

**The Contribution of Polytrauma and Hemodynamic Shock on Infection and Reoperation in Tibia and Femur Fractures: A Multivariate Regression Analysis**

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**Purpose:** Tibia and femur fractures often result from high-energy injuries and frequently occur in multiply injured patients. Prior literature suggests polytrauma is a risk factor for delayed healing and nonunion of these fractures. Work in animal models has demonstrated a negative effect of hemorrhage on fracture healing. However, no clinical studies have delineated which components of polytrauma predict delayed healing or nonunion, and it is unknown if hemorrhage or shock at presentation contributes to postoperative complications after operative management of tibia and femur fractures.

**Methods:** A retrospective review of all tibia and femur fractures treated with an intramedullary nail from 2013-2018 at a single Level I trauma center was performed. Patients age 18-55 years with a tibia fracture or femur fracture below the level of the lesser trochanter treated with intramedullary nailing were eligible. Patients with pathologic fractures, planned revision for bone grafting, and subacute presentation were excluded, leaving 392 tibia and 367 femur fractures included. Patient-specific variables including demographics, American Society of Anesthesiologists class, pH, base deficit, shock index, ISS, open fracture, additional orthopaedic injuries, length of hospital stay, smoking, vascular injury, fasciotomies, use of external fixation, and postoperative weight-bearing status were collected. Fractures were classified using the OTA/AO Classification. All data for reoperations were collected and categorized based on the indication(s) for surgery.

**Results:** There was no significant effect of ISS, pH, shock index, or base deficit on any of the analyzed outcomes. Multivariate analysis showed open fracture (odds ratio [OR] = 4.85,  $P < 0.001$ ), fasciotomies (OR = 2.32,  $P = 0.027$ ), restricted weight bearing (OR = 1.92,  $P = 0.013$ ), and increased age (OR = 1.03,  $P = 0.015$ ) correlated with increased risk of reoperation. Deep infection was predicted by the need for flap coverage (OR = 3.59,  $P = 0.050$ ) and open fracture (OR = 3.12,  $P = 0.023$ ). Predictors of reoperation for aseptic nonunion included open fracture (OR = 2.73,  $P < 0.001$ ), smoking (OR = 1.99,  $P = 0.018$ ), number of additional orthopaedic injuries (OR = 1.12,  $P = 0.048$ ), and increased age (OR = 1.03,  $P = 0.043$ ).

**Conclusion:** These results support previously published literature demonstrating the negative effect of soft-tissue injury around the site of a fracture, but they do not show an effect of shock at presentation on the risk of reoperation, nonunion, or infection. There does not appear to be a clear link between the global magnitude of injury and reoperation. In contrast, a high magnitude of local soft-tissue injury resulting in open fracture, fasciotomies, and a need for flap coverage had a significant effect on reoperation outcomes.