[Primary Care]

Median Nerve Compression From a Nondisplaced Fracture of the Coronoid Process of the Ulna: A Case Report

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Median nerve neuropathy following an elbow injury is uncommon. When it occurs, understanding the median nerve distribution and anatomy is crucial for identifying the cause and for distinguishing cases that can be managed with observation as opposed to intervention. The consequences of misdiagnosis can result in permanent disability. Understanding the mechanisms of nerve injury will help the clinician anticipate prognosis and guide treatment. Stretch, transection, and compression of nerves may present similarly, but isolating the mechanism and the extent of injury can guide the treatment modalities and help predict the overall recovery. The case is a report of median nerve compression in a woman after a nondisplaced fracture of the coronoid process of the ulna. Despite the unique nature of the patient's symptoms, the neuropathy resolved with "watchful waiting." The location of the injury was a key component in identifying the cause of the neuropathy. It highlights the importance of identifying a cause; some cases will resolve without intervention. Clinicians should consider median nerve compression when presented with a patient experiencing neurologic symptoms following such a fracture.

Keywords: elbow fracture; compression neuropathy; median nerve; coronoid process fracture

Median nerve neuropathy following an elbow injury is uncommon. When it occurs, understanding the median nerve distribution and anatomy is crucial for identifying the cause and for distinguishing cases that can be managed with observation as opposed to intervention, given that the consequences of misdiagnosis can result in permanent disability. Understanding the mechanisms of nerve injury will help the clinician anticipate prognosis and guide treatment. Stretch, transection, and compression of nerves may present similarly, but isolating the mechanism and the extent of injury can guide the treatment modalities and help predict the overall recovery.

CASE REPORT

A 21-year-old right-hand dominant woman presented with elbow pain after she slipped and fell on ice, landing on her outstretched left upper extremity. She initially presented to an urgent care clinic where radiographs showed a nondisplaced fracture of the coronoid process of the ulna. She was subsequently referred for evaluation.

Three days after the incident, she reported pain at the elbow, soreness of the wrist, and numbness and tingling of the left thumb and index finger. Physical examination showed diffuse swelling of the elbow. She lacked 15° of terminal extension and could flex to 100°. There was restriction of pronation and supination of about 10° compared to the opposite arm. She had diminished sensation to light touch and pinprick in the median nerve distribution, with some weakness of opposition of the thumb and index finger. She was placed in a soft-mesh posterior elbow pad and simple sling and sent for nerve conduction studies, which showed an abnormal decrease in amplitude of the motor portion of the median nerve consistent with a conduction block. This abnormality was at or proximal to the takeoff of the pronator teres muscle. Motor and sensory conduction of the ulnar nerve was preserved, as was sensory conduction of the median nerve.

At follow-up 10 days later, the elbow pain had improved, and her strength was slowly returning. On examination she lacked 20° of terminal elbow extension and had 130° of elbow flexion. She had slight discomfort at the endpoints of motion and intact

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Figure 1. Lateral views displayed a fracture of the coronoid process in good alignment, shown here by the circle.

sensation to pinprick in the median nerve distribution. She had slight tenderness of the lateral collateral ligament region of the elbow. Anteroposterior and lateral radiographs showed good fracture alignment (see Figure 1). Her conservative treatment was continued and she recovered with no limitations.

DISCUSSION

Median nerve compression associated with elbow injuries is rare. Most documented cases comprise elbow dislocations and associated medial epicondyle fractures that result in nerve entrapment in pediatric and adolescent patients.[1,7,9,11,13,14] Because this finding is uncommon, understanding the median nerve distribution and anatomy is essential for diagnosis.

The median nerve originates at the C6, C7, C8, and T1 nerve roots. Fibers from the medial and lateral cord traverse through the brachial plexus and meet in the axilla to form the median nerve as one of the terminal branches of the brachial plexus[3,12,20] (see Figure 2).

The median nerve then travels on the medial side of the arm and enters the forearm. It emerges from the cubital fossa between the 2 heads of the pronator teres, with the ulnar head inferior and the humeral head superior, passing the bicipital aponeurosis (and the rare anatomic variant ligament of Struthers). This is also the location at which it passes over the coronoid process of the ulna. The anterior interosseous nerve branches off as it passes through the pronator teres to innervate the index and middle flexor digitorum profundus, the flexor pollicis longus, and the pronator quadratus. The median nerve continues its path by traveling inferior to the flexor digitorum superficialis and superior to the flexor digitorum profundus until it reaches the wrist. Possible "choke points" where the nerve is often compressed include connective tissue in this area, the ligament of Struthers (when present), the bicipital aponeurosis, and the space between the heads of the pronator teres[3,12] (see Figure 3).

