Post-operative Complications in Open Tibial Shaft Fractures in Type 2 Diabetic Patients

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INTRODUCTION:

Open tibial shaft fractures represent challenging injuries in orthopaedic trauma due to their high risk of infection, soft tissue compromise, and potential for malunion. These fractures, defined by communications of bone with the external environment, remain a leading cause of postoperative complications. Outcomes can be significantly worsened by type 2 diabetes mellitus, which affects millions of patients in the United States and is associated with impaired wound healing and peripheral vascular disease. Prior literature has shown that diabetes increases the risk of delayed healing, infection, and nonunion in orthopedic procedures—especially in hip and ankle fractures. Despite this, little is known about the impact of type 2 diabetes on open tibial shaft fractures specifically, which are uniquely prone to deep infections. Understanding this relationship is critical, as these infections often lead to prolonged hospitalization, repeated surgeries, and even limb loss. Therefore, this study hypothesizes that diabetic patients with type I or II open tibial shaft fractures have a higher rate of superficial and deep surgical site infections within 180 days following intramedullary nail fixation compared to nondiabetic patients.

METHODS:

A retrospective cohort study using the TriNetX health record network was conducted. Adults (≥18 years) with type I-II open tibial shaft fractures treated with IMN (CPT 27759) and ≥180 days follow-up were grouped by T2DM status. Propensity score matching (1:1) balanced demographics, labs, and comorbidities using the Charlson Comorbidity Index, yielding 941 patients per cohort. Outcomes within 180 days were analyzed using Kaplan Meyer incidence, 95% confidence intervals, and log-rank tests.

RESULTS SECTION:

The study's hypothesis was partially supported as superficial SSI rates were comparable between the two cohorts. (T2DM 26/941 [2.76%] vs non-DM 27/941 [2.87%]; risk ratio [RR] 0.96; P=0.889). However, T2DM was associated with higher risks deep surgical site infection leading to osteomyelitis (99/941 [10.5%] vs 74/941 [7.86%]; RR 1.34; P=0.046) and sepsis (41/941 [4.36%] vs 22/941 [2.34%]; RR 1.86; P=0.015). Secondary outcomes showed no significant differences: repeat debridement (6.16% vs 7.55%), nonunion (3.08% vs 3.40%), amputation (1.17% vs <1.06%), and rehospitalization (34.2% vs 35.5%).

DISCUSSION:

This study found no significant difference in superficial surgical site infection (SSI) rates within 180 days following intramedullary nail fixation of type I–II open tibial shaft fractures between diabetic and nondiabetic patients. However, diabetic patients demonstrated a 34% higher risk of osteomyelitis and an 86% higher risk of sepsis, suggesting that while diabetes may not increase superficial wound infection rates, it predisposes patients to deeper and systemic infections. These findings support the hypothesis that the vascular and immunologic impairments associated with diabetes, such as diminished neutrophil function, endothelial dysfunction, and reduced oxygen and antibiotic delivery, facilitate progression from superficial contamination to deep tissue and systemic infection. Clinically, this highlights the importance of intensified postoperative monitoring, early imaging, and strict glycemic control in diabetic patients with open tibial fractures, even when superficial healing appears satisfactory. Despite the strength of a large multicenter dataset and propensity score matching to reduce baseline differences, this study has important limitations. The use of ICD and CPT coding introduces potential misclassification of outcomes, and diabetes status was based on diagnosis codes rather than glycemic indices, precluding analysis of HbA1c-related risk stratification. Additionally, surveillance bias may have led to higher detection rates of osteomyelitis in diabetics. Overall, the data suggest that while standardized perioperative antisepsis may equalize superficial SSI rates, diabetic patients remain vulnerable to deep and systemic infections, emphasizing the need for enhanced perioperative vigilance and metabolic optimization in this population.

SIGNIFICANCE/CLINICAL RELEVANCE:

This study is significant because it identifies diabetes mellitus as a key factor influencing the progression of deep and systemic infections after open tibial fracture fixation. By clarifying this risk, the work advances understanding of how metabolic disease alters postoperative healing and provides a foundation for developing targeted perioperative interventions, such as optimized glycemic control and enhanced infection surveillance, to reduce morbidity and improve patient outcomes.