Soft-Tissue Injury Should Guide Management in Open Fractures of the Femoral Shaft

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Purpose: Current literature dictates that low-grade open femur fractures can be safely treated with primary intramedullary nailing with temporary external fixation and delayed intramedullary nailing reserved for more severe fractures. However, evidence regarding fixation timing and risk for infection is limited. The purpose of this study was to evaluate how degree of injury and treatment course can impact infection after open mid-shaft and subtrochanteric femur fractures.

Methods: An institutional database was used to identify patients with open femur (AO/OTA 32) fractures from blunt trauma who presented to a Level I trauma center between 2012 and 2020. Patients were excluded for incomplete records, lack of 90-day outcome data, gunshot-related injuries, or traumatic amputation. Deep infection within 90 days was the primary outcome defined by criteria from the Centers for Disease Control and Prevention. Medical records were used to collect days to wound coverage, OTA open fracture classification, time to definitive and temporary (if applicable) fixation, time to antibiotics, age, smoking, and diabetes. Student t tests and multivariable logistic regression were used to identify significant associations between the aforementioned variables and the primary outcome.

Results: 90 patients were identified, of whom 10 (11.1%) went on to develop deep infection. Age, smoking, diabetes, ISS, first surgical debridement after 6 hours, antibiotics after 1 hour, and wound coverage past 5 days were not associated with infection on univariate analysis. Multivariable analysis found a higher OTA skin score (requiring flap/graft coverage or degloving) (AR = 53%, odds ratio [OR] = 9.17, $P \leq 0.001$) and delayed definitive fixation (AR = 32%, OR = 15, $P = 0.04$) were independently associated with the development of deep infection. Only 3 of 68 patients (4.4%) who were treated with primary intramedullary fixation went on to develop deep infection, all of whom required supplemental wound coverage or had degloving injuries.

Conclusion: To our knowledge, this is the first study to specifically examine how timing of antibiotics, debridement, and treatment is related to the development of infection after femur fracture. Delayed definitive fixation and higher degree of skin injury were independently associated with the development of deep infection. While we advocate for early debridement and antibiotics in all patients, in patients with severe skin injury where delayed fixation will be required, clinicians should be mindful of the association with infection and perform several serial debridements before final soft-tissue reconstruction.