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Case Report

Successful Diagnosis and Treatment of Traumatic Radiocarpal Translocation

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Radiocarpal fracture translocations are uncommon injuries without well-defined treatment. This case report presents a patient with this injury that was treated with repair of the volar and dorsal structures and dynamic external fixation. Eight weeks after the procedure, the external fixation device was unlocked to allow wrist flexion and extension only. Twelve weeks after the procedure, the external fixation device was removed completely to allow full wrist range of motion. Six months after surgery, the patient had no reported pain or dysfunction, and no recurrence of radiocarpal translation. Treatment with repair of both volar and dorsal structures and dynamic external fixation was effective for this historically challenging injury to manage.

Radiocarpal translocations are uncommon injuries with treatment that has not been well defined. These injuries can be purely ligamentous in nature or involve osseous structures, such as the styloid process or scaphoid fossa.[1] Treatment generally involves repair of osseus and volar ligamentous structures with or without repair of dorsal structures or supplemental fixation.[1–4] Recurrent instability remains a challenge, suggesting that management may be improved.[1,3] We describe a patient with radiocarpal fracture translocation whose work-up involved magnetic resonance imaging (MRI), enabling recognition of both volar and dorsal capsuloligamentous injury. Subsequently, treatment involved volar and dorsal soft tissue repair. A dynamic external fixation device was applied and selectively unlocked in the postoperative period to allow controlled uniplanar active wrist range of motion. This enabled the soft tissue repair to heal while addressing the issue of wrist stiffness.

Case Report

A 20-year-old right-handed man was involved in a motor vehicle collision and sustained an isolated injury to his right wrist. In the emergency department of an outside hospital, he was provided with a wrist brace and discharged. Upon presentation to our office, radiographs revealed ulnar translocation of the radiocarpal joint with associated radial styloid fracture (Figure 1). MRI was performed and demonstrated both volar and dorsal ligamentous injury (Figure 2).

In surgery, a volar approach to the wrist was performed and revealed disruption of the radioscaphocapitate ligament, radiolunotriquetral ligament, and volar wrist capsule. A second, dorsal incision to the wrist was also performed and revealed disruption of the dorsal radiocarpal ligaments and avulsion of the dorsal capsule off of the dorsal distal radius (Figure 3). An Agee WristJack dynamic external fixation device (Hand Biomechanics Lab, Sacramento, CA) was then placed to span the wrist using a previously described technique.[5]

The radiocarpal joint was indirectly reduced via manipulations of the external fixation device. The volar and dorsal ligaments and capsule were repaired back to their origins on the distal radius using SuturTak and SwiveLock suture anchors (Arthrex, Naples, FL) (Figure 4). Intraoperative radiographs showed the radiocarpal joint to be stable.

Postoperatively, the dynamic external fixation device was kept locked in all planes for 8 weeks following surgery. At the 8-week office visit, the dynamic external fixation device was selectively unlocked to allow wrist flexion and extension only, while keeping ulnar and radial deviation locked. The patient was subsequently

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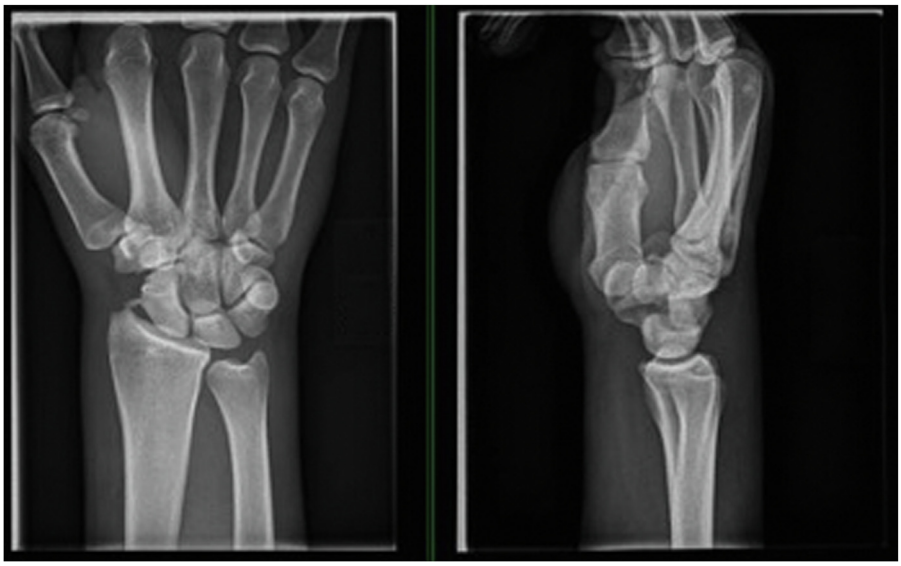

Figure 1. Radiographs of posteroanterior and lateral views of the injured wrist showing a radial styloid avulsion fracture and ulnar translation of the radiocarpal joint.

