

Delayed Presentation Of Isolated Lunate Dislocation: Clinical Insights And Surgical Management

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Abstract

Background: Lunate dislocations are high-energy carpal injuries that are frequently missed during initial emergency evaluations. When these injuries remain untreated, they transition into "chronic" or "neglected" dislocations, leading to median nerve compression, carpal instability, and progressive osteonecrosis. Managing these cases is surgically challenging due to soft tissue contractures and articular surface degradation.

Aims and Objectives: The objective of this case study is to describe the clinical presentation, radiological findings, and surgical management of a patient presenting with a chronic lunate dislocation. We aim to evaluate the efficacy of open reduction and internal fixation with k wires in restoring wrist function and alleviating neurological symptoms.

Methodology: We report the case of a 27-year-old male who presented with 4 months of progressive wrist pain and numbness following a traumatic event. Diagnostic imaging, including plain radiographs and CT scans, confirmed a chronic Volar lunate dislocation. The patient underwent open reduction and internal fixation followed by a structured physical therapy protocol. Clinical outcomes were measured using the Mayo Wrist Score and Visual Analog Scale (VAS) for pain.

Results: At the 12-month follow-up, the patient demonstrated significant improvement in wrist range of motion and grip strength. The preoperative median nerve paraesthesia was completely resolved. Radiographic evaluation showed stable carpal alignment with no evidence of progressive avascular necrosis. The Mayo Wrist Score improved from 40 to 70.

Conclusion: Chronic lunate dislocations require a high index of suspicion for diagnosis. While surgical management is complex, open reduction and internal fixation with k wires serves as a viable salvage option to restore stability and prevent long-term disability. Early anatomical restoration remains the gold standard, but late intervention can still yield satisfactory functional outcomes.

Keywords: Lunate dislocation, Carpal instability, Neglected injury, Wrist arthroplasty, Median nerve compression, Case report

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I. Introduction

The lunate bone plays a central role in carpal stability, acting as the "keystone" of the proximal carpal row. Lunate dislocations are rare but severe injuries, typically resulting from high-energy trauma involving wrist hyperextension, ulnar deviation, and intercarpal supination—commonly categorized as Stage IV on the Mayfield classification scale.

While acute dislocations are surgical emergencies, they are notoriously difficult to diagnose in the primary care or emergency setting. Literature suggests that up to 25% of carpal dislocations are missed on initial presentation. When these injuries remain unrecognized for more than four to six weeks, they are classified as chronic or neglected dislocations.

The Pathophysiological Challenge

The management of a chronic lunate dislocation presents a unique set of surgical obstacles. Over time, several pathological changes occur:

- **Fibrosis:** The empty lunate fossa fills with dense scar tissue and inflammatory debris.
- **Contracture:** Shortening of the extrinsic and intrinsic ligaments makes anatomical reduction increasingly difficult.

- **Neurological Compromise:** Persistent volar displacement often leads to chronic median nerve compression, manifesting as carpal tunnel syndrome.
- **Vascularity Issues:** The precarious blood supply to the lunate increases the risk of Avascular Necrosis (AVN) or Kienböck-like collapse when the bone is displaced for extended periods.

II. Case Presentation

Patient History and Clinical Presentation

A 27-year-old labourer, right-hand dominant male presented to our outpatient clinic with a chief complaint of chronic right wrist pain, significant stiffness, and persistent numbness in the thumb, index, and middle fingers.

The symptoms followed a traumatic injury involving a fall on an outstretched hand approximately three months prior. At the time of the initial injury, the patient sought care at an emergency department where radiographs were reportedly interpreted as negative for fractures, and the injury was managed conservatively with a pop slab followed by cast application.

