

**ORIF OF DORSAL PERILUNATE FRACTURE-DISLOCATIONS AND  
PROGNOSTIC FACTORS**

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**Abstract**

**Introduction:** Perilunate injuries are rare entities and can be difficult to diagnose. Most common type is dorsal perilunate fracture dislocation (97%). Purpose of treatment is anatomic reduction and stable fixation. We aimed to present radiologic and functional results of surgically treated (ORIF) dorsal perilunate fracture-dislocations and discuss the factors influencing the prognosis.

**Methods:** Between 2015 and 2020, 12 patients were operated for perilunate fracture-dislocations in our institute. The mechanism of injuries, soft tissue traumas, etiologic factors and stages according to Herzberg classification were determined. The MAYO wrist score was used for functional evaluation. Scapholunate distance and scapholunate angle were measured and, degenerative changes were investigated in terms of radiologic evaluation.

**Results:** Mean follow-up was 26 (range, 12-48) months. The average age at surgery was 35.7 (range, 18-51) years. 10 patients were male and two were female. Functional results were excellent in two (16.7%), good in one (8.3%), satisfactory in 4 (33.3%) and poor in five (41.7%) patients. Degenerative changes were determined in radiocarpal and mid-carpal joints of 9 wrists (82.4%). In four wrists osteochondral fragments were determined on the head of the capitate. Stage 2 lesions, delayed presentations, open fractures, scapholunate dissociations more than 2 mm had worse functional results.

**Conclusion:** Despite anatomic reduction, ligamentous and chondral injuries which occurred at the time of trauma may result in persistent wrist pain. Mechanism of injury, soft tissue defects and the duration between injury and treatment can affect clinical and radiologic results.

**INTRODUCTION**

Perilunate fracture-dislocations are rare injuries requiring surgical treatment mostly <sup>1</sup>. They constitute 10% of the carpal injuries <sup>2</sup>.

This high energy injuries generally occur after fall on an outstretched hand. The main mechanism is disruption of relation between lunate and capitate bones followed by displacement in anteroposterior direction that cause ligamentous injury and/or carpal fractures. The most common type is dorsal perilunate fracture-dislocation (97%).

The 25% of perilunate fractures and fracture-dislocations are missed in diagnosis and delayed treatment may cause poor outcomes <sup>3</sup>.

In this retrospective study, we aimed to present the radiologic and functional results of surgically treated dorsal perilunate fracture-dislocations and discuss the factors influencing the prognosis.

**METHODS**

Between 2015 and 2020, 20 patients were operated for perilunate fracture-dislocation. 17 patients had dorsal (85%) and three patients (15%) had volar dislocations (Fig. 1).

Patients who do not have enough follow-up or data were excluded from the study. 12 patients (2 females, 10 males; mean age 35.7(range, 18 - 51 years) with dorsal dislocation were included (Table 1).

The average period between injury and procedure was 1.4 days (range, 12 hours-3 days).

**Table 1: Demographics of the patients.**

Patient	Age	Sex	MOI	Side	DE	Concomitant injury	Type	Displacement of capitatum	Displacement of lunate
1	18	M	FH	R	R	Multiple fractures	TS-TRS	DORSAL	STAGE 2A
2	47	M	FH	L	R	<b>e</b>	TS-TTP	DORSAL	STAGE 1
3	38	M	FH	R	R	Ipsilateral elbow dislocation	TS	DORSAL	STAGE 1
4	2	M	FH	R	R	<b>e</b>	TR	DORSAL	STAGE 2A
5	28	M	FH	L	L	<b>e</b>	TS-TTRQ-TP	DORSAL	STAGE 2A
6	44	M	Crush injury	L	R	<b>e</b>	TS-TC	DORSAL	STAGE 2B
7	25	F	FH	L	L	<b>e</b>	TS-TRS-TTRQ	DORSAL	STAGE 2A
8	42	M	FH	R	R	<b>e</b>	TS-TRS	DORSAL	STAGE 1
9	46	M	FH	R	R	Contralateral distal radius fracture	TS	DORSAL	STAGE 1
10	51	M	Simple fall	R	L	<b>e</b>	TRS	DORSAL	STAGE 1
11	25	M	FH	R	R	<b>e</b>	TR	DORSAL	STAGE 2B
12	38	M	FH	L	R		TR	DORSAL	STAGE 2B

