Galeazzi Fracture With Volar Dislocation of the Distal Radioulnar Joint

Suezie Kim, MD, James P. Ward, MD, and Michael E. Rettig, MD

Abstract

Galeazzi fracture dislocations are fractures of the distal one-third of the radial diaphysis with traumatic disruption of the distal radioulnar joint (DRUJ). This injury results in subluxation or dislocation of the ulnar head. We present a case of a Galeazzi fracture with a volar dislocation of the DRUJ. Open reduction of the DRUJ with Kirschner wire fixation in pronation was necessary to reduce the joint and maintain anatomic alignment. Repair of the triangular fibrocartilage complex was also necessary to maintain stability of the DRUJ.

The Galeazzi fracture is an eponym named for an Italian surgeon, Ricardo Galeazzi (1866-1952) based on his case series of these injuries published in 1934. This fracture typically occurs at the junction of the middle and distal third of the radial shaft with an associated distal radioulnar joint (DRUJ) disruption. Because of uniformly poor results with nonoperative treatment, this injury has been referred to as a 'fracture of necessity' requiring surgical treatment for acceptable outcomes and restoration of function.[1-3]

A classification describing the likelihood of instability of the DRUJ, based on distance of the radial shaft fracture from the distal radius articular surface, was proposed by Rettig and Raskin in 2001.[4] This classification not only helped to identify which fractures were most at risk for instability of the DRUJ after radial shaft fracture fixation, but also guided treatment of these injuries. Type I injuries (ie, radial fractures <7.5 cm from the midarticular surface of the distal radius) are more likely to have DRUJ instability after radial fracture fixation than type II injuries (>7.5 cm from the midarticular surface of the distal radius).[4] Type I fractures were found to be more likely to require surgical treatment of the DRUJ after radial shaft fracture fixation.

The DRUJ dislocation of a Galeazzi fracture is commonly described as a dorsal dislocation.[1-7] After fixation of the radial shaft fracture, DRUJ stability should be evaluated in forearm supination, neutral rotation, and forearm pronation. Supination of the forearm usually reduces the dorsal dislocation of the DRUJ with restored stability and the forearm is immobilized in this position. Kirshner wire, fixation of the DRUJ in suspination is required if the DRUJ is unstable but reducible in supination. If the DRUJ is irreducible, open reduction is needed.

Volar dislocations of the DRUJ is rare. Several studies addressing the treatment of isolated volar dislocation of the DRUJ without associated fracture have been reported.[5,8-10] There is a relative paucity of literature regarding the treatment of volar dislocation of the DRUJ associated with a radial shaft fracture.[6,11] However, to our knowledge, there are no prior case reports of a volar dislocation of the DRUJ associated with a radial shaft fracture treated initially with open reduction and internal fixation of the radial shaft and closed treatment of the DRUJ dislocation in a supinated position.

Case Report

A 64-year-old-man was involved in a motor vehicle collision and sustained a twisting injury to his non–dominant left forearm. He had immediate pain, swelling, and deformity. An open wound over the volar aspect of his distal forearm was present. He presented to a local emergency room where initial radiographic evaluation revealed a displaced fracture of the radial shaft. He underwent emergent irrigation and debridement of the open fracture along with open reduction and internal fixation of the

Figure 1. Postoperative lateral radiograph after initial surgery demonstrating volar plate fixation of the radial shaft fracture in anatomic alignment with apparent volar dislocation of the distal ulna.

Dr. Kim and Dr. Ward are Residents, and Dr. Rettig is Clinical Associate Professor, Department of Orthopaedic Surgery, NYU Hospital for Joint Diseases, New York.

Address correspondence to: Michael E. Rettig, MD, 317 E 34th Street, New York, New York (e-mail, Michael.Rettig@nyumc.org).

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Figure 2. CT sagittal reconstruction cuts demonstrating volar dislocation of the DRUJ.

radial shaft through a volar Henry approach, and closed reduction and percutaneous Kirschner wire fixation of the DRUJ with 0.062 Kirschner wires.

Three days after surgical treatment, the patient was referred by the treating physician to the senior author's (MER) office for follow-up evaluation and care. Examination of the left upper extremity revealed a healing left forearm incision and a healing volar ulnar wound without erythema or drainage. The forearm was fixed in supination. Radiographic evaluation of the left forearm and wrist demonstrated volar plate fixation of the radial shaft fracture in anatomic alignment, and Kirschner wire fixation of the DRUJ with apparent volar dislocation of the distal ulna (Figure 1). Computed tomography (CT) of his left wrist confirmed the volar dislocation of the DRUJ (Figure 2).

