Postoperative Periprosthetic Humerus Fractures after Shoulder Arthroplasty: Outcomes of Nonoperative Management

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INTRODUCTION: Postoperative periprosthetic humerus fractures (PPHF) after shoulder arthroplasty are a challenging complication. Traditional treatment algorithms are based on implant stability and fracture classification; however, little is known about the outcomes of nonoperative management or which factors influence the risk of nonunion following nonoperative treatment. This study assessed the outcomes of nonoperative management of PPHF after shoulder arthroplasty and assessed for factors predictive of nonunion.

METHODS: All patients who were nonoperatively managed for a PPHF between 2013 and 2023 were reviewed. After excluding patients who had fractures in the setting of infection, less than 6 months of follow-up, or insufficient radiographic follow-up to assess for fracture union, 42 shoulders were included (76% females) with a mean age of 71.1 years and a mean BMI of 30.4 kg/m^2. Eighty-one percent of PPHF complicated a primary arthroplasty (21 reverse shoulder arthroplasty [RSA], 11 anatomic shoulder arthroplasty [TSA], 2 hemiarthroplasty), with the remaining PPHF occurring after revision RSA (n=8). Fractures were classified according to the Modified Unified Classification system, with 34 (81%) peri-implant fractures (27 [79%] of which were classified as around a well-fixed humeral component), 4 (10%) isolated greater tuberosity PPHF, and 4 (10%) fractures occurring distal to the implant. Univariate analysis was used to determine risk factors for nonunion considering demographics, comorbidities, type of arthroplasty, and fracture type.

RESULTS: Fracture healing was classified as union in 40% (n=17) of fractures, malunion in 31% (n=13), and nonunion in 29% (n=12). Of the 12 nonunions, 83% (n=10) eventually underwent surgery, with the remaining two patients declining surgery. Revision surgery was also eventually performed in 2 (15%) malunited fractures. The mean time to surgery for patients who failed nonoperative management was 12.6 months (range 2.8 to 73.8 months). Operative management varied greatly but was most commonly in the form of open reduction and internal fixation (ORIF) (n=6), followed by ORIF and humeral component revision (n=3). Initial fracture displacement greater than 2 mm was significantly associated with failure of nonoperative management (100% in nonoperative failure cohort vs. 50% in successful nonoperative cohort; $p<0.001$). Additionally, twice as many patients with PPHF at the implant stem tip failed nonoperative management (54% vs. 25%), though this difference did not reach statistical significance ($p=0.089$). With the numbers available, failure of nonoperative management was not found to be significantly associated with age, sex, body mass index, osteoporosis, diabetes, smoking status, or arthroplasty type ($p\leq0.228$).

DISCUSSION AND CONCLUSION: Nonoperative treatment led to fracture union in 71% of the PPHF treated nonoperatively. However, 31% of all fractures were considered malunited. Fracture displacement > 2 mm was associated with nonunion. Fractures at the tip of the humeral component also trended towards nonunion.