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Case Report Open Access

A unique exposition of the mechanism involved in a post-traumatic ulnar nerve injury following a distal radius fracture and K-wire fixation: A case report

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Abstract

Background: Kirschner wire [K-wire] is commonly used to fix a wrist fracture; however, it may damage the (K-wire) surrounding nerves. Although ulnar-nerve injury is uncommon, when it occurs, it can lead to symptoms like numbness, tingling, or hand-muscle atrophy, such as clawing. Sometimes, the complexity of manifestations presents both diagnostic and therapeutic challenges, as encountered in our case, and these symptoms are often overlooked by clinicians. Early detection is vital for effective management and improved outcomes.

Case Presentation: A 59-year-old man presented with intense convulsions in his left forearm and hand, which felt like electric shocks. This distressing sensation was triggered by any movement of his hand, and he reported a strange sensation of having lost his three medial fingers, despite having normal sensations elsewhere. He had been experiencing these symptoms for two years and had been treated with anticonvulsant medications. After surgery, we removed an unusual connection between the nerves, and subsequently the symptoms resolved.

Discussion: It is essential to pay close attention to injuries related to K-wires fixation, especially when they involve the major motor nerves of the hand. Overlooking these injuries can lead to serious consequences.

Keywords: Complication, Distal radius fracture fixation, K-wiring, Ulnar nerve injury.

Introduction

An ulnar nerve injury can happen during the pinning of a wrist fracture when the nerve, located close to the wrist joint, gets compressed or damaged by the pins used to stabilize the broken bone.[1] Complications such as malunion, infection, and injuries to the median and superficial radial nerves are well-known.[2] While ulnar nerve injuries are rare, they can pose significant risks. The literature has documented instances of ulnar nerve injuries at the wrist due to Kirschner wires [K-wires]. Case reports by Heyns et al.,[3] and Muneer et al.,[4] showed ulnar nerve injury symptoms like hand muscle weakness, paresthesia, atrophy, and loss of hand function, which differ from our case. We did not find any literature showing similar findings as seen in our case. This case study highlights a rare instance of ulnar nerve injury that occurred during the pinning process for stabilizing a distal radius fracture.

Objectives

The aim of the study was to delve into the underlying mechanisms and make the clinician aware of clinical signs, diagnostic techniques, and treatment options for these atypical presentations of ulnar nerve injuries. Moreover, this study aimed to highlight the importance of quick recognition and intervention to prevent long-term complications.

Case Presentation

A 59-year-old male patient of healed distal radius fracture presented with a complaint of severe convulsions of the left forearm and hand like an electric shock. He was very fearful and hesitant to perform any movement by his left hand, i.e., finger movements, supination, and pronation, which were precursors of severe, uncontrollable, and painful convulsions. He is a motor

mechanic who suffered a road traffic accident two years ago. It was difficult for him to work with one hand and to support himself. He was a non-smoker and had no comorbidities such as diabetes, hypertension, peripheral vascular disease, alcoholism, or obesity. He was healthy and had no problems with the involved hand before the injury. One day after the injury, the patient underwent reduction and fixation of the fracture with K-wire performed elsewhere. A short arm cast was applied. Unfortunately, after surgery, the patient complained of a continuous tingling sensation in the medial half of the ring and little fingers, which was initially ignored. Following implant removal, the patient experienced minor trembling of the left-hand fingers and the left forearm, which worsened over time. For this, he visited many health-care centers but received no relief. The ulnar nerve was neither explored nor released after implant removal. He was on anticonvulsants for the past two years.

Personal and family history: nothing significant.

Physical examination: revealed no swelling or tenderness in the left wrist; sensations in the hand were normal. The patient did not have feelings for the medial three fingers, as if they were absent, not attached to his left hand. Clawing was absent.

Laboratory examinations: showed normal.

Neurological examination: EMG and NCV reports were inconclusive and suggested decreased conduction velocity in all the forearm nerves.

Imaging examination: patient had old and recent x-rays, fracture was healed [Figure-1]. We did not advise him on any USG, CT, or MRI because slight hand movement triggers irresistible convulsions.

