Ulnar Nerve Injury as a Result of Galeazzi Fracture: A Case Report and Literature Review

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Paul Roettges¹ and Tolga Turker¹

Abstract

Background: Sparse documentation of Galeazzi fracture with associated nerve injury exists in the medical literature. The purpose of this report is to review the available literature in regard to incidence, nerve injury type, treatment strategies, and expected outcomes. **Methods:** We present a classic Galeazzi fracture dislocation with associated complete ulnar nerve transection injury at the level of the wrist. After rigid internal bony stabilization, allograft nerve repair was performed. The patient's presentation, operative management, recovery, and a thorough literature review are discussed. **Results:** Fracture union was attained with near full wrist and elbow range of motion. Despite lack of ulnar nerve function return, the patient was able to resume manual labor occupation. **Conclusions:** Despite its close proximity to the dislocating distal radioulnar joint (DRUJ), thorough review reveals rare associated ulnar nerve palsy. If there is suspicion for nerve injury in the setting of open DRUJ dislocation, the nerve should be explored to identify possible entrapment or transection. Literature supports likely return of nerve function in cases of intact nerve; however, management of nerve transection remains debatable.

Keywords: Galeazzi fracture, Galeazzi, ulnar nerve, ulnar nerve injury, nerve repair, nerve allograft

Introduction

Fracture of the radius shaft with disruption of the distal radioulnar joint (DRUJ) has commonly been referred to as a Galeazzi fracture following Dr Riccardo Galeazzi's series report in 1935.¹⁸ Much of the literature has focused on the outcomes associated with management of the DRUJ injury.^{1-7,9-15,22} However, there is a paucity of case reviews regarding associated ulnar nerve injury and its management. We present a case of complete ulnar nerve transection as a result of classic Galeazzi fracture dislocation.

Case Report

A 45-year-old male presented via emergency medical services after a motorized dirt bike accident resulting in an obvious open forearm injury. He had concurrent liver laceration and L1 superior endplate fracture, both of which were managed conservatively. Initial evaluation documented motor and sensory deficits in the ulnar distribution. No other extremity trauma was identified. Radiographs revealed radius shaft fracture with DRUJ dislocation (Figure 1). The patient received cefazolin and tetanus booster. After initial bedside wound lavage, a closed reduction was performed in the emergency department and the

patient was subsequently brought to surgery less than 24 hours from initial injury as the first case of the coming morning.

Intraoperatively, the patient was found to have complete ulnar nerve transection at the level of the ulna head (Figure 2). The bones and soft tissues were meticulously debrided and irrigated. Open reduction and internal fixation was performed for the open radius fracture. The proximal ulna was then easily reducible within the sigmoid notch. Persistent instability of the DRUJ was noted in both full pronation and full supination, and thus, fixation was augmented with two 1.6-mm Kirschner wires just proximal to the sigmoid notch in neutral DRUJ rotation (Figure 3). Attention turned to the nerve injury. Both ends of the ulnar nerve were evaluated under surgical microscope. Nerve ends had a ragged appearance with significant ecchymosis. Ends were debrided to healthy-appearing neural tissue leaving a 4-cm nerve gap. A tension-free repair was performed utilizing a 4.5-cm nerve

¹University of Arizona College of Medicine, Tucson, USA

Corresponding Author:

Paul Roettges, University of Arizona College of Medicine, 1501 N. Campbell Avenue, Tucson, AZ 85724-5018, USA.
Email: proettges@ortho.arizona.edu

Figure 1. Injury radiographs confirming radius shaft fracture with distal radioulnar joint dislocation.

allograft secured end to end with 8-0 nylon. Distal and proximal nerve repair sites were protected from surrounding tissue with loose neurotube. After surgical intervention, the patient was splinted in neutral pronosupination for 6 weeks followed by initiation of physical therapy. He was fabricated an anticlaw brace. At 6-month follow-up, he has regained near full range of motion lacking 5° of pronation and 10° of supination. He has Tinel sign at the hypothenar region without return of motor or sensory function. Despite lack of return of ulnar nerve function, he has returned to manual labor work.

Discussion

We present a case report of open Galeazzi fracture with complete ulnar nerve transection. A review of the Galeazzi fracture literature demonstrates rare association with noniatrogenic nerve palsy.^{6,8,15,17,19,21,22} Two of these, one each in an adult and an adolescent patient, are documented cases of anterior interosseous neuropraxia from closed injury with complete return of function after a series of months of observation.^{19,21} The remaining articles all make mention of ulnar nerve palsy with Galeazzi fracture. However, a detailed review often finds lack of correlation to the classic Galeazzi injury of radius shaft fracture with DRUJ dislocation or failure to define the type of nerve injury and its management.