**MOI: Mechanism of injury, FH: fall from height, DE: dominant extremity, TS-TRS: trans scaphoid-transradial styloid, TS-TTP: trans scaphoid-trans trapezoid, TS: transscaphoid, TS-TC: trans scaphoid-trans capitata, TS-TRS-TTRQ: trans scaphoid-trans radial styloid-trans triquetrum, TS-TTRQ-TP: trans scaphoid-trans triquetrum-trans priformis, TR: trans radia**

Closed reduction was achieved in four wrists and open reduction was needed in eight patients. The K-wires were placed under fluoroscopy for stabilisation. Open reduction was performed through dorsal approach.

Concomitant scaphoid fractures were fixed with headless compression screw/k wires in four patients.

A short arm cast was applied after the procedure.

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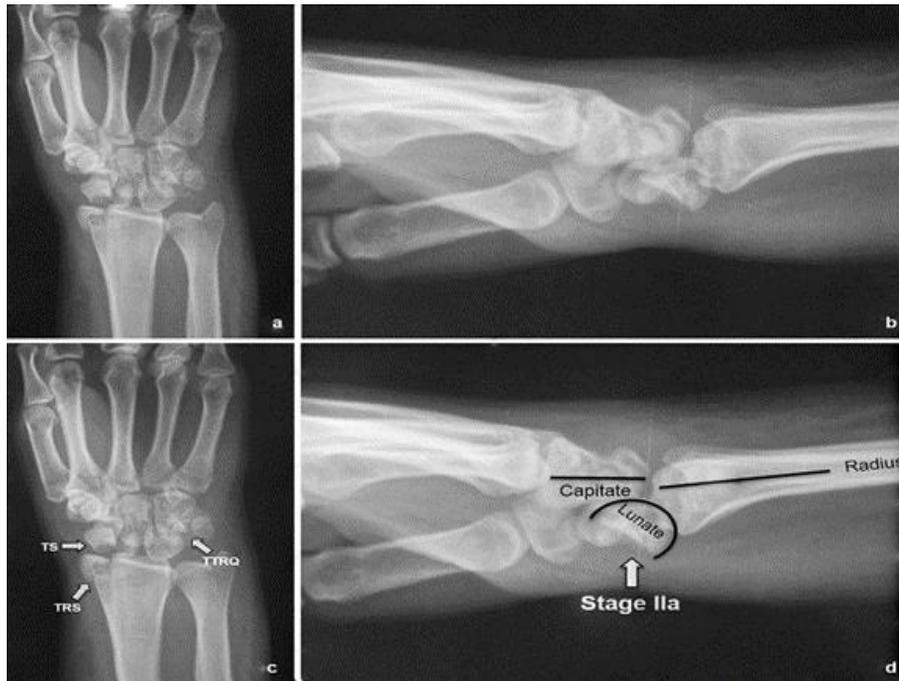


Fig. 1. a, b. AP and lateral radiographs of left wrist of a 25 year-old female after fall from height. c. Trans scaphoid, trans radial-styloid, trans triquetral perilunate fracture dislocation on AP view. d. The relation between longitudinal axes of the radius and capitate. Volar dislocation of the lunate. (Herzberg Stage 2A perilunate fracture dislocation)

