Translunate, Transradial, Transtriquetral, Transtrapezoid Perilunate Dislocation With Multiple Metacarpal Neck Fractures

Sarang Kasture, MBBS, DNB, and Raj Sakamuri, MS, MCh

Abstract

We report a rare case of translunate, transradial, transtriquetral, transtrapezoid perilunate dislocation with multiple metacarpal neck fractures in a young adult. The injury was treated with open reduction and internal fixation. Although the injury was severe, the patient had a satisfactory functional result.

Perilunate fracture-dislocations, rare injuries representing <10% of wrist injuries,[1] are part of a wide spectrum of high-energy trauma injuries. The typical mechanism of injury is a fall on a dorsiflexed and ulnar-deviated wrist with forces progressively traversing the scapholunate, lunocapitate, and lunotriquetral ligaments.[2]

In this article, we report a very unusual case of translunate, transradial, transtriquetral, transtrapezoid perilunate dislocation with multiple metacarpal neck fractures. The patient provided written informed consent for print and electronic publication of this case report.

Case Report

A fit and healthy 30-year-old male software professional fell down stairs, landed on his nondominant right hand, and sustained a high-energy wrist injury. The patient also sustained a concussion, without focal neurologic deficit, and was unable to recall the exact mechanism of the wrist injury (there were no other witnesses). Radiographs of the right wrist in the emergency department showed only a nondisplaced fracture of the neck of the second, third, fourth, and fifth metacarpals and a nondisplaced fracture of the radial styloid. Later, however, the hand surgery team evaluated the radiograph as well as computed tomography (CT) scans and found a translunate, transradial, transtriquetral, transtrapezoid perilunate dislocation of the wrist with multiple metacarpal neck fractures (**Figures 1-5**).

The next day, with the patient under general anesthesia, an attempt to reduce the perilunate dislocation by manipulation was unsuccessful. Open reduction and internal fixation (ORIF) were performed through a dorsal approach; the perilunate dislocation was reduced and stabilized with lunocapitate 1.2-mm Kirschner wire (K-wire). The scapholunate and lunotriquetral ligaments were found to be intact, and the significantly displaced triquetral fracture was treated with internal fixation involving 2 minifragment screws (**Figure 6**). The other carpal fractures were nondisplaced and fixation was not required. The wrist was immobilized in a full cast. At 4 weeks, K-wire and cast were removed and the wrist mobilized under supervision of a hand therapist. Satisfactory radiologic union was noted at 6 weeks. Further follow-up was arranged at 3 months, 6 months, and 1 year (**Figure 7**). At 6 months, the patient had full range of motion and good grip strength. At 12 months, the outcome was excellent (Mayo Wrist Score = 90).

Discussion

Perilunate injuries are classified as lesser arc injuries (purely ligamen-

Take-Home Points

- Emergency physicians should be aware of radiological markers to avoid missing perilunate injuries.
- They should have a low threshold to refer a suspected perilunate injury for urgent specialist assessment.
- Although majority of the injuries demonstrate the classical pattern, one should be aware of atypical injuries.
- The principles of early anatomic reduction and stable fixation remain the same.
- Salvage procedures are only indicated in extensive irreparable injuries.

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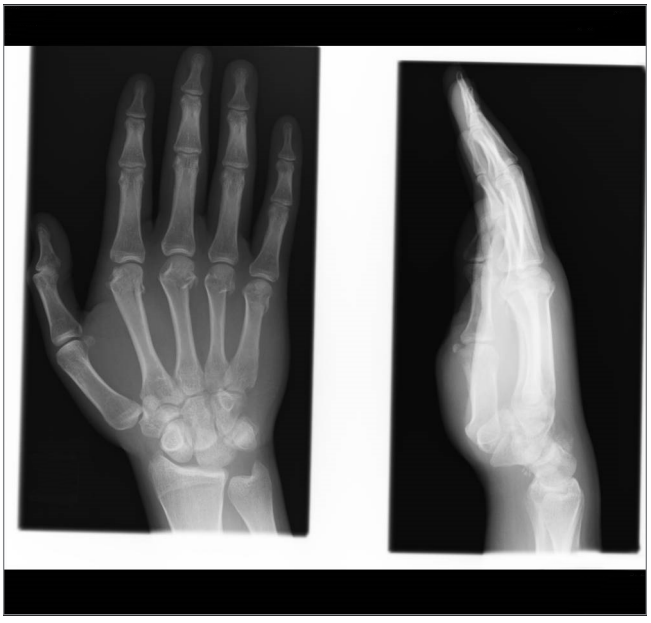

Figure 1. Radiograph shows carpal malalignment.

