

CASE REPORT

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## An unusual variant of perilunate fracture dislocations

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### ABSTRACT

Trans-scaphoid, trans-radial styloid, trans-triquetral perilunate fracture dislocations are rare. We describe a 19-year-old male who suffered this injury after crashing his bicycle. He underwent open reduction internal fixation and percutaneous pinning. Scaphoid union was achieved at 8 weeks. Near complete range of painless motion was achieved by 4 months.

### ARTICLE HISTORY

Received 4 November 2015  
Accepted 7 February 2016

### KEYWORDS

Perilunate; carpal fracture dislocation; trans-scaphoid fracture; trans-styloid fracture

### Introduction

Perilunate fracture dislocations display a continuum of severity, but trans-scaphoid, trans-styloid, trans-triquetral perilunate fracture dislocations are rarely reported in the literature.[1]

### Case Report

A 19-year-old student presented with pain and swelling of the wrist, 4 h after crashing his bicycle. Radiographs revealed fractures of the radial and ulnar styloids, the scaphoid waist and triquetrum, along with a perilunate dislocation (Figure 1). He underwent closed reduction in the ER and subsequent CT scan. He continued to complain of pain and numbness in the median nerve distribution and so underwent emergent carpal tunnel release. He returned to the OR for definitive fixation 1 week later, when the swelling had settled.

The distal radius fracture was fixed with a Synthes 2.4 mm variable angle two-column plate through an extended FCR approach. A standard volar scaphoid approach then confirmed significant comminution of the scaphoid at the fracture site and a cartilage defect on the capitate head.

The scaphoid was fixed with a retrograde 2.4 mm Synthes headless bone screw. Good compression was achieved with this screw, within the limitations of the

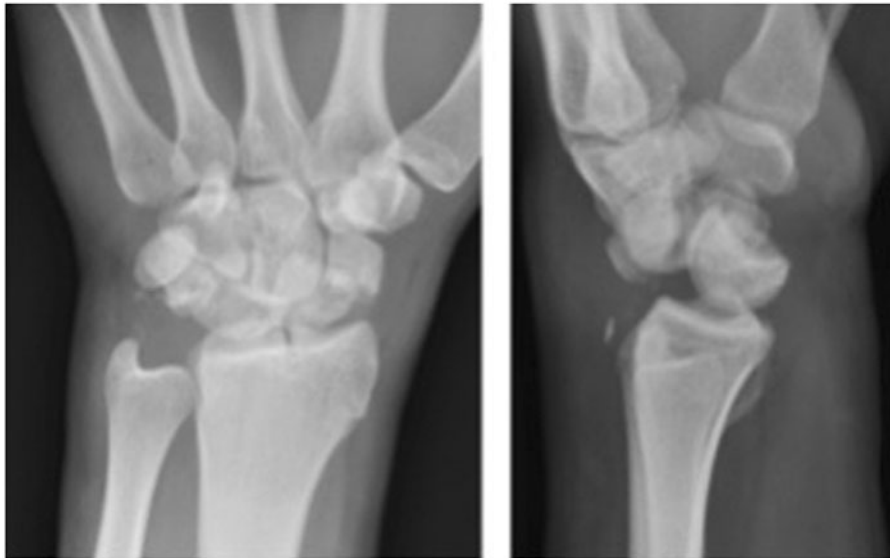
bone loss. The wrist was screened with the image intensifier in movement, and the scaphoid was seen to be moving as 1 unit.

At this point, the overall stability of the wrist was reassessed, and it was found that there was still a significant degree of mid-carpal instability resultant from the triquetral fracture. Crossed 1.25 mm K-wires were, therefore, inserted through the triquetrum into the lunate and through the triquetrum, hamate and into the capitate to stabilize the ulnar side of the mid-carpal joint. Following insertion of these wires, the joint was stabilized. The wires were cut below the level of the skin.

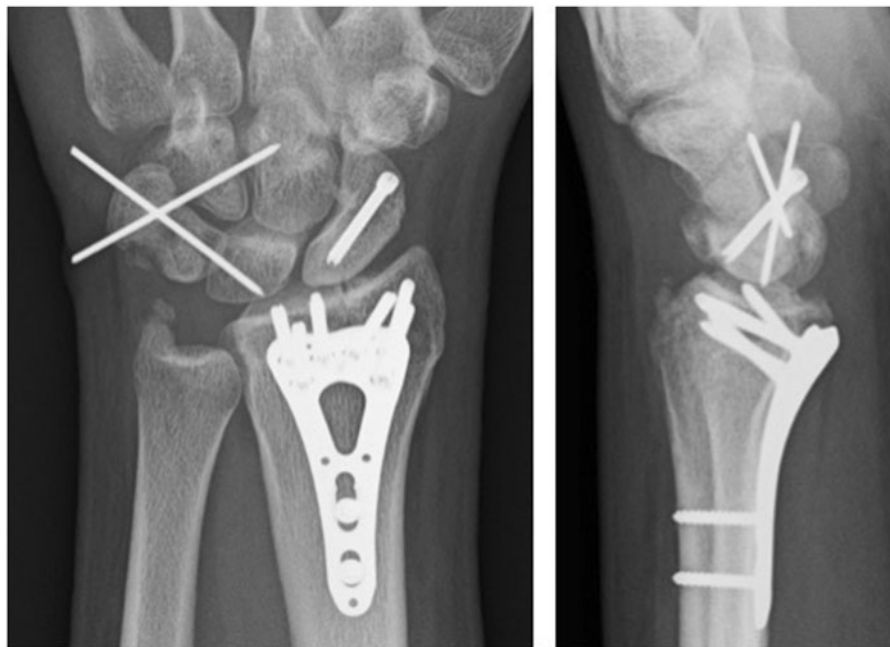
The tourniquet was deflated, and hemostasis was achieved with electrocautery. The capsule overlying the scaphoid was closed with 4-0 Monocryl. The pronator quadratus was repaired with interrupted 4-0 Monocryl, and then the skin incision was closed with subcuticular 4-0 Monocryl. The wound was dressed with Steri-Strips, Telfa, gauze, Webril, and a volar plaster thumb spica slab.

