

ULNAR NERVE PALSY FOLLOWING FRACTURE OF THE DISTAL RADIUS IN AN ADOLESCENT: A CASE REPORT

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In adolescents, neurovascular injury, especially ulnar nerve injury, is rare with fracture of the distal radius. We present a 14-year-old boy who sustained fracture of the distal radius in his right wrist, who also had symptoms of ulnar nerve injury. Close reduction with percutaneous pinning and cast to fix the distal radius fracture was done immediately. Then, we decided to observe the recovery of the nerve injury without providing any emergent nerve exploration. Bone union was achieved after 8 weeks of fixation, and the function of the ulnar nerve was restored completely after 16 weeks of observation. The possibility of ulnar nerve injury should be considered following fracture of the distal aspect of the radius, and we recommend observing the recovery of nerve injury, with no need for emergent nerve exploration.

Key Words: adolescent, fracture of distal radius, ulnar nerve injury
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The distal aspect of the radius and ulna is the most common site of fracture in children. Generally, the mechanism of injury is a fall on an outstretched hand and wrist. The distal fragment usually displaces dorsally, creating an extension deformity. Neurovascular injury, especially ulnar nerve injury, is rare in fracture of the distal radius in children. To our knowledge, there are only a few cases in the literature that mention ulnar nerve injury after distal radius fracture. We report a case of ulnar nerve injury associated with fracture of the distal radius in an adolescent, which recovered spontaneously without any surgical intervention.

CASE PRESENTATION

A 14-year-old boy sustained right wrist pain and deformity after falling on his outstretched hands while playing basketball. He was sent to our emergency room and the radiographs revealed fracture of the right distal radius (Salter–Harris Type II) with dorsal displacement and fracture of the ulnar styloid process with volar protrusion of the distal ulna (Figure 1). The boy complained of numbness over the fourth and fifth digits of his right hand. Initial examination found decreased sensation and weakness in the abduction of the fourth and fifth digits. There was no open wound at the right wrist or any sign of elbow injury. The radial and ulnar pulses were intact. Under general anesthesia, emergent close reduction with percutaneous pinning of the fracture was performed in the operation room under fluoroscopic guidance (Figure 2). The next day, he continued to complain of numbness

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Figure 1. A 14-year-old boy with dorsally displaced right distal radius fracture (arrows) and nondisplaced ulna styloid fracture (arrowhead) with volar protrusion of the distal ulna (Salter–Harris Type II): (A) anteroposterior view; (B) lateral view.



Figure 2. Close reduction with percutaneous pinning and long arm casting was performed immediately: (A) anteroposterior view; (B) lateral view.

over the fourth and fifth digits after the pain had diminished. In addition, he was unable to perform extension of the proximal and distal interphalangeal joints, and adduction and abduction of the fourth and fifth digits. We changed the long arm cast to a short arm cast and bivalved it as soon as possible. There was

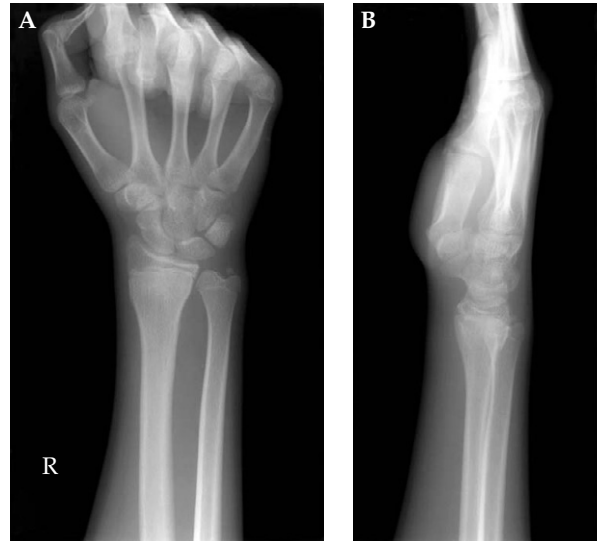


Figure 3. Eight weeks after the injury, solid union of the fracture was achieved: (A) anteroposterior view; (B) lateral view.

no contusion injury or limited motion of his elbow. The symptoms of ulnar nerve palsy did not subside during the admission period. We recommended close observation of the symptoms with regular follow-up at our clinic.

The cast and pin were removed after radiographic callus formation about 4 weeks after injury. He used a wrist brace for 8 weeks, and the radiograph showed solid union of the fracture site (Figure 3). At that time, he still complained of persistent numbness in the fourth and fifth digits. In addition, symptoms of ulnar nerve injury such as clawing of the fourth and fifth digits, positive Froment's sign, and poor intrinsic muscle function were also found. The result of a nerve conduction velocity (NCV) test confirmed the presence of an ulnar nerve lesion in Guyon's canal. The patient received regular rehabilitation treatment and the ulnar nerve function recovered gradually. By 16 weeks after the injury, he had regained full sensation over the fourth and fifth digits of the right hand. On physical examination, there was normal intrinsic muscle function and negative Froment's sign. The boy returned to playing basketball using his right hand without any limitations.

