Are There Modifiable Factors for Decreasing Complications in Low Velocity Civilian Femur Fracture?

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Purpose: Despite their frequency, there are unresolved questions in the treatment of ballistic femur fractures. We report here on outcomes and risk factors for complications following low-velocity ballistic fractures of the femur.

Methods: This was a retrospective single center case series of 238 patients aged 18 years or older presenting with low-velocity civilian ballistic femur fractures from 2011-2020. AO/OTA types 31-33 were included. We collected information on demographics, injury characteristics, treatment, and outcomes. Primary outcome was all cause complications. Treating surgeons decided whether to operatively debride bullet tracts. Patients with and without complications were compared to identify risk factors. Univariate logistic regression was performed to identify risks for nonunion/hardware failure, infection, or reoperation/readmission.

Results: Median age was 28 years, 90% were male, and 63% were current smokers. By AO/OTA classification, 51 (21%) were type 31, 121 (51%) type 32, and 66 (28%) type 33. Two-hundred and six (87%) were treated operatively. Forty-eight patients (20%)%) experienced complications, with 23 (9.7%) undergoing reoperation at mean 251 days post-injury. Median follow-up was 136 days, and median time to union was 148 days.

All-cause complications were associated with older age (31 vs. 27, P=0.011). While not statistically significant, patients with arterial injury had a higher complication rate (8/22, 36.3% vs. 40/216, 18.5%, P=0.055). Time to initial antibiotics did not differ significantly for those without or with complications (1.5 hours vs. 1.6 hours to initial antibiotics, P=0.76), nor did duration of prophylactic antibiotics (P=0.21). On univariate logistic regressions, increasing age (OR 1.05, CI 1.01-1.08, P=0.0045) was associated with nonunion/hardware failure. Only depression (OR 10.7, CI 2.6-43.8) was associated with infection. Increasing age (OR 1.05, CI 1.01-1.08, P=0.0047), depression (OR 0.028, CI 1.1-10.7), and surgical debridement of ballistic wounds (OR 3.2, CI 1.3-7.9, P=0.014) were associated with reoperation/readmission. Analysis by Gustilo-Anderson type showed severity bias in operative debridement, with 17% of type I vs. 69% of type II/III injuries being debrided (P=0.0001). Analysis by Gustilo-Anderson type did not show severity bias in time to first antibiotic administration. Time to initial antibiotics and duration of prophylactic antibiotics again had no significant associations on univariate analyses.

Conclusion: We found a 20% complication rate in ballistic femur fractures. We were unable to identify modifiable factors associated with decreased complications, including antibiotic timing, duration, or performance of operative debridement. While debridement was associated with increased risk of reoperation/readmission, we identified injury severity bias, making interpretation of this result difficult.