Bone Transport Results in Fewer Unplanned Major Reoperations Than Masquelet in the Treatment of Segmental Bone Defects of the Tibia

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Purpose: Bone transport using ring fixators and the induced membrane technique (Masquelet) are commonly used treatment options for the management of segmental bone defects of the tibia following acute trauma or infected nonunion. Both treatments are commonly used; however, comparative evidence for large segmental tibial defects is lacking. We aimed to determine which technique results in higher rates of major unplanned reoperation for the treatment of segmental tibial bone defects greater than 4 cm in length.

Methods: This retrospective, single-center cohort study included adult patients with segmental tibial defects over 4 cm who underwent surgical treatment with bone transport (N = 24) or Masquelet (N = 22) between 2011- 2022 with a minimum 1-year follow-up. All transports were performed with ring fixators and all but one underwent planned autografting at the docking site. The primary outcome was a major unplanned reoperation after either transport initiation (bone transport) or spacer placement (Masquelet), including below-knee amputation, surgical debridement for deep infection, or bone grafting for nonunion. We compared treatments using multivariable logistic regression, adjusting for bone defect size as a potential confounder.

Results: The median defect size was 7.2 cm (interquartile range [IQR], 6.1-10.1) for transport and 5.8 cm for Masquelet (IQR, 4.7-8.0) (P = 0.08). Defect etiology was identified as acute traumatic in 25 patients (54%) and post-infectious in 21 (46%). No differences between groups were identified with respect to defect etiology, defect location, Gustilo-Anderson classification, or coverage requirement. Bone transport was associated with an 85% reduction in the odds of a major unplanned reoperation (odds ratio [OR] 0.15; 95% confidence interval [CI], 0.03-0.58; P = 0.01). The treatment benefit of bone transport was consistent across all 3 components of the primary outcome; however, only its protection against reoperation for deep infection reached statistical significance (OR, 0.18; 95% CI, 0.03-0.76; P = 0.03).

Conclusion: Although bone transport may be challenging for patients and providers, this technique appears to be associated with a large reduction in major reoperations (OR 0.15, P = 0.01) compared to Masquelet for large segmental tibial bone defects. This finding appears to be driven by fewer surgeries for infection in the bone transport group.