Volar perilunate dislocations: possible association with prior wrist injuries

Min Jung Park · David R. Steinberg

Published online: 12 January 2012
© American Association for Hand Surgery 2012

Introduction

Perilunate dislocation/fracture dislocation is a rare injury pattern, most often occurring in young males after high-energy trauma [4]. Most often, etiologies involved are fall from height or motor vehicle accidents. Dorsal dislocation of the capitate is the most common pattern observed. There are many case reports describing unique features of the injury pattern, and correct identification of the extent of injury is crucial in the management and reconstruction of damaged structures. Volar perilunate dislocation is a particularly rare injury pattern among perilunate fracture dislocations. Most commonly, it results from a dorsal to palmar directed force on a flexed wrist. One report has suggested that anatomic factors may contribute to the injury pattern [5]. We present two cases of volar perilunate/dorsal lunate dislocations that occurred via relatively low-energy mechanisms of injury. Interestingly, both patients had a history of prior wrist injury that may have contributed to the injury pattern.

Case 1

A 31-year-old male without significant past medical history presented to the emergency department with a chief complaint of right wrist pain after an altercation in which his wrist was slammed to the ground. The patient's skin was intact, and neurovascular examination was unremarkable. Outside radiographs demonstrated a dorsal lunate/volar perilunate dislocation (Fig. 1a, b).

In the emergency department, closed reduction was attempted with traction and extension of the wrist. Postreduction radiographs and computed tomography scan were obtained which demonstrated subluxation of the proximal row. After discussing the risks and benefits of surgical management, the decision was made to take the patient to the operating room for open reduction and internal fixation. The patient was taken to the operating room approximately 5 h after the initial evaluation.

In the operating room, the lunate was palpable dorsally and easily reducible. However, following reduction, the joint was immediately unstable, and the lunate displaced dorsally again. We approached the wrist through a dorsal longitudinal incision through the third extensor compartment. The lunate was noted to be displaced ulnarly between the fourth and fifth compartments, so further dissection was made into that interval. There was mild capsular attenuation, but no frank rupture of the dorsal capsule. A transverse arthrotomy, parallel with dorsal radiocarpal ligament, was made, which expressed clear yellow joint fluid with no bloody component. Some synovitis was noted on the dorsum of the triquetrum. The scapholunate ligament was completely intact. The lunotriquetral ligament was disrupted and attenuated, and the lunotriquetral joint was noted to be completely unstable. There were some early peripheral arthritic changes noted along the margin. The wound was copiously irrigated. The radial face of the triquetrum and ulnar face of lunate were curetted to facilitate fibrous healing of the lunotriquetral joint. Subsequently, the joint was reduced and maintained in position using Kirschner wires. Two suture anchors were placed in the dorsal triquetrum and lunate to perform capsulodesis. Nonabsorbable sutures were placed as well in order to augment the capsular repair. After hemostasis was achieved, the skin was closed using nylon sutures. Upon questioning the patient's

M. J. Park · D. R. Steinberg (✉)
Hand Surgery Service, Department of Orthopaedic Surgery,
University of Pennsylvania,
3400 Spruce Street, 2 Silverstein,
Philadelphia, PA 19104, USA
e-mail: david.steinberg@uphs.upenn.edu

Fig. 1 Case 1 radiographs of prereduction and postreduction radiographs: **a** prereduction lateral demonstrating dorsal lunate dislocation and **b** prereduction PA showing disruption of proximal carpal row with flexed scaphoid

mother postoperatively, she did relate a history of previous injury to that wrist.

Though the initial plan was to have the patient follow up closely with pin removal at 6–8 weeks postoperatively, the patient was noncompliant. He presented to office approximately 6 months after the initial surgery for the pin removal (Fig. 2). The Kirschner wires were removed in the operating room without complications. The wrist joint was stable to stress testing (Fig. 3). Subsequently the patient was lost to follow-up.

