

Functional outcome of neglected perilunate dislocations treated with open reduction and internal fixation

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ABSTRACT

Introduction: Management of neglected perilunate dislocations is controversial. The various procedures such as open reduction and internal fixation (ORIF), proximal row carpectomy, lunate excision, and wrist arthrodesis have been advocated. The aim of our study was to evaluate the functional outcome of neglected perilunate dislocations managed by ORIF.

Materials and Methods: Over a period of 10 years (1996 to 2006), 14 patients with neglected perilunate dislocations (undiagnosed or untreated for 6 weeks or more) were managed by ORIF. Six patients had dorsal trans-scaphoid perilunate dislocation, 6 patients had volar lunate dislocation while the remaining two had a dorsal perilunate dislocation. The results were evaluated by clinical scoring system of Cooney *et al.*

Results: The average followup was 4.1 years (range 2-12 years). All except one of the patients operated earlier than 5 months had good results. Of the four patients operated after 5 months, two had a fair result while two had a poor outcome. Chondral damage to the capitate was noted intraoperatively in both the cases with poor outcomes. The two patients were found to have avascular necrosis (AVN) of the lunate; however, functional outcome was fair in both, and both were able to return to their profession.

Conclusion: We observed favorable functional results of ORIF in neglected perilunate dislocations up to 5 months after injury. The development of AVN or midcarpal arthritis was not a major disabling factor as long as stability of wrist has been restored. Beyond 5 months, an alternative surgical procedure such as proximal row carpectomy should be contemplated as results of ORIF have not been good uniformly.

Key words: Carpal, neglected, open reduction internal fixation, perilunate dislocation

INTRODUCTION

Perilunate injuries are high energy injuries and encountered in young adults.¹ Up to 25% are diagnosed late, either due to delay in presentation, poor interpretation of radiographs or due to associated injuries that require more urgent attention.¹⁻³ Patients who present within 6 weeks of injury are managed in a manner similar to acute injuries.^{3,4} The treatment in such cases is accurate reduction, ligament reconstruction, and stable fixation till the construct is healed.^{5,6} However, in neglected cases there is no consensus on the most appropriate

treatment method.⁵ The alternative procedures such as proximal row carpectomy,^{7,8} lunate excision,^{9,10} and wrist arthrodesis are described.¹¹ Some have even reported long-term good results with an unreduced dislocation.¹²

We present a retrospective analysis of functional outcome of perilunate dislocation managed with ORIF.

MATERIALS AND METHODS

Fourteen patients between 1996 and 2006 with neglected perilunate dislocations were treated. One patient had bilateral volar lunate dislocation. The cases were classified as neglected if these were undiagnosed or untreated for 6 weeks or more.

Out of 14 patients, 10 cases were initially managed in peripheral centers where the diagnosis was missed. Three patients got treatment from osteopaths. The patient with bilateral volar lunate dislocation remained undiagnosed due to polytrauma and associated head injury. The diagnosis was made subsequently when an attempt was made to mobilize the patient with crutches and he complained of pain in both wrists. The average age of these patients was 34.6 years (range 21 - 48 years). The age with a predominance of males

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(12 males, 2 females). The dominant hand was involved in 11 patients, non-dominant side in 2 patients, and 1 patient had bilateral involvement. The treatment delay is ranged from 6 weeks to 1.5 years [Figure 1].

Out of 14 cases, 6 patients had a dorsal trans-scaphoid perilunate dislocation, 2 patients had a dorsal perilunate dislocation, and 6 patients had a seven volar lunate dislocation with one patient having bilateral volar lunate dislocation. All the patients had painful restriction of wrist movements or weak grip strength. Four patients with volar lunate dislocation had symptoms of chronic median nerve compression; one patient with bilateral volar lunate dislocation had symptoms of median nerve dysfunction in one hand and ulnar nerve dysfunction in the other.