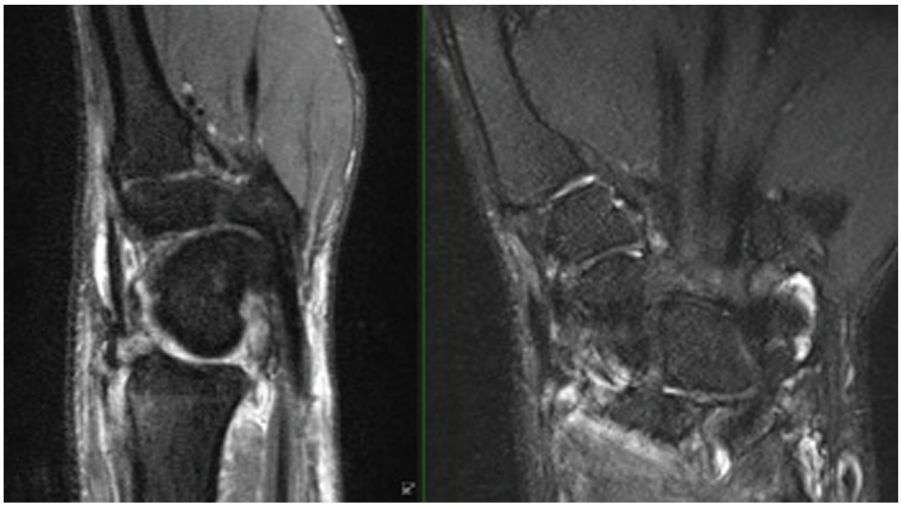

Figure 2. Magnetic resonance imaging provides sagittal and coronal views of the injured wrist showing volar and dorsal radiocarpal capsuloligamentous injury.

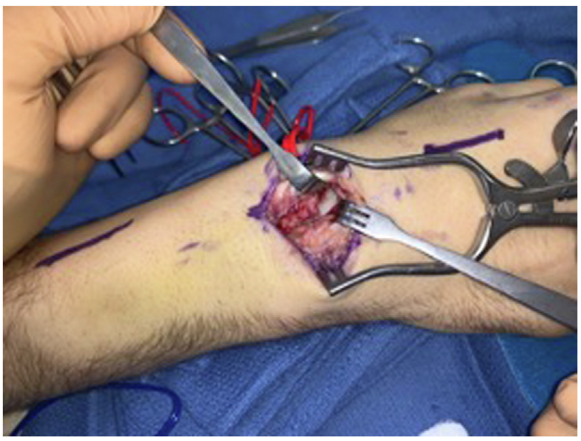

Figure 3. Intraoperative photograph showing avulsed dorsal radiocarpal ligaments and capsule.

Figure 4. Intraoperative photograph showing repaired volar radiocarpal ligaments and capsule with dynamic external fixator in place.

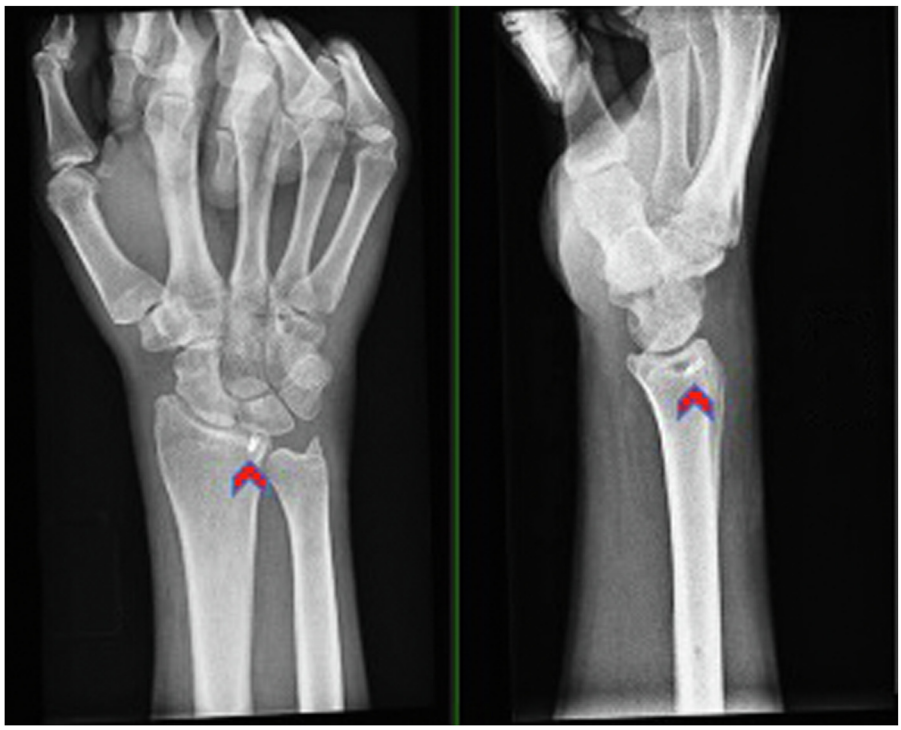

Figure 5. Six-month postoperative radiographs showing maintenance of reduction. Red arrow indicates Arthrex SuturTak.

encouraged to work on flexion and extension range of motion with occupational therapy and at home.

