Volarly Displaced Transscaphoid, Translunate, Transtriquetrum Fracture of the Carpus: Case Report

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A 16-year-old girl sustained a transscaphoid, translunate, transtriquetrum volarly displaced fracture due to shear stress in the coronal plane. Treatment involved open reduction and internal fixation of the fractures followed by immobilization. At 15 months' follow-up, grip strength and motion were diminished compared with the uninjured wrist. Radiographs demonstrated fully healed fractures with narrowing of the cartilage space between the capitate and the lunate. *(J Hand Surg Am. 2014;39(8):1507–1511. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Carpal fracture dislocation, coronal fracture, scaphoid, lunate, triquetrum.

Severe injuries to the carpus can be devastating and are often associated with poor outcomes from arthritic-related sequelae. Owing to the rare nature of these injuries, only a few patterns have been well described.[1] We present a 16-year-old girl who sustained a volarly displaced transscaphoid, translunate, transtriquetrum injury in the coronal plane. This injury pattern may represent a unique presentation of the currently established classifications of carpal derangement.

CASE REPORT

A 16-year-old girl was involved in an all-terrain vehicle rollover while traveling 25 to 30 miles per hour. She presented to the emergency department with complaints of left wrist, right clavicle, and back pain. Examination of the left wrist revealed marked volar swelling and deformity, painful range of motion, and no neurovascular compromise. Plain radiographs revealed what was initially interpreted as a perilunate dislocation (Fig. 1). A closed reduction with longitudinal traction with dorsal carpal translation was attempted but was only partially successful, because the patient continued to have major carpal instability despite the dislocation apparently having been reduced. To more closely delineate the nature of the injury, a computed tomography (CT) study revealed coronal fractures of the scaphoid, lunate, and triquetrum and an oblique fracture through the base of the ulnar styloid (Fig. 2).

Open reduction and internal fixation via dorsal and palmar approaches were performed. Dorsally, the third extensor compartment was opened via a longitudinal incision, and an ulnar-based retinacular flap was created by dividing the septum between the third and the fourth as well as between the fourth and the fifth extensor compartments. None of the dorsal ligaments were damaged. An extended carpal tunnel incision was made to address the volar carpal injury and to assist in the reduction of the fractures. All volar extrinsic ligaments were intact. A ligament-sparing dorsal capsulotomy was performed, and the carpus was exposed (Fig. 3). revealing intact intrinsic ligaments. The scaphoid fracture was reduced and fixed through a dorsal approach using a cannulated compression screw (Trimed Orthopedics, Valencia, CA) and an antirotation K-wire. The lunate fracture was fixed with 2 compression screws (Trimed) placed

