

Functional Bracing of Humerus Fractures Results in Very High Union Rate in Patients without Comorbidities, Especially when Pain has Improved by 6 Weeks

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INTRODUCTION:

Nonsurgical management of diaphyseal humerus fractures with functional bracing has been widely employed but the prevalence of union with this method remains controversial and limited information exists on factors associated with nonunion. The purpose of this study was to determine the union rate and to identify factors associated with nonunion following functional bracing of fractures of the humerus.

METHODS: This is a retrospective review of medical records of adult patients with isolated, closed, diaphyseal humerus fractures treated with functional bracing at an academic level I trauma center during a 12-year period. The exclusion criteria were: pediatric patients, open humerus fractures, fractures with intra-articular extension, pathologic fractures, periprosthetic fractures, presence of other orthopaedic injuries, presentation to our center more than 3 weeks from injury, and loss to follow up. Clinical union of the fracture was defined as absence of pain or gross motion at the fracture site, whereas radiographic union was defined as presence of bridging callus across three cortices on two orthogonal radiographic views. Nonunion was diagnosed when there was persistent pain and/or motion at the fracture site without signs of progressive healing on radiographs. Patient and fracture variables were compared between the nonunion and union groups to identify factors associated with nonunion. The Mann–Whitney U test was used for analysis of continuous variables and the chi-square test for categorical variables.

RESULTS:

Our study cohort consisted of 319 patients, 132 women and 187 men, with a median age of 37 years (interquartile range [IQR], 26 to 54 years). Median follow up was 23 weeks (IQR, 14-34 weeks) from injury. The union rate after functional bracing of humerus fractures was 85% (271 of 319 fractures). In patients with united fractures, clinical union occurred at a median time of 9 weeks (IQR, 7-12 weeks) and radiographic union at 11 weeks (IQR, 9-14 weeks). Median elbow range of motion was 145° (IQR, 120-145°) and no patients reported any functional limitations.

Nonunion was significantly associated with the following patient and fracture factors: increased age (49 vs. 35 years, $p=0.004$), presence of diabetes mellitus (33% vs. 13%, $p<0.001$), obesity (35% vs. 13%, $p<0.001$), any comorbidity (73% vs. 40%, $p<0.001$), and complete displacement of the fracture fragments with no bone contact on injury radiographs (27% vs. 9%, $p<0.001$). In the union group, 92% of patients reported improvement in pain at 6 (± 1) weeks (no pain or reduced pain compared to their previous visit) compared to 48% in the nonunion group ($p<0.001$). In patients without comorbidities the union rate was 93%. When patients without comorbidities reported improvement in pain at approximately 6 weeks, the union rate increased to 97%.

DISCUSSION AND CONCLUSION:

Functional bracing results in union in most patients with an isolated diaphyseal humerus fracture. However, increased age, comorbidities, complete fracture displacement, and absence of improvement in pain at 6 weeks are factors strongly associated with development of nonunion. The union rate is very high in healthy patients, especially when they report symptomatic improvement by 6 weeks, even though at that time radiographic evidence of progression of healing may still be absent.