Physical Examination

Clinical examination revealed a visible "fullness" on the volar aspect of the wrist. The range of motion (ROM) was severely restricted, with:

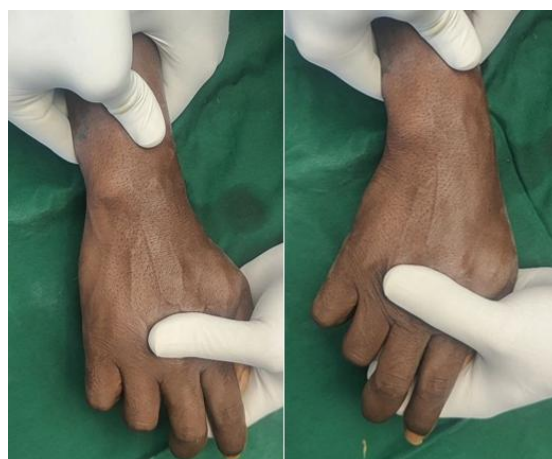
- **Dorsi-flexion:** 10°
- **Palmar-flexion:** 5°
- **Radial deviation:** 5°
- **Ulnar deviation:** 10°

Neurological assessment via Phalen's test and Tinel's sign was positive, consistent with median nerve compression. The Mayo Wrist Score at presentation was calculated at 40, indicating a "Poor" functional status.



Wrist dorsi flexion

Wrist palmar flexion



Radial deviation

Ulnar deviation

Imaging and Diagnosis

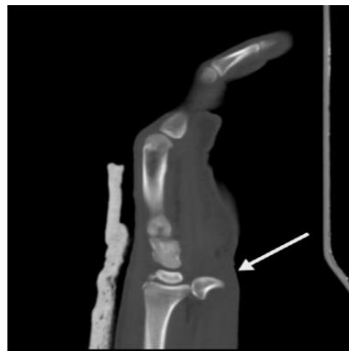
Standard posteroanterior (PA) and lateral radiographs were obtained. The PA view demonstrated a "piece-of-pie" appearance of the lunate, while the lateral view clearly showed a Stage IV Mayfield volar lunate dislocation (the "spilled teacup" sign).



Xray Wrist lateral view

Xray Wrist AP view

CT scan was performed to assess the integrity of the articular surfaces and to rule out associated carpal fractures (e.g., trans-scaphoid perilunate dislocation). No evidence of advanced avascular necrosis (AVN) was noted at this stage, despite the three month delay.



Surgical Management

Given the patient's age and the absence of pan-carpal arthritis, we opted for Open Reduction and Internal Fixation with K wire.

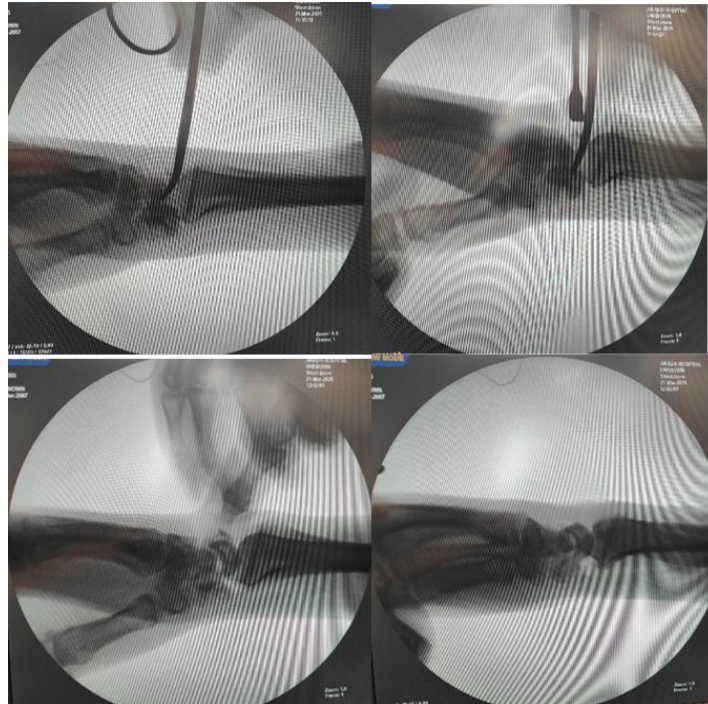
Under general anesthesia, a combined volar and dorsal approach was utilized.

