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ABOUT COVER

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Lunate dislocation with avulsed triquetral fracture: A case report

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Abstract

BACKGROUND

Lunate dislocation is an uncommon traumatic wrist injury that require prompt surgical management. Misdiagnosis or delayed treatment often leads to a poor outcome. Open reduction and surgical repair of disrupted ligaments are done in most cases to prevent long-term joint dysfunction. However, this method has certain limitations that include partial functional improvement, which poses a high risk for degenerative arthritis and wrist instability.

CASE SUMMARY

A 37-year-old man presented to the Emergency Department of our hospital following a motorcycle accident. Physical examination revealed swelling and tenderness of the right hand and wrist. The patient was initially misdiagnosed with a wrist contusion by an emergency physician, but was eventually diagnosed with lunate dislocation associated with a triquetral avulsed fracture, indicated for open reduction and ligament repair. We performed closed reduction and two Kirschner wire fixations following Tavernier's method. The injured hand was protected with a standard short-arm orthosis for one month. The patient returned to normal daily work without discomfort at five months postoperatively. Encouragingly, there was no lunate necrosis or arthritis in the latest radiologic examinations.

CONCLUSION

This case provides evidence that the closed reduction technique for addressing such cases can reduce soft tissue destruction.

Key Words: Hand trauma; Carpal injury; Lunate dislocation; Triquetral fracture; Closed reduction; Case report

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Core Tip: Lunate fracture dislocation is considered urgent open reduction and surgical repair of disrupted ligaments. However, this method still has certain limitations and can raise a high risk for degenerative arthritis and wrist instability. In this case, it provides evidence that closed reduction technique can reduce soft tissue destruction and minimize the risk of post-traumatic sequelae. Surgeons should attempt to try closed reduction before open reduction in such selected cases.

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INTRODUCTION

Lunate dislocations with associated avulsed triquetral bone fracture caused by high energy trauma are rarely reported. According to literature reviews, 7% of all carpus injuries involve the lunate, of which only 3% are classified as volar lunate dislocations [1,2]. Owing to their rarity, they are often misdiagnosed and may be missed in 25% of cases [3]. The initial presentation is often atypical. To date, there is no consensus regarding the optimal treatment of lunate dislocation. Currently, most authors consider urgent open reduction for the dislocation, repair or reconstruction of the surrounding carpal ligaments and capsules, and fixation with Kirschner wires or screws. We found these surgical options to be frequently associated with complications and unsatisfactory results. Herein, we report a rare case of acute lunate dislocation with triquetral fracture treated by closed reduction with Kirschner wires. The radiological results were encouraging and the patient demonstrated satisfactory function of the wrist joint.

This manuscript follows the CARE guidelines, and written informed consent was obtained from the patient for publication of this manuscript and the accompanying images.

CASE PRESENTATION

Chief complaints

A 37-year-old man presented to the Emergency Department of our hospital with closed injury to the right side of the face and right wrist, and hyper-extension of the wrist. Initially, the patient complained of headache, dizziness, and moderate pain in the right wrist.

History of present illness

The patient symptoms started after a fall from his motor vehicle an hour prior to presentation at the hospital.

History of past illness

The patient had no relevant past medical history.

Personal and family history

Non-contributory.

Physical examination

The chin was obviously swollen and deformed, and the right wrist appeared slightly swollen; however, distal pulsation, thumb/finger motion, finger sensation remained normal.

Laboratory examinations

All the blood tests were within normal values.

