The Role of Cultures in Diaphyseal Tibia Nonunions: A Multicenter Study

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Purpose: Routine intraoperative culture of presumed aseptic tibial nonunions remains controversial. We aimed to describe the role of cultures and outcomes among diaphyseal tibia nonunions in both presumed septic and aseptic nonunions.

Methods: Patients from 10 academic Level I trauma centers who sustained a diaphyseal tibia fracture (AO/OTA 42) and underwent nonunion repair were retrospectively identified. Patients with preoperative (within 48 hours of surgery) inflammatory markers (erythrocyte sedimentation rate, C-reactive protein, and white blood-cell count) with or without intraoperative cultures at the time of nonunion surgery were included. Minimum follow-up for inclusion was 6 months after nonunion repair. The rate of complications was the primary outcome. Secondary outcomes included positive cultures and treatment with systemic antibiotics after nonunion repair. Patients with positive screening serum markers were considered presumed septic while those with negative screening markers were considered presumed aseptic. Surprise positive was defined as presumed aseptic with positive intraoperative cultures. $\chi 2$, Fisher exact, and Kruskal-Wallis tests were used for statistical comparisons. A level of significance was set a priori at $P<0.05$.

Results: A total of 191 tibia nonunions with complete preoperative inflammatory makers were included. 136 (71%) of these had intraoperative cultures taken. Average length of follow-up was 19.2 months. 32% of patients (43 of 136) had positive intraoperative cultures. 7% (10 of 136) had negative preoperative inflammatory markers with positive cultures (surprise positive). Patients with positive culture results compared to negative culture results were more likely to have persistent nonunion after repair (37% vs 13%; $P<0.01$), and require readmission for related complications (35% vs 18%; $P = 0.05$). Patients with positive cultures had increased risk of persistent nonunion (odds ratio [OR] 4.0, 95% confidence interval [CI]: 1.7-9.5, $P<0.01$) and readmission (OR 2.4, 95% CI: 1.1-5.4, $P= 0.04$) compared to patients with negative cultures. Patients with surprise positive cultures, even when treated, had similar complications rates to those with no cultures taken with the exception of higher readmission rates than the no culture taken group (40% vs 7.4%; $P = 0.035$). Patients with positive cultures (presumed septic + surprise positive) demonstrated more persistent nonunions (37% vs 7%; $P<0.01$) and increased readmission rates (35% vs 7%; $P<0.01$) compared to the group with no culture taken.

Conclusion: This study further demonstrates the controversy in intraoperative cultures. Prognostic value exists when taken. On the contrary, the clinical course of those patients without cultures was similar or favorable compared to those with surprise positive cultures. More data are needed to define the role of culture in the presumed aseptic nonunion.