Seven days after the injury the patient underwent reconstruction of the DRUJ. After the Kirschner wires were removed, open reduction of the volarly dislocated DRUJ was completed through a dorsal capsulotomy, with pronation of the forearm. Two 2.5 mm Statek soft tissue attachment devices (Zimmer, Warsaw, Indiana) were placed in the distal ulna adjacent to the ulnar styloid to repair the avulsed triangular fibrocartilage complex (TFCC). Two 0.062 Kirschner wires were placed from the distal ulna into the distal radius proximal to the DRUJ, with the forearm in pronation to maintain the reduction of the DRUJ (Figure 3). After closure, a long arm splint was applied.

Postoperatively, the wounds healed without complication. The patient was placed in a long arm cast. Eight weeks postoperatively, the Kirschner wires were removed and the patient was referred for occupational therapy to restore range of motion and strength. Subsequent follow-up evaluation demonstrated a well-

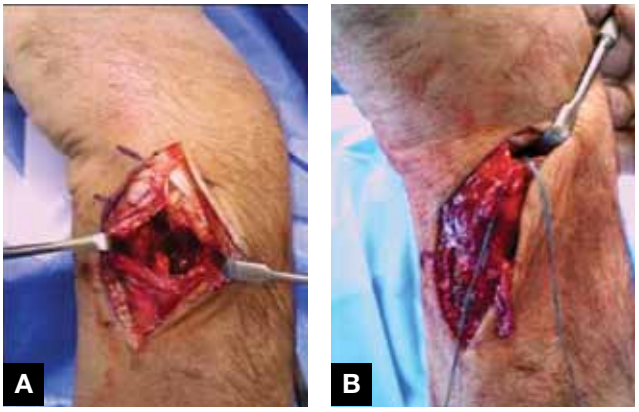

Figure 3. Intraoperative photos of the avulsed traingular fibrocartilage complex (A) and repair of TFCC with 2 suture anchors (B).

healed incision site, functional range of motion, as well as maintenance of the alignment of his DRUJ and healing of the radial shaft fracture (Figure 4). At 1 year after definitive surgery, radiographs demonstrated a healed radial shaft fracture and maintenance of the alignment of the DRUJ (Figure 5). The patient was able to dorsiflex his wrist to 55° degrees, palmar flex his wrist to 50°, supinate to 60°, and pronate to 80°.

Discussion

The combination of a radial shaft with DRUJ dislocation has been well known after Galeazzi's seminal work in 1934. The injury was, however, initially described in 1822 by Sir Ashley Cooper. Although there are various theories on the mechanism of injury, the force that results in

Figure 4. Posteroanterior (A) and lateral (B) postoperative radiographs demonstrating healing radial shaft fracture in anatomic alignment and Kirschner wires maintaing DRUJ reduction.

fracture of the radial shaft likely disrupts the interosseous membrane, and supporting structures of the DRUJ resulting in a dislocation.[6,12]

The axis of rotation of the forearm occurs at the ulnar fovea as it articulates with the distal radius.[8] The dorsal dislocation of the DRUJ, the most common injury pattern, is thought to arise from an excessive pronation force at the time of injury.[6] Conversely, the less commonly seen volar dislocation of the DRUJ is thought to be caused by forced supination of the wrist. Anatomically, the reason for the preponderance of dorsal dislocations of the DRUJ has not yet been elucidated. The most common mechanisms of injury, Galeazzi fractures, are falls from height and motor vehicle collisions. During these acts, the forearm is more commonly in a hyper-pronated position, thus providing a mechanistic reason for the predilection for dorsal dislocations.

The treatment of volar dislocations is similar to treatment of dorsal dislocations except for the reduction maneuver. The radial shaft fracture must be anatomically reduced and rigidly fixed. The forearm is placed in a pronated position to reduce the DRUJ.[1,2]

The triangular fibrocartilage originates at the fovea of the ulna and attaches to the ulnar styloid and consists of the meniscal homologue, ulnolunate ligament, ulnotriquetral ligament, fibrocartilagenous disc, ulnar collateral ligament, and the extensor carpi ulnaris tendon sheath.[13] This structure contributes to the stabilization of the DRUJ and a tear in this complex can result in dislocation of the ulnar head which may require repair for stable reduction.[14,15] In this case, the triangular fibrocartialage was avulsed from its insertion, which is similar to the pathology seen in dorsal dislocations of the DRUJ.

In our case, it is unclear whether the volar dislocation occurred at the initial time of injury or after operative fixation. Careful evaluation of PA and lateral radiographs or CT scan is necessary to determine appropriate reduction maneuvers and operative fixation options.

Conclusion

Volar dislocations of the DRUJ associated with Galeazzi fractures are rare. Open reduction of the DRUJ with Kirschner wire fixation in pronation was necessary to reduce the joint and maintain anatomic alignment. Repair of the triangular fibrocartilage complex was also required to help preserve stability.

Figure 5. Posteroanterior, oblique, lateral postoperative images 1 year after surgery demonstrating healed radial shaft fracture and maintenance of anatomic alignment of DRUJ.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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This paper will be judged for the Resident Writer's Award.