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# Extreme proximal migration of dislocated lunate over carpal ligament – A case report

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ABSTRACT

Dislocation of the lunate and proximal pole of the scaphoid with displacement of the fragments proximal to the radiocarpal joint, characterized as a total dislocation, is very rare, with only six cases reported. Dislocated lunate are generally located around the radiocarpal joint or within carpal ligament. However, there have been no reports of dislocated lunate over the carpal ligament. We present a patient with volar dislocation of the lunate that featured extreme migration to approximately 6 cm proximal to flexor digitorum superficialis through the transcarpal ligament.

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## Introduction

Transscaphoid volar lunate dislocation is very rare,[1] and is usually the result of high-energy trauma, making it difficult to treat. Dislocation of the lunate and proximal pole of the scaphoid with displacement of the fragments proximal to the radiocarpal joint, characterized as a total dislocation, is exceptionally rare.[2–5] The location of dislocated lunate is generally around or proximal to the radiocarpal joint or, in the case of isolated lunate dislocation, within the carpal ligament.[2–5] However, no reports have described a dislocated lunate over the carpal ligament. We present a case with volar dislocation of the lunate that migrated to approximately 6 cm proximal to the flexor digitorum superficialis through the transcarpal ligament.

## Case report

A 30-year-old, right-handed male sustained an isolated injury to the left wrist after falling down the stairs. The left wrist was painful, swollen, and tender to palpation. The hand was neurovascularly intact, with no sensory deficit in the distribution of the median nerve. Wrist motion was limited and a palpable mass-like lesion about 2 × 3 × 3 cm in size was observed on the mid-portion of the forearm. Plain posteroanterior and lateral radiograms of the left wrist revealed volar transscaphoid fracture and lunate dislocation. The proximal fragment of the scaphoid was displaced along with the lunate in a volar direction, and the lunate had migrated to approximately 6 cm proximal to the flexor digitorum superficialis through the transcarpal ligament (Fig. 1).

With the patient under general anesthesia, the dislocated lunate was removed from the forearm area. The carpal tunnel was initially released through a volar approach and the carpal bones were exposed, then the lunate and proximal pole of the scaphoid were reduced (Fig. 2). The scaphoid fracture was reduced and fixed with three 0.045 inch Kirschner wires. The dislocated lunate, which was denuded of any soft-tissue attachments, was restored to its normal position as fast as possible, and was stabilized with two 0.045 inch Kirschner wires. Additional repair of the intrinsic ligament between the scaphoid, lunate, and capitates was performed. However, it was not easy to restore the anatomical repair since all ligament structures were friable, fibrillated, and attenuated due to severe soft tissue injury (Fig. 3). The postoperative course was uneventful. Four weeks post-operatively, the two Kirschner wires fixing the scapholunate joint were removed. Seven weeks postoperatively, the three Kirschner wires for the scaphoid were removed. At a 12-month follow-up visit, there was mild limitation of wrist motion, as follows: flexion was 40°, extension was 35°, ulnar deviation was

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**Fig. 1.** Plain posteroanterior (A) and lateral (B) radiographs showing the transscaphoid volar lunate dislocation. The proximal fragment of the scaphoid fracture was displaced. The dislocated lunate was located approximately 6 cm proximal to the radiocarpal joint. 3-D Reconstruction CT images (C, D) also showing proximal migration of the dislocated lunate.

40°, and radial deviation was 30°. X-ray examination at postoperative 12 months showed osseous union and ulnar subluxation of the scaphoid and dorso-ulnar subluxation of lunate, but no evidence of radiocarpal or midcarpal arthritis, and osteonecrosis of the lunate or the proximal pole of the scaphoid (Fig. 4).

## Discussion

Transscaphoid volar lunate dislocation is an uncommon injury. The mechanisms of perilunate dislocation are extension, ulnar deviation, and intercarpal supination, while intercarpal supination is a major component. This injury can be divided into a lesser-arc injury and a greater-arc injury.[6] A lesser-arc injury refers to the purely ligamentous disruption around the lunate (disruption of the radiocapitate, radioscaphoid and volar radiotriquetral ligaments). However, the ligaments including the ulnolunate ligaments between the lunate, ulna, and radius remain intact. In a greater-arc injury, the osseous structures around the lunate including the scaphoid waist are fractured. Although the bony structure is injured, the intercarpal ligaments between the lunate and fractured


**Fig. 2.** Intraoperative volar inspection of the wrist. (A) Dislocated lunate removed from the flexor digitorum superficialis 6 cm proximal from the radiocarpal joint (B) Through a volar approach, the carpal tunnel was released and the carpal bones were exposed. Absence of the scaphoid and lunate was shown. (C) Photo showing the reduction of the lunate and proximal pole of the scaphoid.


