Distal Humerus Fixation – Can We Treat with Independent Screws?

Zuhair J. Mohammed[1], Robert W. Rutz[1], Matthew Yeager[1], Loren C. Tholcke[1], Sterling Tran[1], Clay A. Spitler[1]
[1]University of Alabama at Birmingham, Birmingham, AL
Email of Presenting Author

Disclosures: Zuhair J. Mohammed (N), Robert W. Rutz (N), Matthew Yeager (N), Loren C. Tholcke (N), Sterling Tran (N), Clay A. Spitler (N)

INTRODUCTION: Distal humerus fractures in adults require open reduction and internal fixation to allow for early range of motion. Stable fixation is required to allow early range of motion and some authors have proposed that every screw placed in a construct is placed through a plate to provide optimal stability. This study investigates if fixation using independent screw(s) outside a plate impacts union rates following distal humerus fracture.

METHODS: A retrospective review was conducted examining surgically treated distal humerus fractures from 3/1/2015 until 12/31/2021. Fractures were divided into two groups. Group 1 was comprised of constructs which included independent screw(s) not passing through a plate. Group 2 constructs had all screws passing through plates. Data was gathered on manner of fixation, screw placement, demographics, comorbidities, adverse outcomes, nonunion rates, fracture patterns, and length of follow-up. Independent t-tests and Pearson's chi-square were used to determine if differences exist with these groupings.

RESULTS SECTION: Our cohort included 109 cases. Reviewing medical records identified 57 cases to have independent screw(s) outside of the plates, and 52 cases having all screws pass through plates. We noted no significant differences in baseline demographic characteristics and comorbidities between the two cohorts. There was a significant difference in operative time between the two cohorts (239 minutes vs. 202, p=0.024). The nonunion rates of these groups were 8.77% and 15.38% respectively (p=0.287). We noted no other significant differences in complications following fracture fixation. We also noted no significant differences in elbow flexion, extension, and available arc at 6 month follow-up between the two cohorts.

DISCUSSION: Contrary to some of the principles of optimizing stability of distal humerus fracture fixation, this study found no difference in union rates between constructs where all screws in the articular block pass through a plate and those with independent screw fixation followed by plating. The transition from provisional to definitive fixation can be challenging and independent screw fixation can make this transition more efficient. Additionally, independent screws outside the plate are sometimes necessary to adequately capture all articular fragments (particularly coronal plane articular fracture fragments). This data supports that each fracture pattern should be independently assessed to provide the most biomechanically sound construct for the fracture in the most efficient manner, with the knowledge that independent screws placed outside the primary plates have no effect on union rates.

SIGNIFICANCE/CLINICAL RELEVANCE: Traditional literature in distal humerus fixation focuses on principles of fracture fixation to increase construct stability, including the concept that every screw placed in distal fragments should pass through a plate. Our study challenges those notions, showing equivalent surgical outcomes and union rates with the use of independent screws to control distal fragments and fracture comminution.

REFERENCES:

1. Meling, T., Harboe, K. & Søreide, K. Incidence of traumatic long-bone fractures requiring in-hospital management: A prospective age- and gender-specific analysis of 4890 fractures. *Injury* **40**, (2009).
2. Yetter, T. R., Weatherby, P. J. & Somerson, J. S. Complications of articular distal humeral fracture fixation: a systematic review and meta-analysis. *J. Shoulder Elb. Surg.* **30**, 1957–1967 (2021).
3. O'Driscoll, S. W., Sanchez-Sotelo, J. & Torchia, M. E. Management of the smashed distal humerus. *Orthopedic Clinics of North America* vol. 33 (2002).

IMAGES AND TABLES: Images and tables will appear at the end of the abstract and must be sized to fit within the abstract. Three images and/or tables are allowed per abstract.

Complication	No Independent Screw	Independent Screw	P-value
Wound Dehiscence	1 (2%)	7 (12%)	0.064
Superficial Infection	2 (4%)	4 (7%)	0.681
Deep Infection	3 (6%)	10 (18%)	0.058
Hardware Failure	2 (4%)	5 (9%)	0.441
Hardware Removal	6 (12%)	9 (16%)	0.520
Unplanned reoperation	16 (31%)	24 (42%)	0.220
Postop Ulnar Neuropathy	11 (21%)	10 (18%)	0.633
Nonunion	8 (15%)	5 (9%)	0.287

Table 1: Postoperative Outcomes

Mean degrees (n) +/-SD	Independent Screw	No Independent Screw	p-value*
Flexion at 6-month follow-up	111.5 (40) +/-23.3	117.2 (33) +/-21.8	0.284
Extension at 6-month follow-up	13.7 (36) +/-15.3	15.5 (33) +/-17.1	0.652
Available Arc 6-month follow-up	97.2 (40) +/-32.5	101.0 (30) +/-32.7	0.631

Table 2: Range-of-Motion Outcomes at 6 months Follow-Up