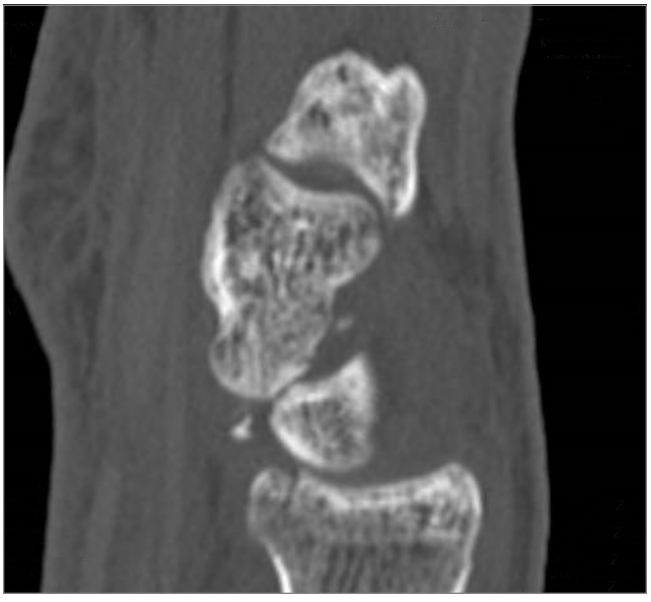

Figure 2. Computed tomography shows lunate volar lip fracture and radius fracture.

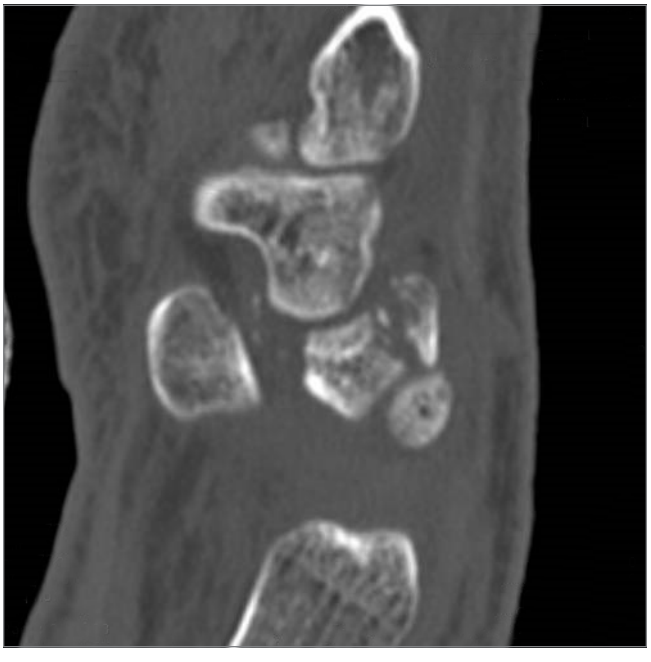

Figure 3. Computed tomography shows displaced triquetral fracture.

Figure 4. Computed tomography shows radial styloid fracture.

tous) or greater arc injuries (osseoligamentous). Greater arc injuries involve fracture of one or more carpal bones with associated ligamentous injuries.[3] The greater or lesser arc injuries described by Mayfield and colleagues[2] imply a specific pattern of force transmission with axial loading in a dorsiflexed and ulnar-deviated wrist with intercarpal supination. Graham[4] introduced a concept of inferior arc injury with the forces passing through the radiocarpal joint with fracture of the radial styloid or juxta-articular margin. Similarly, lunate fracture in perilunate dislocations was explained by Bain and colleagues[5] in the translunate arc concept in which forces pass through the lunate bone. A study involving a literature review of translunate perilunate dislocations noted associated transradial, trans-