**Fig. 3.** Immediate postoperative plain PA (A) and lateral (B) radiographs showing the anatomical reduction and percutaneous fixation with Kirschner wires (three 0.045 inch Kirschner wires for the scaphoid fracture, and two 0.045 inch Kirschner wires for the dislocated lunate).

structures, such as scapholunate ligaments, remain intact. Repair of the remaining ligaments may be helpful in reduction and revascularization after surgery.

Previous reports showed one of the two types of injury.[1–5,7–9] In contrast, this case featured a extensive proximal migration of the lunate over the carpal ligament. There was no ligamentous attachment between the lunate and the surrounding bone. Therefore, this case featured combined lesser (ligament injuries) and greater arc (scaphoid fracture) injuries. There is no consensus concerning whether a dorsal or a combined dorsal–volar approach is most suitable for open treatment of these injuries. The dorsal approach provides the best exposure for anatomical alignment and interosseous ligament repair, and a volar incision allows decompression of the carpal tunnel and direct repair of the palmar capsule and ligament tear. Most surgeons favor the combined approach because of the restoration of the intercarpal relationships to achieve wrist stability and to avoid median nerve compression.[2,3] However, in the present case, we chose the volar approach because of concerns about additional soft tissue injury and subsequent development of avascular necrosis that might result from the dorsal approach, particularly severe soft tissue destruction and complete disruption of all ligamentous structures around the lunate. The incomplete ligament reconstruction with K-wire fixation in the volar approach that was apparent in the last follow up X-


**Fig. 4.** Twelve-month postoperative plain PA (A) and lateral (B) radiographs showing osseous union and ulnar subluxation of the scaphoid and dorso-ulnar subluxation of lunate, but no evidence of radiocarpal or midcarpal arthritis, and osteonecrosis of the lunate or the proximal pole of the scaphoid.

ray lead to reduction loss and difficulty in preserving the alignment of the dislocated lunate due to the presence of extensive intercarpal ligament disruption. Therefore, complete primary ligament repair through a combined volar and dorsal approach would be required when performing open reduction and internal fixation in such a complicated case featuring extensive ligamentous disruption. However, complete ligament primary repair is difficult because there is severe loss of ligaments and torn ligaments are friable. Therefore, tag sutures or intra-osseous suture using suture anchor is needed for effective ligament reconstruction. In addition, for scaphoid fracture healing, screw fixation using a Herbert or compression screw may be needed for secure fixation. Presently, K-wire fixation was used because of scaphoid fracture comminution.[5] In such a complicated case, some authors advocate consideration of the proximal row carpectomy[10,11] but this procedure may increase instability and herald a catastrophic result. This can be performed as a secondary procedure where all soft tissue injuries have healed or in chronic unreduced carpal dislocations.[4]

Accurate fracture reduction and union, interosseous ligament repair or reconstruction is critical in the restoration of the intercarpal stability and obtaining a good result. The last follow-up X-ray revealed limited areas of avascular necrosis of the lunate without any collapse. Other authors reported a higher incidence of avascular necrosis of lunate or scaphoid (44%) in case of transscaphoid lunate or perilunate dislocation.[9] Therefore, a longer period of follow up will be needed for appropriate treatment for complications like avascular necrosis.

In previous reports, the lunate did not pass the palmar transcarpal ligament because it is a very strong structure and there is no space under the palmar transcarpal ligament. However, this case uniquely featured an extreme proximal migration of the dislocated lunate over the carpal ligament.

In conclusion, the treatment of extreme proximal migration of the dislocated lunate over the carpal ligament is needed open reduction and internal fixation with a combine dorsal and volar approach for complete ligament reconstruction avoiding complications such as reduction loss or avascular necrosis.

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