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Transverse translunate fracture–dislocation: A rare injury

Fracture-luxation translunaire transversale : une lésion exceptionnelle

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Abstract

Perilunate fracture–dislocation is rare. We report the case of a 24-year-old male who fell from his motorcycle and presented with a transverse lunate fracture with perilunate ligament damage. The initial diagnosis based on X-rays was confirmed by CT scan. A dorsal approach was used to obtain good reduction, double screw fixation and ligament reinsertion protected by temporary K-wires. To the best of our knowledge, this is the first case of transverse lunate fracture within perilunate fracture–dislocation. The patient returned to normal activities after 6 months.

Keywords: Carpus; Lunate; Dislocation; Fracture; Ligament

Résumé

Les fractures-luxations périlunaires du carpe sont rares. Nous rapportons le cas d'un homme de 24 ans, droitier qui, dans les suites d'une chute par accident de la voie publique en moto, a présenté une fracture-luxation translunaire avec atteinte ligamentaire périlunaire. Le diagnostic, suspecté sur les radiographies initiales, a été confirmé par un scanner. Un abord postérieur a été réalisé pour permettre une réduction de la fracture fixée par un double vissage enfoui, associée à une réinsertion ligamentaire et brochage temporaire en protection. Il s'agit, à notre connaissance, du premier cas rapporté de fracture transversale du lunatum dans le cadre d'une fracture-luxation périlunaire. Le patient a pu reprendre ses activités dans un délai de 6 mois.

Mots clés : Carpe ; Lunatum ; Luxation ; Fracture ; Ligament

1. Introduction

Perilunate fracture–dislocations of the carpal bones are rare [1–3]. We will describe the first case involving a transverse fracture of the lunate with complex perilunate ligament damage.

2. Case report

This was a young man of 24 years who suffered trauma to both wrists following a motorcycle accident in September 2009. The initial examination found painful swelling of both wrists associated with total functional disability and pain during passive motion of the fingers with no sensory or motor neurological deficit, vascular damage or skin disorder.

The initial radiological assessment performed in the emergency room revealed a perilunate fracture–dislocation of the left wrist and a lunotriquetral separation with static volar axial misalignment of the intermediate segment (VISI) of the

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right wrist (Figs. 1 and 2). Specialized advice was sought, and after rereading the initial x-rays, a CT scan was performed to confirm the diagnosis of transverse lunate fracture in the left wrist associated with a comminuted intra-articular fracture of the radial styloid process and a fracture of the ulnar styloid process (Figs. 3 and 4). The CT scan also confirmed the dorsal displacement of the distal fragment of the lunate and the integrity of the articular lunocapitate surfaces.

Because of the observed displacement, we decided to perform urgent surgical treatment. Treatment consisted of a dorsal approach with capsulotomy according to Berger et al.

[4], combining compression of the bone block with flat head screws for the lunate and reduction of the articular surface of the radial styloid process under visual control. Surgical exploration confirmed the scapholunate and lunotriquetral ligament tears. Ligament reattachment with a Mitek™ microanchor was performed and the repair was protected by temporary K-wire pinning in the left wrist (Fig. 5). The ulnar styloid process fracture was not fixed because the distal radioulnar joint in the left wrist was not unstable.

The patient used a simple wrist splint for 45 days. Active mobilization of the metacarpophalangeal and interphalangeal