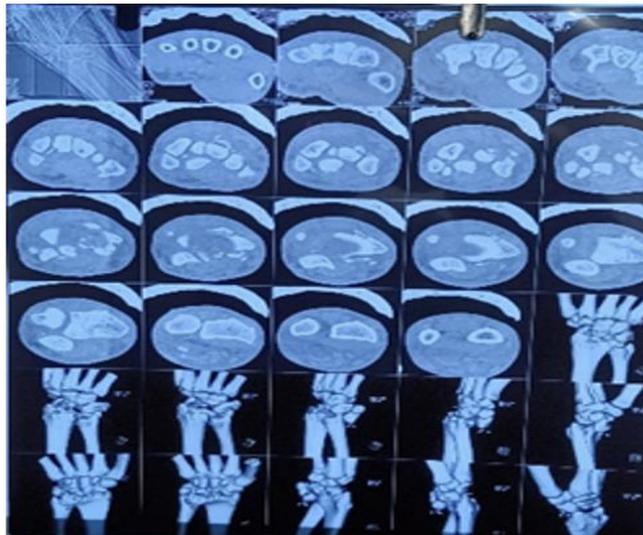


Fig. 2. a, b. The postop and follow-up x rays of the patient in Fig. Scaphoid was fixed with headless compression screw. K-wire was placed in through the capito-lunate joint in order to fix distal row to the proximal row. Fixation of scapho-capitate, triquetro-lunate and triquetrocapitate joints with K-wires was essential for perilunate stability. d. Post-op control AP and lateral radiographs.

Pre-op x ray film of the wrist



CT-Scan of the wrist



**CT SCAN OF RIGHT WRIST**

**PROTOCOL:** Axial images were obtained through the wrist without intravenous contrast. 3 D reconstructions were performed and viewed in bone and soft tissue windows.

**OBSERVATIONS:**

- Comminuted displaced fracture of scaphoid at the waist.
- Fracture of the hamate bone.
- Comminute intra articular fracture of distal end of radius.
- Anterior medial dislocation of lunate.
- Negative ulnar variance by 3 mm is seen.
- Rest of the visualized bones are normal.
- Soft tissue edema around the wrist noted.
- Parts in slab.

**IMPRESSION:**

- Transcaphoid trans hamate, trans radial lunate dislocation.  
(FRACTURES)

Intra-op images

Incision made over the dorsal aspect of wrist



Dorsal aspect of the wrist exposed



Intra op C-arm images of the wrist AP view



Wrist lateral view



Post-op Pop cast application was done



Follow-up X-ray films of the wrist



The casts and K-wires were removed with a mean of 8.06 (6-10) weeks after surgery and range of motion exercises were started.

The etiology, mechanism of injury, concomitant injuries, and stage of the injury were determined according to the Herzberg classification<sup>3</sup> (Fig. 3).

Mayo wrist score was used for functional evaluation.

The severity of the pain, return to the work, range of motion, and grip strength were evaluated.

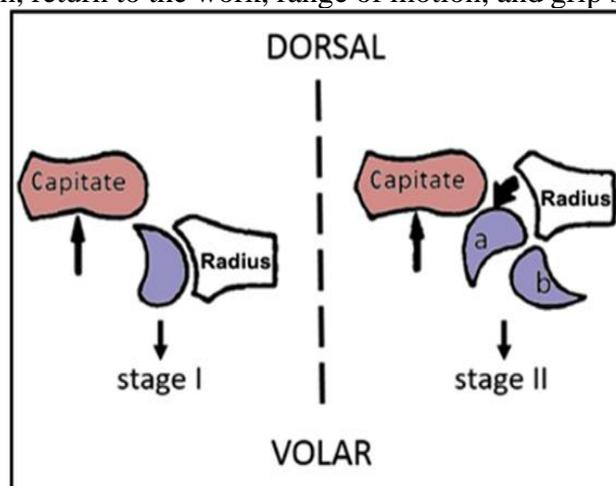


Fig. 3. Herzberg classified perilunate fracture dislocations according to the relation of the capitate with the radius.