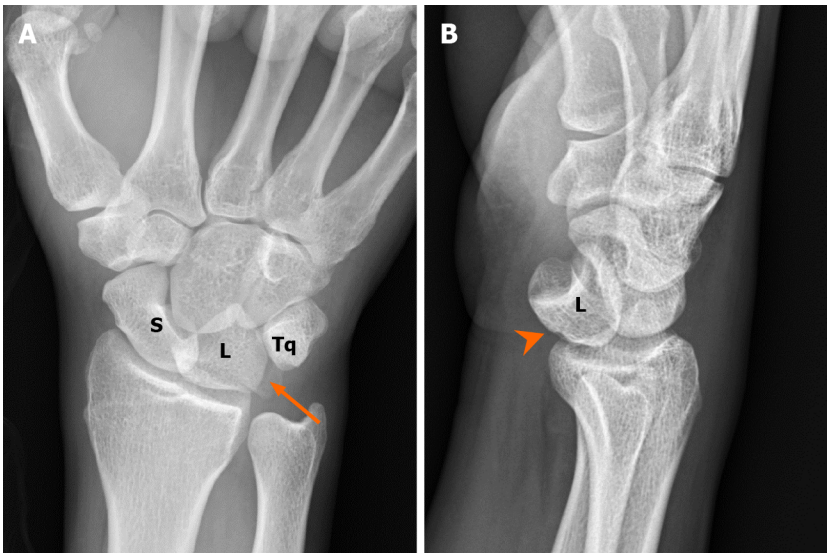


Figure 1 A 37-year-old man with multiple traumas. Radiological examinations revealed acute lunate dislocation with triquetral fracture. A: Plain radiograph in the emergency department showed triangular appearance of the lunate (piece of pie) with triquetral fracture. Note the avulsion of the triquetrum (arrow) due to failure of the lunotriquetral ligaments; B: Lateral view of the radiograph showed volar dislocation of the lunate bone (arrowhead). S: Scaphoid, L: Lunate, Tq: Triquetrum.

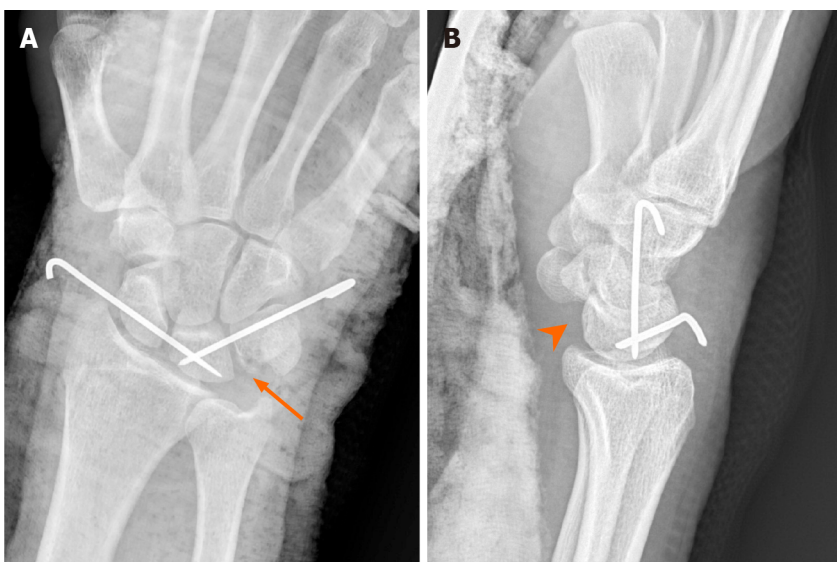


Figure 2 Post closed reduction and fixation with two Kirschner wires. A: The postoperative plain radiograph showed appropriate reduction of the lunate with the smooth alignment of the great arc. Note the avulsed triquetrum (arrow) reduced by ligamentotaxis of the lunotriquetral ligament; B: Lateral view of the radiograph showed appropriate reduction with neutral scapholunate angle (arrowhead).

Imaging examinations

An emergency physician made the initial diagnosis of fracture of the right mandibular body and contusion of the right wrist at the first survey after radiologic evaluations.

MULTIDISCIPLINARY EXPERT CONSULTATION

While waiting for facial bone surgery, the swelling and pain in the right wrist increased, with reduction in the range of motion. An orthopedic surgeon was consulted and re-evaluation of the plain radiograph of the right wrist revealed a triangular appearance of the lunate (piece of pie) with triquetral fracture in the antero-posterior view, and angulation and volar displacement of the lunate (spilled tea cup) in the lateral view (Figure 1)[4].