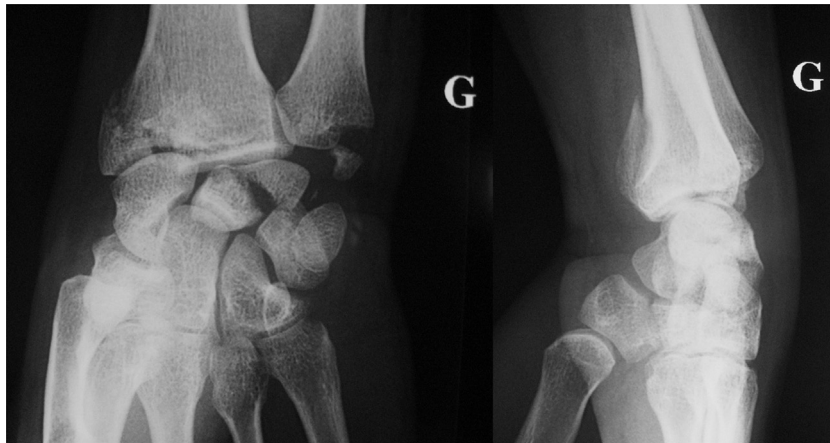


Fig. 1. Standard preoperative A/P and lateral radiographs of the left wrist.

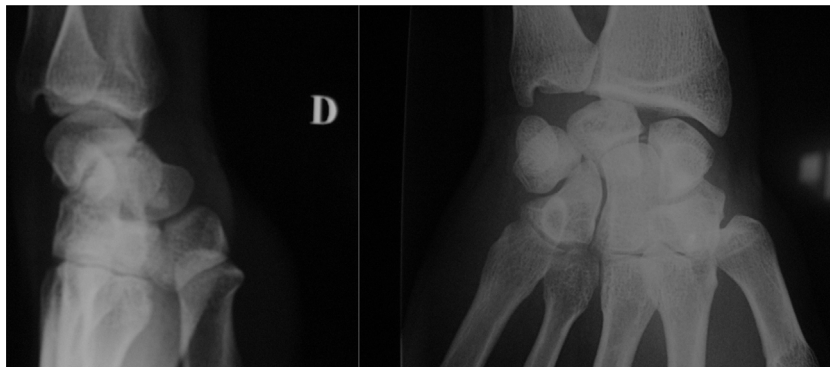


Fig. 2. Standard preoperative A/P and lateral radiographs of the right wrist.

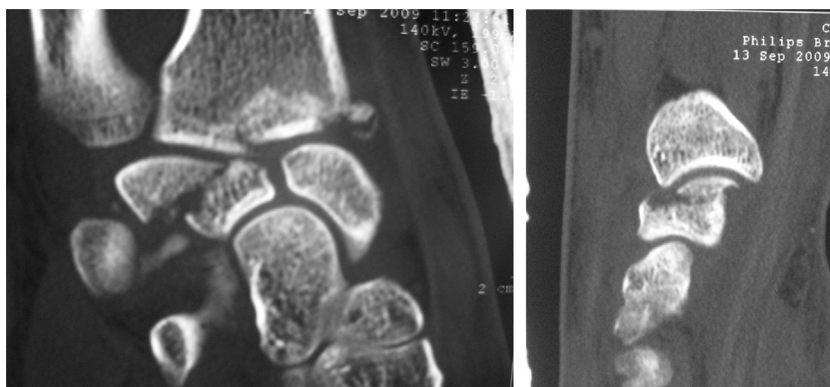


Fig. 3. Initial CT scan with frontal and sagittal sections showing the lunate and radius fractures.