Open reduction was performed through the dorsal approach in eight patients (six with dorsal trans-scaphoid perilunate dislocation and two with dorsal perilunate dislocation). The dense fibrous tissue from the carpal joint spaces using a fine bone nibbler was removed. The scaphoid fracture surfaces were freshened using a fine curette. Manual longitudinal distraction was then applied intraoperatively. A blunt small curved periosteum elevator was used to carefully shoe-horn or lever the capitate into the lunate fossa and reduce the luno-capitate joint. In two patients with dorsal perilunate dislocations, two 1.5 mm K-wires were used as joysticks in the scaphoid and lunate. The lunate was flexed and the scaphoid extended, while an assistant drove K-wires across scapho-lunate, luno-triquetrum, and capito-lunate articulations. The scaphoid fractures in the six patients with dorsal trans-scaphoid perilunate dislocations were fixed using Herbert screws. Bone grafting was done in all six cases with graft taken from the distal radius. Combined volar and dorsal approach was used in the six patients with seven volar lunate dislocations. The volar approach enabled decompression of the median nerve and facilitated clearing of the lunate fossa and subsequent lunate reduction. K-wires were used to stabilize the scapho-lunate, luno-triquetrum, and capito-lunate articulations. The capsular rents were repaired using reabsorbable sutures.

Postoperatively, the wrist was immobilized in the neutral position, using a below elbow Plaster of Paris (POP) cast. The POP was changed at 4 weeks, and discontinued after 8 weeks post-surgery, when K-wires were removed. A wrist brace was continued for another 4 weeks along with wrist mobilization exercises. In patients (n=6) with scaphoid fracture, the cast was continued for 12 weeks post-surgery.

Serial wrist radiographs were done routinely at 6 weeks, 12 weeks, 6 months and at last followup. Clinical and radiological assessment of results was done at last

followup. The patients were evaluated according to the clinical scoring system described by Cooney *et al.*¹³ [Table 1].

The patients were followed-up for an average period of 4.1 years (2-12 years). Among the six patients with dorsal trans-scaphoid perilunate dislocation, four patients had a good outcome score [Table 2]. There was one fair and one poor outcome. Among the six patients with volar lunate dislocation, there were four good results and two fair outcomes. Among the two cases with dorsal perilunate dislocation, one patient had a good result and the second patient presenting 68 weeks after the injury had a poor result. One patient with dorsal trans-scaphoid perilunate dislocation had delayed fracture healing. The scaphoid eventually united by 4.5 months. The patient with dorsal

Table 1 Clinical scoring chart (Cooney, 1987)¹³

Category and description	Points
Pain (25 points)	
None	25
Mild occasional (with heavy use)	20
Moderate (with normal use, not at rest)	10
Severe, constant	0
Range of motion (25 points)	
Flexion + Extension (degrees)	
>140	25
100-140	20
70-99	15
40-69	10
<40	0
Grip strength (25 points) ^a	
Normal	25
Diminished but >50% of normal	15
Less than 50% of normal	0
Activities (25 points)	
Same activities	25
Restricted activities caused by injured wrist	15
Change of work or sport caused by injured wrist	0

Excellent ≥ 95 points; good ≥ 75 points; fair ≥ 60 points; poor < 60 points; ^a normal is the contralateral side (minus or plus 10% depending on dominance) if not disabled. If disabled, then reference is made to normal estimated values with respect to age

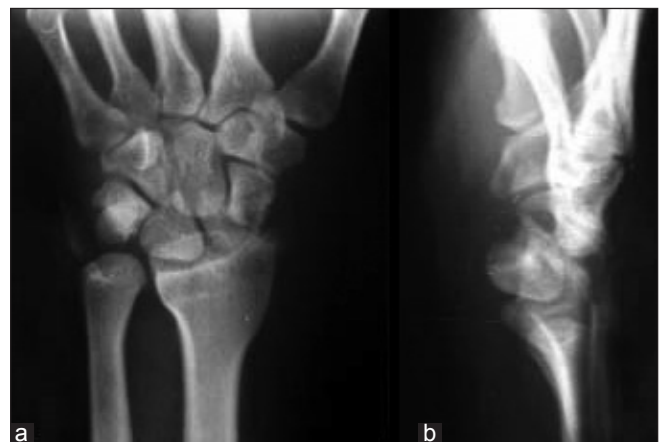


Figure 1 (a and b): Anteroposterior and lateral views of wrist showing dorsal transscaphoid perilunate dislocation

perilunate dislocation presenting at 68 weeks developed mid-carpal arthritis clearly seen at 2 year followup visit [Figure 2]. Two patients (including the patient with bilateral involvement) with volar lunate dislocation presenting more than 5 months after injury eventually developed avascular necrosis (AVN) of the lunate and mid-carpal arthritis of all the involved wrist joints [Figures 3 and 4]. Over all 5 wrist (3 volar dislocation, 1 trans-scaphoid and one dorsal dislocation) were operated after 5 months had poor ($n=2$), fair ($n=3$) result.

