



Bilateral Volar Lunate Dislocation with Radial Fracture Associated: a Case Report

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Accepted: 24 October 2022 / Published online: 5 November 2022
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Abstract

Carpal dislocations are a rare condition usually resulting from a high-energy trauma on the hyperextended hand in ulnar deviation. To the best of our knowledge, only 6 cases of bilateral volar lunate dislocation have been reported in literature, and none of them presents with an associated radial fracture. We report a 3-year follow-up of a patient who sustained bilateral volar lunate dislocation with radial fracture associated treated surgically to reduce the fracture and to reconstruct the injured ligaments. A 51-year-old sustained an injury to both wrists in a fall while paragliding. He presented with pain to both wrists and his back. Physical examination showed diffuse swelling in his wrists and tenderness to his lumbar region. A total body CT scan showed L1–L3 vertebral fractures requiring surgical treatment. Wrists radiographic investigation revealed bilateral volar lunate dislocation associated to a right wrist ulnar and radial styloid fracture with radius interposition into the scapho-luno-triquetral articulation. We treated the patient with K-wires and external fixation on the right side and K-wires and a cast on the left side. Three years after treatment the range of motion in the right wrist compared to the left was: 75°/70° of flexion, 70°/65° of extension, 30°/35° of ulnar deviation, 20°/15° of radial deviation, 85°/80° of supination and 80°/70° of pronation. Bilateral perilunate dislocations or fracture dislocations are extremely rare. These patterns of injuries are commonly missed initially, especially in patients with multiple traumas, so the patient may present at a later date with secondary complications. Perilunate carpal dislocation may be treated with closed reduction but may also require open reduction and reconstruction of injured ligaments in order to restore stability and allow return to function. The purpose of this study is to present a rare and frequently misdiagnosed clinical entity, hereupon commonly undertreated resulting in poor long-term results. Prompt diagnosis and treatment is mandatory to allow rapid return to function and to avoid secondary complications.

Keywords Carpus · Dislocation · Bilateral · Ligament Injury · Perilunate · Volar

Introduction

Carpal dislocations represent rare conditions usually resulting from a high-energy trauma to hyperextended hand with ulnar deviation. These injuries may be easily overlooked or misdiagnosed, especially in case of polytrauma.

Anatomically the lunate is very well supported by several anatomic structures such as scapho-lunate and luno-triquetral ligaments, surrounding carpal bones and radiocarpal joints. High-energy trauma is required to dislocate these structures; thus, a lunate dislocation is often associated to bone fractures [1–5].

This condition is often complicated by compression of median nerve with sensory dysfunction or avascular necrosis secondary to vascular impairment. Thus, early diagnosis and surgical treatment are mandatory to achieve good clinical outcome [6].

To the best of our knowledge, only 6 cases of bilateral volar lunate dislocation have been reported in the literature [3–5, 7–9], but this is the first time that a patient presents with an associated radial fracture with radius interposition into the scapho-luno-triquetral articulation.

This article is part of the Topical Collection on *Surgery*

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The purpose of this study is to present a rare clinical entity which inevitably leads to frequent treatment delays and undertreatments. We report the clinical and radiological results of surgical treatment of bilateral volar lunate dislocation with radial fracture associated at 3 years with overall discussion of surgical options and current strategies.

Case Report

A 51-year-old, right-handed man sustained high-energy bilateral wrist trauma as a result of a paragliding fall. During the night, he was taken to the Emergency Department conscious and with stable vital signs. Patient related no significant pre-existing comorbidities and reported severe pain to both wrists and low-back. Physical examination showed diffuse bilateral wrist swelling and lumbar tenderness, but no median nerve injury signs nor radicular deficits were shown.

A total body CT scan was negative for internal injuries but showed L1 and L3 vertebral fractures (A3 and A1 respectively, based on the AO Classification) requiring surgical treatment. Wrists X-rays revealed a volar dislocation of lunate bone on both sides (Figs. 1–2), but on the right side, a displaced and comminute fracture of the distal radial epiphysis with fracture of ulnar styloid and radius interposition into the scapho-luno-triquetral joint was shown (Figs. 1–2).

The fracture on the right wrist was promptly reduced and immobilized with orthosis in the Emergency Department. New X-rays and CT scan of both wrists were performed and the patient was prepared for surgery. Spinal stabilization was delayed as CT scan showed no indication for immediate intervention.

Patient was positioned supine under general anaesthesia and tourniquet at 250 mmHg was applied bilaterally. Hand surgeons started on the right side: through a longitudinal palmar approach, the carpal tunnel was released, and the lunate was reduced and fixed with three 2 mm k-wires



Fig. 1 Left and right wrist preoperative anteroposterior X-rays



Fig. 2 Left and right wrist pre-operative lateral X-rays

(scapho-lunate, luno-triquetral, scapho-capitate). Repair of the palmar capsule was also performed. Comminuted distal radius fracture was treated by open reduction and fixed with three k-wire and an external fixator for additional stability (Fig. 3).

