

Operative and Nonsurgical Treatment of Periprosthetic Humerus Fractures after Shoulder Arthroplasty: A Systematic Review and Meta-Analysis

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INTRODUCTION: Periprosthetic humerus fracture is a relatively rare complication following shoulder arthroplasty. As shoulder arthroplasty volume increases, more periprosthetic fractures are anticipated. Some surgeons routinely perform internal fixation for humerus shaft fractures adjacent to a humeral stem, while others recommend first-line nonsurgical treatment. The purpose of this study was to identify and describe the prevalence of operative and nonsurgical treatment options for periprosthetic humerus fractures, their associated outcomes, and complications. Our goal was to provide clinical insights for surgeons on the outcomes and complications associated with various treatment options through a systematic review of the published literature over the past 3 decades.

METHODS: We performed a systematic review of studies reporting clinical or radiographic outcomes and complications after operative or nonsurgical treatment of postoperative periprosthetic humerus fractures following shoulder arthroplasty. Subgroup analysis was conducted for differences in surgical outcomes between open reduction internal fixation (ORIF) and revision arthroplasty.

RESULTS: Twenty studies met the inclusion criteria (196 humeri; 1 level III, and 19 level IV studies). The mean clinical follow-up period was 2.6 years. Most fractures were Cofield B (42%), followed by C (27%), and A (12%); 19% were not classified. Forty-two percent of index implants were reverse total shoulders, 27% anatomic total shoulders, 16% hemiarthroplasties, and 1% resurfacing; implant design was not reported for 14%. The average time from index procedure to fracture was 2.9 years. One-hundred-sixty-seven (85.2%) fractures were treated operatively, 26 (13.3%) were treated nonsurgically, and 3 (1.5%) were missing information. Although nonsurgically treated fractures had a shorter average time to union (21.5 weeks vs. 24.7 weeks, $P = 0.03$), they were more likely to malunite (19% vs. 0.6%, $P < 0.01$) and trended toward higher rates of nonunion (31% vs. 15%, $P = 0.09$). Time to union was shorter in the ORIF group than revision arthroplasty group (24 weeks vs. 29.5 weeks, $P < 0.01$). Overall complication rate was 33%. Nonsurgical treatment had a higher complication rate (58% vs. 35%, $P = 0.03$), largely driven by increased risk of additional operation (23% vs. 9%, $P = 0.04$). Among surgically treated fractures, revision arthroplasty had more complications than ORIF (61% vs. 25%, $P < 0.01$), largely driven by higher nonunion rates.

DISCUSSION AND CONCLUSION: This systematic review is the largest report of treatment methods, outcomes, and complications of periprosthetic humerus fracture after shoulder arthroplasty in the current literature. The results suggest that complications may be more frequent than previously understood. With a 70% healing rate, nonsurgical management is a viable treatment option, but should be weighed against high risk of complications and need for future procedures. ORIF is associated with a higher union rate and fewer complications than revision arthroplasty.