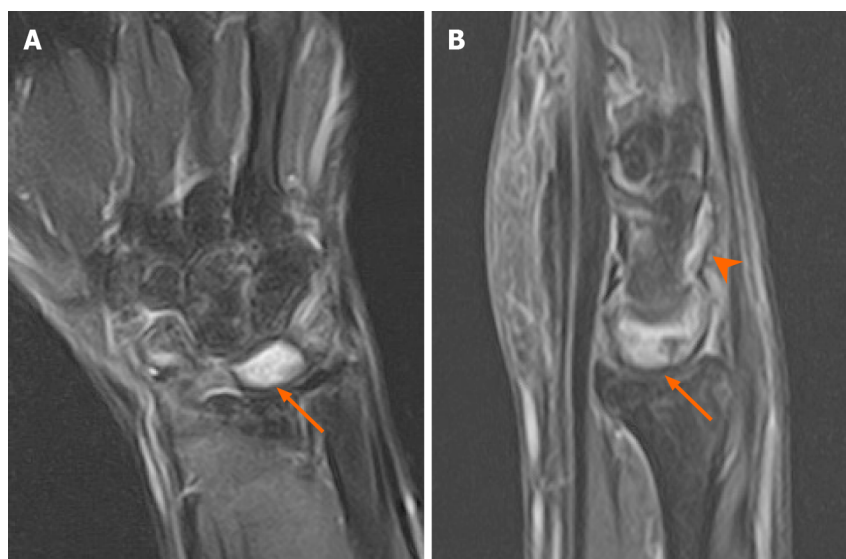


Figure 3 Two months postoperative magnetic resonance imaging showed residual bone edema of the lunate. A: Magnetic resonance imaging (MRI) in T2W coronal Fat saturation (FS) showed residual bone marrow edema in scaphoid, triquetrum and particularly, the lunate (arrow). This finding might be attributed to the post-traumatic or postoperative change; B: MRI in T2W sagittal FS showed lunate bone marrow edema and effusion in the intercarpal joints (arrowhead).

FINAL DIAGNOSIS

The patient was finally diagnosed with acute lunate volar dislocation with avulsed triquetral fracture. This fracture pattern could be classified as Mayfield classification stage IV[5].

TREATMENT

An attempt at closed reduction in the emergency room failed due to excessive swelling of the wrist and inability of the patient to cooperate with the reduction maneuver due to pain. The patient was then scheduled for open reduction and surrounding carpal ligaments repair.

The patient was taken to the operation room approximately 30 h after sustaining trauma. We first tried closed reduction again under general anesthesia using Tavernier's method, first described in 1906[6]. Fortunately, the dislocated lunate could be reduced with gentle manual traction and slight wrist extension. This was followed by fixation using two Kirschner wires for maintaining reduction (one from the scaphoid to the lunate, and the other from the triquetrum to the lunate). The surgical course was uneventful, and only two pin holes were created (Figure 2). The wrist was immobilized for 4 wk with short arm orthosis and hand therapy for another 8 wk.

OUTCOME AND FOLLOW-UP

Magnetic resonance imaging (MRI) performed 2 mo postoperatively revealed residual bone marrow edema in the lunate, triquetrum, and scaphoid (Figure 3). Complete bony healing of the triquetrum was confirmed by radiographic examination 20 wk after the trauma (Figure 4). The patient resumed daily activities 24 wk after the trauma. The range of motion of the right wrist was satisfactory with an extension / flexion range of 90°-0°-75°, and pronation/supination range of 90°-0°-90° (Figure 5). The patient experienced no pain at rest, and only reported mild pain related to activity. The movement of the fingers, peripheral sensibility and circulation were fair. There was no avascular necrosis of the lunate, scapholunate instability, or carpal joint arthritis during the one-year follow-up (Figure 6). Furthermore, the patient was underwent a follow-up MRI about 18 mo postoperatively. The lunate edema was almost completely resorbed and the lunate bone had no features of progressing into osteonecrosis (Figure 7).

