

## Does the Timing, Type, and Method of Flap Coverage After Open Tibia Fracture Fixation Influence the Rate of Deep Infection?

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**Purpose:** Optimal timing of soft-tissue coverage remains controversial with recent evidence to support early coverage post-injury and within 2 days of definitive fracture fixation. Absent from these investigations, and the aim of this study, is the influence of timing from definitive fixation to flap coverage on infection and nonunion rates while accounting for flap method and tissue type.

**Methods:** Patients aged  $\geq 18$  presenting to a Level I trauma center between 2013 and 2022 with open tibia fractures requiring fixation and soft-tissue coverage were reviewed. Patients diagnosed with infection prior to flap coverage were excluded. The following key variables were recorded and compared: time from definitive fixation to soft tissue coverage ( $\leq 72$  hours vs  $>72$  hours), method of coverage (rotational vs free tissue transfer), and tissue type (muscle vs fasciocutaneous). The primary and secondary outcomes were deep infection and fracture nonunion, respectively.

**Results:** 86 patients were screened and 53 were eligible (54 extremities). Mean follow-up was 482 days. A greater rate of deep infection following free tissue transfer (13/32, 40.1%) was observed compared to rotational flaps (0/22;  $P < 0.001$ ). 12 of 43 muscle flaps (27.9%) developed infection compared to 1/11 (9.1%;  $P = 0.16$ ) fasciocutaneous flaps. Although insignificant, the rate of infection was almost twice as high when wounds were covered  $>72$  hours after fixation (9/30, 30.0%) compared to  $\leq 72$  hours (4/24, 16.7%;  $P = 0.25$ ). Free tissue coverage  $\leq 72$  hours resulted in 4/15 infections (26.7%) compared to  $>72$  hours 9/17 (52.3%,  $P = 0.13$ ). There were no significant differences in infection based on tissue type and timing: muscle  $\leq 72$  hours 4/20 (20%) vs  $>72$  hours 8/23 (34.7%;  $P = 0.28$ ); fasciocutaneous  $\leq 72$  hours (0/4) vs  $>72$  hours 1/7 (14.3%,  $P = 0.48$ ). 13 of 32 extremities covered with free tissue transfers and 2 of 22 with rotational flaps developed nonunion ( $P = 0.01$ ). 4 of 15 free flaps  $\leq 72$  hours were complicated by nonunion compared to 9 of 17  $>72$  hours ( $P = 0.13$ ).

**Conclusion:** Free flaps for open tibia fractures, regardless of timing, were associated with an increased rate of deep infection and nonunion compared to rotational flaps. Open tibia fractures covered with muscle or free flaps  $>72$  hours after definitive fixation demonstrated an insignificant trend toward deep infection and nonunion.