Case 2

A 44-year-old right-handed male patient presented to the emergency department after being assaulted with a blunt object while trying to protect himself, sustaining a scalp laceration and a left volar perilunate dislocation,. His past medical history was significant for seizure disorder, schizophrenia, and repair of right forearm laceration by

the senior author. Plain radiographs demonstrated a transscaphoid volar perilunate dislocation, and a healed radial styloid fracture with old ulnar styloid fibrous union (Fig. 4). The patient had intact skin, mild wrist swelling, and an unremarkable neurovascular examination.

In the emergency room, closed reduction with conscious sedation was performed with axial traction and extension of the wrist without complication, and the patient was placed in thumb spica sugar-tong splint. He was instructed to follow up in the clinic in 1 week. In the office, after a discussion regarding the risks and benefits of surgical stabilization, the patient consented to an open reduction and internal fixation of the right scaphoid fracture and volar perilunate dislocation. A CT scan was obtained in preparation for surgery which demonstrated the transscaphoid volar perilunate fracture dislocation with evidence of prior radial styloid and ulnar styloid injury.

Intraoperatively, a standard longitudinal incision was made over the dorsal wrist. The soft tissue dissection was

Fig. 2 Case 1, radiographs 6 months after surgery: **a** PA, **b** lateral, and **c** oblique views

Fig. 3 Case 1, intraop fluoroscopy after pin removal. **a** PA showing stable carpal relationships—ulnar translation of carpus on radius did not correlate with the patient's clinically stable wrist. **b** Lateral view

carried down over the third compartment. A longitudinal arthrotomy was made, and there was noted to be a fracture of the proximal pole of the scaphoid with mild comminution as well as a partial scaphoid interosseous ligament disruption, and dorsal and volar capsule disruption. The scaphoid fracture was reduced and stabilized with a cannulated headless screw. Nonabsorbable sutures were used to repair the dorsal capsule as well as the interosseous ligament disruption. Prior to complete capsular closure, the demineralized bone matrix was placed within the nonarticular portion of the fracture to promote healing.

A separate volar incision was made in order to repair the volar wrist capsule. A standard carpal tunnel release incision was extended proximally, and the median nerve and flexor tendons were retracted radially. Transverse disruption of the volar carpal ligaments was noted. A heavy nonabsorbable suture was used to repair the volar carpal ligaments. Final radiographs confirmed satisfactory reduction of the fracture dislocation. The patient was immobilized in a thumb spica sugar-tong splint.

On the first postoperative visit, patient presented without a splint and stated that he had removed the splint after it had become submerged in a hot tub 2 days prior to his appointment. Physical examination demonstrated intact incisions without evidence of infection, and radiographs demonstrated maintenance of the reduction. Subsequently, the patient was recasted. His cast

was removed without complication following three more weeks of immobilization.

At 1 year follow-up, the patient was doing reasonably well with a negative Watson's maneuver, 45° of extension, 25° of flexion, 10° of radial, and 25° of ulnar deviation. He had full digital motion. Grip strength on second setting (Jamar Dynamometer, Lafayette Instrument, Lafayette, IN) was 60 lbs compared to 105 lbs on the contralateral side.

Radiographs revealed a healed scaphoid fracture with no evidence of carpal instability. The scapholunate angle was approximately 45°, and the radiolunate angle was 0°. The capitate was noted to be in slight extension, but congruent with the lunate (Fig. 5).

Discussion

We present two cases along the spectrum of volar perilunate dislocations with relatively low-energy mechanism and evidence of prior wrist injury. The first patient presented with a dorsal lunate dislocation, which we consider as a variant of volar perilunate dislocation (just as a volar lunate dislocation represents the end stage of the more common dorsal perilunate dislocation injury pattern). Our suspicion of previous wrist trauma was supported by the early arthritic changes of the lunotriquetral joint with an attenuated/absent interosseous ligament and no blood within the joint. Simple

Fig. 4 Case 2, prereduction radiographs: **a** PA; **b** lateral, showing dorsal displacement of lunate and volar carpal dislocation; and **c** oblique

Fig. 5 Case 2, 1 year follow-up radiographs: **a** PA, **b** lateral, and **c** oblique views

disruption of the lunotriquetral ligament rupture itself is unlikely to contribute to volar intercalated segment instability without the presence of additional structural damage [6]. We believe that the acute on chronic injury in this patient could have contributed to the unusual dorsal lunate dislocation. The patient's ulnar-sided carpal instability pattern and lack of intra-articular hematoma support the suspicion that a prior lunotriquetral injury could have contributed to this injury pattern. The patient recalled distant wrist injury after a fall, for which he did not seek medical attention, and from which he remained asymptomatic until this most recent event.