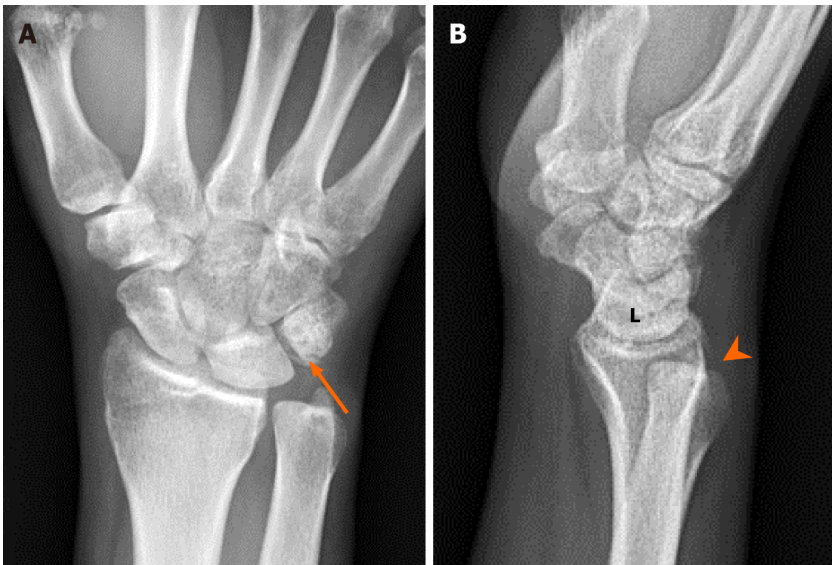


Figure 4 Five months postoperative plain radiograph showed appropriate lunate alignment. A: The radiograph showed solid union of the avulsed triquetrum (arrow) with no associated widening of the scapholunate and lunotriquetral joint space, and no necrotic changes in the lunate; B: Lateral view of the wrist joint showed a neutral scapholunate ligament with no obvious volar or dorsal intercalated segment instability. However, residual distal radioulnar joint subluxation was observed during follow-up (arrowhead).

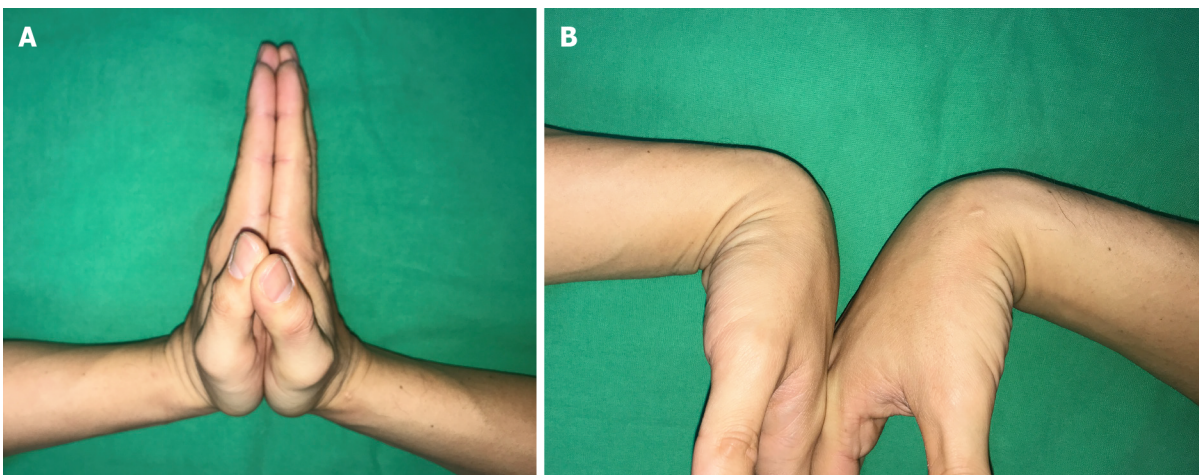


Figure 5 Wrist motion range six months postoperatively. A: With 90° extension; B: 75° flexion.

DISCUSSION

Lunate injury or peri-lunate injury may be easily missed at the initial presentation. According to the literature, approximately 25% of cases are associated with missed or delayed diagnosis. Lunate injury may result in progressive carpal instability, median neuropathy, avascular necrosis of the lunate, and end- to post-traumatic arthritis of the wrist joint[7]. The mechanism of injury is forced hyperextension, ulnar deviation, and intercarpal supination of the wrist[8].

Mayfield described the pattern of progressive peri-lunate instability in 1984[5]. In stage I, the distal carpal row is forced into hyperextension, and the scaphotrapezoid-capitate ligaments extend the scaphoid, opening the space of Poirier, resulting in a complete scapholunate dissociation. In stage II, the scaphoid-distal row complex may dislocate dorsally relative to the lunate. In stage III, persistent hyperextension may lead to the ulnar limb of the arcuate ligament pulling the triquetrum dorsally, causing failure of the lunotriquetral ligaments. In stage IV, the capitate may be forced by the still-intact radioscapho-capitate ligaments to push the lunate forward until it dislocates rotationally into the carpal canal.

