

Predictors of Nonunions in Young Patients with Femoral Neck Fractures

Adeet Amin, BA; Graham Albert, BA; Elizabeth Gausden, MD; John Wesley Munz, MD; Joshua Layne Gary, MD; Andrew Moon Choo, MD; Milton L. Routt, MD; Timothy S. Achor, MD; Stephen James Warner, MD, PhD

McGovern Medical School at UTHealth, Houston, TX, United States

Purpose: Femoral neck fractures (OTA 31B) in young patients can be difficult injuries to treat, with 20%-40% of patients developing nonunions or early fixation failures. These complications are debilitating in young patients with the potential for significant morbidity. The factors that contribute to the development of nonunions in these patients are poorly understood. The purpose of this study was to determine if specific patient factors, fracture characteristics, or surgical treatments contributed to higher rates of nonunion in young patients with femoral neck fractures.

Methods: We conducted a retrospective review of patients who underwent operative treatment for femoral neck fractures from 2013-2017 at a single institution. Inclusion criteria consisted of patients between ages 15-65 years, operative management of the femoral neck fracture, and a minimum clinical follow-up of 3 months. We recorded patient demographics, injury mechanisms, concomitant injuries, fracture characteristics, bone quality, reduction quality, fixation implants, and postoperative outcomes. A univariate analysis was performed on all variables measured, using Wilcoxon-rank sum for continuous variables and χ^2 or Fisher's exact test for categorical variables. A simple logistic regression was also performed for each variable in order to present odds ratios. Adjusted odds ratios were calculated along with their respected 95% confidence intervals.

Results: 70 patients were included in the study. Average patient age was 41.3 years (range, 15-65). 19 of the 70 patients (27.1%) developed a nonunion. When comparing patients who healed their fracture and those who developed a nonunion, age, sex, smoking status, body mass index, bone density, time to surgery, reduction quality, fracture location, and Pauwels' angle did not show significance in predicting nonunions. In our cohort, fracture displacement ($P = 0.004$), comminution ($P = 0.003$), Garden classification ($P < 0.001$), and open reduction technique ($P = 0.001$) were significant predictors for femoral neck nonunions. When controlling for age and sex, patients with severe displacement had 22.2 times increased odds of nonunion compared to those fractures without severe displacement ($P = 0.007$).

Conclusion: Femoral neck fractures in young patients can have high rates of nonunion, which can lead to significant patient morbidity. In this study, fracture characteristics can be significant predictors of patients who subsequently progressed to nonunions, while patient and injury factors were not predictive. Determining which patients are high risk for femoral neck nonunions may provide the opportunity for additional measures to optimize bone healing in this subset of patients and minimize the potential for future complications.