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Original article

# Peri-lunate dislocation and fracture-dislocation of the wrist: Retrospective evaluation of 65 cases



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## ABSTRACT

**Introduction:** Peri-lunate wrist dislocations and fracture-dislocations are related to high-energy trauma. Prognosis is often compromised because of the complexity of the lesions. The purpose of this study was to assess outcomes of acute peri-lunate injuries and correlate them with the type of lesion and management. **Materiel and methods:** A monocenter retrospective study has been conducted. Sixty-five patients (65 wrists) were reviewed. According to Herzberg's classification, there were 18 isolated peri-lunate dislocations and 47 peri-lunate fracture-dislocations – 27 with a scaphoid fracture and 20 with an intact scaphoid. The displacement was dorsal in 62 cases. All patients were treated surgically.

**Results:** At an average follow-up of 8 years (2–16) the average Cooney score was 66 points, quick-DASH score 21 points, and PRWE score 28 points. Pain score was 1.3 out of 10 points at rest and 4.3 out of 10 with effort. The flexion–extension arc was 96° with an average strength of 38 kg (70 ± 23% of opposite side). Radiographic analysis has shown decrease in carpal height, increase in ulnar translation, and DISI. Sign of wrist arthritis was found in 58.5% of the cases. The rate of osteonecrosis was 7.7%. Regional sympathetic painful syndrome was observed in 12%. In 26% of the cases a secondary surgery was needed. No influence has been found with the final results between fracture-dislocation and isolated dislocation, and delay of treatment. Osteochondral lesions observed at surgery ( $P=0.035$ ), osteonecrosis at follow-up ( $P=0.017$ ), and modification of the scapho-lunate angle ( $P=0.029$ ) were correlated with the occurrence of osteoarthritis.

**Discussion:** Peri-lunate dislocation and fracture-dislocation represent severe wrist trauma with often numerous sequelae with follow-up: pain, stiffness, loss of strength, carpal instability and arthritis. Early diagnosis and anatomic reduction are prerequisite to a satisfactory functional result. Capsulo-ligamentous lesions must be repaired and fractures must be fixed.

**Type of study/level of evidence:** Therapeutic IV.

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## 1. Introduction

Peri-lunate wrist dislocations and fracture-dislocations are related to high-energy trauma. Few publications have been reported in literature and often multicenter studies have been published [1–16]. Diagnosis can still be missed in the emergency room [1–6]. Prognosis is often compromised because lesions are often complex involving the capsule, the ligaments and the joint cartilage. Even guidelines for treatment have been proposed, results are often unsatisfactory [2,4,6,17]. Our hypothesis was that clinical and radiographic outcome was dependent of the type of lesion and the

type of management. A monocenter retrospective study has been conducted to evaluate the incidence of this trauma, to analyze the clinical and radiographic outcome according to the type of lesion and management, and to find prognosis factors.

## 2. Materials and method

### 2.1. Study characteristics

A retrospective study has been conducted in our University Hospital with a level-I trauma center. Inclusion criteria were: all patients who sustained a unilateral acute (less than 7 days) peri-lunate dislocation or peri-lunate fracture-dislocation; treated surgically; who agreed to be part of this study; and followed-up a minimum of 2 years. Exclusion criteria were: patients who

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**Table 1**  
Classification according to Herzberg et al. [2] classification of the 65 cases.

	Peri-lunate dislocation (n = 18)	Peri-lunate fracture-dislocation without scaphoid fracture (n = 20)	Peri-lunate fracture-dislocation with scaphoid fracture (n = 27)	All cases (n = 65)
<i>Dorsal displacement</i>				62
Stage I	8	9	19	36
Stage IIA	9	7	6	22
Stage IIB	1	3	0	4
<i>Palmar displacement</i>				3
Stage I	0	0	2 (Fenton syndrome)	2
Stage II	0	1	0	1
<i>Treatment</i>				
Percutaneous	6	3	1	10
Dorsal approach	11	15	16	42
Palmar approach	0	0	7	7
Both approaches	1	2	3	6

sustained a sub-acute or chronic (more than 7 days) peri-lunate dislocation or fracture-dislocation; followed-up less than 2 years.