DISCUSSION

Fracture of the distal radius is a common injury during the adolescent growth spurt. The peak incidence of

fracture of the distal radius occurs between the ages 11.5 and 12.5 years for girls and between 13.5 and 14.5 years for boys, which perfectly matches the age of peak velocity of growth of height [1]. Generally, the mechanism of injury is a fall on an outstretched hand and wrist. The distal fragment usually displaces dorsally, creating an extension deformity that is clinically apparent. Neurovascular injury is uncommon in such fractures, and ulnar nerve injury is even rarer [2]. On reviewing the literature, we found several case reports that describe ulnar nerve injury associated with fracture of the distal radius [3–12]. Ulnar nerve lesions associated with fracture of the distal radius tend to occur more in young adults who have sustained high-impact injury and marked dorsal displacement of the distal fragment than are generally met in patients with Colles' fracture [8].

Howard stated that ulnar neuropathy associated with wrist injuries might result from: (1) severe contusion of the nerve; (2) pressure on the nerve caused by hemorrhage and edema related to the fracture; and (3) intraneural fibrosis in delayed or progressive paralysis [3]. The rarity of ulnar nerve injuries in the wrist is probably due to the anatomic relationship of the ulna nerve in the wrist and forearm. The ulnar nerve runs along the flexor digitorum profundus, under cover of the flexor carpi ulnaris muscle, and becomes superficial at the level of the flexor carpi ulnaris tendon. Then the ulnar nerve passes through Guyon's canal at the wrist level. The walls of Guyon's canal consists of the volar carpal ligament palmarly, the transverse carpal ligament dorsally, and the pisiform and pisohamate ligament laterally [13]. According to anatomic study, Vance and Gelberman [8] and Clarke and Spencer [10] demonstrated that the ulnar nerve has greater excursion in Guyon's canal than the median nerve in the carpal canal, which may be the reason for the rarity of ulnar nerve injury in wrist injuries.

In this case, the boy had sustained fracture of the distal radius (Salter–Harris Type II) combined with fracture of the tip of the ulnar styloid and volar protrusion of the distal ulna. He had numbness over the fourth and fifth digits and loss of intrinsic muscle function of his right hand. NCV test demonstrated that the ulnar nerve lesion was located at Guyon's canal. Similar to this case, Joshi reported a case of traumatic neuritis of the ulnar nerve associated with Colles' fracture, and considered that the ulnar nerve

lesion was caused by the fracture of the ulnar styloid process [7]. We suppose that the fracture of the ulnar styloid might imply the possibility of ulnar nerve injury. The function of the ulnar nerve should always be checked before performing close reduction of the fracture of the distal radius and ulna styloid in the emergency room. We recommended close observation of the recovery of ulnar nerve function in this case. To our knowledge, there are no standard procedures of treatment for ulnar nerve injury associated with fracture of the distal radius and ulna. However, Vance and Gelberman proposed that Guyon's canal be explored and decompressed if ulnar nerve function does not improve within 24–36 hours after appropriate fracture reduction, even though one patient recovered spontaneously without neurolysis in their series [8]. Poppi et al [9] and Clarke and Spencer [10] stated that the causes of ulnar nerve palsy following fractures of the distal radius were associated with serious contusion and dense scar tissue formation around the nerve, and early surgical neurolysis was successful in all patients. On the other hand, Neiman et al presented the case of a 12-year-old boy who sustained a closed fracture of the distal radius and ulna with ulnar nerve palsy that recovered spontaneously 17 weeks after the injury [12]. He concluded that the mechanism of ulnar nerve injury following fracture of the distal radius and ulna was caused by axonotmesis rather than nerve entrapment, and recommended observation of the nerve injury after fracture reduction. Ducker stated this same concept: that a contusion of the nerve resulting in neurapraxia or axonotmesis will resolve spontaneously without the need for neurolysis and exploration surgery [14]. We decided to follow Neiman et al's and Ducker's suggestion. As we expected, after 16 weeks of observation, the function of the ulnar nerve was restored fully without any deficit of hand function.

In conclusion, the incidence of ulnar nerve injury following fracture of the distal radius and ulna styloid in adolescents is rare. However, the possibility of ulnar nerve injury should be taken into consideration, and ulnar nerve function in patients who have sustained a fracture of the distal radius should always be checked. Even if ulnar nerve injury is present, we strongly recommend reduction of the displaced fracture fragment as soon as possible and observation of the nerve injury with regular follow-up, without any necessity of emergent nerve exploration.

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青少年之遠端橈骨骨折伴隨尺神經損傷 — 個案報告

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神經血管的受傷，特別是尺神經的受損，在青少年的遠端橈骨骨折中是很少伴隨發生的。我們報告一名十四歲的男孩發生右腕的遠端橈骨骨折，同時有同側尺神經受損之症狀出現。我們立刻施行閉鎖性骨折復位及經皮骨釘合併石膏固定遠端橈骨骨折。我們決定採取觀察尺神經功能的復原，不採取緊急的神經探查術。病人在受傷後的第八週骨折癒合，在第十六週尺神經功能完全恢復。在處理遠端橈骨骨折時仍要考慮發生尺神經損傷之可能性。即使如此，我們仍建議觀察尺神經功能的復原並不需要採取緊急的神經探查術。

關鍵詞：青少年，遠端橈骨骨折，尺神經受損
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