At 12 weeks following surgery, the dynamic external fixation device was completely removed under local anesthesia in the office, and the patient allowed range in his wrist in all planes of motion.

Six months after surgery, radiographs showed maintained alignment of the radiocarpal joint (Figure 5). The patient's injured wrist flexion measured 60°, extension measured 20°, ulnar deviation was 40°, and radial deviation was 20° (Figure 6). His uninjured wrist flexion measured 80°, extension was 40°, ulnar deviation was 45°, and radial deviation measured 20°. He denied any wrist pain and reported no limitations in performing his daily activities.

Discussion

To our knowledge, management of radiocarpal fracture translocations incorporating MRI to ascertain the extent of soft tissue injury, subsequent repair of volar and dorsal capsuloligamentous structures depending on the imaging findings, and supplemental fixation with a dynamic external fixator has not been delineated in the literature.

Historically, radiocarpal fracture translocations have been difficult to diagnose and treat. In cases attributable to pure ligamentous injury, radiographic findings may be subtle and initially read as unremarkable. Injury should be suspected when there is less than 50% articulation between the lunate and lunate facet of the distal radius or when there is an increased distance between the scaphoid and radial styloid on an anterior-posterior radiograph of the wrist in neutral position.[6] Comparison radiographs of the uninjured wrist can also be helpful.

Dumontier et al[1] reviewed 27 cases of radiocarpal dislocations and developed a classification system to separate these injuries into two categories. Type 1 injuries involve radiocarpal dislocations with or without a fracture of the tip of the styloid process. Type 2 injuries involve radiocarpal dislocations associated with a fracture of the distal radius through the scaphoid fossa. In both groups, stability of the radiocarpal joint is severely compromised, and open surgical treatment is recommended.

Open treatment generally involves repair of at least the volar extrinsic radiocarpal ligaments. Indeed, studies have validated the volar radioscaphocapitate and radiolunate ligaments as critical structures in preventing radiocarpal dislocation.[7] However, the importance of the dorsal radiocarpal capsuloligamentous structures in maintaining radiocarpal stability has been recognized as well. In a cadaveric study, Viegas et al[8] demonstrated that ulnar translocation occurs when all of the extrinsic wrist ligaments are damaged. They note that repairing only the volar ligaments is not sufficient to prevent translation. In a recent biomechanical study by Bui et al,[9] the dorsal radiocarpal soft tissue structures were found to significantly contribute to volar radiocarpal instability in injuries with volar lunate facet fragments. These findings suggest that the dorsal ligamentous structures of the wrist play a critical role in preventing radiocarpal instability. In line with this notion, some authors have reported promising outcomes with repair of both volar and dorsal capsule and ligamentous structures.[3,4] Thus, we recommend that the work-up of all patients with radiocarpal fracture translocations include MRI to determine the extent of injury. When the dorsal capsuloligamentous structures are found to be involved, treatment should include both volar and dorsal repair.

In these patients, temporary supplemental fixation is often employed to maintain radiocarpal joint concentricity while the soft tissue repairs heal. Described methods have included the use of dorsal spanning plates or percutaneous wires.[2,4] However, there is a challenge of maintaining immobilization while also avoiding excessive stiffness. We addressed this with application of a dynamic external fixation device that could be selectively unlocked at different time points in the postoperative period to allow early but controlled advances in wrist motion. We were encouraged by the data of studies demonstrating good results in patients with unstable distal radius fractures treated with dynamic external fixation, with outcomes and complications comparable to patients treated with static external fixation.[10]

Figure 6. Photographs at the 6-month postoperative visit showing range of motion of injured wrist (patient's right) compared to uninjured wrist.

In the present case, a patient with a radiocarpal fracture translocation had findings of both volar and dorsal radiocarpal ligamentous injury on MRI. The patient was treated using volar as well as dorsal repair of structures with additional stabilization provided by the application of a dynamic external fixation device. The use of a dynamic external fixation device allowed for careful graduated advances in motion, helping to achieve early motion to avoid stiffness while maintaining stability as the soft tissue repairs healed. No recurrence of radiocarpal translation was observed at long term follow-up.

Statement of Informed Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 (5).

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