

Isolated Lunate Fracture Nonunion: A Case Report of Chronic Wrist Pain in a 37 Years Old Male

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1. Abstract

1.1. Introduction

Lunate fractures are considered rare to get fractured accounting for 0.5-1% of all carpal fractures. Usually they are accompanied with other wrist injuries rather than isolated. Usually patients will present late to seek medical advice and they will be complaining of limitation on in wrist motion and chronic pain. As a sequel if left untreated patient may develop avascular necrosis of the lunate.

1.2. Case Presentation

We report a case of 37-year-old male with no prior medical history complaining of right wrist pain, painful grip and limited range of motion for 2 years. Further imaging was ordered which included Magnetic resonance imaging (MRI) and showed signs of prior partial displaced lunate fracture with signs of nonunion and signs of partial injury of scapholunate ligament and injury to the triangular fibrocartilage complex (TFCC). Patient underwent wrist arthroscopic TFCC tightening, SL tightening and open reduction internal fixation with 2 headless screws. Follow up after 18 months of post-operative management showed slow and minimal bony union with no signs of avascular necrosis of the lunate bone. Patient is pain free with full range of motion.

1.3. Conclusion

Lunate fractures are rare fracture to be isolated, so high suspicious of index should be there whenever there is history of fall over the wrist with normal plain radiographs. Early intervention with open

reduction internal fixation for displaced lunate fractures in order to prevented further complications such as avascular necrosis of the lunate.

2. Introduction

Lunate fractures are relatively uncommon, accounting for only 0.5-1% of all carpal fractures. These fractures are often associated with other wrist injuries, making isolated cases relatively rare. Due to their subtle nature, lunate fractures are frequently diagnosed late, with patients presenting with significant symptoms only after a considerable delay. Typical symptoms include limited wrist motion and chronic pain, and if not properly managed, these fractures can progress to severe complications, such as avascular necrosis of the lunate bone, which can have a profound impact on wrist function and overall quality of life.

3. Case Presentation

We report the case of a 37-year-old male with no significant prior medical history who presented with persistent pain in his right wrist, accompanied by a painful grip and a markedly restricted range of motion that had persisted for two years. The onset of his symptoms was linked to a motor vehicle accident. Initial medical evaluations, including plain radiographs, did not reveal significant findings, and no further treatment was provided at that time. As symptoms worsened, the patient sought further evaluation at our specialized orthopedic clinic. Upon examination, pain and restricted range of motion were noted (flexion of 40° and extension of

30°) compared to the contralateral wrist. Tenderness was observed over the dorsal central aspect of the wrist and the triangular fibrocartilage complex (TFCC), with a positive fovea sign. Laxity at the distal radioulnar joint and a positive Watson test were also noted. The examination of the ipsilateral elbow and shoulder was unremarkable, and neurovascular assessments were normal. Further diagnostic imaging, including plain radiographs and Magnetic Resonance Imaging (MRI), was conducted. MRI findings revealed an oblique fracture affecting the volar third of the lunate bone, with evidence of partial adjacent cortical irregularities, marrow edema, and sclerosis indicative of nonunion and potential avascular necrosis. Partial dorsal and, to a lesser extent, volar displacement of the fracture was observed. MRI also showed prior low-grade partial injury to the scapholunate ligament and signal changes in the TFCC. Based on these findings, the patient was recommended for surgical intervention, which included TFCC repair and open reduction with internal fixation of the lunate.

4. Surgical Procedure

The surgical approach commenced with wrist arthroscopy using standard portals [1-4] (3-4 and 6R-6U). Diagnostic arthroscopy confirmed an injury to the scapholunate ligament, specifically involving the intermediate and volar parts. Additionally, the TFCC appeared loose, as evidenced by a positive trampoline test. The TFCC was addressed using a transosseous technique to restore stability. Following arthroscopy, a direct volar approach was utilized. This approach involved performing a carpal tunnel release to expose the wrist capsule and facilitate access to the carpal bones. Upon exposure, the lunate bone was identified, and the fracture site was meticulously debrided to remove any devitalized tissue and ensure a clean surface for healing. Reduction of the fracture was achieved under direct fluoroscopic guidance, and two headless screws were inserted to secure the lunate bone. The surgical site was closed in layers, beginning with the capsule, followed by subcutaneous tissue, and skin closure. A dorsal back slab was applied post-operatively to immobilize the wrist and support the healing process.

