Transscaphoid Dorsal Lunate Dislocation: A Case Presentation and Review of the Literature

Ahmadreza Afshar¹ Ali Tabrizi¹ Ali Aidenlou¹

¹Department of Orthopedics, Imam Khomeini Hospital, Urmia University of Medical Sciences, Urmia, Iran

Address for correspondence Ahmadreza Afshar, MD, Department of Orthopedics, Imam Khomeini Hospital, Urmia University of Medical Sciences, Modares Street, Ershad Boulevard, Urmia 57157 81351, Iran (e-mail: afshar_ah@yahoo.com).

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Abstract

Keywords

- carpal
- dislocation
- dorsal lunate dislocation
- perilunate dislocation
- transscaphoid dorsal lunate dislocation
- transscaphoid PLD
- wrist injuries

This case report describes a 74-year-old man with the rare injury of transscaphoid dorsal lunate dislocation (LD). He sustained a crushing injury with a huge amount of energy to his right wrist while working with a pressing machine. There were deep abrasions and areas of skin necrosis on the dorsum of the wrist. The patient was treated with closed reduction and a Herbert screw fixation for the scaphoid fracture. Six months postoperatively, avascular necrosis (AVN) of the lunate and scaphoid was apparent on the wrist radiographs. We offered a proximal row carpectomy to the patient, but he declined surgery because he was able to perform his activity of daily living. Dorsal LD as well as its variants has a high prevalence of AVN of the lunate. Delayed diagnosis, delayed treatment, and open reduction increase the risk of AVN development of the lunate. The level of evidence is therapeutic IV.

Introduction

Perilunate injuries account 10% of wrist injuries. The most prevalent pattern of perilunate dislocation (PLD) is dorsal, while the most common pattern of lunate dislocation (LD) is volar. PLD may be accompanied with fracture of some elements of the greater arch, particularly the scaphoid producing perilunate fracture–dislocation (PLFD).¹

Volar PLD is an uncommon injury and dorsal LD is a very rare injury. In a retrospective case series of 166 patients with PLD and PLFD collected from seven specialized center, there were 4 patients with volar PLFD and 1 patient with dorsal LD.¹

There are limited case reports describing dorsal LD and its variants in the literature.^{2–13} The current case report describes a case of transscaphoid dorsal LD.

Case Presentation

A 74-year-old man sustained a crush injury of his right wrist while working with a pressing machine. He was referred to us after 3 days of his injury. The right wrist and hand were painful and swollen. There was tenderness on palpation of

the wrist. There were deep abrasions and areas of skin necrosis on the dorsum of the wrist (►Fig. 1). An anteroposterior radiograph of the right wrist demonstrated a disrupted proximal Gilula's lines, derangement of proximal carpal row, loss of carpal height, overlapped carpal bones, a scaphoid fracture, and a fracture of the ulnar styloid (►Fig. 2). A lateral right wrist radiograph demonstrated dorsal dislocation of the lunate (►Fig. 3). Computed tomography scan demonstrated dorsal dislocation of the lunate along with proximal fragment of the scaphoid (►Figs. 4 and 5).

Under general anesthesia, closed reduction was performed with longitudinal traction and direct pressure on the lunate. The wrist was easily reduced and the corrected alignment of carpal bones was verified with intraoperative fluoroscopy. The scaphoid fracture was fixed with a Herbert screw percutaneously. The wrist was immobilized with a thumb spica for 8 weeks (►Fig. 6). Six months postoperatively, he had occasionally mild right wrist pain. The right wrist grip strength was 15 kg, while the left was 35 kg. The right wrist range of motion was 20 degrees flexion and 35 dorsiflexion. The right wrist radiographs demonstrated that the scaphoid reduction was lost, scaphoid was collapsed, and sclerosis was developed in the scaphoid and lunate (►Fig. 7). We offered

Fig. 1 Clinical photography demonstrates deep abrasions and areas of skin necrosis on the dorsum of the wrist 3 days after the accident.

