Impact of Distal Radius Fracture Morphology on Post-Operative Outcomes

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INTRODUCTION: Distal radius fractures (DRF) are one of the most common injuries seen in the practice of orthopaedic surgery, representing roughly 2.5% of all emergency room visits and 44% of all fractures.[1] Elderly adults and young children are disproportionately affected. Despite its high incidence, debate remains on optimal management strategies. Open reduction, internal fixation is currently the standard of care. Many studies have compared different techniques of fixation for various fracture morphologies, yet there is a paucity of research examining differences in outcomes based on the type of DRF. We hypothesize that patients with multi-fragment DRF will have worse outcomes than those with single-fragment DRF.

METHODS: The National Surgical Quality Improvement Program (NSQIP) database was queried for distal radius fractures between the years 2012-2021 using three unique CPT codes. Code 25607 represents patients with single fragment fracture, code 25608 represents 2-fragment fractures, and code 25609 represents 3-fragment fractures. One-way ANOVA tests and multi-variate logistical regression analysis was performed using the R software.[2]

RESULTS SECTION: A total of 32,649 patients were included in our study. 11,834 patients had single fragment fractures, 10,404 patients had 2-fragment fractures, and 10,411 patients had 3-fragment fractures. Total length of hospital stay was significantly longer in the 1-fragment cohort compared to both the 2-fragment and 3-fragment cohorts (**Table 1**). No significant difference in length of stay was observed between the 2-fragment and 3-fragment groups. There was also no significant difference in time from admission to operation between the three groups. Patients with 3-fragment fractures had significantly lower rates of DVT, reoperation, and death compared to patients with 1-fragment fractures (**Table 2 & Figure 1**). No significant differences were seen in post-operative outcomes between 1-fragment and 2-fragment groups.

DISCUSSION: We found a relatively even distribution of fracture types across a 10-year period. Patients experiencing 1-fragment DRF had significantly longer lengths of hospital stay. Interestingly, patients sustaining 3-fragment fractures had significantly lower rates of several post-operative complications including death. Patients with 1-fragment fractures likely represent elderly patients sustaining low-energy trauma. Therefore, it is conceivable that these patients have longer hospital stays and increased complication rates due to their underlying comorbidities and poor functional status. In contrast, the 3-fragment fracture group likely represents younger patients sustaining high-energy trauma. Due to a relative lack of significant comorbidities, these patients have an increased likelihood of adequate recovery.

SIGNIFICANCE/CLINICAL RELEVANCE: Patients sustaining 1-fragment DRF have longer lengths of stay and increased complication rates compared to those with more severe 2- and 3-fragment fractures. Thus, orthopaedic surgeons must be attuned to the complexities of patients sustaining these seemingly benign injuries.

REFERENCES: [1] Chung KC, Spilson SV. The frequency and epidemiology of hand and forearm fractures in the United States. J Hand Surg Am. 2001;26(5):908-915. [2] R Core Team (2023). R: A language and environment for statistical computing. Vienna, Austria. https://www.R-project.org/

IMAGES AND TABLES:

Perioperative Data	Difference 1 Frag to 2 Frag (95% CI)	p-value	Difference 1 Frag to 3 Frag (95% CI)	p-value	Difference 2 Frag to 3 Frag (95% CI)	p-value
Hospital Admission to Operation	0.09 (-0.05 - 0.22)	0.27	0.08 (-0.05 - 0.21)	0.3	0.003 (-0.14 - 0.13)	0.99
Total Lengh of Hospital Stay	0.17 (-0.07 - 0.27)	**< 0.001**	0.16 (-0.06 - 0.26)	**< 0.001**	0.01 (-0.09 - 0.11)	0.98
Days from Operation to Discharge	0.08 (-0.03 - 0.14)	**< 0.01**	0.07 (-0.02 - 0.13)	**< 0.01**	0.01 (-0.05 - 0.07)	0.9

Table 1. Perioperative data comparison between patients undergoing open treatment of the distal radius

Perioperative Data	Odds Ratio 2 Fragments	p-value	Odds Ratio 3 Fragments	p-value
DVT	0.68 (0.23-1.79)	0.45	0.11 (0.01-0.58)	**< 0.05**
Reoperation	1.12 (0.83-1.51)	0.45	1.35 (1.02-1.80)	**< 0.05**
Death	0.57 (0.22-1.32)	0.21	0.38 (0.14-0.92)	**< 0.05**

Table 2. Perioperative data comparing odds of complication by fracture type, with one fragment fracture as reference

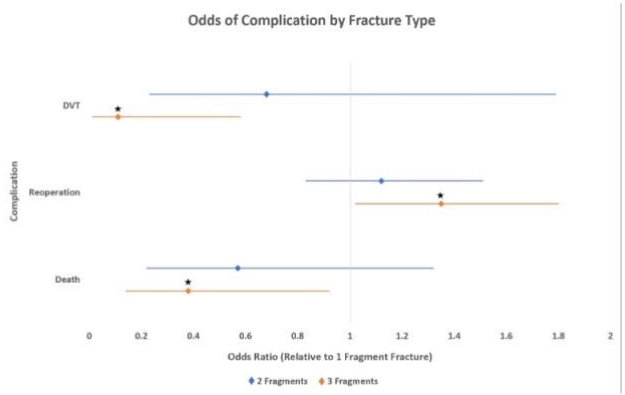

Figure 1. Differences in post-operative complications between the three fragment groups.