5. Outcome

The patient was evaluated 10 days post-surgery. The surgical wound was inspected, and a full cast was applied above the elbow. The cast was maintained for 3 weeks, after which it was replaced with another full cast for an additional 2 weeks. Following cast removal, physical therapy was initiated to aid in regaining strength and range of motion. At the 3-month follow-up, the patient reported significant improvement, being pain-free with enhanced ROM (flexion of 65° and extension of 50°). A CT scan performed at this stage revealed no evidence of screw loosening, although bony union was minimal with no formation of bony bridges. Continued

physical therapy was prescribed, commencing 6 weeks after cast removal. At the 18-month follow-up, imaging showed stable minimal bony union with no signs of avascular necrosis of the lunate bone. The patient maintained a full range of motion and remained asymptomatic.



Figure 1: Anteroposterior radiographs of the right wrist taken prior to the surgical intervention of the lunate bone showing obvious deformity over the lunate bone.



Figure 2: Lateral radiographs of the right wrist taken prior to the surgical intervention of the lunate bone showing obvious deformity over the lunate bone.

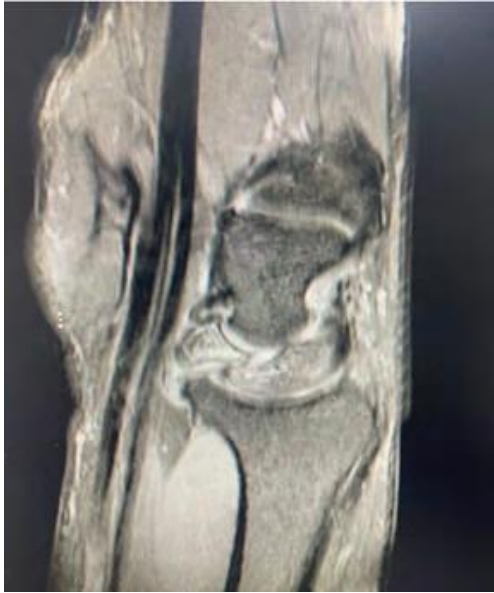


Figure 3: Sagittal cut magnetic resonance imaging scans taken prior to the surgical intervention of the right wrist showing fracture line over the lunate.

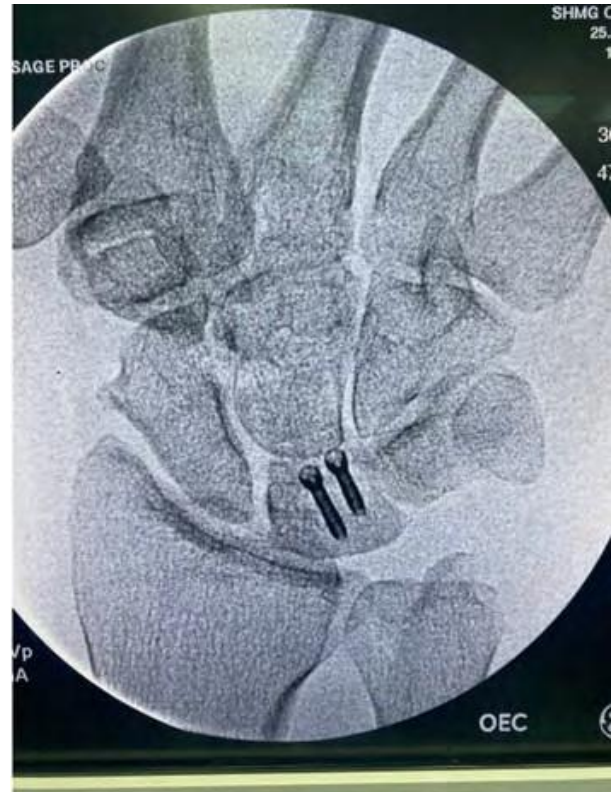


Figure 5: Anteroposterior radiographs of the right wrist taken after the fixation of the lunate bone showing two headless screws over the lunate.



