

Ulnar Nerve Management with Distal Humerus Fracture Fixation: A Meta-Analysis



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KEYWORDS

• Humerus • Internal fixation • Ulnar nerve • Meta-analysis • Transposition • Decompression

KEY POINTS

- Ulnar neuropathy is common after distal humerus fracture repair surgery, with an overall incidence of 19% postoperatively.
- The ulnar nerve is typically managed intraoperatively with in situ neurolysis or transposition during fracture fixation.
- Postoperative ulnar neuropathy was increased in patients who underwent transposition versus in situ management of the ulnar nerve.
- It is unclear if the higher prevalence of neuropathy in cases with a transposition is due to greater fracture severity, iatrogenic injury during dissection or transposition, or subsequent postsurgical scarring with fracture healing. However, the authors can conclude transposition does not have a protective effect against the development of late ulnar neuropathy after distal humerus fracture repair surgery.

INTRODUCTION

Fractures of the elbow account for approximately 7% of adult fractures,¹ and distal humerus fractures comprise 30% of all elbow fractures.² When open reduction and internal fixation (ORIF) is indicated, several operative complications such as nonunion, loss of functional motion, and ulnar neuropathy have been reported.^{3,4} Sodergard and colleagues⁵ discussed complications following ORIF of distal humerus fractures, including fixation failure, nerve injury, and infection. Furthermore, Gofton and colleagues⁶ reported complication rates up to 48%, which included heterotopic ossification (17%), infection (9%), and olecranon nonunion (9%).

Ulnar neuropathy in particular poses a unique challenge, as it can be a product of the initial injury, surgical management, or postoperative rehabilitation. The rate of ulnar neuropathy following ORIF of distal humerus fractures has been reported between 0% and 51% in previously described studies.^{7,8} It is currently not well understood what the best method is for managing the ulnar nerve during ORIF between leaving the nerve in situ or transposing it.

Huang and colleagues⁸ conducted a retrospective evaluation of distal humerus fractures treated operatively at a level 1 trauma center between 1997 and 2005 in patients older than 65 years. At the final follow-up (range 20–99 months), the

Disclosure Statement: The authors have no relevant disclosures.

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Hand Clin 34 (2018) 97–103

<https://doi.org/10.1016/j.hcl.2017.09.010>

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mean Mayo Elbow Performance score was 83 (range 55–100) with 6 excellent (95–100), 3 good (75–90), 3 fair (60–74), and 2 poor (less than 60) results. They reported a postoperative rate of ulnar neuropathy of 0%.

Similarly, Doornberg and colleagues⁹ conducted a retrospective study looking at 30 adult patients who underwent operative treatment of complete articular fractures of the distal humerus. The average age of this cohort was 35 years. The average length of the follow-up was 19 years (range 12–35 years). They used multiple surveys to assess functional outcomes. Ultimately, they found that at the follow-up, the average flexion arc was greater than 100°, the average Disabilities of Arm, Shoulder, and Hands (DASH) score was comparable with the average score in the general US population and that arthrosis was present in most (80%) of the patients; these outcomes were not independent predictors of patient-rated disability (DASH score) or surgeon-rated elbow function. They also described only a 3% rate of postoperative ulnar neuropathy.

On the other hand, Vazquez and colleagues¹⁰ retrospectively evaluated 69 distal humerus bicolumnar fractures treated with ORIF. In 47 patients, the nerve was left anterior in the subcutaneous tissues; in the remainder of the patients, it was placed back in the cubital tunnel. They reported 14 patients with documented ulnar nerve dysfunction at either the immediate postoperative period or at the final evaluation. In the immediate postoperative period, 7 patients had neuropathy and 4 had been transposed. In 3 of these patients, symptoms resolved at the 1-year point; but 7 additional patients developed neuropathy and, among those, 5 had been transposed. Ultimately, there was no significant difference between the two strategies of handling the ulnar nerve and the development of ulnar neuropathy.

Chen and colleagues¹¹ performed a retrospective review of 137 consecutive patients who underwent ORIF of an Orthopedic Trauma Association 13A or 13C distal humerus fracture by one of 3 orthopedic trauma surgeons at 2 institutions between 1996 and 2005. Two cohorts were identified: 89 patients (mean age 48.6 years) who had not undergone an ulnar nerve transposition and 48 patients (mean age 43.2 years) who had undergone a transposition during ORIF. The decision for transposition was based on surgeon preference and implant position. They found that symptoms of ulnar neuritis occurred 4 times more frequently in patients who had undergone transposition. The incidence of postoperative ulnar neuritis in patients who had undergone transposition was 16 of 48 (33%) and only 8 of 89

(9%) in patients who underwent in situ decompression. Based on this study, the investigators do not recommend routine transposition of the ulnar nerve at the time of ORIF of distal humerus fractures.

Ruan and colleagues¹² evaluated 117 consecutive patients who sustained an Arbeitsgemeinschaft für Osteosynthesefragen (AO) type C fracture of the distal humerus and were treated with ORIF. They found that 29 of the patients (24.8%) presented with ulnar nerve symptoms before operative treatment. They then divided that cohort into 2 groups: one group received ORIF in conjunction with anterior subfascial transposition of the ulnar nerve and the other group received ORIF in conjunction with in situ decompression. All patients were followed up for an average of 29.5 months postoperatively, and all fractures healed appropriately. They found that in the transposition group, 12 of 15 patients recovered completely and 3 patients recovered partially. In the in situ decompression group, they found that 8 of 14 nerves recovered completely and 6 patients recovered partially. They concluded that transposition of the nerve may have benefits with respect to postoperative recovery of nerve function.

In the Canadian Orthopedic Trauma Society's randomized trial of ORIF versus total elbow arthroplasty for bicolumnar fractures of the distal humerus, 20 patients were randomized to receive ORIF and 20 were randomized to receive total elbow arthroplasty (TEA). Five of the patients randomized to the ORIF group were converted intraoperatively to TEA. They routinely transposed the ulnar nerve in both cohorts and reported that the rate of postoperative ulnar nerve symptoms was 20% (5 patients in the ORIF group and 3 in the TEA group).³

Worden and Ilyas¹³ conducted a retrospective chart review of all patients aged 18 years and older who underwent ORIF for a distal humerus fracture between 2004 and 2008 at a level I urban academic medical center. Patients were excluded if they had a preinjury history of ulnar nerve dysfunction. The ulnar nerve was either managed with an in situ release or anterior transposition. McGowan¹⁴ staging was used to assess the severity of ulnar nerve dysfunction. Grade I was defined as minimal lesions with no motor weakness of the ulnar intrinsic and paresthesia in the ulnar nerve distribution. Grade II was defined as intermediate lesions with weak interossei and decreased sensation. Grade III was defined as a severe lesion with interossei paralysis and marked hypoesthesia. They included 24 cases and found that 50% of the cases had undergone in situ release and 50% were anteriorly transposed. Ultimately, they reported a 38% incidence of postoperative ulnar

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