Predictors of Failure in Reverse Obliquity Intertrochanteric Femur Fractures

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Purpose: Reverse obliquity (AO/OTA 31-A3) intertrochanteric (IT) femur fractures are associated with a high degree of patient morbidity and mortality. While negative effects of varus malreductions in proximal femur biomechanics are well known, the effect of coronal plane reduction on fixation failure in reverse obliquity IT fractures specifically has not been established. The purpose of this study was to assess the rates and risk factors for fixation failure, nonunion, and reoperation in reverse obliquity IT fracture treated with cephalomedullary nails (CMNs). We hypothesized the rate of fixation failure would be <5% when reduced with a postoperative neck shaft angle (NSA) >125°.

Methods: Adults who sustained IT fractures (AO/OTA 31A1-A3) between January 2014 and May 2021 at 13 Level I trauma centers across the United States treated with CMNs with a minimum of 3 months follow-up were included. Exclusion criteria included non-IT fractures and pathologic fractures. Initial differences in outcomes were analyzed with a chi-squared test. Backward elimination multivariable regression that accounted for age, sex, mechanism, fracture pattern, and acceptable reduction quality (defined as a postoperative NSA >125°) was used to identify risk factors for adverse outcomes.

Results: There were 2132 intertrochanteric fractures identified during the study period, of which 305 (14.3%) were reverse obliquity fractures. Complications included 5 cases (1.6%) of fixation failure, 3 nonunions (1.0%), and 16 reoperations (5.2%). Age, sex, and mechanism of injury were not significantly associated with any outcomes. Compared to patients with adequate reduction, varus malreduction was significantly associated with fixation failure (5.5% vs 0.8%, P = 0.014), and reoperation (10.9% vs 4.0%, P = 0.039), but was not significantly associated with nonunion. Only varus malreduction (defined as a postoperative NSA ≤125°) was a significant risk factor for fixation failure (odds ratio [OR] 7.07 [95% confidence interval [CI] 1.15-43.36], P = 0.035) as well as reoperation (OR 2.90 [95% CI 1.01-8.36], P = 0.048).

Conclusion: Postoperative coronal NSA <125° was associated with a greater than seven times increase in the odds of fixation failure and almost triple the odds of reoperation in reverse obliquity intertrochanteric femur fractures treated with cephalomedullary nails. Less than 1% of cases with adequate reduction had fixation failure, suggesting excellent results can be achieved in this morbid fracture pattern with proper reduction.