RESULTS

No patient had an excellent result. All patients except two returned to pre-injury work at an average time period of 25 weeks (20–36 weeks). No patient had post-operative

wound healing problems. No post-operative neurological deterioration was encountered. The four patients (3 median N + one ulnar N) with pre-operative neurological deficit improved gradually over a period of 10 to 18 weeks postoperatively (average 13.5 weeks).

DISCUSSION

Perilunate dislocations represent approximately 10% of all wrist injuries and are diagnosed late in 25% of cases.⁵ This percentage may be even higher in developing countries where lack of awareness and inadequate penetration of medical facilities in rural areas compounds the problem.

Late diagnosed perilunate dislocation (PLD) presents with many issues; principal among these are the anticipated

Table 2: Summary of the patients

Case	Age (yrs)	Sex	Type of dislocation	Delay (weeks)	Nerve deficit	Approach	Complications	Pain	ROM	Grip	Activity	Total	Outcome score
1	21	M	Trans-scaphoid	6		Dorsal		20	20	25	25	90	Good
2	24	M	Trans-scaphoid	8		Dorsal		20	20	25	25	90	Good
3	37	M	Volar lunate	10	Median nerve	Combined volar and dorsal		20	15	25	25	85	Good
4	42	M	Dorsal PLD	11		Dorsal		20	15	15	25	80	Good
5	29	M	Trans-scaphoid	9		Dorsal		20	15	25	25	85	Good
6	33	M	Trans-scaphoid	18		Dorsal	Scaphoid union delayed till 4.5 months	20	10	15	15	60	Fair
7	46	M	Volar lunate	16		Combined volar and dorsal		20	15	25	15	75	Good
8	40	F	Volar lunate	18		Combined volar and dorsal		20	15	25	15	75	Good
9	34	M	Volar lunate	22	Median nerve	Combined volar and dorsal	Lunate AVN, midcarpal arthritis	10	20	15	15	60	Fair
10	29	M	Trans-scaphoid	16		Dorsal		10	20	25	25	80	Good
11	27	M	Trans-scaphoid	33		Dorsal	Midcarpal arthritis	10	15	15	0	40	Poor
12	30	F	Volar lunate	19	Median nerve	Combined volar and dorsal		20	15	25	25	85	Good
13	45	M	Volar lunate	21	Median nerve	Combined volar and dorsal	Lunate AVN, midcarpal arthritis	10	20	15	15	60	Fair
			Volar lunate	21	Ulnar nerve	Combined volar and dorsal	Lunate AVN, midcarpal arthritis	10	20	15	15	60	Fair
14	48	M	Dorsal PLD	68		Dorsal	Midcarpal arthritis	10	10	0	0	20	Poor

ROM: Range of motion; AVN: Avascular necrosis; PLD: Perilunate dislocation

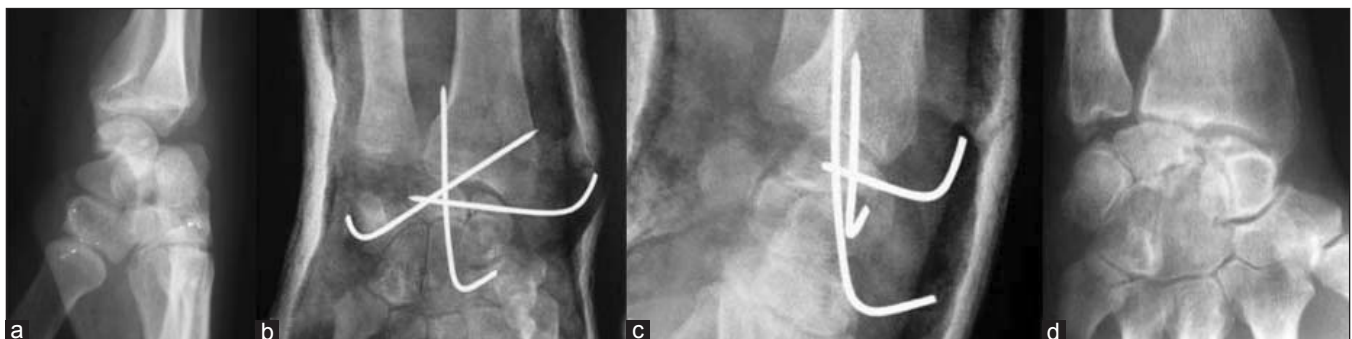


Figure 2: (a) Preoperative X-ray picture, lateral view, of a 1.5-year-old showing unreduced perilunate dislocation. (b and c) anteroposterior and lateral view of same case after open reduction and internal fixation with K-wires. (d) Follow-up X-ray at 2 years



