CASE REPORT

SINGLE-STAGE REDUCTION OF NEGLECTED PERILUNATE DISLOCATION: A CASE REPORT

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ABSTRACT

Neglected perilunate dislocations are rare and challenging injuries. We report a 59 days old perilunate dislocation in a 55 year old right-handed male. X-ray and CT imaging revealed a dorsal perilunate dislocation with no additional fractures and no increased density or microarchitectural collapse of the lunate or scaphoid. A single-stage open reduction and internal K-wire fixation procedure through a dorsal and volar approach was done. Eighteen months after the procedure, the patient was pain free during movement and had a ROM of 70%. His grip strength was 80.8% the opposite side and the Mayo wrist score was calculated 75. Full range of finger movement was achieved and he carried out his routine without any other complication.

Keywords: *Perilunate dislocation, wrist, chronic injury, lunate bone.*

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INTRODUCTION

Perilunate dislocation is a rare high-energy injury (1). It is characterized by a disruption of most capsular and ligamentous connections of the lunate and the adjacent carpal bones. The bone stock needs to be strong enough to resist the amount of torque involved in lunate dislocations without causing fractures (2). Reasonably, most patients are therefore young males (3). The ligament disruption may also be associated with different carpal fractures (4) and thus encompasses a spectrum of injuries. Data documenting the global epidemiology of these injuries is limited. Duckworth et al. (3) demonstrated an incidence of $0.5/10^5$ individuals per year. In neglected cases a soft tissue contracture develops, with reduces the space to seat the bones. Additionally, there is a increased chance of avascular necrosis. This injury is therefore very difficult to treat (1,5). The natural history of untreated or poorly treated perilunate injuries is progressive wrist arthritis, median nerve dysfunction, chronic regional pain syndrome and weak grip (6). Up to our knowledge, there is a lack of information in the literature regarding the management of neglected fracture dislocation of the carpal bones presenting 6 weeks after injury (7). Most authors agree that open reduction and internal fixation is necessary and may be used up to 2 months following injury (6-8) mainly using a two-stage procedure (5,7). We present a successful single-stage reconstruction in a neglected perilunate dislocation. Our procedure achieved an excellent postoperative result despite the observed capitolunate synostosis.

CASE REPORT

An 55 year old, right-handed male school teacher sustained a fall from height on a dorsal flexed hand 59 days ago. The patient did not seek immediate medical attention. He presented as regularly scheduled patient with a painful and stiff wrist without any neurovascular deficit. The anteroposterior and lateral X-ray of the right wrist revealed a dorsal perilunate dislocation (Mayfield III) with no additional fractures (Figure 1).



Figure 1. Preoperative antero-posterior and lateral radiography of the right wrist. Near the index proximal phalanx a metal foreign body (arrow).

Computed tomography (CT) of the wrist showed no carpal bone fractures and no increased density or microarchitectural collapse of the lunate or scaphoid (Figure 2).



Figure 2. Preoperative CT image of the right wrist with perilunate luxation.

A single stage treatment under tourniquet control was planned. Open reduction and internal fixation was done by a combined volar and dorsal approach to the wrist joint. Initially, through a volar approach, the carpal tunnel was released. Realignment of the bones was assisted by a second longitudinal dorsal incision. No damage to the articular surface of the capitate or lunate was noted (Figure 3).



Figure 3. Periperative photograph showing the lunate denuded of soft tissue. No damage to the articular surface is seen.

The lunate, which was denuded of soft tissue attachments on the radial and ulnar side (Scapholunate and Lunotriquetral ligament tear), was stabilized with tree Kirschner (K) wires (Narcissus, Ada, Serbia) to the capitate, triquetrum and scaphoid. A fourth K wire was applied securing the scaphoid, capitate and hamate bone (Figure 4). The K-wire position was checked under fluoroscopy and the wires were cut above the skin. The volar lunate ligaments were secured with two 1,5 mm bone anchors. After the reduction and fixation of the bones to their normal position, an below elbow spica slab was applied in functional position of hand and forearm.

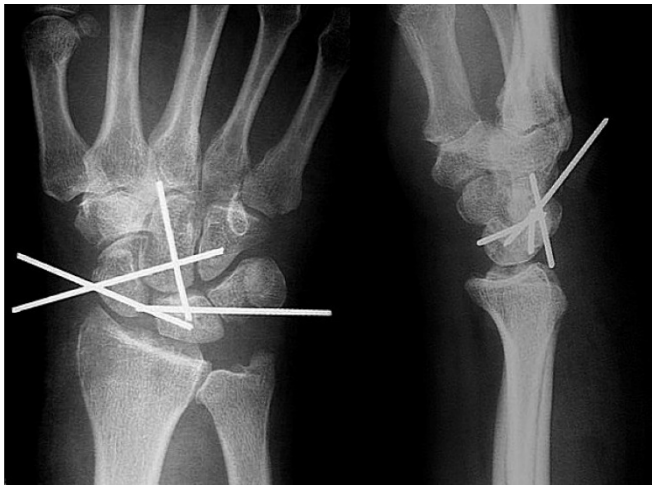


Figure 4. Postoperative anteroposterior and lateral radiography showing lunate bone stabilization with four K-wires.

Suture removal was done at 2 weeks and a below elbow spica slab was continued for 4 weeks. The K-wires were removed after 9 weeks. Even before the last K-wire was removed, the patient was mobilized, for active/assisted hand and wrist mobilization. Strengthening exercises were started after complete K-wire removal.