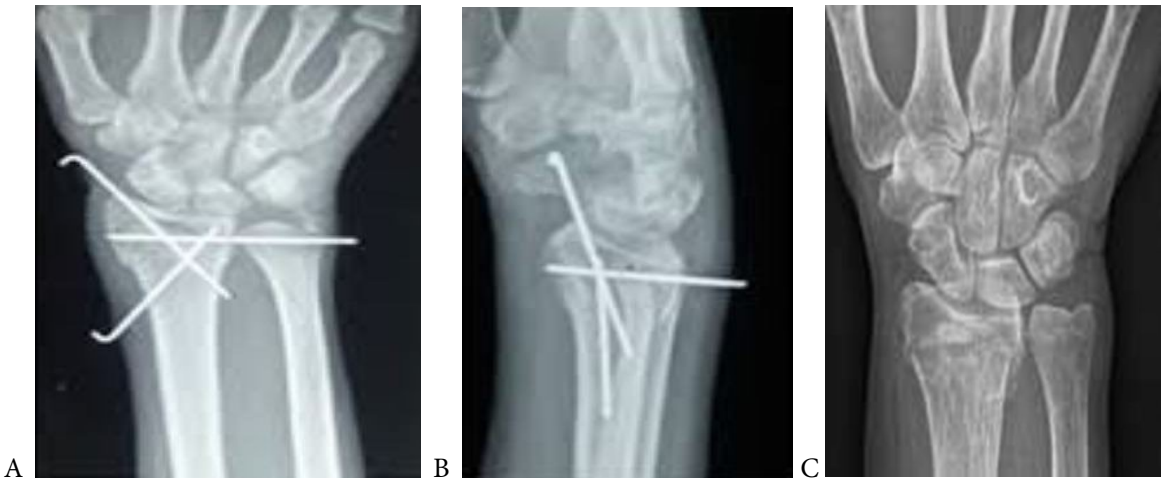

Figure-1. Radiographs of our patient: (A) and (B) anteroposterior and lateral radiographs; (C) anteroposterior radiograph of the wrist after K-wire removal

Case management: The patient underwent ulnar nerve exploration and neurolysis after two years. The principal branches of the ulnar nerve were identified and traced from proximal to wrist to the bifurcation. The intra-operative findings revealed a fine band and a fascial connection between just above ulnar nerve bifurcation and median nerves, which were the main culprits of these manifestations [Figure-2]. Both were excised and the neurological symptoms of our patient showed improvement on the very same day after the procedure. He was able to pronate and supinate forearm normally, and his hand and finger movements were smooth and effortless [Figure-3].

Ethical considerations

The study was conducted in accordance with the declaration of Helsinki and written consent was obtained from the patient for this case report.

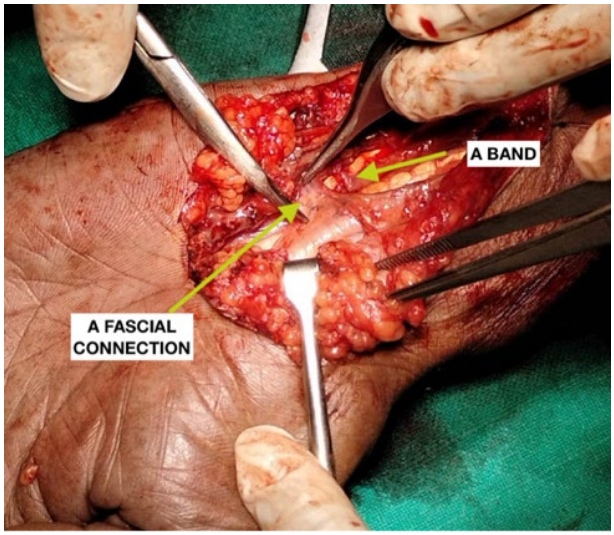

Figure-2. The intraoperative photograph shows an anomalous fascial connection and a transverse band

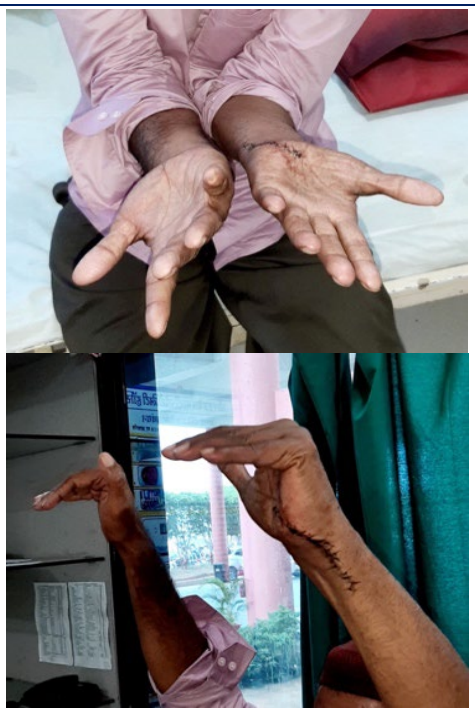

Figure-3. Outcome of our case 4 weeks after surgery, A) normal supination and B) normal flexion at MCP joints

Discussion

A lot of the existing literature tends to focus on median nerve involvement, which means that ulnar neuropathy often gets overlooked and is not fully understood.[3] If the K-wire is inserted at the wrong angle, especially when it goes through the distal radio ulnar joint it can inadvertently compress the nerve, particularly in cases where there are anatomical variations or when imaging support is lacking.[5] In our case, the injury likely occurred due to pressure from shifted fracture pieces or some accidental trauma during the wire insertion. This resulted in a connection between the ulnar and median nerves over time.