Figure 3 (a-d): X-ray photographs. AP and lateral views of both wrists showing bilateral volar lunate dislocation



Figure 4 (a and b): Clinical outcome of same case (as in Figure 3) at one year post surgery showing fair result



Figure 4 (c-f): X-ray results of both sides, showing evidence of AVN, collapse, and mid-carpal arthritis

complications at surgery due to extensive fibrosis and scarring, uncertainty of return of full function after reduction, and possibility of developing AVN of reduced lunate postoperatively. There is always potential for mid-carpal arthritis to develop in late cases. Furthermore, numerous treatment options have been advocated. These range from ORIF^{14,15} proximal row carpectomy,^{7,8} lunate excision,^{9,10} and wrist arthrodesis.¹¹

There is no consensus about the upper time limit till when open reduction of perilunate dislocations could be

attempted without significant complications. Komurcu *et al.*¹⁶ performed ORIF in six cases with trans-scaphoid perilunate dislocation up to 40 days post-injury (average 26 days) and reported favorable results. Takami *et al.*¹⁷ recommended ORIF up to 2 months post-injury. Seigert *et al.*¹⁸ reported good results of chronic perilunate dislocations reduced as late as 35 weeks after injury; nevertheless, the incidence of good results reduces significantly with delays more than 8-12 weeks post-injury. In our series, cases operated earlier than 5 months have good results. Of the four patients (5 wrist) operated after 5 months, two had a fair result while three wrist had a poor outcome. Our findings are similar to those of Kailu *et al.*⁵ who have reported a favorable outcome in cases delayed up to 25 weeks.

Kailu *et al.*⁵ have also noted that poor results correlate with not only duration of injury but with also the presence of chondral damage. This is also borne out by our study as significant chondral damage to the capitate was noted intra-operatively in both the cases with poor results.

Dimitriou *et al.*¹⁹ have noted that avascular collapse of lunate does not always leads to significant functional disability. This observation is supported by our study. Both our patients with AVN of the lunate had a fair outcome and were able to return to their professions. Kailu *et al.*⁵ have emphasized repair of scapho-lunate and lunotriquetral ligaments in neglected perilunate dislocations. Seigert¹⁸ performed ligament repair in one out of six patients with chronic perilunate dislocation. In our experience with 14 cases, stabilization of the reduced carpus with K-wires across the scapho-lunate, luno-capitate, and luno-triquetral joints provides a satisfactory functional outcome. We believe that with extensive fibrosis and scarring in chronic cases and the extensive dissection required to reduce the dislocation; attempting to repair the retracted ligament ends is not worthwhile. Both Kailu *et al.*⁵ and Siegert *et al.*¹⁸ have not commented on the technique used to perform repair in neglected cases. Furthermore, it may be suggested to use a wrist distracter intra-operatively or if possible, a few days preoperatively to help overcome the extensive fibrosis and scarring and to facilitate the clearing of the lunate fossa.

Other options for management in this unique neglected injury pattern have been reported. Arthrodesis of wrist is reported to give painless and stable joint, it may not be acceptable to most patients. MacAusland⁹ and Russell¹⁰ reported satisfactory results after excision of the lunate in cases with lunate dislocations. Later on, Seigert *et al.*¹⁸ and Inoue *et al.*²⁰ reported that excision of lunate alone may lead to irreversible changes due to the development of radioscaphoid arthritis. Seigert *et al.*¹⁸ and Rettig⁸ have reported favorable results with proximal row carpectomy in 2 and 12 cases, respectively. This study indicates that the functional results of ORIF in neglected perilunate dislocations up to 5 months after injury are favorable and even the development of AVN or midcarpal arthritis may not be a major disabling factor, as the benefits of a stable wrist could outweigh the disadvantages. However, beyond 5 months, an alternative surgical procedure such as proximal row carpectomy may be kept in mind.

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