Transstyloid Perilunate Fracture-Dislocations of the Carpus, a Review of Two Cases

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Abstract Transstyloid perilunate fracture-dislocations of the carpus resulting from a force in an ulnar-to-radial direction are rare injuries. We present two cases of transstyloid perilunate fracture-dislocations of the carpus, one of which dislocated palmarly and was accompanied with fractures of the triquetrum and the ulnar styloid. The treatment algorithms are described and a satisfactory reduction is the goal for optimal functional recovery.

Keywords Fracture dislocation of the carpus · Perilunate · Transstyloid

Introduction

Perilunate dislocations and fracture-dislocations of the carpus are relatively uncommon injuries [1] and represent only 10 % of all carpal injuries [2]. Volar perilunate fracture-dislocation of the carpus is a rare injury [3]. Fracture-dislocations of the carpus resulting from a force applied in a radial-to-ulnar direction have been described in previous case reports. While, the

fracture-dislocation pattern resulting from an ulnar-sided force is less described [4]. Fracture of the radial styloid rarely accompanies perilunate fracture-dislocation of the carpus. We present two cases of transstyloid perilunate fracture-dislocations of the carpus caused by ulnar-sided force. One case includes the rare combination of palmar displacement and triangular fracture.

Case Presentation

Case 1

A 41-year-old male driver was involved in a car-pedestrian accident. His left hip was directly impacted by the car and he fell down on his right side of body. His right arm and wrist was pressed under the body. Severe pain, deformity and limited motion were noticed immediately on the left hip joint and the right wrist. The patient was transferred to our department. Radiographs were taken and showed posterior dislocation of the hip and fracture of the left acetabulum. Radiographs of the right wrist demonstrated a radial styloid fracture, an ulnar styloid fracture, a palmar and radial perilunate dislocation with associated fracture of triquetrum (Fig. 1a and b).

Under anaesthesia, the palmar and radial perilunate fracture-dislocation of the carpus was closely reduced by traction and dorsal extension at 9 h after injury. The radial styloid was reduced and fixed with k-wires percutaneously. The fracture segments of the ulnar styloid and the triquetrum didn't disturb the flexion and extension of the wrist (Fig. 2a and b). No further reduction and fixation of the ulnar styloid

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Fig. 1 The anteroposterior (a) and lateral (b) radiographs of the right wrist showed a radial styloid fracture, an ulnar styloid fracture, a palmar and radial perilunate dislocation with associated fracture of the triquetrum

and triquetrum fractures was applied. The wrist was deemed to have a stable closed reduction and immobilized with a long arm spica cast. The cast and k-wires were removed under local anaesthesia 4 weeks later and the patient was started on physical rehabilitation. At 12-month follow-up, the anteroposterior and lateral radiographs (Fig. 3a and b) and three dimensional reconstruction images of computed tomography (Fig. 4a and b) of the right wrist were taken. The radiographs showed malunion of the triquetrum and the free body of the fractured ulnar styloid. No arthritis and avascular necrosis of the carpal bones were observed on the radiographs. The right wrist was painless, with 60 ° flexion, 40 ° extension, 30 ° ulnar deviation and 20 ° radial deviation. The patient returned to his previous work at 12 months postoperatively.

Fig. 2 The alignment of the carpal bones was restored. The fracture of the radial styloid was fixed with k-wires. The wrist was immobilized with a long arm spica cast. (a anteroposterior view and b lateral view)

Case 2

A 34-year-old male construction worker fell from 8-m height with the right arm and wrist pressed under the body. The patient sustained left comminuted calcaneal fracture, left femoral shaft fracture and a dorsal transstyloid perilunate dislocation of the right carpus (Fig. 5a and b). Under anaesthesia, closed manipulation was attempted to reduce the transstyloid perilunate dislocation of the carpus at 11 h after injury and a long arm spica cast was applied to fix the dislocation. Radiographs were taken and demonstrated an unreduced perilunate dislocation. An open dorsal approach was then made to reduce and fix the fracture dislocation at 15 h after initial injury. The scapholunate ligament, capitotriquetrum ligament and collateral carpal radial ligament were noted to be torn. The wrist joint was flexed