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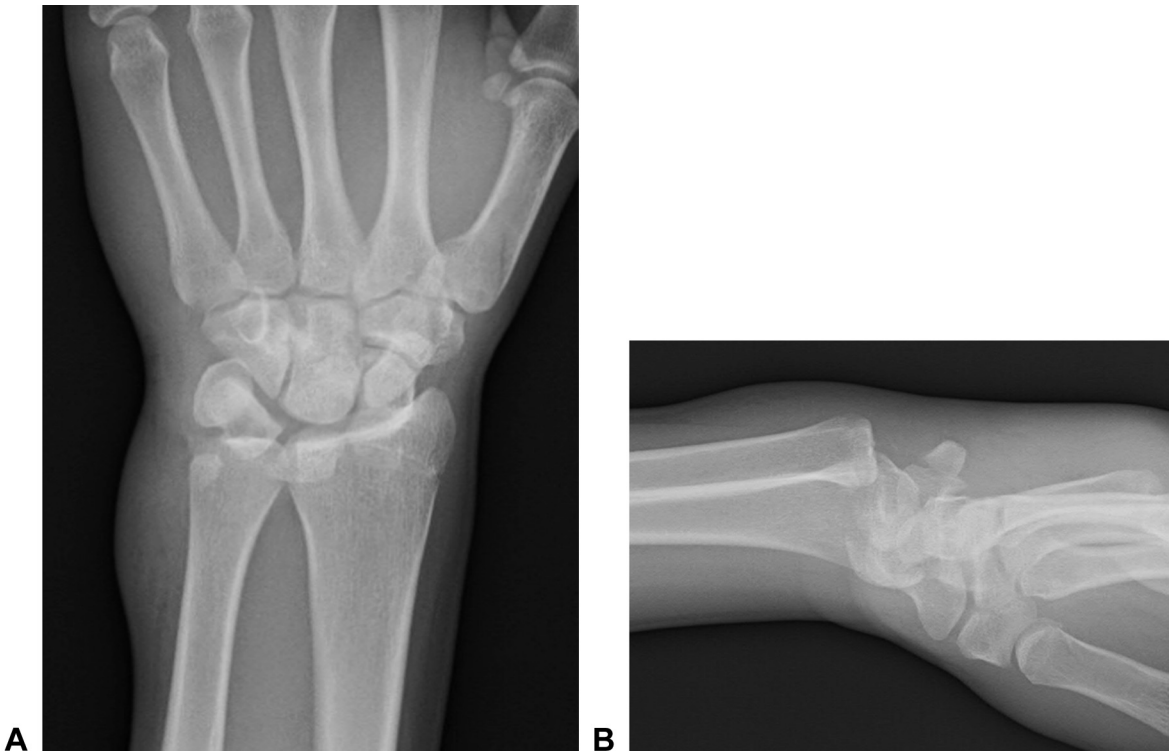

FIGURE 1: Presentation radiographs including anteroposterior **A** and lateral **B** views of the wrist. There is a clearly visible scaphoid fracture with what appears to be a carpal dislocation. The triquetral fracture can be seen on the lateral view, and the lunate fracture is difficult to visualize.

volar-to-dorsal. Afterward, the triquetral fracture was fixed by dorsal-to-volar placement of a compression screw (Trimed). Finally, owing to instability of the distal radioulnar joint, the ulnar styloid fracture was fixed with a K-wire. Examination at this point revealed full stability of the distal radioulnar, radiocarpal, and intercarpal joints.

The dorsal capsule and extensor retinaculum were repaired, and the wrist and forearm were immobilized in a sugar tong postoperative dressing. After 2 weeks, the orthosis was replaced by a Muenster-style thumb spica cast for 4 weeks. Six weeks after surgery, radiographs indicated adequate carpal alignment, the ulnar styloid wire was removed, and a short-arm cast was placed. A CT study 3 months after surgery revealed complete union of all 3 carpal bone fractures with no avascular necrosis. The patient then underwent removal of the antirotation K-wire and one of the compressive screws in the lunate to eliminate discomfort and to prevent damage to the radiocarpal joint. She returned to activity as tolerated. Fifteen months postinjury, wrist flexion was 45° and extension was 50°. Grip strength was 18 kg, compared with 28 kg on the opposite side. There was no tenderness and no evidence of instability. Radiographs demonstrated healed fractures with loss of cartilage space between the capitate and the lunate (Fig. 4). The patient returned fully satisfied to normal activity including competitive high school volleyball.

DISCUSSION

Displaced carpal fractures typically are the result of high-energy trauma. Many of these tend to occur as a result of a fall on an outstretched hand. Although it is true that many of these injuries result in the so-called perilunate model defined by Mayfield et al[2] and expanded by others,[3–5] certain aspects of this case disagree with this type of injury classification. First, in the perilunate injury model, volar dislocation of the lunate can occur only after the progressive failure of ligaments or carpal bones about or through the lunate. If this were truly a perilunate injury, we would expect to see obvious carpal derangement at the intercarpal level, yet the preservation of Gilula arcs II and III on initial anteroposterior x-ray (Fig. 1) seems to dispute this.

Second, the nature of the carpal fractures also appears to be in conflict with this model. Because perilunate injuries tend to occur after a fall on an outstretched hand, the carpal fractures seen are almost always in the axial plane and less commonly in the sagittal plane. Our patient's fractures occurred in the