

**Multicenter Retrospective Analysis of Humeral Shaft Fractures:
Are Sarmiento's Results Widely Reproducible?**

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Purpose: The purpose of this multicenter study is to evaluate in a large cohort the rate of conversion from closed treatment of humeral shaft fractures with a fracture brace to surgical intervention, and the reasons for change in patient management.

Methods: Patients with a closed humeral shaft fracture managed nonoperatively with a functional brace from 2005-2015 were reviewed retrospectively from 8 trauma centers. Patients <18 years old, pathologic and periprosthetic fractures, nondiaphyseal fractures, and patients lost to follow-up before union or conversion to surgery were excluded. Demographics, mechanism of injury, fracture characteristics, comorbidities, neurovascular injuries, and fracture union were recorded. In the event of conversion to surgery, time from injury to surgery and reason were entered. Univariate and regression analysis were performed to find variables associated with a higher rate of conversion to surgical treatment.

Results: 1269 patients were included in the study. Mean age was 47 years (range, 18-92) with 49% being male. 11% presented with symptoms of radial nerve palsy before application of the fracture brace. Successful union was achieved at an average of 15 weeks. A total of 344 fractures (27%) were converted to surgical intervention. Of those, 60% developed a nonunion, 24% had malalignment beyond acceptable parameters, 12% were noncompliant to functional brace, and 4% had persistent signs of radial nerve palsy requiring exploration. 10 patients (3.9%) converted to surgery required a subsequent intervention. All patients with radial nerve palsy fully recovered except one. Univariate comparisons showed that females and Caucasians were significantly ($p < 0.05$) more likely to be converted to surgery. The multivariate logistic regression identified females as being 1.6 times more likely and smokers to be 1.8 times more likely to be converted to surgery ($P < 0.05$). No specific fracture pattern was linked to a higher rate of conversion.

Conclusion: This large multicenter study identified a 27% surgical conversion rate, with nonunion as the most common reason for surgical intervention. These results are markedly different than previously reported. One out of four humeral shaft fractures treated conservatively at these trauma centers are converted to surgical intervention. These modern results may be helpful when counseling patients on choosing between functional bracing and surgical intervention for humeral shaft fractures.