

## **Humerus Periprosthetic Fracture Patterns Differ in Short-Stem Versus Standard-Stem Shoulder Arthroplasty Implants**

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**Purpose:** There have been no published studies evaluating the impact of the humeral prosthesis stem length on resulting periprosthetic fracture patterns and the implications this has for treatment. We hypothesized that there would be no difference in fracture patterns or recommended treatment between short- and standard-stem implants.

**Methods:** This retrospective comparative study identified patients evaluated or treated within our hospital network between December 2011 and January 2021 using ICD-9 and ICD-10 codes. Patients were included if they sustained a periprosthetic fracture of the humerus around the stem of a shoulder hemiarthroplasty, total shoulder arthroplasty, or reverse shoulder arthroplasty. Patients were excluded if they had an intraoperative fracture of the humerus, an isolated glenoid periprosthetic fracture, or unavailable injury radiographs depicting the humerus fracture. Three upper extremity-trained surgeons evaluated all radiographs for 5 criteria assessing stem stability after the fracture and signs of stem loosening prior to the fracture using 2 classification schemes: Wright and Cofield, and the Unified Classification System (UCS). Additionally, they recorded their recommended treatment for each case. Data were pooled based on majority agreement; when there was no agreement a fourth investigator served as the tie-breaker.

**Results:** 76 patients met inclusion criteria. They were divided into short stem ( $n = 18$ ) and standard stem ( $n = 58$ ) groups. Patients with a short stem were significantly more likely to be classified as having a loose prosthesis after fracture (67% vs 33%,  $P = 0.01$ ). Significant differences were identified between the 2 groups upon evaluation of the UCS fracture patterns ( $P = 0.01$ ) with more patients in the standard-stem group having B1 fractures (45% vs 28%) and more patients in the short-stem group having B2 fractures (56% vs 17%). The proposed plan for patient treatment was different between the 2 groups ( $P = 0.004$ ): more patients in the standard-stem group were recommended open reduction and internal fixation (50% vs 33%) or nonoperative treatment (17% vs 0%), and more patients in the short-stem group were recommended revision arthroplasty (50% vs 29%).

**Conclusion:** This study suggests patients sustaining a periprosthetic fracture around a short stem humeral implant are more likely to have an unstable prosthesis and require humeral stem revision at surgery, when compared to a standard-stem humeral prosthesis. Treating surgeons should be aware of this increased risk of humeral stem loosening when evaluating patients with periprosthetic humerus fractures and planning a treatment course.