How Long Can Debridement Wait in Type IIIB Open Tibia Fractures?

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Purpose: Excessive time from injury to debridement in open fractures increases infection rates. However, the safe window to surgical debridement in grossly contaminated Gustilo type IIIB fractures requiring flap coverage has not been specifically analyzed.

Methods: This was a multicenter study. Consecutive patients with Gustilo type III tibial fractures requiring flap coverage were included. We evaluated data from a compiled registry that included patient factors, timing of injury, antibiotic administration, debridement, as well as the contamination level. An analysis was performed to determine the time to debridement at which an increase in infection rates occurred. We did separate analyses for highly and moderately contaminated injuries including adjustments with a propensity methodology. Finally, we used a spline regression analysis, controlling for timing of antibiotics (early was considered to be ≤1 hour) to determine the inflection points for increases in infection based on the time to initial debridement.

Results: 407 patients were included, of which 383 (94.1%) had a recorded contamination level. 131 patients had severe contamination. The overall infection rate was 21.0%. Severely contaminated fractures had a higher infection rate than non–grossly contaminated fractures (29.0% vs 15.9%; $P = 0.02$). After propensity adjustment for patient, injury, and treatment factors, severely contaminated fractures demonstrated a higher infection rate than less contaminated fractures by only 8.8% (95% confidence interval [CI] 0.2 to 17.3%, $P = 0.04$). Along the time to debridement axis, grossly contaminated fractures became infected at earlier debridement times than non–severely contaminated fractures, suggesting a shorter "safe window" to debridement. In spline regression analyses, after controlling for early antibiotics, there was a significant rise in the odds per hour of infection for highly contaminated injuries after 12 hours (odds ratio [OR] 1.14, 95% CI 1.00 to 1.30, $P = 0.05$) that further increased at 15 hours (OR 1.16, 95% CI 1.01 to 1.34, $P = 0.04$). Less contaminated fractures demonstrated a rise only at 15 hours (OR 1.08, 95% CI 1.0 to 1.18, $P = 0.051$). Importantly, when not controlling for time to antibiotics there was a plausible increment in the odds per hour infection rate as early as 9 hours after injury (OR 1.11, 95% CI 0.98 to 1.25, $P = 0.09$).

Conclusion: In Gustilo type IIIB fractures requiring flap coverage, the safe window to debridement is dependent on both the timing of antibiotic administration and contamination of the wound. Ideally the earlier the debridement, the better, but this becomes more crucial if antibiotics are not delivered in the first hour and if the wound is grossly contaminated. With early antibiotic administration, severely contaminated fractures show increases in infection at 12 and then again at 15 hours to debridement while non–severely contaminated injuries do not demonstrate an infection risk increase until after 15 hours from injury.