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Outcome assessment of two stage reduction and fixation in neglected trans scaphoid peri lunate fracture dislocation

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ABSTRACT

Background: Perilunate instability is a type of carpal instability complex. Perilunate injuries occur after high-energy traumas to the wrist or falls on the outstretched hand.
Methods: The hospital based prospective study was held in the department of Orthopaedics, SMS medical college and Hospital, Jaipur from April 2016 to November 2017. It included 25 cases of neglected trans scaphoid peri lunate fracture dislocation treated in 2 stages surgical procedures.
Results: Median nerve was involved in 6 (24%) patients. Pain was also graded as subjective pain. Most of patients had pain free wrist at 1 year follow up post surgery while 2 patients had pain on routine activity, 5 patients had pain on sternous activity and pain was permanent in 1 patient. Mean scapholunate and radiolunate angles were 54 degrees (range 40 to 60 degrees) and 9.8 degrees (range 5 to 15 degrees) on the immediate postoperative radiographs and 54.8 degrees (range 40 to 65 degrees) and 10.6 degrees (5 to 20 degrees) at 1 years follow up. Mild degenerative changes were seen in the radiocarpal joint in 3 patients and in midcarpal joint in 4 patients one patient had both radiocarpal joint arthritis and midcarpal joint arthritis two patients developed superficial pin tract infection.
Conclusions: On the basis of our study we finally conclude staged reduction should be considered for neglected trans scaphoid peri lunate dislocations.

Keywords: Scaphoid peri lunate, Dislocations, Midcarpal joint, Radiocarpal joint

INTRODUCTION

The stability of the wrist during motion and interrelated motions depends on the capsuloligamentous integrity and the contact surface contours of the carpal bones.[1] Carpal instability is a broad term that is used to describe the carpal position that results following disruption to bone and/or wrist ligaments. These injuries are mostly the result of a fall from a height, a motor vehicle or motorcycle accident, or a sporting event. Young men are usually affected by this injury, with an average age of 30 years.[2-4]

Perilunate instability is a type of carpal instability complex. Perilunate injuries occur after high-energy traumas to the wrist or falls on the outstretched hand. They produce a marked and variable disruption of the carpal anatomy, but their constant and defining feature is a dislocation of the head of the capitate from the distal surface of the lunate, most often dorsalward but sometimes anteriorward. As they represent a continuum of progressive ligamentous and bony damage many variations can be observed depending on the direction and amplitude of the deforming forces, anatomical differences in the carpal bones, and the status of the

ligaments and the muscles when the injury was sustained.[5-10]

Perilunate injuries (PLIs) are uncommon, present in two common patterns: the perilunate dislocation (PLD) and the perilunate fracture dislocation (PLFD).[2]

The treatment of perilunate injuries has evolved over the years and includes closed reduction and immobilization, closed reduction and percutaneous fixation, external fixation combined with or without internal fixation, open reduction and fixation with Kirschner wires (k wires) or screws, lunate excision, proximal row carpectomy and 4-corner fusion.[11-22] Trans-scaphoid fractures can be treated with or without bone graft from the distal radius; scaphoid comminution is a good indication for grafting. Garcia-Elias and colleagues found that trans-scaphoid patterns have a 3.8% incidence of concomitant complete scapholunate disruption.[11] Recent popularity over arthroscopic-assisted percutaneous fixation for scaphoid fractures has spurred the use of these alternative treatment options for trans-scaphoid perilunate dislocations.

METHODS

The hospital based prospective study was held in the department of Orthopaedics, SMS medical college and Hospital, Jaipur from April 2016 to November 2017. It included 25 cases of neglected trans scaphoid peri lunate fracture dislocation treated in 2 stages surgical procedures with following criteria.

Inclusion criteria

Inclusion criteria were patient having closed trans scaphoid peri lunate fracture dislocation with duration of injury more than 6 weeks; skeletally mature patient; absence of any major comorbid illness; absence of any fracture lines extending up to the wrist joint; patient consenting to be included in study.