## 2.2. Patient demographics

Between 1995 and 2010, 4963 wrists' traumas were operated in our department. A peri-lunate dislocation was found in 234 cases (4.7%). All patients have been contacted, and 148 refused to participate for any evaluation, 12 were lost for follow-up and 9 were excluded because they did not feel the inclusion criteria. Sixty-five patients (65 wrists) were included in this study. There were 62 men (95%) and 3 women (5%) of 33 years on average (range: 17–73) at the initial trauma. The dominant hand was involved in 31 cases. Thirty-two patients were involved in heavy manual labors. In all cases a high-energy trauma was responsible of the wrist trauma.

Lesions are summarized in Table 1. A scaphoid fractures were associated in 27 out of 47, whereas other fractures were observed in the 20 other cases: triquetrum (2), capitate (2), radial styloid (10), intra-articular radius (10), and ulnar styloid (17). Delay for reduction of peri-lunate dislocation was 6.6 hours (range: 2–16). Diagnosis was delayed of more than 24 hours in 5 cases, average 3.6 days (range: 1 to 7 days).

## 2.3. Surgical technique

All patients were treated surgically. Approaches are summarized in Table 1. Cartilage lesions were found in 31 cases of the 48 dorsal open approaches with involvement of the head of the capitate in 14. Chips fractures or fractures avulsions, as described by Herzberg et al. [2], was found in 7 cases. Stabilization of the carpus was performed with 12/10 mm K-wires through the scaphoid and lunate in 40 cases, through the lunate and triquetrum in 50, and through the scaphoid and capitate in 20. Scaphoid fractures were fixed with a Herbert type of screw of 2.0 mm in 22 and with K-wires in 5. Two capitate fractures and one of the two triquetrum fractures were fixed with screws. Radius fractures were fixed with locking plates or with K-wires. Lesion of the scapho-lunate ligament was noted in 32 out of 48 wrists after open dorsal approach. Ligament repair was performed in 29 cases with anchor fixation, whereas it was not possible to repair the ligament in 3. A dorsal capsulodesis was performed in 19 cases. In 8 cases, a median nerve neurolysis was performed because of numbness in the median territory. Average duration of surgery was 80 minutes (range: 20–240). Time of wrist immobilization was 9 weeks (range: 6–24 weeks). Therapy was initiated for an average of 4 months (range: 1–12 months).

## 2.4. Method of evaluation

An observer independent of the surgeons who performed the procedures reviewed all 65 patients. The results of the postoperative clinical evaluation consisted of analyzing on both wrists, pain level with a visual analogic scale (VAS), range of motion, strength with JAMAR® dynamometer, and stability of the carpus performing the Watson test [18]. Functional evaluation was performed using global functional scores as the Cooney score [4], the quick-DASH score [19] and the PRWE score [20,21]. Postero-anterior views of the wrist in neutral position, ulnar and radial inclinations, and lateral views were performed. The regularity of the arc of Gilula was noted on the postero-anterior views [22]. The Bouman [23] and the Aufauvre [24] indexes were measured to evaluate ulnar translation of the carpus. Finally, a distance of more than 3 mm between the scaphoid and the lunate was considered pathological and correlated with non-functional intra-carpal ligaments. The scapho-lunate angle was calculated on the lateral views. Sign of osteoarthritis, osteonecrosis or modification of bone density, as well as nonunion of carpal bones were also noted.

## 2.5. Statistical analysis

A univariate analysis of the data was done. The Chi<sup>2</sup> test was used to compare categorical values. ANOVA analyses, in conjunction with Tukey's test, were also used to compare means. The level of significance was set at  $P < 0.05$ .

## 3. Results

### 3.1. Overall results

All 65 patients were reviewed with 8 years average follow-up (range: 2–16). All results are summarized in Table 2. Delay to return to work was 5 months on average (range: 0–24 months). Fifty-four out of 65 patients (83%) could return to their previous work whereas 9 had to change their type of work. One patient never return to work, and one went to retirement.

### 3.2. Clinical results

Clinical results are summarized in Table 2. The Watson test was negative for all wrists.

### 3.3. Radiographic results

All radiographic results are summarized in Table 3. Sign of arthritis was observed in 38 out of 65 (58.5%) cases. A SLAC wrist

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