

Received: 2017.01.07
Accepted: 2017.01.13
Published: 2017.02.07

Volar Trans-Scaphoid Perilunate Dislocation of the Wrist: A Case Report

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Data Interpretation D
Manuscript Preparation E
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Conflict of interest: None declared

Background: Palmar perilunate fracture-dislocations in which the lunate remains in its normal position when the other carpal bones dislocate towards the volar aspect of the wrist accounts for less than 3% of perilunate dislocations.

Case Report: A 24-year-old motorcyclist was admitted to our Department after having been involved in a traffic accident in which he had landed with his outstretched right hand on the road surface. X-rays revealed a volar trans-scaphoid perilunate dislocation of the carpus. Because closed reduction initially failed, the patient was transferred immediately to the operating theater for open reduction and fixation. Through a volar approach the median nerve was decompressed, the scaphoid was fixed with a cannulated screw, and the volar capsular-ligamentous complex was repaired with interrupted sutures. The carpus was relocated and stabilized with 2 K-wires through a dorsal approach. At 2-year follow-up, he had good range of motion and grip strength and demonstrated a Mayo wrist score of 86 points.

Conclusions: Volar trans-scaphoid perilunate carpal dislocations are rare injuries and can be initially missed if not properly assessed. Early management with anatomical fixation using both volar and dorsal approaches can provide an excellent clinical outcome.

MeSH Keywords: **Carpal Joints • Dislocations • Internal Fixators • Lunate Bone • Scaphoid Bone**

Full-text PDF: <http://www.medscicaserep.com/abstract/index/idArt/903218>

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Background

Volar trans-scaphoid perilunate carpal dislocations are rare injuries, and up to 25% of cases could be initially missed [1]. Few cases with volar dislocation of the carpus have been reported so far in the literature [1–8]. The exact mechanism of injury is still a matter of debate; both forced hyperflexion and forced hyperextension have been proposed as an injury mechanism [6,9], although others have found history of prior injury and reported radiographic evidence of contributing factors [5]. These severe injuries can lead to numerous complications such as post-traumatic arthritis, chondrolysis, carpal instability, osteonecrosis of the scaphoid and/or lunate, chronic carpal tunnel syndrome, and sympathetic dystrophy [1,5,7,8,10]. Young men at their 30s are usually affected, but there have also been reports in children [1,3]. Although closed reduction and casting can produce satisfactory results, the injury pattern confers carpal instability as it is difficult to maintain proper reduction with closed means only [11]. As a result, these injuries are managed with either percutaneous fixation or, preferably, open reduction and internal fixation, especially when a displaced fracture of the scaphoid exists. We present

such a case in a 24-year-old male patient involved in a traffic accident. Early reduction and internal fixation led to an excellent outcome at 2-year follow-up.

Case Report

A 24-year-old male motorcyclist was admitted after having been involved in a traffic accident in which he landed with his outstretched right hand on the road surface. He distinctly remembered falling on the dorsal aspect of his forearm with the wrist volar-flexed. Physical examination showed an obvious silver-fork deformity, pronounced swelling, and tenderness to palpation. The skin was intact and the patient had no neurovascular compromise or other skeletal injuries. He was unable to move his wrist but retained limited flexion of his fingers. Plain radiographs revealed a volar trans-scaphoid perilunate dislocation of the carpus (Figure 1A, 1B). A closed reduction was attempted at the emergency room under local anesthesia, but was unsuccessful as the wrist was extremely unstable (Figure 1C, 1D). After temporary long-arm cast application, the patient was transferred immediately to the operative theater.



Figure 1. (A) AP. (B) Lateral radiographs of the patient's right wrist showing a volar trans-scaphoid perilunate dislocation of the carpus. After attempting closed reduction, the AP (C) and lateral radiographs (D) showed persistent instability.