The rarity of this complication can lead to delays in diagnosis, especially when symptoms are mild or masked by postoperative discomfort. Electrophysiological tests and imaging techniques can help confirm the diagnosis. High-resolution ultrasonography and MRI are fantastic tools for assessing nerve integrity and identifying where compression is happening. Unfortunately, these were not done in our patient due to uncontrollable convulsions at initiation of any hand movement. Electromyography (EMG) and nerve conduction studies help gauge the extent of any damage and guide treatment decisions but it was inconclusive in this case. X-rays can reveal issues like K-wires being misplaced, which can irritate the nerve.

Treatment options vary from careful monitoring to targeted exploratory surgery and neurolysis, depending on the severity and progression of the condition. When nerves experience demyelination, often due to trauma, it disrupts the transmission of signals. This can lead to nerve dysfunction, making hand movements more challenging and resulting in various neurological symptoms, like muscle weakness and spasms or clawing. It is important to note, though, that this process does not directly cause hand convulsions in the same way that seizures do as it seen in our patient. This particular condition, as we observed in our patient, is quite rare, which often results in delays in getting a proper diagnosis. This is especially true when it is masked by more common problems, such as median nerve compression. Reports show that ulnar nerve injuries often result from direct trauma from displaced fracture fragments or pressure from broken pieces, particularly around the ulnar styloid.[3,5] Traction injuries can occur when the arm is repositioned or manipulated, while compression might result from swelling or bleeding after surgery.[1-5] Additionally, iatrogenic injuries can occur from placing K-wires near the distal radioulnar joint.[1,2] Our patient presented with a group of symptoms: trembling or convulsions of the hand and forearm at initiation of any hand movement, sense of absent medial three fingers and fear for any hand movement. Anomalous linkages between the ulnar and median nerves, including Riche-Cannieu anastomosis or Berrettini anastomosis, or Martin-Gruber and Marinacci anastomoses,[6] can be excluded since the patient symptoms appeared after fracture fixation and improved after surgery. The deep sensations we feel in our hands, like knowing where they are and how they are moving, mainly come from the nerves connected to our muscles, tendons, ligaments, and joints. These nerves are different from those that detect surface sensations; they send crucial signals to our brain about our hands' position and movement, which helps us with fine motor skills and coordination. While there are reports of ulnar nerve injuries in the literature, we could not find any cases that match the specific presentation of ulnar nerve injury we are discussing.

It is possible that at the site of the injury, an unusual connection is causing the motor fibres of the ulnar nerve, those that handle deep sensations in the medial side of hand, to send signals to the forearm muscles. It seems like the part of the hand that should be transmitting nerve signals in the deeper medial area is not expressing properly in its intended anatomical position.

In such cases, surgical exploration is recommended if symptoms persist for more than 6 to 8 weeks or worsen despite conservative measures.[7,9,10] Delaying treatment can lead to permanent nerve damage and less-than-ideal functional outcomes.[10] The severity of the nerve injury related to K-wire placement can be categorized as

neuropraxia, axonotmesis, or neurotmesis and the location of the damage.[8,10] Classifications might also consider the degree of sensory or motor impairment linked to the particular nerve branch involved; however, there may not be a universally accepted and standardized classification system for this context in the current literature.[8] This case underscores the importance of precise surgical technique, which includes careful wire placement and awareness of anatomical variations. We achieved a successful outcome after ulnar nerve neurolysis and the excision of an anomalous soft tissue connection and a band between the ulnar and median nerves [Figure-3]. We believe that prompt surgical exploration is necessary for cases of ulnar nerve injury that occurred after surgical repair of a fracture.[7,9,10]

Conclusions

Neurones of both nerves were damaged during fracture or after a procedure (k-wire fixation), and anomalous synaptic connections developed between the ulnar and median nerves over time. Sensory function recovered gradually. Injuries associated with K wires at the wrist level must not be overlooked, particularly when they involve significant motor nerves of the hand. Neglecting such injuries, even to a minor extent, can lead to severe consequences for the patient. It is essential that these procedures be conducted under appropriate supervision. Timely intervention could have avoided this much suffering.

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Competing interests

The authors declare that they have no competing interests.

Abbreviations

K- wire: Kirschner's wire.

Authors' contributions

All authors read and approved the final manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis.

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Availability of data and materials

The data used in this study are available from the corresponding author on request.

Ethics approval and consent to participate

The study was conducted in accordance with the declaration of Helsinki and written consent was obtained from the patient for this case report.

Consent for publication

By submitting this document, the authors declare their consent for the final accepted version of the manuscript to be considered for publication.

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