Fig. 3 The anteroposterior (a) and lateral (b) radiographs demonstrated the carpal bones, a malunion of the triquetrum and the free body of fractured ulnar styloid

and the capitatum was reduced to the lunate bone. The other carpal bones were subsequently reduced. The scapho-lunate, triquetrolunate and capitoulunate joints were stabilized with k-wires. The fracture of the radial styloid was then fixed with k-wires. The right wrist was immobilized with a long arm spica cast postoperatively (Fig. 6a and b). The left femoral shaft fracture and the left calcaneal fracture were treated with open reduction and internal fixation. The cast and the k-wires were removed 4 weeks after operation. Functional exercises and rehabilitational activities were carried out under the guide of professional rehabilitators. At 12-month follow-up, the radiographs delineated slightly displaced scapholunate joint and a 3 mm gap between the hamatum and lunatum (Fig. 7a and b). No arthritis and avascular necrosis of the carpal bones were observed on the radiographs of the wrist. The right wrist was mildly painful after long-hour work, with rang of motion limits

of 75 ° flexion, 45 ° extension, 30 ° ulnar deviation and 25 ° radial deviation. The patient continued his previous work as the pain was tolerated at 14 months postoperatively.

Discussion

Both patients were involved in high-energy traumas and both sustained multiple injuries. One of the common radiological features of the two cases is radial perilunate fracture-dislocation of the carpus. Although the patients can't describe the position of the injured arms in detail, it is reasonable to deduce that the perilunate fracture-dislocations may be caused by an ulnar-sided force based upon the radially displaced carpal bones demonstrated on radiographs of the right carpus. Fracture-dislocations of the carpus caused by a

Fig. 4 The palmar view (a) and the dorsal view (b) of the three dimensional reconstruction images of computed tomography demonstrated the alignment of the carpal bones, the malunion of the triquetrum and the free body of fractured ulnar styloid

Fig. 5 The anteroposterior (a) and lateral (b) radiographs of the right wrist delineated a radial styloid fracture and a slightly dorsal and radial perilunate dislocation

radial-to-ulnar force have been described in previous reports [3, 5–9]. The perilunate fracture-dislocation resulting from a force applied at the ulnar side of the wrist is rare. In case 1, the ulnar to radial and slightly dorsal to palmar force led to fractures of the ulnar styloid and the triquetrum. Then the force was transmitted through the radiocarpal joint, scapholunate joint and the distal radius, which resulted in palmar perilunate dislocation occurring in conjunction with a fracture through the radial styloid. In case 2, the force occurred in an ulnar to radial direction and in a slightly volar to dorsal direction, and was transmitted through the radiocarpal joint, scapholunate joint and the distal radius, which resulted in a dorsal perilunate dislocation associated with a fracture through the radial styloid. Transstyloid perilunate fracture-dislocation of the carpus is the second common characteristic of both cases. Another radiological feature of case 1 is the associated fractures of the triquetrum and the ulnar styloid.

Perilunate dislocations and fracture-dislocations are potentially serious wrist injuries, which are particularly important as they tend to attack young people and may lead to considerable long-term morbidity due to the development of radio-carpal arthritis, carpal instability, or median nerve damage [1]. Perilunate dislocation of the carpus can also lead to avascular necrosis of the carpal bones, especially the lunate. Lesire MR et al. studied the incidence of lunate necrosis in 110 perilunate dislocations and 21 cases (19 %) developed a necrosis during follow ups [10]. In addition, persistent wrist pain is very common [11]. In case 1, the wrist pain disappeared gradually along with progressive rehabilitation exercise and at 1 year follow-up, the patient suffered no pain. Unfortunately, the second patient still suffered mild wrist pain. Perilunate dislocation of the carpus was treated with conservative manipulative reduction and the fracture of the radial styloid was fixed with percutaneous

Fig. 6 The carpal bones were reduced and fixed with k-wires. The fracture of the radial styloid was also fixed with k-wires. The right wrist was immobilized with a long arm spica cast postoperatively. (a anteroposterior view and b lateral view)

Fig. 7 The anteroposterior (a) and lateral (b) radiographs demonstrated malalignment of scapholunate joint and a gap between the hamatum and lunatum at 12-month follow-up

k-wires in the first patient. Since open reduction increases the risk of secondary necrosis of the carpal bones to a great extent, Lesire MR et al. also advocated a closed reduction with percutaneous pin fixation for perilunate dislocation of the carpus [10]. Although the ulnar styloid and triquetrum fractures were not reduced and fixed, the carpal bones conformed to the distal radius well. The malunion of the triquetrum and the free segment of the ulnar styloid didn't disturb the motion of the wrist. Nonunion of the ulnar styloid is a common lesion resulting from upper extremity injuries [12]. The majority of non-unions is asymptomatic in spite of displacement on radiographs [13, 14]. Symptomatic nonunions are only found in a minority of these injuries. In symptomatic cases, the pain may be caused by abnormal motion from the nonunion site, instability of the distal radioulnar joint, or tear of the triangular fibrocartilage complex with or without distal radioulnar instability [12–15]. In case 1, the fracture segment of ulnar styloid was displaced and abnormal motion would not occurred in the nonunion site. The distal radioulnar joint was intact and stable. The patient was pain-free at 12-month follow up with satisfactory functional recovery of the affected wrist and a favorable prognosis can be expected in the long term. The second case was treated with open reduction and k-wire fixation after failure of the manipulative reduction in managing the perilunate dislocation. However, malalignment of carpal bones was observed on postoperative radiographs. Professional rehabilitation exercise rather than further operation was recommended to the second patient, since intensive exercises can improve the functional recovery of the wrist [16] and can avoid the potential avascular necrosis of the carpal bones caused by open surgery [10]. At 12-month follow-up, mild pain still disturbed the patient.