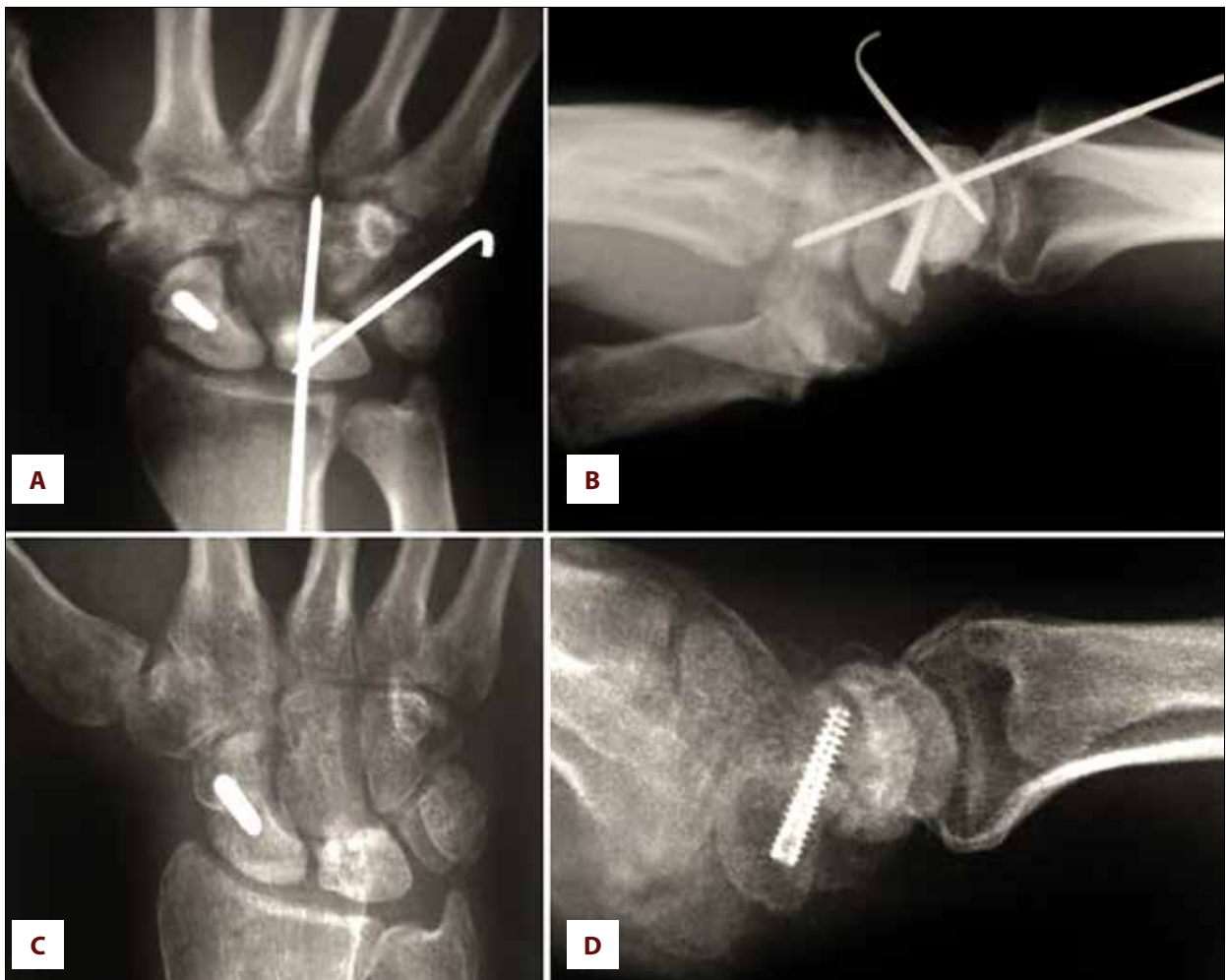


Figure 2. (A, B) AP and lateral postoperative x-rays show reduction of the dislocation and fixation with 2 KW: the first one was placed through the distal radius into the lunate and the capitate, and the second K-wire was placed through the triquetrum to the lunate. Scaphoid fracture was fixed with cannulated compression screw. (C, D) AP and lateral x-rays at the final follow-up showing good alignment of the carpus.