With the second patient, there was radiographic and intra-operative evidence of previous radial styloid and ulnar styloid fractures. These prior injuries may have contributed to subtle instability of the wrist, predisposing this patient to the acute volar perilunate dislocation injury pattern. This patient had a classic radial to ulnar pattern of perilunate fracture dislocation as evidenced by the scaphoid fracture. The prior radial styloid fracture with associated soft tissue injury could have contributed to chronic ligamentous instability that had been asymptomatic.

As volar perilunate dislocations are a rare injury, it is important to recognize the mechanism of injury and possible predisposing factors when evaluating and planning treatment in patients with this injury. Volar perilunate fracture dislocations have been described in the literature, and various treatment strategies have been reported. Although closed reduction and casting can produce satisfactory result [1, 2, 5], the injury pattern confers carpal instability, and it is difficult to maintain reduction with closed treatment. As a result, these injuries are often treated definitively with either percutaneous fixation or, preferably, open reduction and internal fixation [3, 7, 8, 10]. With the dorsal blood supply to the scaphoid, a volar approach is advocated by some authors [3, 9]. However, stable reduction can be difficult with a volar approach alone, and there should be a low threshold to utilize a dorsal approach, especially if one suspects primary disruption of the dorsal capsule or interosseous ligaments as presented in case 1. A

dorsal approach also facilitates anatomic reduction of the carpus.

We present two cases of volar perilunate fracture dislocation, with evidence of previous pathology that may have predisposed the patients to this atypical injury pattern. When evaluating the much less common volar perilunate dislocation, one should carefully investigate prior injury history, radiographic evidence of contributing factors, and carefully devise the treatment plan accordingly. Most often, these injuries will require open reduction and internal fixation in the operating room to restore alignment and achieve stable fixation.

Conflict of interest No pharmaceutical or industry support was given for this study. The authors received no financial compensation.

References

1. Aitken AP, Nalebuff EA. Volar transnavicular perilunar dislocation of the carpus. *J Bone Joint Surg Am.* 1960;42-A:1051–7.
2. Fernandes HJ, Koberle G, Ferreira GH, et al. Volar transscaphoid perilunar dislocation. *Hand.* 1983;15:276–80.
3. Hayeems EB, Schemitsch EH. Volar transscaphoid perilunate fracture dislocation: case report and review. *J Trauma.* 1996;40:1031–3.
4. Herzberg G. Perilunate and axial carpal dislocations and fracture-dislocations. *J Hand Surg Am.* 2008;33:1659–68.
5. Pournaras J, Kappas A. Volar perilunar dislocation. A case report. *J Bone Joint Surg Am.* 1979;61:625–6.
6. Reagan DS, Linscheid RL, Dobyns JH. Lunotriquetral sprains. *J Hand Surg Am.* 1984;9:502–14.
7. Saunier J, Chamay A. Volar perilunar dislocation of the wrist. *Clin Orthop Relat Res.* 1981;157:139–42.
8. Schwartz GB. A volar transscaphoid perilunate fracture dislocation. *Orthop Rev.* 1986;15:170–3.
9. Taleisnik J, Kelly PJ. The extraosseous and intraosseous blood supply of the scaphoid bone. *J Bone Joint Surg Am.* 1966;48:1125–37.
10. Woodward AH, Neviaser RJ, Nisenfeld F. Radial and volar perilunate transscaphoid fracture dislocation. *South Med J.* 1975;68:926–8.