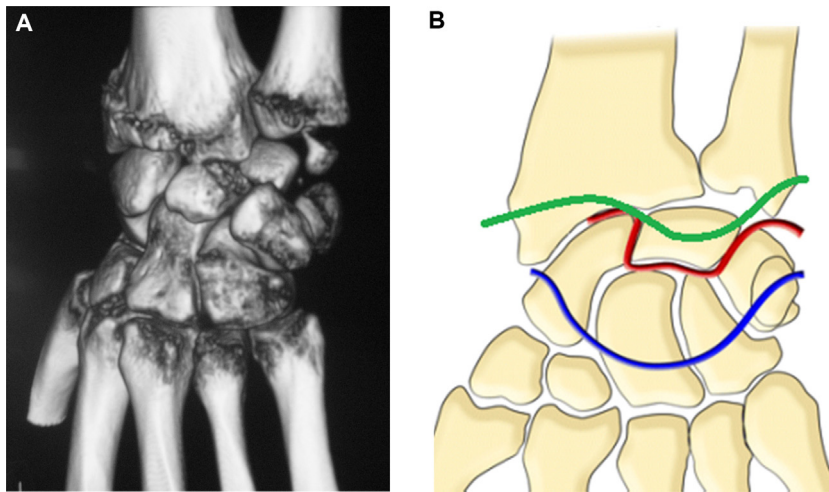


Fig. 4. Initial CT with 3D reconstruction (A). Diagram of the injury arcs described by Bain (B): green line: transulate arc; red line: small arc; blue line: large arc.

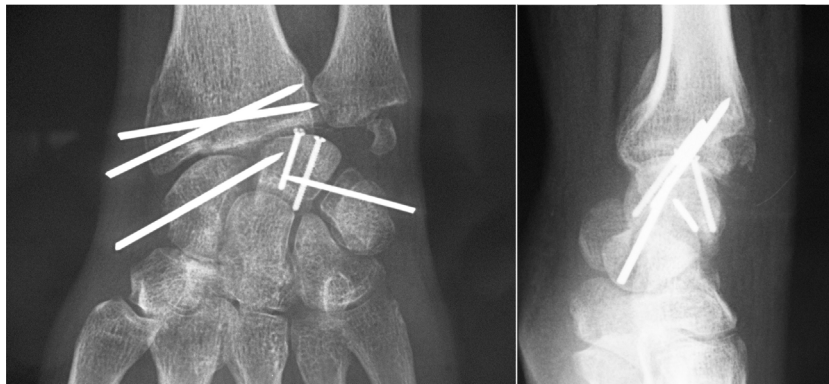


Fig. 5. Standard intraoperative A/P and lateral radiographs of the left wrist.

joints was allowed during the immediate postoperative period. Union of the bone fractures was confirmed at 6 weeks and the K-wire was removed during outpatient surgery.

At the 1-year follow-up, the patient has regained all of his range of motion symmetrically with 70° in extension, 60° in flexion, 30° in ulnar deviation and 15° in radial deviation; he had no specific limitations in his activities. He had a PRWE total score of 8/100 [5] and a grip strength of 45 kg on a Jamar dynamometer in the right hand and 40 kg in the left hand [6]. No aseptic necrosis of the lunate was observed during the final assessment of the left wrist (Figs. 6 and 7).

3. Discussion

Malgaigne was the first to describe perilunate fracture–dislocation in 1855 [7]. Lunate fractures represent 2% to 3.9% of all carpal fractures [2,8] and occur in combination with perilunate fracture–dislocation in 5% to 7% of wrist injuries [7,9]. Perilunate fracture–dislocation usually occurs among men between 20 and 30 years of age following a fall from a significant height or in a motor vehicle accident involving high kinetic energy [10]. Predominantly, perilunate dislocations are dorsal with only 3% being volar [10]. Conway et al. reported



Fig. 6. One year control radiographs with A/P view of radial deviation, A/P view of ulnar deviation and lateral view of the left wrist.



Fig. 7. Comparative clinical outcome in flexion and extension after 1 year.

three cases of volar transunate fracture–dislocation in 1989 [11]. In 2008, Lavelle et al. reported one case of coronal lunate fracture associated with ligament damage [12]. It is only in 1988 that a true transverse fracture, isolated from the lunate, was reported [13]. Yakoubi et al., in 2007, reported a frontal lunate fracture with dislocation of the perilunate [14]. Bain et al. reported several cases of frontal transunate fracture–dislocation, but none were transverse [3]. During our literature search, we found no case with an injury combination like the one described here (Table 1).

