



## Fracture of the Volar Lip of the Lunate in the Face of Perilunate Injury. Report of Three Cases and Review of Literature

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**DOI:** 10.31080/ASOR.2022.05.0512

**Received:** May 31, 2022

**Published:** December 05, 2022

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### Abstract

Lunate fractures associated with perilunate dislocation are very rare. The diagnosis is often difficult as is the treatment itself. Up to 25% go on to be undiagnosed in the emergency room (ER) setting.

We present 3 very different cases of perilunate dislocation with lunate volar lip fracture occurring in the different hospitals around the world (Spain, Colombia and Chile). All 3 were diagnosed in the ER, however the treatments differ.

We aim to show the spectrum of treatment of these high energy lesions either acute or chronic and the outcomes of these.

**Keywords:** Fracture; Volar Lip; Lunate; Perilunate

### Introduction

Perilunate dislocations and lunate fracture tend to occur mostly in young males due to a high energy trauma. The pathomechanics involves a load applied to the wrist while in dorsiflexion and ulnar deviation. According to Conway, an additional axial force produced by the capitate, is responsible for the lunate fracture [1].

Lunate fractures are seen in association with ligament damage, which are key for carpal stability; Literature revision shows isolated ligament damage and even some variants of complex carpal instability [2].

X-Ray study can underestimate the size and displacement of the fracture fragments, so a CAT scan is indicated in these cases.

Palmar pole fractures require reduction and osteosynthesis to prevent chronic subluxation of the capitate and midcarpal arthritis [8].

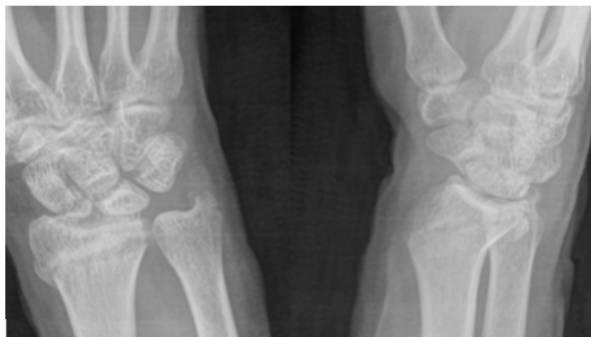
### Case Presentation

Here we present 3 cases of lunate fractures associated with perilunate dislocations in 3 centers around the world, Spain, Colombia, and Chile

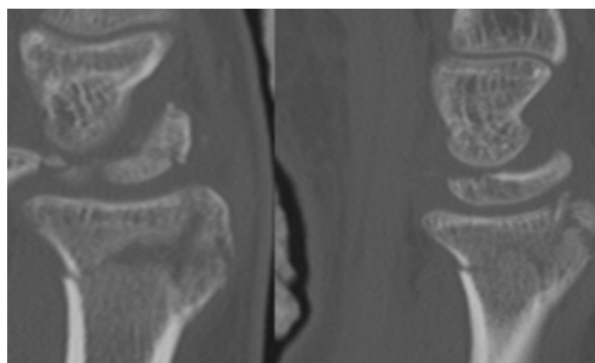
#### Case 1

25-year-old male manual worker who suffered a motorcycle accident with right hand trauma. He presented in the ER with severe swelling and pain. Initial study with X-rays shows an extraarticular distal radius fracture with scaphoid fracture. Bone scan also shows a lunate fracture with 180 degrees of rotation of the volar pole, comminuted fracture of the proximal pole of the scaphoid and anterior subluxation of the capitate. He was operated via double approach with ORIF of the scaphoid and ligament reconstruction. During follow up he was pain free with a flexo-extension range

of 45°-0°-45°. At the 18 months evaluation some early arthritic changes to the midcarpal joint were seen on the X-Rays.



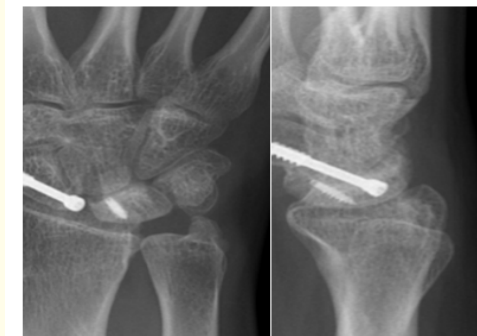
**Figure 1**



**Figure 2**



**Figure 3**



**Figure 4**

### Case 2

25-year-old male involved in a mountaineering accident where he fell approximately 10 mts with right hand trauma. He arrives at the ER department with great swelling and deformity. X-ray study shows perilunate dislocation and a scaphoid fracture. Bone scan also shows a volar pole fracture of the lunate.

Surgical resolution involves a double approach with ORIF of the scaphoid with an Accutrack screw, trans osseous suture to the lunate and ligament repair. The patient has a good recovery, pain free and with 50°-0°-45° range of motion of the wrist. He was back in his job 18 months post trauma.