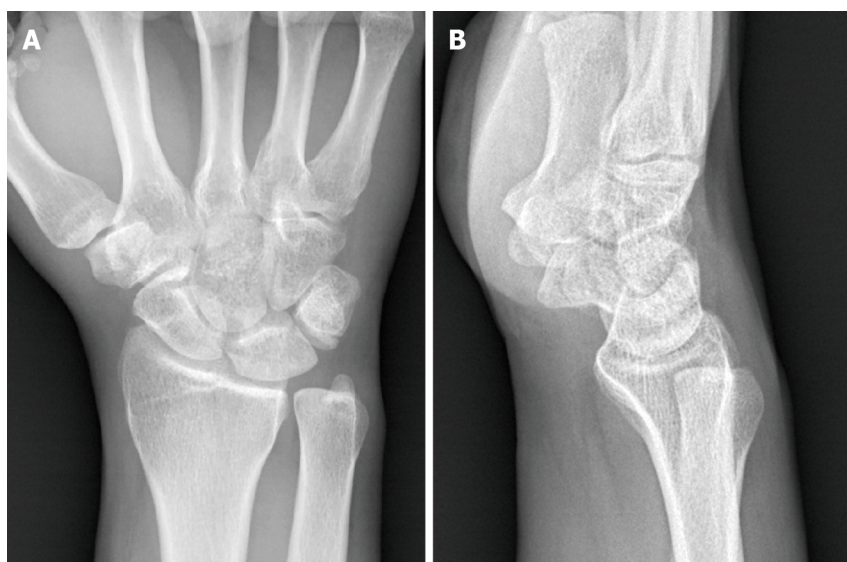


Figure 6 One year postoperative plain radiograph showed appropriate lunate alignment. A: Anteroposterior view of the wrist joint; B: Lateral view of the wrist joint. There was no evidence of avascular necrosis of the lunate, scapholunate instability, or carpal joint arthritis.

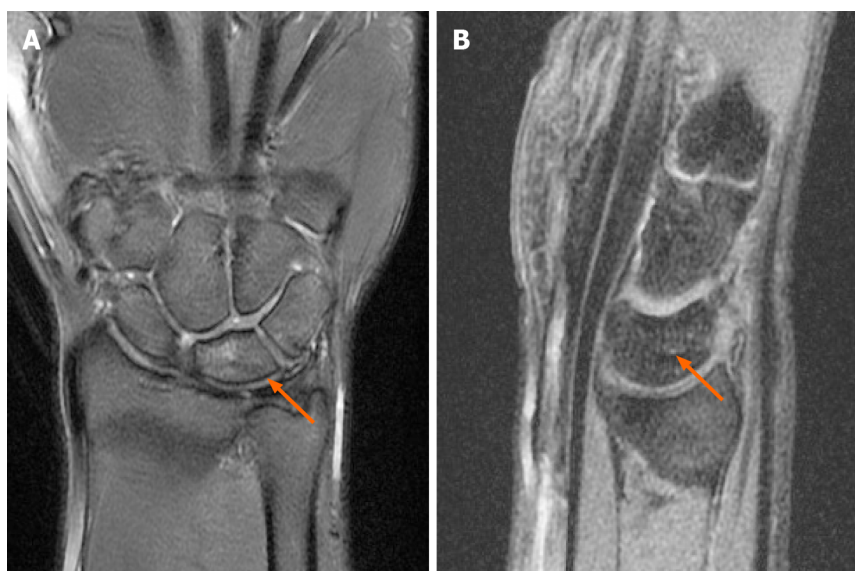


Figure 7 Magnetic resonance imaging follow-up 18 mo postoperatively. A: Coronal section; B: Sagittal section. These findings showed almost completely resorption of bone edema of the lunate (arrow) and did not progress into osteonecrosis.

Treatment of lunate or peri-lunate injury is currently challenging, given its rarity and high complication rate. The goals of surgical management are confirmation of reductions, ligamentous repair/reconstructions, fixation of associated fractures, and supplemental fixation of the bony architecture to facilitate ligamentous healing. The surgery can be performed through volar, dorsal, or combined approaches with carpal tunnel release. Herzberg suggested the single dorsal approach for cases in which the rotation of the dislocated lunate is less than 90°, and the double approach when the rotation of the bone is more than 90°[9]. However, several studies have demonstrated comparable outcomes. Thus, the choice of approach is largely influenced by surgeon preference[10-13].

This is the first such case in our practice to be treated with closed reduction and percutaneous Kirschner wires fixation. The reduction technique is meticulous and crucial. Although we agree that the closed reduction method can only be used in early-diagnosed cases of acute lunate dislocation, this surgical technique can provide an alternative treatment option that may be useful in selected cases.

CONCLUSION

This case provides evidence that the closed reduction technique for addressing acute lunate dislocation and managing triquetral fracture can reduce soft tissue destruction with the use of ligamentotaxis reduction. Postoperative 18 mo follow-up showed satisfactory outcome without progressive sequelae of carpal joint arthritis.

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