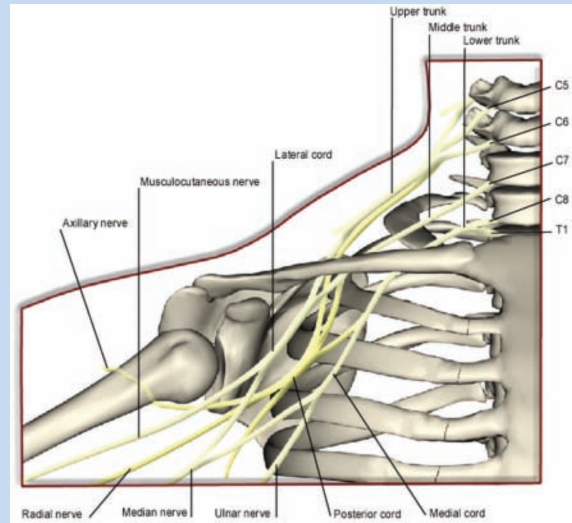

Figure 2. The median nerve is the product of fibers from the medial and lateral cords as they traverse the brachial plexus.[8]

The median nerve innervates a majority of the flexor muscles of the forearm and digits, as well as sensation of the distal dorsal fingertips and the volar aspect of the first, second, third, and radial half of the fourth fingers. Injury to this nerve results in a significant impairment of extremity function.[2,12,17]

This case is an example of a compression neuropathy secondary to local inflammation or hematoma development, most likely within the joint capsule as the nerve passed through the region of injury.[4] Such injuries are often associated with pronator teres deficits. Similar neuropathies are seen with overuse-type injures, such as a pronator teres syndrome, but are uncommon in trauma. Hallett[7] discussed the more likely causes of median neuropathies associated with elbow trauma, including a posterior entrapment, entrapment in a healing fracture, and a looping of the nerve into the anteromedial aspect of the joint. However, this discussion focused primarily on trauma that included posterior dislocation of the elbow. Review of the literature did not yield any cases associated with this fracture pattern.

It is helpful to understand the different ways in which a nerve can be injured in order to anticipate the prognosis associated with a specific injury. The predominant classification system of peripheral nerve injuries uses 3 increasing levels of severity: neurapraxia, axonotmesis, and neurotmesis. Neurapraxia is conduction slowing or a complete block.[18] Axonotmesis is a physical disruption of the axons within an intact epineurium. Neurotmesis is the complete transection of the nerve and epinerium.[15,18,19]

Compression injuries typically cause neurapraxia, although more severe events can result in axonotmesis and neurotmesis. Treatment is conservative to include relief of the compression, time to allow the nerve to heal, and physical therapy modalities. Prognosis is excellent, with recovery within 2 to 12

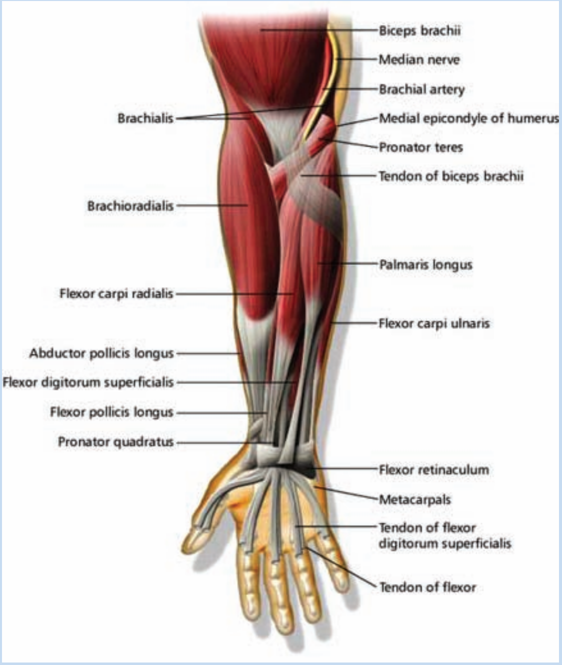

Figure 3. As the median nerve passes through the anterior aspect of the elbow, there are multiple anatomic structures that can interfere with appropriate nerve conduction, thus causing a neuropathy.[8]

weeks and with more severe cases taking 6 months. Stretch or traction injuries can cause neurapraxia as well as axonotmesis injuries.[10] Because of the injury to the axon, recovery is prolonged, and predicting recovery time is difficult. Treatment consists of (1) physical therapy to include strengthening of the muscles innervated by the affected nerve and (2) time. In more severe axonotmesis injuries, surgery may be required. The prognosis ranges from good to poor. Laceration injuries resulting in neurotmesis require surgery, with a poor prognosis of full recovery.[5,6,10,15,16]

CONCLUSION

This case is unique because it shows that a fracture of the coronoid process of the ulna can cause a median nerve compression. Because median nerve compression is an uncommon injury, understanding the anatomy and nerve distribution is central in its diagnosis. This case suggests that these patients have an excellent prognosis, with conservative management of compression injuries, with serial monitoring of the patient's condition, and with intervention only if it does not resolve or if a worsening of symptoms occurs.

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