Exclusion criteria

Exclusion criteria were co-morbid condition affecting fracture union; ipsilateral metacarpal fracture, phalanx fracture and distal radius /ulna fracture; refusal of patient being a part of study; open fracture.

Upon arrival in orthopaedics OPD of SMS hospital all patients were thoroughly evaluated for preliminary information regarding name, age, sex, address, date of injury, mechanism of injury and other associated injury. Patients were subjected to routine blood investigations including blood hemoglobin level, total and diffrential leukocyte counts, ECG and chest x-ray. A pre anaesthetic checkup was performed. The affected part and corresponding upper limb was prepared just the night before.

Patients position

The patient was positioned supine on the operating table, and the affected extremity was placed on a radiopaque hand table. An upper-arm tourniquet was applied, being well padded, and the tourniquet is inflated after the arm was prepared and draped.

Approach and incision

A spanning external fixator was applied across the carpal bones with two pins in dorsolateral aspect of the radius and two pins in the second metacarpal. This was used for gentle distraction across the carpal bones at the rate of 1 mm per day.

Post operative management

Mobilisation of the shoulder, elbow and digital articulations were started in the immediate postoperative period. The hand was elevated for 48 hours, and the patient's neurologic and vascular status were monitored. Patient was kept for overnight admission to the hospital.

Follow up

Patients were followed up with weekly radiographs following surgery to judge adequate distraction. Distraction was termed adequate when there was no change in the intercarpal alignment on further distraction with the proximal pole of capitate coming to lie at the level of distal part of lunate in the lateral radiograph and radiocarpal joint started distracting.

This was followed by a second stage open reduction and internal fixation of the carpal bones and intercarpal ligament reconstruction using dorsal approach.

Statistical analysis

Statistical analysis was performed with the SPSS, version 21 for Windows statistical software package (SPSS inc., Chicago, IL, USA). The Categorical data was presented as numbers (percent) and were compared among groups using Chi square test. The quantitative data was presented as mean and standard deviation and were compared by students t-test. Probability was considered to be significant if less than 0.05.

RESULTS

Most of the patients of our study belonged to the productive age group i.e. 21-30 years. Oldest patient in our study is 56 years old while youngest is 18 years old. Males are representing the largest group afflicted with neglected trans scaphoid peri lunate fracture dislocation in our study. According to Herzberg's radiological classification, 16 patients were type A, 1 patient was type A1, 2 patients were type B, 5 were type B1 and 1 was type C1.

Table 1: Distribution of duration b/w injury and surgery according to Functional outcome.

Duration b/w inj n sx	Functional			
	Excellent	Good	Satisfactory	Poor
1.5 mth	8	-	-	-
2 mth	4	-	-	-
2.5 mth	1	5	-	-
3 mth	-	2	-	-
3.5 mth	-	1	-	-
4.5 mth	-	-	1	-
5 mth	-	-	2	-
10 mth	-	-	-	1
Total	13	8	3	1

8 patients were operated at 1.5 months and 4 patients were operated at 2 months after injury had excellent functional outcome. 6 patients were operated at 2.5 months after injury of which 1 had excellent and 5 had good functional outcome. 2 patients were operated at 3 months and 1 was operated at 3.5 months after injury had good functional outcome. 3 patient had satisfactory functional outcome of which 1 was operated at 4.5 months and 2 patients were operated at 5 months after injury. 1 patient was operated at 10 months after injury and had poor functional outcome.

Table 2: MN recovery.

		Number of cases	Percentage (%)
MN Involved	Yes	6	24.00
	No	19	76.00
	Total	25	100.00

Median nerve recovery was present in 6 (24%) patients. In all these patients median nerve recovered fully at 1 year follow up post surgery.

Table 3: Subjective pain.

	Number of cases	Percentage (%)
N	17	68.0
Pain on sternous activity	5	20.0
Permanent pain	1	4.0
Pain on routine activity	2	8.0
Total	25	100

Pain was also graded as subjective pain. Most of patients had pain free wrist at 1 year follow up post surgery while 2 patients had pain on routine activity, 5 patients had pain on sternous activity and pain was permanent in 1 patient.