The left wrist was eventually treated with dorsal approach fixing the lunate with three 1.8 mm k-wires. A below-elbow cast was applied. Spinal surgery was performed at day 1 with T12-L3 stabilization.

The day after spinal surgery bilateral X-rays showed good reduction and stable osteosynthesis (Fig. 3).

Patient was transferred to a spinal rehabilitation centre at day 15. As for hand surgery, he was monthly assessed by X-rays and clinical examination without signs of displacement. The immobilization cast, the k-wires and the external fixation were removed after 3 months (Fig. 4). Rehabilitation was started at this time with progressive mobilization of both wrists and subsequently hand strength-focused exercises. After 1 month of rehabilitation, the range of motion in both wrists was good with mild pain at the extreme active range of motion.

The patient was able to resume work 2 months after.

Three years post-surgery radiographs showed union of radial fracture (Figs. 5–6), and clinical examination showed improvement of the range of motion in both wrists. The patient reported no pain and good grip strength.

The range of motion in the right wrist compared to the left was 75°/70° of flexion, 70°/65° of extension, 30°/35° of ulnar deviation, 20°/15° of radial deviation, 85°/80° of supination and 80°/70° of pronation (Table 1).

Overall range of motion was better on the right side (Table 1, Fig. 7), whereas, as for the grip strength, it was equal between right and left hand.

The hand function was assessed using the Disabilities to the Arm, Shoulder and Hand (DASH): the patient obtained a score of 9.2.

Fig. 3 Left and right wrist post-operative X-rays

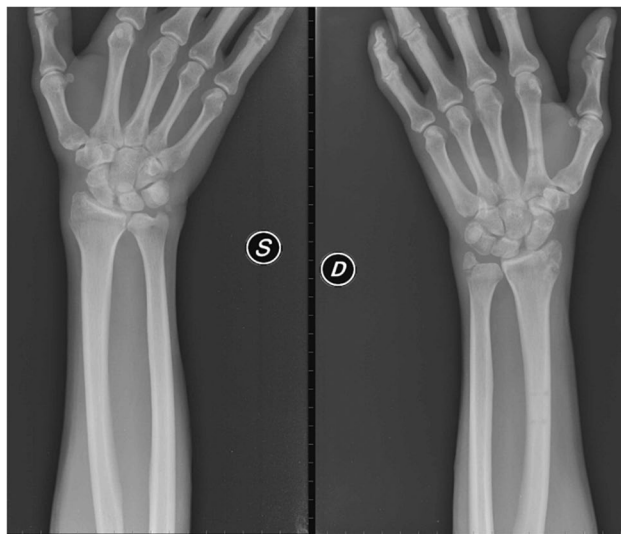
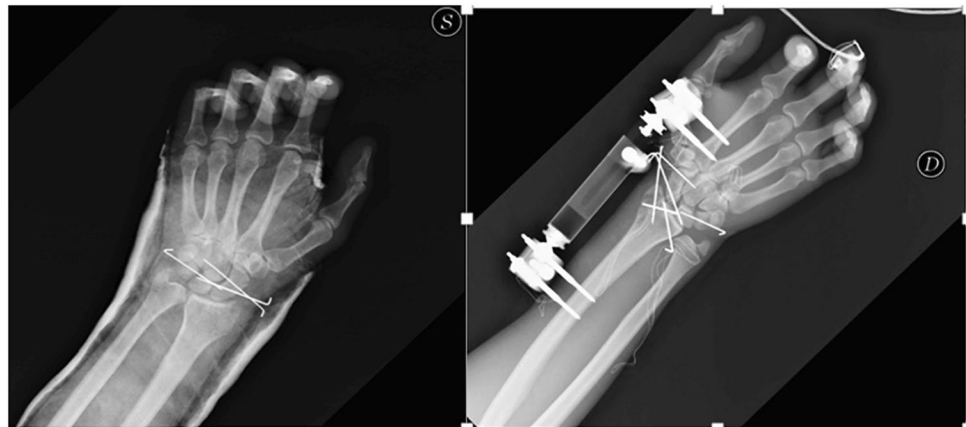


Fig. 4 Left and right wrist X-rays 3 months post-surgery

Discussion

This case report shows acute surgical management of bilateral volar lunate dislocation. We report excellent clinical

and radiological outcome 3 years after surgery.

Bilateral perilunate dislocations or fracture dislocations are extremely rare [3–5, 7–9]: the first case of bilateral perilunate dislocation was described in 1950 on a ship carpenter. His injury was treated by manipulation and immobilization in plaster cast [8].