He was seen at 2-weeks postop and placed into a thumb spica cast. The patient was again seen at 8-weeks postop with follow-up X-rays that showed a united scaphoid fracture (Figure 2). K-wires were removed.

After the postoperative cast was removed, the patient completed five visits of physical therapy with a certified hand therapist. Gentle manual passive



**Figure 1.** Injury PA and lateral of the left wrist. Fractures of the distal radius, scaphoid, triquetrum, and ulnar styloid. Note the dorsal dislocation of the capitate and the volar rotation of the lunate on the lateral radiograph. Note the absence of joint space around the lunate as well as superimposition of the capitate on the PA radiograph.



**Figure 2.** Eight-week postoperative radiographs.

stretching was performed along with fluidotherapy. The patient progressed to weighted range of motion exercises using free weights and resistance bands.

### Discussion

Perilunate fracture dislocations usually occur from a fall on an outstretched hand leading to hyperextension and supination of the carpus in relation to a pronated forearm. These injuries follow a sequential

pattern around the carpus. Failure begins with the radial aspect of the wrist, including the radial styloid, scaphoid waist, proximal pole of the scaphoid, or scapholunate joint.[2,3] As the energy moves distal and ulnar, the capitate body may fracture or disruption of the capitulunate joint can occur. Next, injury to the base of the hamate, the triquetrum, or the lunotriquetral joint takes place. Finally, the energy exits ulnarly and fracture of the ulnar styloid may be present.[2]



**Figure 3.** Range of motion at 4-months post surgery.

Our patient's injury began with fracture of the radial styloid. The energy propagated through the scaphoid and continued through the greater arc injuring the radial collateral ligament. It continued by creating an avulsion fracture of the triquetrum via the palmar ulnotriquetral ligament and finally exited through the ulnar styloid.[2] Rather than identifying ligamentous structures that were injured through soft tissue dissection, the carpus was percutaneously stabilized with K-wires.

Perilunate fracture dislocations frequently go undiagnosed (up to 25%) in the emergency department which leads to delayed treatment.[4,5] A reason for under diagnosis is poor radiographic images and lack of scrutiny on the part of the reader.[2,6,7] The arcs of Gilula should be noted on the PA view, while alignment on the lateral view should be determined. These injuries are difficult to manage with only 50% of patients achieving excellent Mayo scores after fixation.[2,8] The study by Capo et al. found the average flexion–extension arc was 82°, forearm rotation was 155°, and grip strength averaged 59% of the uninjured hand using a combined volar and dorsal approach.[9] Chou et al. showed that percutaneous screw and K-wire fixation in acute transcaphoid perilunate dislocations demonstrated impaired flexion and supination when compared to the contralateral, normal wrist.[10] At an average of 58-weeks postop, Massed revealed a 52% flexion–extension arc in comparison to uninjured controls in chronic perilunate injuries (mean

of 29 weeks from injury). However, 74% reported satisfaction with their outcome.[11] Operative transcaphoid perilunate dislocations had better outcomes with regard to Mayo wrist scores and range of motion compared to nonoperative management.[12] Common problems such as loss of motion and decreased grip strength can persist despite appropriate operative fixation.[13] However, Forli et al. showed that the presence of radiological arthritis and static carpal instability did not reduce the function at a minimum of 10 years of follow-up.[14]

Osseous and ligamentous injury severity in fracture dislocations about the wrist has led several authors to recommend open reduction and internal fixation.[1,6,15,16] We had excellent results by 4-month follow-up, achieving a painless wrist with good ROM and strength (Figure 3). Our patient's injury differed from the majority of other reports due to the transstyloid radius and ulna components. Majeed et al. reported a good result after a similar injury that required external fixation and carpal pinning.[1] Gellman et al. concluded that reduction of the scaphoid and mid-carpal joint, as well as restoring the articular surface of the lunate led to full, pain-free motion.[17] Stevanovic et al. obtained a pain-free outcome that lacked normal range of motion at 6 months.[16] In the series by Herzberg, they demonstrated fixation of the scaphoid alone without addressing the ligamentous injury led to further dissociation, translation, and other carpal collapse patterns.[6] Additionally, Raab et al. showed good results in

professional athletes with purely ligamentous perilunate injuries fixed with K-wires at 5-year follow-up.[18] We have shown that an excellent clinical outcome can be achieved with prompt ORIF of osseous structures and stabilization of the wrist ligamentous injury in this fracture dislocation pattern.

### Disclosure statement

This material has not been published previously and will not be submitted for publication elsewhere. No conflicts of interest exist.

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