 4: Photograph at 20 weeks follow up. The ulnar claw hand has resolved

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