The position of the capitate (dorsal or volar) determines the type of dislocation. The relation of lunate and radius is normal in Stage 1 injury but lunate is displaced to the palmar side in Stage 2.

In stage 2a rotation of the lunate is less than 90° and more in Stage 2b [3].

## RESULT

8 patients had right sided and 4 had left sided injury.

The mechanism of injury was fall from height in 10 patients, simple fall in one and crush injury in the other one.

According to Herzberg classification; 5 wrists had stage 1 injury, 4 had stage 2a and 3 had stage 2b fracture-dislocation (Table 1).

The scaphoid fracture was the most common bone injury accompanying to the perilunate dislocations (in 5 wrists, 41%).

Isolated bone injuries were scaphoid fracture in two patients, radial styloid fracture in three and distal radial fracture in five patients.

Mean follow up time was 26 (range, 12-48) months. Average Mayo score value was 60.8 (range 25-90).

According to the Mayo scores; 2 wrists had excellent (16.7%), 1 had good (8.3%), 4 (33.3%) had satisfactory and 5 (41.7%) had poor results (Fig. 4).

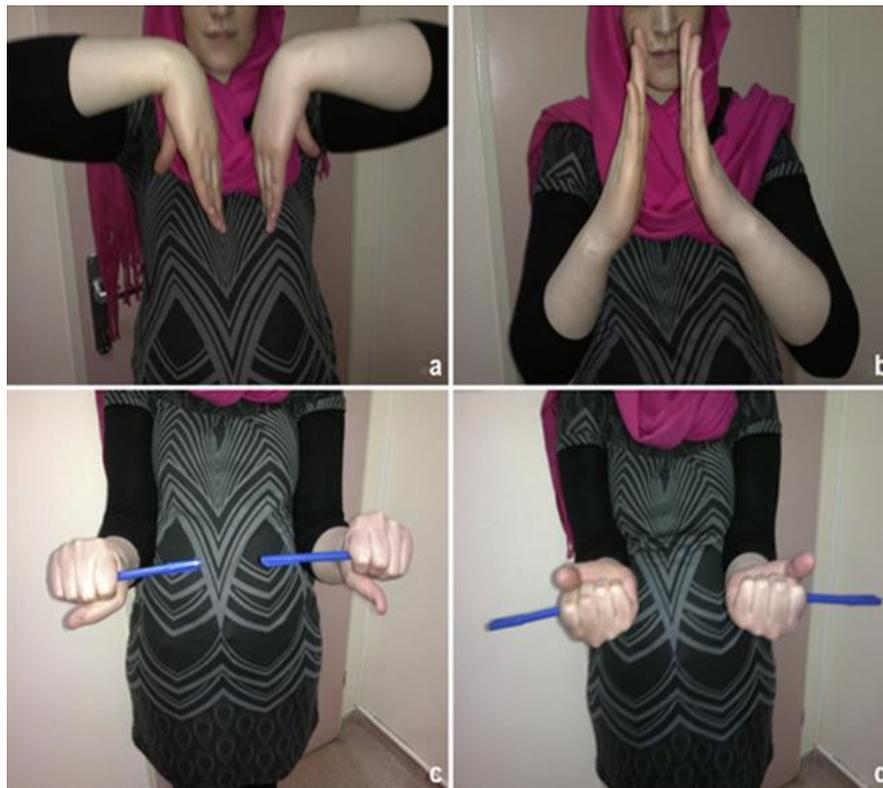


Fig. 4. Clinical examination of the patient. Mayo wrist score was satisfactory (70 points).

## DISCUSSION

The term of perilunate fracture dislocation was first described by Mayfield. It constitutes 7% of the all wrist injuries.<sup>3</sup>

The injury starts on radial side of palmar ligamentous complex and advances to the ulnar side.<sup>5,6</sup>

In Stage 1, interosseous scapholunate and radioscapohcapitate ligaments are ruptured; in Stage 2 the injury effects space of Poirier.

Stage 3 describes the rupture of the lunotriquetral ligament and perilunate dislocations.

