Bony entrapment of ulnar nerve after closed forearm fracture: A case report

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ABSTRACT
We report a case of ulnar nerve palsy following forearm fracture in a 13-year-old girl. Significant anterior angulation and displacement of the ulna were noted. Operation was performed 3 months after the injury, when no recovery of numbness and claw hand deformity were demonstrated. Intra-operatively the ulnar nerve was found to be embedded between fragments of the fractured ulna, which showed lack of callus formation on the preoperative radiograph. The patient achieved complete recovery of sensory and motor functions 4 months after the surgery.

Key words: forearm injuries; palsy; ulnar nerve

INTRODUCTION
Ulnar nerve injury rarely complicates closed fracture of the shaft of the forearm. We report a case in which the fracture of the shaft of the forearm was complicated by progressive ulnar nerve palsy during the period of non-operative treatment.

CASE REPORT
A 13-year-old girl, who had no remarkable history of illness, presented with numbness on the ulnar side of the left hand and limitation in forearm rotation after sustaining a diaphyseal fracture of the left radius and ulna. She underwent manual reduction and cast fixation on the day of injury in a local hospital (Fig. 1). After 3 days, she noticed numbness in the ring and little fingers, which was aggravated by forearm...
rotation, and pain on the flexor side of the forearm during fingers extension. After 2 months, she was referred to our department because of gradually worsening numbness, displacement of the fracture site of the forearm on plain radiographs, and persisting limitation in forearm rotation.

Apart from limitation in the range of forearm motion (anterior pronation, $-10^\circ$; supination, $20^\circ$), swelling and tenderness in the forearm were not observed in the first physical examination upon the girl’s presentation at our department. Hypoesthesia (Semmes-Weinstein test blue number 6) was observed in the little finger and the ulnar half of the ring finger, and Tinel’s sign was elicited at the ulnar fracture site. Three months after initial injury, atrophy of the interosseous muscles and claw hand deformity of the ring and little fingers developed. Plain radiographs showed signs of bone union in both the radius and ulna (Fig. 2). In the radius, angular deformity (convexity on the ulnar side, $16^\circ$) was observed. Callus formation was not observed in a part of the ulnar fracture area.

Three months after injury i.e. one month after being referred to our department, the patient was admitted for neurolysis of the ulnar nerve and corrective osteotomy of the radius under general anaesthesia. On operation it was revealed that the ulnar nerve, together with the ulnar artery and the fascia of the flexor digitorum profundus muscle, adhered between the fractured ulnar fragments (Fig. 3a). On dissection, the ulnar nerve was found to be embedded in the fracture site of the ulna that lacked callus formation on preoperative plain radiographs. When external neurolysis was advanced, the nerve showed marked adhesion to the periosteum at a more proximal site (Fig. 3b).
Postoperatively, numbness and tingling of the little finger gradually subsided. Recovery of the ulnar nerve function was evident one week after operation. Four months later there was complete recovery of sensation and motor function, as well as radiographic evidence of correction of the deformity of the radius. Limitation in forearm rotation also disappeared (Fig. 4). By one year after surgery, the patient had no complaint of numbness and tingling, and no limitation in forearm rotation at the last follow-up visit.

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DISCUSSION

Ulnar nerve injury rarely complicates closed fracture of the shaft of the forearm, and only 7 cases, excluding the current one, have been reported in the literature so far.1-4 In all these reported cases, the patients had displaced forearm fracture showing convexity on the flexor side and underwent non-operative treatment. Of the 7 patients, 3 had transient palsy, while the remaining 4 showed progressive palsy due to bony entrapment. In the latter 4 patients, progressive ulnar nerve palsy developed after manual reduction, and neurolysis was performed 10 to 16 weeks thereafter (Table). Sensation improved in all of these patients, but reduced muscle power was observed in 2 patients at 6 months and one year after operation. In the current case, neurolysis was performed 13 weeks after manual reduction, and both muscle power and sensation on the fracture side returned to normal 4 months after operation. Based on these results, we conclude that neurolysis for progressive ulnar nerve palsy due to bony entrapment is conducive to satisfactory recovery.

The ulnar nerve runs parallel to the flexor digitorum profundus muscle in the deep layer of the flexor carpi ulnaris muscle in the forearm, and is protected by the muscle from the surrounding area. Compared with the median nerve in the carpal tunnel, the ulnar nerve in the Guyon canal is relatively mobile, thus accounting for its infrequent injury associated with fracture.5,6

Shaw and Murphy7 reported a patient with entrapment of the flexor digitorum profundus muscle of the ring and the little fingers in the fracture site of the forearm. Our patient also showed entrapment of the ulnar nerve, together with the fascia of the flexor digitorum profundus muscles of the ring and little fingers, at the fracture site. This entrapment of the ulnar nerve, with the fascia of the flexor digitorum profundus muscles of the ring and the little fingers, might have occurred when the ulna, displaced in a spike pattern with convexity on the flexor side, was manually reduced.

Based on all the reported cases, the clinical characteristics of progressive ulnar nerve palsy due to bone entrapment after fracture can be summarised as follows:

1. Motor and sensory impairment of the ulnar nerve is observed at the time of manual reduction;
2. Palsy gradually progresses; and
3. Radiographs show angular deformity and partial absence of callus formation at the fracture site.

Matev8 reported a patient showing posterior displacement of the median nerve beyond the medial epicondyle of the humerus after posterior lateral dislocation of the elbow joint, and termed the callus-lacking image, due to entrapment of the nerve between the fractured fragments of the humerus, the Matev’s sign. In the current case, there was also similar defect of callus formation, which was confirmed during operation to be the entrapment point of the ulnar nerve.

REFERENCES