**Figure 5**

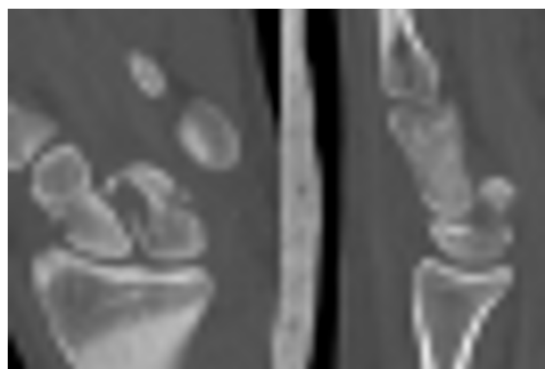


Figure 6

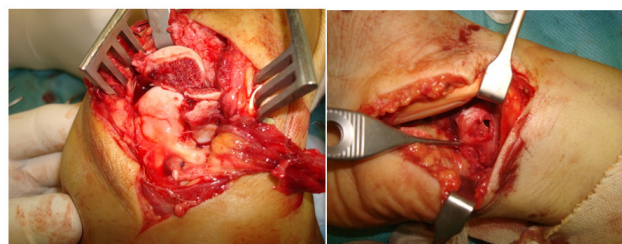


Figure 7



Figure 8

### Case 3

27-year-old male who suffered a motorcycle accident. He arrived at the ER with swelling of the right hand and wrist with associated deformity and pain. X rays and scanner show a Perilunate dislocation of the right-hand Mayfield IV with radial styloid fracture, comminute fracture of the proximal pole of the scaphoid and volar comminute lunate fracture. The patient was discharged the following day with the diagnosis of distal radius fracture. He underwent surgical intervention 10 days later. During surgery the diagnosis of perilunate dislocation was made and he underwent open reduction of radial styloid fracture with K wires. Upon consolidation of the distal radius fracture a proximal carpectomy was performed. During follow up he is pain free on his right hand and wrist and shows limited range of motion but no limitation in his basic daily activities.



Figure 9



Figure 10

### Results

2 patients, cases 1 and 3 were followed up to 24 months. Case 2 was followed up to 18 months.

During that period all 3 patients were pain free and returned to their previous work and sports activities.

In all cases there were degenerative changes present, in the midcarpal area in both patients that underwent surgical repair, and in the radiocarpal area in the patient that underwent proximal row carpectomy.

Case	Dorso volar ROM	Pronosupination	Grip strenght	PRWE
1	45°/50°	Complete	65%	22
2	50°/50°	Complete	70%	29
3	35°/40°	Limited	50%	40

**Table 1**

## Discussion

Perilunate dislocations occur secondary to high energy trauma. The spectrum of lesion involves damage to ligaments, bone or both. Purely ligamentary injuries are described as lesser arc lesions while associations with fractures are major arc lesions [6]. Perilunate dislocation follows a distinct sequence: Disruption of scapholunate ligament following capitotunate articulation failure, lunotriquetral articulation and ligament failure. These events lead to failure of dorsocarpal ligaments causing the lunate to rotate and dislocate into the carpal tunnel.

Mayfield, *et al.* described 4 different stages going from scapholunate dissociation in stage I till lunate dislocation from the lunar fossa (usually volar) with median nerve compression in stage IV [3,10].

Herzberg further classification divides lesions into stage 1 with no lunate dislocation and stage 2 with dorsal lunate dislocation subdivided into stage 2A with less than 90° of rotation and 2B with more than 90° rotation [4,5].

The clinical presentation is acute swelling of the wrist and deformity following high energy trauma, occurring often in male patients. Up to 25% may present with median nerve compression due to lunate volar dislocation, most common in Mayfield stage IV [10].

The diagnosis is made with wrist x rays in AP and lateral projections. AP projection shows a break in Gilula's arcs and the "piece of pie" appearance of the lunate due to its palmar rotation.

In the lateral projection there is loss of alignment in the carpus, increased scapholunate angle > 70° and the "spilled teacup" sign due to lunate dislocation.

The treatment in the ER setting is reduction and temporary splinting following surgical repair.

Non operative treatment is reserved for patients with severe comorbidities that don't allow them to undergo surgery. This is often associated with poor outcomes and sometimes recurrent dislocations.

Surgical repair involves reduction, fracture fixation and ligamentary repair.

Surgical approach can be done dorsally, volar or combined. The combined approach offers more exposure and easier reduction however increased swelling and potential devascularization can occur. Transient ischemia of the lunate occurs up to 12,5% and although benign should be observed [7,9].

## Conclusion

Proximal row carpectomy is indicated in chronic cases (over 8 weeks after injury with no cartilage damage).

Wrist Arthrodesis is reserved for chronic cases with cartilage damage.

In all cases degenerative changes may occur even when with a precocious surgical resolution [8].

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