Fig. 2 Anteroposterior right wrist radiograph demonstrates a disrupted proximal Gilula's lines, derangement of proximal carpal row, loss of carpal height, overlapped carpal bones, a scaphoid fracture, and a fracture of the ulnar styloid.

a proximal row carpectomy to the patient, but he declined surgery. The only complain of the patient was some irritation over the head of the Herbert screw. Despite a restricted wrist function, the patient was able to perform his activity of daily living. We intended to follow up the patient; however, he was reluctant to come for follow-up examinations.

Discussion

Progressive dorsal perilunate instability is induced by a combination of forced hyperextension, ulnar deviation, and supination of the wrist relative to the radius. Mayfield et al

Fig. 3 Lateral right wrist radiograph demonstrates dorsal dislocation of the lunate.

Fig. 4 Computed tomography demonstrates dorsal dislocation of the lunate.

described four stages of sequential failure of the lesser arch. Stage I represents scapholunate failure. Stage II represents disruption of "space of Poirier" and capitulunate failure. Stage III represents lunotriquetral failure. A volar LD represents stage IV. The greater arch lesion involves fracture through the radial styloid, scaphoid, capitate, triquetrum, and ulna. LD may be accompanied with a fracture of one or more wrist bones, particularly the scaphoid, producing a mixed pattern of fracture-dislocation through the lesser and greater arches.¹⁴

It has been suggested that the induced mechanism for volar PLD or volar PLFD is forced hyperflexion and supination of the wrist relative to the radius. It is an opposite mechanism that produces the more common dorsal perilunate instability. A dorsal LD represents the end stage of volar PLD or volar PLFD.²⁻¹³ Volar PLD and dorsal LD have been also reported because of a relatively low-energy trauma. In those cases, probably previous wrist injuries and chronic ligamentous laxity may predispose the wrist to develop the lesion.^{7,12}

In the current case, the skin condition provides clue that the applied force to the wrist was a dorsovolar shear force. The patient had suffered a huge amount of energy to his wrist that had fractured the scaphoid, disrupted all the volar and dorsal restrain ligaments of the lunate. We think that initially the carpus was dislocated volarly and then the proximal scaphoid fragment and lunate were forced dorsally during the relocation of the carpus.

Treatments of dorsal LD ranges from closed reduction and immobilization, open reduction, ligaments repair and fixation of the concomitant fracture, lunate excision, and

proximal row carpectomy. ► **Table 1** demonstrates a cumulative data of 14 patients with dorsal LD and its variants collected from English literature and the current case. Kim et al, Shukla and Yadav, and Siddiqui and Sarkar treated three patients with close reduction and percutaneous pinning.^{4,11,12}

Bilos and Hui and Neavin et al treated two patients with open reduction and repaired the ligaments; however, the patients demonstrated sclerosis and avascular necrosis (AVN) on follow-ups.^{2,6} Seidenstein reported a case of delayed diagnosed isolated dorsal LD by 3 months that was treated with lunate excision.¹⁰ Bilos and Hui, Bjerregaard and Holst-Nielsen, and Neavin et al have described three cases of transstyloid dorsal LDs.^{2,3,6} In the experience of Bjerregaard and Holst-Nielsen, the patient's treatment was delayed by 8 weeks because of inappropriate soft tissue. At surgery, the lunate was completely free and avascular due to completely torn its ligaments and attachments. To enhance revascularization of the lunate, the authors performed arthrodesis between the lunate, capitate, scaphoid, and triquetrum.³

In the transscaphoid PLD, fixation of the scaphoid is the key element for stable reduction. In the current case, we treated the patients with closed reduction and percutaneous fixation of the scaphoid with a Herbert screw. On 6 months postoperatively, radiographs AVN was apparent in the lunate and scaphoid; however, the clinical outcomes do not necessarily correlated with radiographic findings particularly in the elderly patients.