Our hypothesis is that our patient was subjected to a movement combining extension, supination and ulnar deviation. We believe our patient initially placed his hands on the hypothenar eminence in hyperextension and ulnar deviation of the wrist, causing the scaphoid and the lunate to flex and leaving the triquetrum in abnormal extension. This led to breaking of the lunotriquetral joint and that trauma was followed by hyperextension and radial translation that caused the scapholunate ligament tear and the radius fracture [15,16]. This is a transverse shear mechanism of injury. Mayfield et al. described the mechanism of perilunate dislocation, suggesting that injuring forces spread around the lunate but not through it, which is contrary to our case [17]. This is how Johnson described the damage to the first and second Gilula carpal arcs according to Bain (Fig. 4, red and blue line) [18]. Like Bain et al., we believe that lesions of the transunate arc must be added (Fig. 4, green line) [3,16]. Unlike Bain et al., we do not believe that capitate impaction on the lunate is the origin of the fracture; instead there is hyperextension with the forearm

extending from supination and pronation, leading to a transverse translation from the ulnar side to the radial side [19]. Our case could be classified as a variant of the transunar fracture–dislocation on an intact scaphoid with dorsal displacement (Fig. 8) [10].

The diagnosis is based on clinical examination and standard radiographs. CT scan must be performed if there is any doubt, in order to avoid a delay in diagnosis [1,2]; this ensures better planning of the procedure by avoiding intraoperative discovery of a fracture [20]. The CT scan can determine the type of fractures, their displacement and reveal any associated ligament injuries.

Treatment uses a dorsal approach to reduce the intra-articular fracture of the lunate and reduce the scapholunate and lunotriquetral diastasis by ligament reattachment and temporary K-wire pinning. In 2008, Firth and Aden recommended a dual dorsal/volar approach to reattach the dorsal scapholunate and volar lunotriquetral ligaments [21]. Despite the severity of the initial injury, no osteonecrosis of the lunate was observed [9]. Early lunate fixation is likely to reduce this risk [9,11].

Unlike some authors [9], we have not yet used arthroscopy in the care of these complex fracture–dislocations of the carpus affecting the proximal and distal carpal rows. Some of the potential advantages of arthroscopy are:

- comprehensive assessment of ligament damage, namely the intrinsic, extrinsic and cartilaginous ligaments;
- reduction in the size of the surgical incision, thereby postoperative stiffness;

Table 1
Summary of cases of transunate fracture–dislocations.

Authors	Number of cases	Lunate fracture type
Teisen and Hjarbaek [13]	1	Transverse (type IV)
Conway et al. [11]	3	Scaphoid frontal damage
Amavarati et al. [8]	1	Sagittal
Yakoubi et al. [14]	1	Frontal
Lavelle et al. [12]	1	Frontal
Briseño and Yao [20]	1	Frontal
Bain et al. [16]	22	Frontal
Akane et al. [9]	1	Frontal
Our study	1	Transverse with perilunate ligament damage without scaphoid lesion

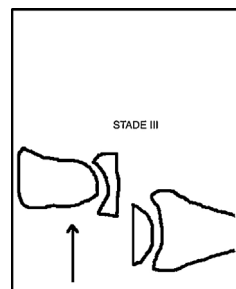


Fig. 8. Alternative mechanism in the Herzberg classification: transunate fracture–dislocation of intact scaphoid and stage III dorsal displacement.

- help determine the mechanism of injury and thereby propose a specific treatment [22]. The use of arthroscopy can also be considered for an isolated fracture of a bone in the proximal row [22–24]. It does not seem appropriate to use proximal row carpectomy as first-line treatment [14,25–27].

4. Conclusion

Our case is the first reported case of a transverse fracture of the lunate as part of a translunar fracture–dislocation with lunotriquetral and scapholunate damage. The injury mechanism confirms the translunate arc hypothesis. CT scan should be performed when the initial diagnosis is uncertain in order not to delay the treatment. The fracture must be perfectly reduced and requires – in our opinion – a surgical approach that allows for screw insertion and ligament repair to obtain satisfactory functional results.

Disclosure of interest

The authors declare that they have no competing interest.

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