

Risk Factors for Infection in Severe Open Tibial Shaft Fractures

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Purpose: The rate of infection in Gustilo-Anderson Type III tibial shaft fractures ranges from 20% to 50%. Considering the significant morbidity associated with infection in this injury, our study sought to identify risk factors for infection in patients with severe Type IIIA and Type IIIB (requiring soft-tissue flap if limb was left at anatomic length and rotation) tibial shaft fractures. By better understanding factors associated with infection, we hope to identify those who may most benefit from additional preventative or therapeutic measures.

Methods: This is a secondary analysis of the FIXIT trial, a multicenter, randomized controlled trial of severe Type IIIA or IIIB open tibial shaft fractures treated with either internal fixation or ring external fixation. The primary outcome of this secondary study was deep surgical site infection, defined as an infection necessitating surgical debridement within 1 year of the index surgery. An observational cohort of patients that declined randomization was also included in this study. We considered 14 baseline demographic and injury characteristics as potential risk factors. These factors were identified to be studied based on existing literature on orthopaedic trauma-related infection. The multivariate logistic regression model used forward stepwise elimination to select a final set of risk factors. The model was internally validated and the estimates were optimism-corrected using repeated 10-fold cross-validation.

Results: The study cohort for this secondary analysis included 430 patients. Deep surgical site infection requiring reoperation occurred in 108 patients (25%). Our final model identified 4 risk factors for infection and included: age >40 years (odds ratio [OR] 2.00; 95% confidence interval [CI] 1.27-3.13), Gustilo-Anderson Type IIIB (OR 1.80; 95% CI 1.09-2.96), embedded wound contamination (OR 1.69; 95% CI 1.05-2.72), and wound length (OR 1.02 per cm; 95% CI 1.00-1.05).

Conclusion: Based on this secondary analysis of high-quality prospective trial data, surgeons can now counsel patients over 40 years in age as well as those with Type IIIB fractures, longer wound lengths, or embedded wound contamination that they are at markedly higher risk of infection. This may influence treatment decisions and better prepare patients for poor outcomes. Additionally, these risk factors now allow us to begin to better direct future research on how to mitigate the risk in this patient population.

Table 1. Factors associated with deep surgical site infection.

Factor	Odds Ratio	95% CI	P Value
Age > 40 years vs. ≤ 40 years	2.00	1.27 to 3.13	<0.01
Gustilo-Anderson Type IIIB vs. IIIA	1.80	1.09 to 2.96	0.02
Embedded wound contamination vs. No or minimal contamination	1.69	1.05 to 2.72	0.03
Wound length, per 1 cm	1.02	1.00 to 1.05	0.09

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device they wish to use in clinical practice.