

Implant Retention for Tibial Shaft Fracture-Related Infection Does No Worse than Early Nail Exchange, but Both Are Associated with High Nonunion and Amputation Rates

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Purpose: Fracture-related infection (FRI) is a severe complication post fracture fixation that increases the risk of multiple adverse outcomes. Dilemma exists regarding treatment strategy, which can involve either implant retention or exchange while treating infection. The purpose of this study was to compare primary bone healing, ultimate bone healing, and infection clearance in patients with FRI following intramedullary nailing (IMN) of the tibia.

Methods: We retrospectively reviewed patients from four Level I trauma centers identified through billing registries between January 2013 and December 2020. Medical records were reviewed for patient demographics, comorbidities, injury characteristics, surgical treatment strategies, microbiology, and infectious disease treatment. Incidences of primary bone healing (within 1 year of index IMN or without further intervention for healing), ultimate bone healing (final follow-up), and infection clearance were calculated for implant retention and implant exchange. Bivariate analysis assessed multiple factors that may play a role in FRI treatment success or failure.

Results: We identified 97 patients who subsequently received unplanned operative treatment for FRI within 90 days of initial IMN. 22 were excluded for incomplete records. Of the remaining patients, 30 (40%) were treated via implant retention and 45 (60%) via implant exchange. Mean follow-up was 15 months. Primary union was observed in 34.7% (26/75), whereas 65.3% (49/75) had a primary outcome of delayed union, nonunion, or amputation. Ultimate union was achieved in 75.8% (47/62), whereas 24.2% (15/62) had persistent nonunion or amputation (13 patients excluded as ultimate healing status unknown). No significant difference was seen in primary bone healing ($P = 0.77$), ultimate bone healing ($P = 0.22$), or infection clearance ($P = 0.11$) between strategies. Statistically significant factors associated with ultimate failure to heal were Gustilo-Anderson IIIB / IIIC fractures ($P = 0.02$), time from injury to initial IMN ($P < 0.001$) and worsening systemic host grade B ($P = 0.046$). Fewer surgeries performed following initial FRI treatment was positively associated with primary bone healing ($P < 0.001$), ultimate bone healing ($P = 0.03$), and infection clearance ($P = 0.01$).

Conclusion: Treatment of FRI following tibial IMN with either implant retention or exchange does not appear to affect bone healing or infection clearance. Rather, worsening injury characteristics and host factors were associated with decreased bone healing. Additionally, fewer surgeries performed for infection and subsequent complications was positively associated with infection clearance and bone union, suggesting that more severe FRIs are less likely to heal. Further research delineating risk factors for failure and defining optimal care of FRIs following tibial IMN is warranted.