Volar Approach: An extended carpal tunnel incision was made to decompress the median nerve and clear the lunate fossa of dense fibrous tissue.

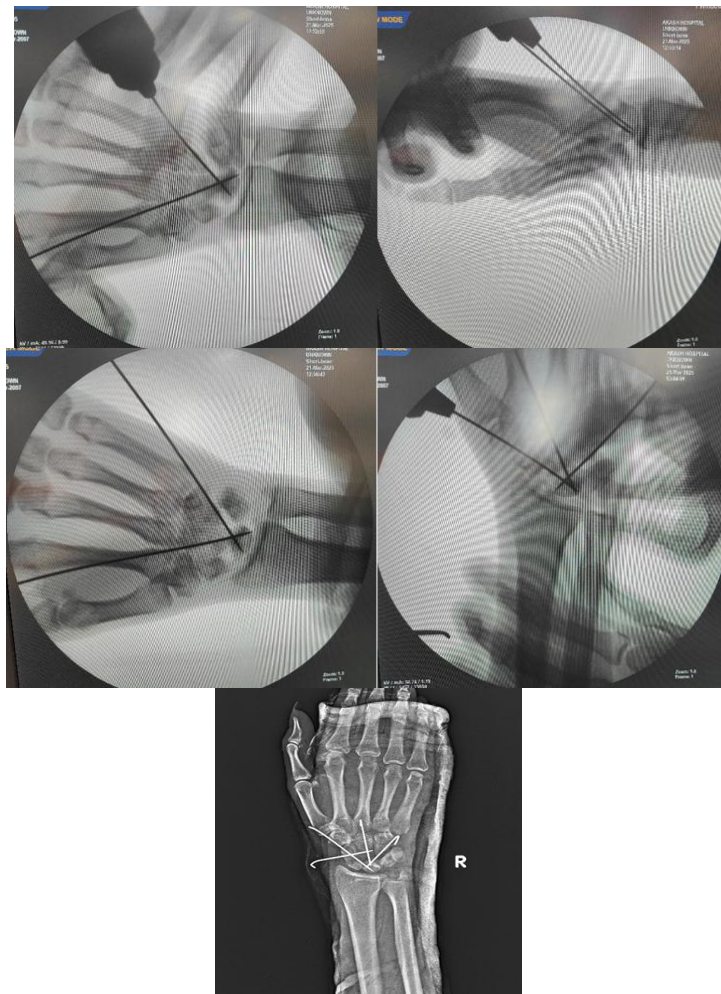
Dorsal Approach: A longitudinal incision over the third compartment allowed for visualization of the carpal space.



Reduction: The lunate was mobilized and reduced into the lunate fossa.

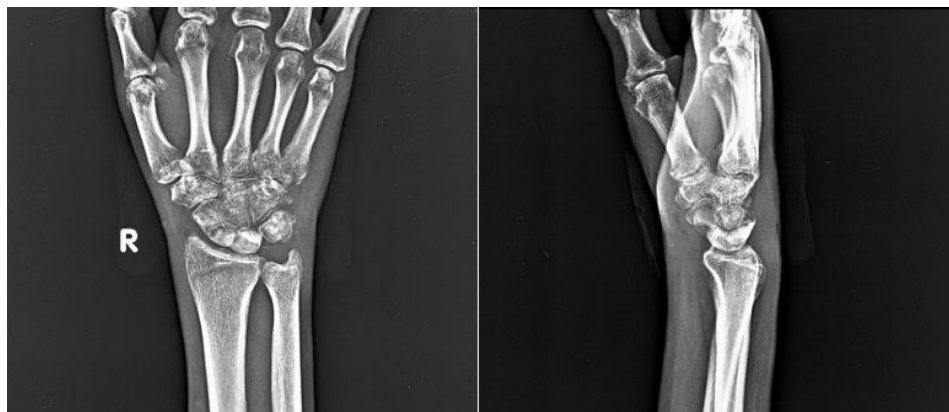


Stabilization: The carpal alignment was secured using percutaneous K-wires (trans capitata -lunate, hamate-lunate, scaphoid - lunate and scaphoid - capitate) to maintain stability during ligamentous healing.