Eighteen months after the procedure, the patient was pain free during movement and had 30° wrist flexion, 40° wrist extension (range of motion (ROM) 70°) (Figure 5). He had 25° ulnar and 20° radial deviation. His grip strength was 25.8kg (80.8% the opposite side) and the Mayo wrist score was calculated 75 with is referred as „good“. Full range of finger movement was achieved and he carried out his routine without any other complication. Due to a metal foreign body in his index finger a follow up MRI scan was not done. The radiography and CT scan revealed abnormal bone positions, no evidence of radiocarpal arthritis and a capitolunate synostosis. His carpal indices were: Scapholunate angle 70°, lunocapitate angle -20°, and scapholunate distance 3 mm (Figure 6).

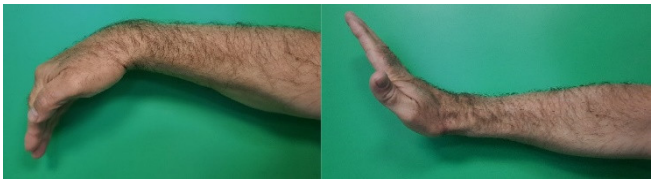


Figure 5. Clinical photographs showing range of movement of the right wrist.



Figure 6. Radiography and CT scan 18 months after the procedure reveals a capitolunate synostosis (arrow).

DISCUSSION

Direct comparison of the operative results for chronic perilunate injuries is difficult because of the variability of cases and low incidence of these injuries. In our patient, there was no evidence of lunate osteonecrosis or instability, despite the duration of displacement and the absence of any soft tissue attachments ascertained during the operation. Perilunate dislocation and fracture-dislocation extremely alter the intercarpal relationships, still they are frequently misinterpreted during initial evaluations. Late reduction of perilunate dislocations is difficult and salvage procedures such as proximal row carpectomy, excision of the lunate or wrist arthrodesis

have been recommended (9). One of the first articles dealing with neglected perilunate dislocations was published in 1988 by *Siegert* et al. (10). In their study of sixteen neglected perilunate dislocations the best outcome was achieved with open reduction and internal fixation as in our procedure. *Inoue* et al. (8) treated twenty-eight patients with neglected perilunate dislocation. They concluded that proximal row carpectomy should be considered in chronic perilunate dislocations who are seen 2 months after injury. Their findings are in accordance with our position. *Kailu* et al. (11) also reported good follow up results in their six chronic perilunate dislocations concluding that open reduction and internal fixation can be applied in the treatment of delayed and some chronic cases. *Garg* et al. reported sixteen patients treated more than 3 months after injury in a two stage reconstruction procedure (4).

We performed an open reduction single stage fixation with K-wire through a dorsal and volar approach. There is a number of reasons for our single stage procedure. Firstly, we did not have access to a gradual distraction external fixator. Secondly, we did not discover any fractues, meaning that an open reduction was more difficult to achieve, but finally the lunatum was more stable. Lastly, the length of treatment is significantly shorter.

Massoud and *Naam* (6) conducted a study treating 19 chronic perilunate dislocations and gained a postoperative ROM averaged 72° (42° flexion, 30° extension), which is similar to our study. They used a single volar approach for 12 patient and a combined approach for the remaining 7 patients. *Israel* et al. showed their operative results of 16 perilunate dislocations and had substantial better ROM (127°± 26°) (5). However their patients were treated mostly hours after admission and the study participants had 33 years on average. It's worth mentioning that a wide range of results (ROM 66°-144°) are achieved in similar studies (5). At the final follow-up of our patient, the lunate was relatively dorsally flexed on the lateral view but the lunocapitate angle was -20°, this might be the reason for decreased dorsiflexion.

Komurcu et al. (9) showed that their delayed treated group had a grip strength of 26.33 ± 13.48 kg with is similar to our patient. Compared with the contralateral side *Massoud* and *Naam* (6) accomplished an averaged postoperative grip strength of 87%. Their study group, of chronic perilunate injuries, consisted of younger individuals averaged 27 years. As with the previous measure, a wide range of results (59% - 87% of opposite side) is achieved in similar studies (5).

Kremer et al. (12) reported a decreased Mayo wrist score in patients treated with a combined approach compared with those treated with a single dorsal approach (64.3 vs 79.4). Our patient had a better outcome score although he was treated with a combined approach. *Forli* et al. (13) reported the long-term outcomes of 18 patients with perilunate luxation and at least 10 years of follow-up. They found a average Mayo wrist score of 76. Their result is similar to ours although we did not have a such long follow up. *Massoud* and *Naam* (6) reported in their study of chronic perilunate injuries a average Mayo wrist score of 56. Similarly, *Israeli* et al. (5) reported a mean Mayo wrist score of 68±12 in their 16 perilunate dislocations. These scores are lower than the score of our patient. The difference may be attributed to the fact that our patient is not a manual worker, and he has not experienced pain during his daily routine.

The authors are aware that a larger number of single-stage reconstructions is necessary in order to have a better insight into the success of this procedure.

CONCLUSION

Neglected perilunate dislocations are rare and challenging injuries. We believe that better results can be achieved with open reduction and internal fixation rather then lunate excision. Although radiologic result does not always correlate with the clinical outcome, acceptable result in our case indicates that open reduction and internal fixation can be preferred as a treatment in delayed cases.

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INSTITUTIONAL REVIEW BOARD STATEMENT

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INFORMED CONSENT STATEMENT

Patient informed consent was aquired before writing of this report.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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