Timing of Flap Coverage: What Matters Most—Injury-to-Flap or Definitive-Fixation-to-Flap?

Leah Gitajn, MD, MS*; Lily Mundy, MD; Susana Diaz Coto; Mark Gage, MD; Nathan N. O'Hara, PhD; Philip R. Wolinsky, MD; William T. Obremskey, MD, MPH, FIOTA; Gorden D. Potter, MD; Michael J. Beltran, MD; John A. Scolaro, MD, MA; Sheila Sprague, PhD; Gerard P. Slobogean, MD, MPH; PREP-IT Investigators*

Purpose: Severe open fractures requiring coverage present a substantial challenge due to heightened infection risk. Proposed modifiable time points, including injury-to-flap and definitive-fixation-to-flap intervals, have been linked to infection risk. However, existing studies suffer from selection bias, small sample sizes, and reliance on retrospective data. This study aimed to investigate these time intervals' association with infection risk using high-quality, prospectively collected, adjudicated data.

Methods: 138 patients from the Aqueous Prep and PREPARE trials requiring acute free or rotational flap for open fracture were included. Primary outcome was deep surgical site infection using Centers for Disease Control and Prevention criteria. Exposures included injury-to-flap, first-debridement-to-flap, and definitive-fixation-to- flap intervals. Multivariable logistic regression adjusted for potential confounders.

Results: 21 patients (15.2%) developed deep infection. No significant independent association was found between deep infection and injury-to-flap (11.9 vs 9.4 days, odds ratio [OR] 1.04, 95% confidence interval [CI] 0.98-1.12, P = 0.13), first-debridement-to-flap (11.1 vs 8.8 days, OR 1.04, 95% CI 0.98-1.11, P = 0.16), or definitive-fixation-to-flap (5.4 vs 6.1 days, OR 1.01, 95% CI 0.98-1.11, P = 0.69).

Conclusion: Despite prior studies demonstrating associations between flap coverage and injury or definitive fixation times, this analysis revealed no independent link. However, the infection rate was double that of the broader PREP-IT open fracture cohort indicating increased risk for injuries requiring a flap. Adjusting definitive fixation or flap timing may not mitigate this risk.

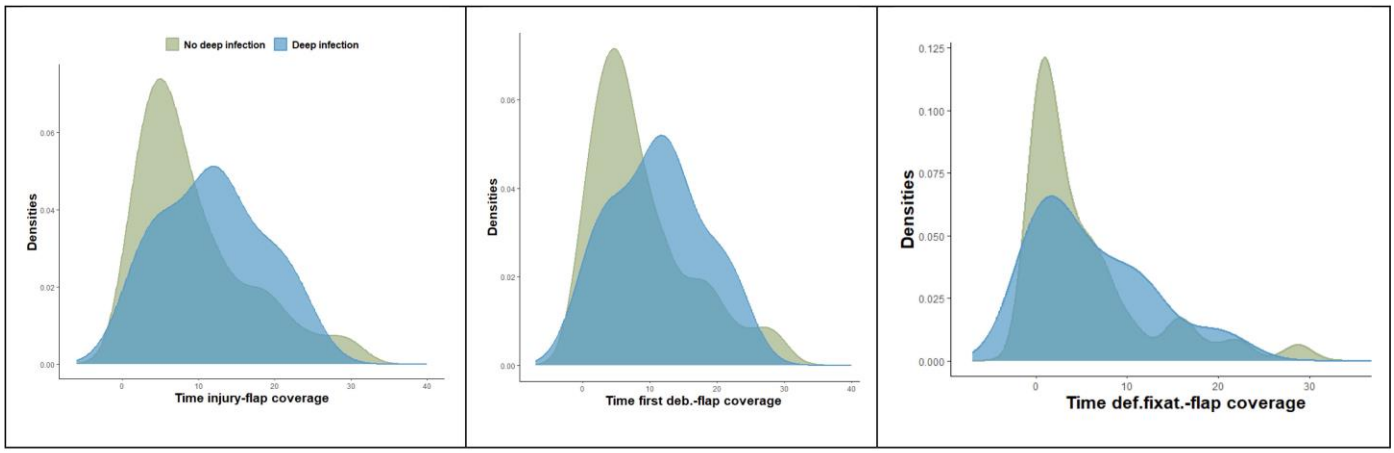

Figure 1. Density functions of the time from injury to flap coverage (left), time from first debridement to flap coverage (center) and time from definitive fixation to flap coverage (right) on open fractures with deep infection (blue) and without deep infection (green). X-axis scale is days.