Figure 4: Coronal cut magnetic resonance imaging scans taken prior to the surgical intervention of the right wrist showing fracture line over the lunate with TFCC injury.



Figure 6: Lateral radiographs of the right wrist taken after the fixation of the lunate bone showing two headless screws over the lunate.



Figure 7: Sagittal view of the right wrist taken after the fixation of the lunate bone showing two headless screws over the lunate.



Figure 8: Coronal view of the right wrist taken after the fixation of the lunate bone showing two headless screws over the lunate.

6. Discussion

Lunate fractures, though rare, present unique diagnostic and management challenges. These injuries typically occur as a result of falls on an outstretched hand or direct trauma, and they are frequently associated with other wrist injuries, making isolated cases less common [6]. Due to their subtle presentation, lunate fractures are often missed on initial evaluations, particularly when plain radiographs do not show conclusive evidence of injury [3]. This delay in diagnosis can result in worsened symptoms and complicated treatment. The case presented here illustrates the importance of maintaining a high index of suspicion for lunate fractures in patients with a history of wrist trauma, especially when initial imaging studies are inconclusive. The delayed presentation in this case, coupled with nonunion and early signs of avascular necrosis, underscores the need for thorough and comprehensive diagnostic evaluations. Advanced imaging techniques, such as MRI and CT, play a crucial role in identifying these fractures and assessing associated complications. The classification of lunate fractures, as described by Teisen et al. [7]. Provides valuable insights into the morphology and location of these injuries, which can influence treatment decisions and prognostic outcomes. The classification includes: Type I (volar pole fractures affecting the volar nutrient artery, which is the most common type), Type II (chip fractures), Type III (dorsal pole fractures affecting the dorsal nutrient artery), Type IV (sagittal fractures through the body), and Type V (transverse fractures through the body of the lunate) [9]. Understanding the specific type of fracture can guide treatment strategies and help predict the likelihood of complications such as avascular necrosis. The prognosis for lunate fractures is generally favorable when treated appropriately, with good rates of bony union and functional recovery. However, avascular necrosis, although rare, remains a serious potential complication. Factors that can influence the risk of avascular necrosis include the timing of surgical intervention, the vascular anatomy of the lunate, patient smoking status, and the type of fracture [3]. For acute non-displaced lunate fractures, conservative management with immobilization is often sufficient. In contrast, displaced fractures typically require surgical intervention, such as open reduction and internal fixation, to achieve optimal outcomes [1]. In this case, the presence of displacement, nonunion, and early signs of avascular necrosis necessitated an aggressive surgical approach, including open reduction and fixation with headless screws. Previous studies have demonstrated that fixation with compression screws can lead to successful resolution of symptoms and stable bony union. In retrospect, the use of bone grafting might have further facilitated radiological healing and improved outcomes [6].

This case highlights the importance of timely and effective intervention in managing complex lunate fractures. The combination of surgical fixation, arthroscopic repair, and post-operative rehabilitation contributed to a positive outcome, with the patient

achieving full functional recovery and remaining pain-free. Future considerations for similar cases may include exploring additional adjunctive treatments, such as bone grafting, to enhance healing and prevent complications.

7. Conclusion

Lunate fractures, while infrequent, are rarely isolated injuries, making it essential to maintain a high index of suspicion in patients with a history of wrist trauma, particularly when initial plain radiographs do not reveal conclusive findings. Early and appropriate surgical intervention, including open reduction and internal fixation for displaced lunate fractures, is crucial to prevent complications such as avascular necrosis and to achieve optimal functional outcomes.

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