A study by Odena et al has been cited; however, a review of this case demonstrates the injury to be what was termed a bipolar injury consisting of radius and ulna fractures with proximal radioulnar joint and DRUJ dislocations. Furthermore, the only mention of nerve injury states that severed

nerves and tendons were sutured without further detail.⁸ A study by Wong et al is often cited in discussion of Galeazzi fracture-associated nerve palsy. However, its review finds that none of their patients had associated nerve injury. Instead, there is merely a mention of a personal communication to a physician that had experienced an “ulnar nerve lesion” without further detail.²² In the largest case series to date, Mikić document a case of ulnar nerve palsy that later was explored at the time of distal ulna resection and found to have intact nerve despite a lack of return of function. This patient was documented to have fracture of both the radius and ulna with subluxation of the DRUJ, which Mikić had included in his series as a Galeazzi variant.⁶ Case discussion by Saitoh et al documents an intra-articular distal radius fracture that had associated median and ulnar nerve paresthesias.¹⁷ Due to subsequent loss of reduction and planned corrective osteotomy, a computed tomography study was attained which demonstrated anterior dislocation of the ulna head from the sigmoid notch, thus justifying the author’s stance of a Galeazzi variant type injury. Treatment consisted of decompression of the carpal tunnel and Guyon canal, division of a compressive adjacent vessel, and correction of the bony deformity resulting in full resolution of these sensory palsies over a 5-month period. Ring et al present a series of 36 patients with isolated radial shaft fractures, 9 of which are determined to be classic Galeazzi injuries. There is mention of one case with associated “complete ulnar nerve palsy;” however, no further details are provided leaving it unclear the nature of the nerve palsy, its management, and whether it was associated with classic Galeazzi fracture or isolated radial shaft fracture.¹⁵

In light of above reports, our case appears to be the only case that documents the type of nerve injury, its management, and outcome. While a mechanism of injury is difficult to distinguish in light of a high-energy injury with wide zone of injury, our inspection of the wound and the location of the nerve injury appears consistent with the head of the ulna stretching the nerve to failure during dislocation and extrusion from the soft tissue envelope. We hypothesize that this led to a complete midsubstance tear of the ulnar nerve at the level of the distal ulna with the avulsed nerve ends having a broader zone of injury than what may be expected in the case of a sharp laceration. The limited documented literature supports that nerve palsy with intact nerve is likely to resolve in a series of months. If nerve compression or entrapment is encountered, this too can expect resolution of the palsy after freeing the nerve in a primary or delayed fashion. In the absence of defined treatment strategies for Galeazzi fracture with ulnar nerve transection, we proceeded to debride the torn nerve ends to healthy neural tissue and repair utilizing nerve allograft at the time of index procedure. Safa and Buncke recently reviewed the body of literature regarding the use of peripheral nerve allograft. They combined this with their experience in a multicenter nerve registry

Figure 2. Intraoperative image with arrows highlighting the two ends of the transected ulnar nerve prior to debridement.

Figure 3. Postoperative radiographs demonstrating rigid, anatomic fixation of the radius with Kirschner wire augmentation proximal to the reduced distal radioulnar joint.

including 146 repairs. While the majority of these repairs were sensory nerves, 22 were major mixed or motor nerves with gaps up to 65 mm. Within these, they report M3 or better recovery in 86% and M4 or better in 58%. The average reported gap was 30 mm. They matched these with contemporary autograft repair cases and found no statistical difference in return of function.¹⁶ In light of this, as well as the lack of donor site morbidity and decreased operative time, we believe allograft repair to have been a reasonable treatment strategy. Other possible considerations when analyzing failure of return of nerve function are the timing of repair

and the need for prophylactic decompression at compressive sites near the zone of injury such as the Guyon canal. Our debridement of nerve ends to healthy-appearing neural tissue encompassed 4 cm of nerve and appeared sufficient at the time. However, in retrospect, it may have been wise to perform nerve repair in a delayed fashion so as to allow the extent of the neural injury to more formally declare itself. Further dissection of the ulnar nerve distally to the Guyon canal would have required extension of our surgical site and further soft tissue insult. Acute Guyon canal decompression has not been supported in the Galeazzi or forearm fracture literature. Vastamaki et al review delayed ulnar nerve repair in 110 patients. The majority of the patients' injuries were at the level of the wrist and forearm. Despite autograft repair, they had 31.3% of patients with M1S1 or worse recovery.²⁰ Age greater than 40 and associated fracture both were independently statistically significant negative prognosticators. Sharp laceration was a statistically significant positive prognosticator. This illustrates the many difficulties encountered in our case. Ultimately, lack of nerve function return may have been expected more than 30% of the time in our case; however, the most appropriate management in regard to timing and technique of repair in high-energy trauma is certainly a consideration in future cases.

Conclusion

We present a classic Galeazzi fracture dislocation with associated complete ulnar nerve transection. A detailed pre-operative exam is vital in the appropriate management of this injury. If there is suspicion for nerve injury in the setting of open DRUJ dislocation, the nerve should be explored to identify possible entrapment or transection. Entrapped nerve can be relocated at the time of DRUJ stabilization. The literature supports likely return of nerve function in cases of intact nerve. Our case demonstrates ulnar nerve

transection in a large zone of injury to be a difficult scenario without reliable return of ulnar nerve function despite microsurgical allograft repair. Further analysis is needed as to the appropriate management. Despite lack of ulnar nerve function return, patients may expect to be able to continue manual labor with the associated low ulnar nerve deficits.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

This article does not contain any studies with human or animal subjects.

Statement of Informed Consent

Informed consent was obtained from all individual participants included in the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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