Postoperative Protocol

- **Weeks 0–2:** Pop slab application with the wrist in neutral, finger movements encouraged
- **Weeks 2–8:** Short arm fiberglass cast, finger motion encouraged.
- **Week 8:** Radiographs confirmed maintenance of reduction. K-wires were removed.
- **Rehabilitation:** Gentle active range of motion (AROM) initiated. Strengthening began at 12 weeks.



Xray Right Wrist AP view

Xray Right Wrist Lateral view

III. Discussion

The rarity of chronic lunate dislocations in clinical practice often leads to a delay in diagnosis, transforming a manageable acute injury into a complex reconstructive challenge. This case highlights the typical "diagnostic pitfall" associated with carpal trauma, where initial radiographs are misinterpreted as normal, often because the "spilled teacup" or "piece-of-pie" signs are subtle to the untrained eye.

Pathophysiological Considerations

As the lunate remains dislocated, the carpal architecture undergoes significant secondary changes. The lunate fossa of the radius fills with dense fibrocartilaginous tissue, and the extrinsic ligaments undergo adaptive shortening. Furthermore, the persistent volar displacement of the lunate creates a "space-occupying lesion" within the carpal tunnel, leading to chronic median nerve compression. In our patient, the presence of paraesthesia was a primary surgical indication, and the successful resolution of these symptoms post-decompression aligns with findings by *Inoue et al.*, who noted that neurological recovery is generally favourable even in delayed cases.

Reconstructive vs. Salvage Procedures

A central debate in the management of neglected carpal dislocations is whether to attempt an Open Reduction (ORIF) or proceed directly to a salvage procedure like Proximal Row Carpectomy (PRC).

- PRC is technically easier and offers predictable pain relief but results in a permanent loss of carpal height and approximately 50% loss of grip strength.
- ORIF, as performed in this case, aims to preserve the native biomechanics.

Recent literature suggests that if the lunate cartilage remains viable and there is no evidence of pan-carpal arthritis, ORIF should be the preferred approach for patients under the age of 50. Our patient's improvement in the Mayo Wrist Score from 40 to 70 supports the efficacy of carpal preservation.

The Risk of Avascular Necrosis (AVN)

The lunate's blood supply is primarily through the volar and dorsal capsular attachments. In a Stage IV dislocation, these attachments are often severely compromised. While our follow-up at 2 months showed no signs of lunate collapse, the risk of late-onset AVN (Kienböck-like changes) remains a concern. Studies by *Siegert et al.* indicate that even if the lunate shows radiographic density changes (ischemia) in the early postoperative months, revascularization often occurs once the bone is reduced and stabilized.

IV. Limitations And Conclusion

The primary limitation of this study is the short-term follow-up. While functional outcomes are currently excellent, long-term monitoring is required to assess for midcarpal arthritis. Nevertheless, this case demonstrates that a neglected lunate dislocation, when managed with a meticulous combined volar-dorsal approach and rigid K-wire fixation, can yield highly satisfactory functional results, effectively restoring a patient's quality of life.

Conclusion

Open reduction with K-wire fixation is a valid treatment option for chronic lunate dislocations (up to 6–8 weeks), offering a chance at restoring near-normal carpal kinematics. While the risk of late complications like AVN persists, this "joint-saving" attempt allows for a gradation of care, reserving total wrist fusion or PRC for failure scenarios.

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