Mean scapholunate and radiolunate angles were 54 degrees (range 40 to 60 degrees) and 9.8 degrees (range 5 to 15 degrees) on the immediate postoperative radiographs and 54.8 degrees (range 40 to 65 degrees) and 10.6 degrees (5 to 20 degrees) at 1 years follow up.

Table 4: Post op x-ray.

	Post op x-ray		1 year		P value
	Mean	SD	Mean	SD	
Scapholunate angle (SLA)	54	6.12	54.8	7.56	0.682
Radiolunate angle unit (RLA)	9.8	3.37	10.6	4.85	0.502

Table 5: Flexion -Extension arc.

	Mean	SD
Flexion	57.48	5.40
Extension	43.32	6.56
Complete Arc	101.2	11.01

Mean wrist flexion is 57.48±5.40 degrees (40 to 65 degrees), extension is 43.32±6.56 degrees (20 to 55 degrees) mean flexion extension arc is 101.2±11.01 degrees.

Table 6: Complications.

	Number of cases
MCJ	4
MCJ, RCJ	1
RCJ	3
SPTI	2
Total	25

Mild degenerative changes were seen in the radiocarpal joint in 3 patients and in midcarpal joint in 4 patients one patient had both radiocarpal joint arthritis and midcarpal joint arthritis two patients developed superficial pin tract infection.

DISCUSSION

There are many reports on treatment of acute perilunate dislocations. But the treatment of chronic perilunate dislocations is less often discussed. Late presentation of these injuries not only complicates the treatment but also makes results less satisfactory. Proper evaluation of patients with wrist injuries is thus very important to exclude perilunate instability. Failure to get stress views in suspected cases and unfamiliarity of the treating physician with the normal carpal anatomy can lead to perilunate dislocation being missed at the time of injury. These present later with chronic wrist pain, swelling or median nerve symptoms. Interestingly these patients may regain range of motion with subsidence of pain but function of the wrist joint remains poor with poor grip strength and inability to return to previous activities.

Median nerve compressive symptoms were present in 6 (24%) cases in our study. In the study conducted by Herzberg et al median nerve compressive symptoms were present in 23%.[19] Literature suggested that in median nerve compression an additional volar approach for carpal tunnel release is required. But in our study when distraction was applied using external fixator none of them showed any evidence of worsening of median nerve symptoms. This is probably because the carpal bone are aligned as the distraction is applied and pressure over the median nerve is offloaded. Furthermore During second surgery when all carpal bones are reduced and fixed, this relieved median nerve compression completely. So none of our patients required carpal tunnel release through volar approach. Recovery was noted in all 6 patients at 1 one year follow up.

Table 7: Chronic injuries treated with internal fixation.

	Inoue[23]	Kailu[24]	Kumurchu[17]	Our study
Cases	6	6	6	25
Duration between inj n sx	16 wks	17 wks	26 days	2.76 m
Mean f/u	6.8 yrs	7.5 yrs	45 months	1 yr
Functional outcome	3 good, 1 fair, 2 poor	4 good, 1 fair, 1 poor	1 excellent, 1 good, 4 fair	13 excellent 8 good 3 fair 1 poor
F-e arc		93º	95.5º	101.2º

CONCLUSION

On the basis of our study we finally conclude staged reduction should be considered for neglected trans scaphoid peri lunate dislocations. It is difficult to achieve good results in these injuries. Our experiences with two staged reduction and fixation of these injuries are encouraging. Staged treatment of these injuries has several advantages. The soft tissues are stretched gradually to achieve some alignment of the bones before surgery. This avoids the need of extensive dissection and soft tissue stripping at the time of surgery. Secondly the distractor unloads the carpal bones of excessive and nonanatomic forces. This may help in cartilage regeneration and fibrocartilage formation. This limits the need for soft tissue dissection at the time of surgery and achieves better outcomes as compared to salvage procedures or single stage open reduction. If properly executed, a good functional pain free range of motion is the usual outcome.

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