Since then, to the best of our knowledge, 5 other cases have been reported in literature [3–5, 7–9], but this is the first time that a patient presents with bilateral volar lunate dislocation associated to a right wrist ulnar and radial styloid fracture with radius interposition into the scapho-luno-triquetral articulation.

This injury pattern is commonly overlooked and severe late complications are frequently observed (i.e. stiffness, avascular necrosis and wrist osteoarthritis) [9].

Perilunate carpal dislocation may be treated with closed reduction but may also require open reduction and reconstruction of some or all of the injured ligaments in order to restore stability and allow return to function [10–13]. Conventional treatment options include closed reduction and immobilization with a cast or closed reduction and stabilization with percutaneous Kirschner wires. For extended injuries, open reduction is recommended with ligament repair and proper restoration of relationship between carpal bones with fixation with k-wires, screws or external fixator [14].

Fig. 5 Bilateral anteroposterior and lateral X-rays 3 years post-surgery

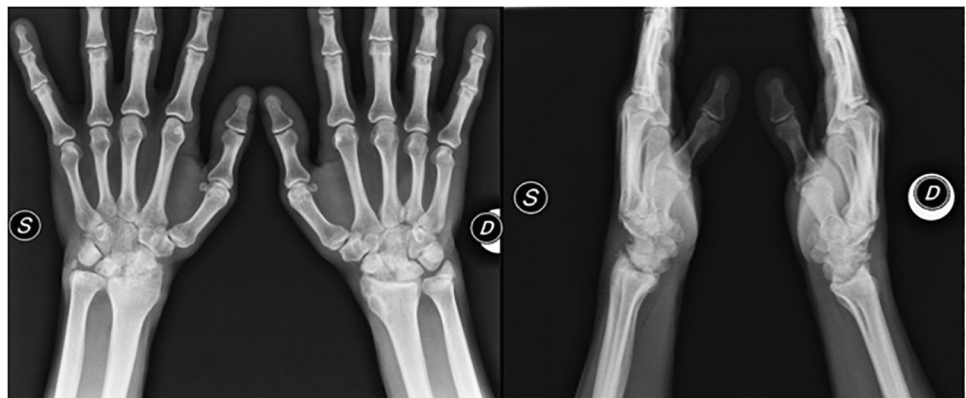




Fig. 6 Bilateral ulnar deviation X-rays 3 years post-surgery

Closed reduction has the main disadvantage of progressive loosening of the anatomical reduction over time with poor clinical outcome [15]. Furthermore, carpal tunnel symptoms often follow a closed reduction technique and secondary surgical intervention to release the transverse carpal ligament is often required.

A dorsal, volar or combined approach may be necessary, and the decision usually depends on surgeon preference [16, 17]. The dorsal approach provides the best exposure for an anatomical alignment and interosseous ligament repair [18]. Nonetheless, a volar approach allows carpal tunnel decompression and direct repair of ligaments and palmar capsule [19].

In this case, a dorsal approach on the left side was preferred to reduce the lunate and stabilize the carpal bones. On the right side, a volar approach was chosen to reduce the lunate bone, decompress the carpal tunnel and treat the radial fracture. Treating the radial fracture was mandatory also because of its interposition into the scapho-lunotriquetral articulation: if we had not reduced the radial

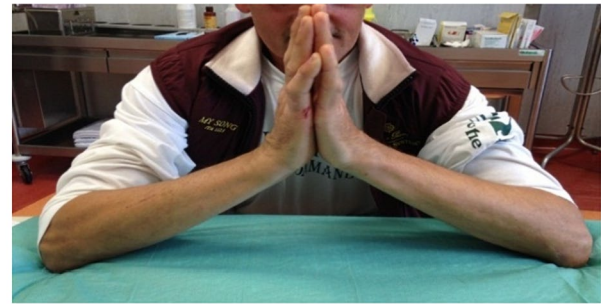


Fig. 7 Flexion and extension of both wrists 3 years post-surgery

fracture it would not have been possible to restore all the correct joints.

The functional outcome after 3 years is reasonably good as the patient reports no pain, good grip strength and a minimal loss of range of motion especially in extension.

Author contribution All authors reviewed and approved the final version and have agreed to be accountable for all aspects of the work including any issues related to accuracy or integrity.

Data availability Not applicable.

Code availability Not applicable.

Declarations

Ethics approval Not applicable.

Table 1 Range of motion of both wrists 4 months and 3 years post-surgery (degrees)

	Flexion	Extension	Ulnar deviation	Radial deviation	Supination	Pronation
4 MONTHS						
Right wrist	65	60	30	15	70	75
Left wrist	60	55	35	10	70	65
3 YEARS						
Right wrist	75	70	30	20	85	80
Left wrist	70	65	35	15	80	70

Consent to participate Written informed consent was obtained by the patient for submission to the journal.

Consent for publication The consent for publication was obtained from the patient.

Conflict of interest The authors declare no competing interests.

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