Intramedullary Threaded Nail Fixation for Distal Ulna Fractures: A Case Series Detailing Radiographic and Functional Outcomes

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INTRODUCTION:

Intramedullary headless compression screw (IMHS) fixation of upper extremity fractures has gained popularity secondary to providing sufficient stability for early range of motion while limiting disruption of the soft tissues. Traditionally, this construct has been implemented in the fixation of metacarpal fractures. Limited in the current literature but prevalent in practice is the utilization of similar implants for the fixation of distal ulnar neck fractures. There are various techniques described for the treatment of distal ulnar neck fractures, including: non-operative management, distal ulna resection, Kirschner-wire (K-wire) fixation, tension band wiring, internal fixation with plate and screws and more recently intramedullary threaded nail (IMTN) fixation. IMTNs offer multiple potential advantages in the treatment of distal ulnar neck fractures when compared to alternative fixation options, namely absence of hardware prominence and minimal soft tissue disruption. For distal ulnar neck fractures, plate fixation is well established in the literature as the gold standard for stability and union. However, the distal ulna has a tenuous soft tissue envelope. Prominent hardware is a known complication and favors lower profile implants. Additionally, the size of the distal fracture fragment typically limits fixation options. In comparison, IMTNs are implants are inserted retrograde, with no hardware prominence and minimal soft tissue disruption. However, there is a scarcity of literature analyzing the clinical outcomes or surgical technique of IMTNs. The aim of this study was to report the radiographic and functional outcomes for patients with distal ulnar neck fractures treated with IMTN fixation method at a single institution.

METHODS:

At a single Level 1 Trauma Center, a retrospective review was conducted for patients with distal ulnar neck fractures treated with retrograde IMTN between 2022 and 2024. Exclusion criteria included inadequate follow-up or subsequent unrelated procedures or injuries on the operative extremity. A single surgeon performed all procedures using percutaneous retrograde IMTN fixation through the central disc of the triangular fibrocartilage complex (TFCC). Patients were initially immobilized postoperatively before initiating a range of motion (ROM) protocol two weeks post-operatively. Post-operative radiographic images were used to calculate the ratio of IMTN diameter to the distal ulnar medullary isthmus diameter proximal to the fracture site. Radiographic changes in displacement, angulation, and ulnar variance were calculated between the initial follow-up radiograph and the patient's follow-up radiographs. Functional outcomes including grip strength, quickDASH score, and ROM arc were collected.

RESULTS:

Seven patients with distal ulnar neck fractures were treated with percutaneous retrograde IMTN between 2022 and 2024. They were followed for a minimum of three months post-operatively. All patients were female with an average age of 65.6 years old. All distal ulna fractures were associated with operatively treated intra-articular distal radius fractures. All patients were treated with 75 mm length and 4.5 mm diameter IMTNs. IMTN-to-Isthmus ratio was greater than 60% in all cases. Average radiographic displacement and angulation were unchanged at the final follow-up except for one patient who experienced 3mm of translation. The average ulnar variance increased by 0.98 mm. Patients achieved average final forearm pronation-supination arc of 146 degrees and average final wrist flexion-extension arc of 98 degrees. Functionally the average grip strength as a percentage of the contralateral side was 45%. At last follow-up, the average quickDASH score was 15 and there were no postoperative complications. Specifically, no patients demonstrated ulnar sided wrist pain at last follow up and there were no instances of nonunion or revision surgery.

DISCUSSION AND CONCLUSION: Management of distal ulnar neck fractures with an ipsilateral distal radius fracture can be challenging due to the high degree of instability in a high demand patient. Plate and screw fixation theoretically offers superior rotational control of an unstable fracture, but plates can be difficult to position and usually involve significant soft tissue disruption. More recently, and like the technique described in this study, is the use of a retrograde IMTN for fixation. The authors have previously published a limited case series detailing three patients in which outcomes using IMTN were favorable however there was limited functional and patient reported outcome data collected in our previous series. The lack of patient reported outcomes and small sample size limited the generalizability of our previous findings. This updated series continues to highlight the positive outcomes that are achievable with use of IMTN fixation. Compared to open reduction and internal fixation of ulnar neck fractures, the IMTN is minimally disruptive to the soft tissue envelope. While the insertion site is through the central disc of the TFCC, the innervated TFCC insertion is avoided, and zero of our seven patients reported ulnar sided wrist pain at last follow up. Additionally, our patients experienced normalization of quickDASH scores at last follow up with restoration of range of motion and functional grip strength. Post-operative radiographic outcomes demonstrate appropriate alignment with minimal residual displacement and no residual angulation

following IMTN fixation. The authors continue to highlight retrograde IMTN fixation as a novel surgical technique for the treatment of distal ulnar neck fractures that can be pursued with favorable outcomes.