It should be noted that the reduction of both cases could be improved, particularly in the second case. In addition, we

should have fixed the scaphoid and lunate in place with k-wires to maintain the reduction and fixation in the first case. However, both patients sustained no arthritis and avascular necrosis of the carpal bones. The manipulative reduction or the ORIF with k-wires share the advantages of preserving the potentially affected blood supply of the carpal bones.

Conclusion

We described the radiological features of two cases of trans-styloid perilunate fracture-dislocation of the carpus. A satisfactory reduction is the goal for optimal functional recovery. It is necessary to minimize the damage to the blood supply of carpal bones to avoid avascular necrosis [16–18]. The marginal fracture segments can be ignored if they don't interfere with the motion of the wrist [13, 14].

References

1. Sochart DH, Birdsall PD, Paul AS (1996) Perilunate fracture-dislocation: a continually missed injury. *J Accid Emerg Med* 13:213–216
2. Brunner WG, Spencer RF (1992) Combined radio-carpal and mid-carpal dislocation. A case report. *J Hand Surg Br* 17:140–143
3. Masmejean EH, Romano SJ, Saffar PH (1998) Palmar perilunate fracture-dislocation of the carpus. *J Hand Surg Br* 23:264–265
4. Enoki NR, Sheppard JE, Taljanovic MS (2008) Transstyloid, translunate fracture-dislocation of the wrist: case report. *J Hand Surg Am* 33:1131–1134
5. Mason GC, Bowman MW, Fu FH (1986) Translunate, perilunate fracture-dislocation of the wrist. A case report. *Orthopedics* 9:1001–1004
6. Mudgal CS, Psenica J, Jupiter JB (1999) Radiocarpal fracture-dislocation. *J Hand Surg Br* 24:92–98

7. Watanabe K, Nishikimi J (2001) Transstyloid radiocarpal dislocation. *Hand Surg* 6:113–120
8. Amaravati RS, Saji MJ, Rajagopal HP (2005) Greater arc injury of the wrist with fractured lunate bone: a case report. *J Orthop Surg (Hong Kong)* 13:310–313
9. Takase K, Yamamoto K (2006) Unusual combined scaphoid and lunate fracture of the wrist: a case report. *J Hand Surg Am* 31:414–417
10. Lesire MR, Allieu Y, Bonnel F et al (1982) Traumatic etiology of Kienboeck's disease. (Perilunate subluxations and semilunate necrosis). *Ann Chir Main* 1:242–246
11. Martinage A, Balaguer T, Chignon-Sicard B, Monteil MC, Dreant N, Lebreton E (2008) Perilunate dislocations and fracture-dislocations of the wrist, a review of 14 cases. *Chir Main* 27:31–39
12. Protopsaltis TS, Ruch DS (2010) Triangular fibrocartilage complex tears associated with symptomatic ulnar styloid nonunions. *J Hand Surg Am* 35:1251–1255
13. Zenke Y, Sakai A, Oshige T, Moritani S, Nakamura T (2009) The effect of an associated ulnar styloid fracture on the outcome after fixation of a fracture of the distal radius. *J Bone Joint Surg 91B*: 102–107
14. Hauck RM, Skahen J III, Palmer AK (1996) Classification and treatment of ulnar styloid nonunion. *J Hand Surg* 21A:418–422
15. May MM, Lawton JN, Blazar PE (2002) Ulnar styloid fractures associated with distal radius fractures: incidence and implications for distal radioulnar joint instability. *J Hand Surg* 27A:965–971
16. Soejima O, Iida H, Naito M (2003) Transscaphoid-transtriquetral perilunate fracture dislocation: report of a case and review of the literature. *Arch Orthop Trauma Surg* 123:305–307
17. Worland RL, Dick HM (1975) Transnavicular perilunate dislocations. *J Trauma* 15:407–412
18. Moneim MS, Hofmann KE 3rd, Omer GE (1984) Transscaphoid perilunate fracture-dislocation. Result of open reduction and pin fixation. *Clin Orthop Relat Res* 190:227–235