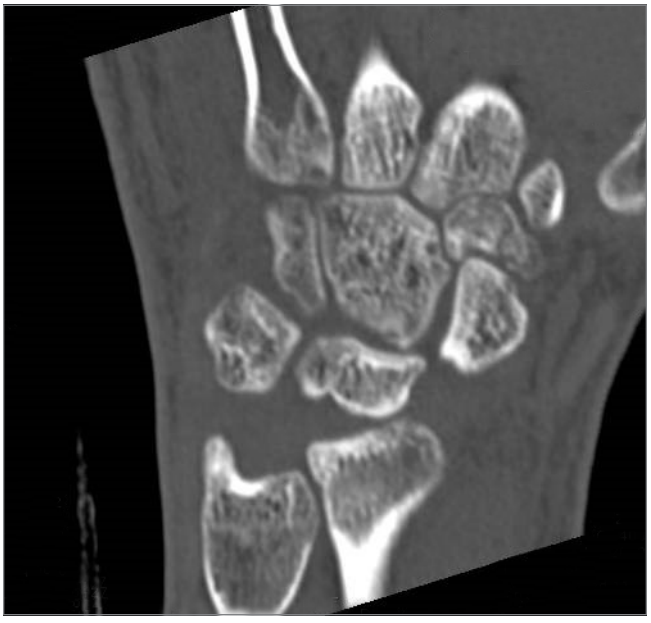

Figure 5. Computed tomography shows trapezoidal fracture.

Figure 6. Radiograph after open reduction and internal fixation.

scaphoid, transcapitate, and transtriquetral fractures in order of decreasing frequency.[6] To our knowledge, no case of translunate perilunate dislocation with multiple carpal and metacarpal fractures with radial styloid fracture has been reported in the literature.

Our patient's associated multiple metacarpal neck fractures can be explained by the peculiar double-impact injury with initial axial loading across the hyperextended metacarpophalangeal joint, followed by axial loading across the hyperextended and ulnar-deviated wrist, causing greater arc perilunate fracture-dislocation. The mechanism of lunate injury in this case seems to be longitudinal impaction of the capitate shearing against the volar lunate in the axial plane causing a volar lip fracture (Teisen type I), and this may be accentuated by tension in the volar radiolunate ligament.[6,7] Associated triquetral fracture in perilunate dislocation is well described in the literature.[6] However, the trapezoid fracture in our case implies a very atypical pattern of force transmission with the arc probably passing more distally through the trapezoid laterally and the triquetrum medially.

This case, which represents a very rare fracture pattern associated with perilunate dislocation, may have been caused by the variable position of the wrist and the pattern of load transmission at time of impact. Although the majority of cases demonstrate the classical pattern described in the literature, it may not be unusual to find atypical fracture patterns, especially those associated with high-energy trauma.

Figure 7. Radiograph 1 year after open reduction and internal fixation.

Perilunate injuries have been missed in busy emergency departments and orthopedic practices. An estimated 25% of such injuries can be missed on initial presentation.[8] In the present case, fracture of the radial styloid provided a clue to possible more complex carpal injuries involving the scaphoid, lunate, or scapholunate ligament, as Graham[4] suggested with the concept of the "transverse pattern"

of force transmission. In this case as well, the injury was initially missed, and its extent became evident only with CT. Therefore, emergency teams should have a very low threshold for suspecting and evaluating high-energy wrist injuries.

The goal in the treatment of perilunate dislocation with multiple carpal fractures is anatomical reduction and restoration of carpal alignment—which frequently require ORIF, though acute salvage procedures like proximal row carpectomy may be considered in irreparable fractures with extensive ligament injuries.[9] For open reduction, the approach can be dorsal, volar, or a combination. The approach in our patient's case was dorsal. His triquetral fracture, his only displaced fracture, was treated with internal fixation. All other fractures were nondisplaced, stable, and did not warrant internal fixation.

A high index of suspicion and urgent specialist consultation are essential in suspected perilunate injuries. The injury and fracture pattern may be atypical, but the principles of early anatomical reduction and stable fixation remain the same.

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