In stage 4, long and short radiolunate ligaments are damaged and lunate dislocates. <sup>1</sup> (Fig. 5).

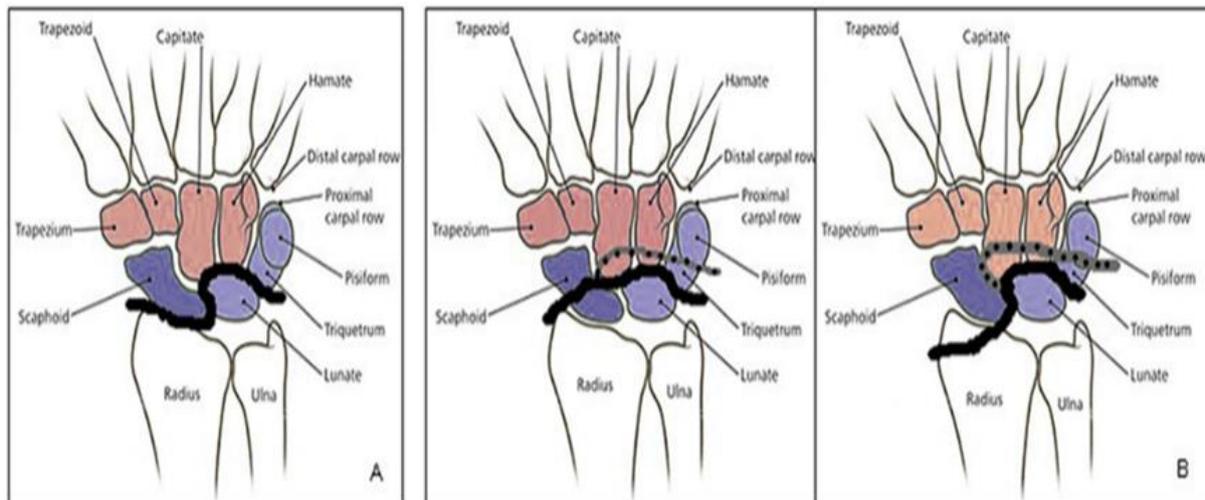


Fig. 5. The progression of injury from radial to the ulnar sides according to the Mayfield classification. In each step a new ligamentous injury or bone fracture occurs. a) Lesser arc injury, b) Greater arc injury <sup>1</sup>

The injury of the lesser arc causes perilunate dislocation but injury of the greater arc may cause different types of perilunate fracture- dislocations depending on the directions and magnitude of the acting forces.

Greater arc injuries have worse prognosis <sup>1</sup>. In our study, all patients had greater arc injuries and different types of carpal fractures.

Herzberg emphasized the importance of the dorsal proximal row ligaments and after scaphoid fixation, he recommended perilunate fixation with K- wires which stabilize the radiolunate and triquetrolunate joints.

In our study we preferred dorsal approach for open reduction. The time between injury and treatment is another prognostic factor.

In the study of Herzberg et al, the results of patients who were treated in first week of trauma had better results compared to patients operated later than first week <sup>3</sup>.

In our study, the patients who had more than and less than 2 mm of scapholunate distance had mean MAYO scores as 51.6 and 62.8 points, respectively. We accepted scapholunate dissociation as a factor of poor prognosis

## CONCLUSION

Perilunate fracture dislocations are rare. The mechanism of injury has to be clarified, once staging is done treatment is to be decided carefully.

The anatomic relation between capitate, lunate and radius has to be preserved; subluxations in intercarpal joints and fractures of the carpal bones have to be fixed.

Despite anatomic reduction, persistent pain can be observed in some patients due to ligamentous and chondral injuries.

The mechanism of injury, concomitant soft tissue damage, and time between the trauma and treatment are prognostic factors for clinical and radiologic results.

Stage 1 injuries have good prognosis but stage 2 injuries may have poor outcomes.

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