Open reduction was achieved utilizing both volar and dorsal approaches. An extended carpal tunnel incision was used for median nerve decompression and fixation of the scaphoid with a cannulated headless screw. Subsequent capsular-ligamentous complex repair was performed with interrupted non-absorbable sutures. Using a standard dorsal approach, the carpus was relocated and fixed with 2 K-wires (1.6 mm) in the following manner: the first wire was placed through the distal radius into the lunate and capitate, and the second K-wire was placed through the triquetrum to the lunate (Figure 2A, 2B). A complete tear in the scapholunate ligament was directly repaired with absorbable sutures, while the lunotriquetral ligament was found to be intact. Postoperatively, a long-arm thumb spica cast was applied with the wrist in neutral position. Two weeks later, the sutures were removed and the cast was exchanged for a normal scaphoid cast. At 8 weeks, the K-wires were removed and the patient began intensive hand

therapy (Figure 2C, 2D). At 2-year follow-up, the active range of wrist motion was 75° in flexion and 85° in extension. The range of radial deviation was 0° to 22° and the range of ulnar deviation 0° to 33° (Figure 3). The patient had also full pronation and supination. The grip strength (Jama dynamometer) was 100 pounds to the right side compared to 110 pounds on his normal side. The functional result according to Mayo wrist score was excellent (86/100 points).

Discussion

According to Niazi [4], the first case of volar perilunate dislocation (VPLD) was reported by Speed in 1950. VPLD is a type of carpal instability complex [CIC] injury in which both capsular and intercarpal components have been impaired and is often manifested as fracture-dislocation, with the most frequent



Figure 3. Clinical result at the final follow-up: the range of active motion of the wrist was 85° in extension and 75° in flexion. The arc of radial deviation was 0° to 22° and the arc of the ulnar deviation was 0° to 33°. The Mayo wrist score was excellent (86/100).

fracture being that of the scaphoid and the next most common that of the lunate.

Two distinct mechanisms of injury are described in the literature, with the force applied to either a *palmar flexed* wrist, which forces the capitate anteriorly, resulting in volar translation of the carpus [6], or with the force applied onto a *hyperextended* wrist with the forearm in supination [9]. Niazi [4] performed a cadaveric study that supported the hyperextension theory and described 3 types of injury: rupture of the palmar ligaments, rupture of the scaphotrapezium ligament, and posterior shearing forces to the carpus. In volar trans-scaphoid perilunate dislocations (VTSPDLs), the fracture of the scaphoid typically has a very unstable vertical orientation in the frontal plane, making recognition of the fracture difficult on a standard posteroanterior view. The diagnosis is most easily made on the lateral view. Although successful treatment has been reported with closed reduction alone [6], VTSPDLs are exceedingly unstable injuries; in most cases, the only reliable way to realign and stabilize the scaphoid and perilunate injury is operative treatment [2–4,5,7,8]. The type of surgical approach is controversial; while some surgeons advocate a dorsal approach, most prefer a volar approach. The volar approach allows control over the median nerve, which is not possible using the dorsal method. However, repair of a ruptured palmar radiocarpal ligament is better accessed with the volar approach, while

adhesion to the flexor tendons is minimized. A combined volar-dorsal approach [12] can be used safely and effectively to restore normal intercarpal relationships and provide fixation for accompanying fractures, as in our case. For the majority of patients, the outcome after this procedure is characterized by acceptable pain relief and nearly normal functional motion and grip strength. The type of internal fixation favored by most authors is use of K-wires and cannulated screws [11]. Ligament repair, in case of tearing, can be accomplished with transosseous sutures or mini-anchors [5]. External fixation can be used during the operation as a distraction device, to allow indirect reduction, but after completion of bone and ligament reconstruction distraction should be reduced, allowing the fixator to function only as a neutralization frame. Savvidou et al. [13] reported a series of 20 patients who suffered an acute perilunate fracture-dislocation, and showed satisfactory midterm functional and radiographic outcomes with the use of external fixation and provisional K-wire fixation.

Conclusions

Volar trans-scaphoid perilunate dislocations are extremely rare injuries. The mechanism of injury is either a dorsal force to a volar-flexed wrist or a forceful extension of the wrist, as in our case. Immediate management of these injuries with

open reduction, internal scaphoid fixation using a cannulated compression screw, carpal and interosseous ligament repair, and early cast removal (4 weeks) can result in optimal functional recovery if there has been no significant damage of the articular surface or median nerve injury. The double-incision technique is useful in such cases because it provides good exposure of carpal bones, thus permitting optimal restoration of alignment. In our case, the patient had substantial

displacement of the osseous structures along with severe ligamentous disruption. At the last follow-up, 2 years postoperatively, he had almost full functional recovery, but long-term monitoring is advisable because late complications like scaphoid AVN or radiocarpal arthritis may appear. The satisfactory outcome may be attributed to the immediate intervention, the anatomic reduction and stable fixation, and the short immobilization period.

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