Although transient vascular compromise of the lunate after dorsal PLFD or volar LD may be a frequent occurrence,^{1,15} AVN of the lunate has been rarely reported.¹⁶⁻¹⁸ In a review of 206 volar LDs, only two (1%) cases developed AVN of the lunate.⁵ On the contrary, AVN of the lunate is a major concern

Fig. 5 Three-dimensional computed tomography reconstruction of the right wrist demonstrates dorsal dislocation of the lunate along with proximal fragment of the scaphoid.

Fig. 6 Postoperative anteroposterior and lateral radiographs of the right wrist demonstrate satisfactory alignment of the lunate and scaphoid.

Fig. 7 Six months postoperative radiograph demonstrates avascular necrosis and collapse of the lunate and scaphoid.

Table 1 Cumulative data of 14 patients including current case with dorsal lunate dislocation and its variants

Authors	Age/sex	Diagnosis	Treatment	Follow-up	Development of AVN
Bilos and Hui (1981) ² ; case 1	27/M	Dorsal lunate dislocation	Open reduction with ligaments repair	15 mo	No
Bilos and Hui (1981) ² ; case 2	59/M	Transstyloid dorsal lunate dislocation	Open reduction with ligaments repair	12 mo	Yes
Bjerregaard and Holst-Nielsen (1988) ³	44/M	Transstyloid dorsal lunate dislocation	Open reduction and limited arthrodesis	16 mo	Not applicable
Kim et al (2016) ⁴	41/M	Transtrapezoid dorsal lunate dislocation	Closed reduction and percutaneous pinning	16 mo	No
Mueller (1984) ⁵	22/M	Dorsal lunate dislocation	Closed reduction and percutaneous pinning	8 mo	Yes
Neavin et al (2009) ⁶	51/M	Transstyloid dorsal lunate dislocation	Open reduction with ligaments repair	12 mo	Yes
Park and Steinberg (2012) ⁷	31/M	Dorsal lunate dislocation	Open reduction with ligaments repair	Lost to follow-up	Not applicable
Peshin et al (2008) ⁸	M	Transstyloid dorsal lunate dislocation	Proximal row carpectomy	–	Not applicable
Schwartz et al (1990) ⁹	77/M	Dorsal lunate dislocation	Proximal row carpectomy	12 mo	Not applicable
Seidenstein (1956) ¹⁰	50/M	Dorsal lunate dislocation	Lunate excision	16 mo	Not applicable
Shukla and Yadav (2018) ¹¹	52/M	Dorsal lunate dislocation	Closed reduction and percutaneous pinning	6 mo	Insufficient follow-up
Siddiqui and Sarkar (2012) ¹²	56/F	Dorsal lunate dislocation	Closed reduction and percutaneous pinning	3 mo	Insufficient follow-up
Zaidenberg et al (2016) ¹³	52/M	Dorsal lunate dislocation	Open reduction with ligaments repair	24 mo	Yes
This study (2019)	74/M	Transscaphoid dorsal lunate dislocation	Closed reduction, percutaneous Herbert screw fixation	9 mo	Yes

Abbreviation: AVN, avascular necrosis.

after dorsal LD. In a cumulative data of 14 patients with dorsal LD and its variants collected from English literature and the current case (►Table 1), 5 patients developed AVN,^{2,5,6,13} 1 patient was treated with excision of the lunate because of delayed treatment,¹⁰ 1 patient was treated with limited arthrodesis to enhance revascularization of the lunate,³ 2 patients were treated with proximal row carpectomy,^{8,9} 1 patient was lost to follow-up,⁷ and 2 patients had only a few months of follow-ups that were insufficient to verify about development of AVN of the lunate.^{11,12} AVN was not reported in two patients.^{2,4} The authors, who have the experience of open reduction for dorsal LD, had observed that the lunates were laying subcutaneously without any ligamentous attachments.^{2,3,6,9,10} It seems that dorsal LD as well as its variants has a high prevalence of AVN of the lunate. Delayed diagnosis, delayed treatment, and open reduction increase the risk of AVN development of the lunate.²⁻¹³

Conflict of Interest

None declared.

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