Is Selectively Culturing Long Bone Nonunions Safe? A Multicenter Study

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Purpose: The predictive ability for occult infection of preoperative inflammatory markers in fracture nonunion surgery has been a subject of debate for decades. Further, there is uncertainty around the practice of routine culture due to risk of spurious results in presumed aseptic versus missing a hidden pathogen. This study aimed to evaluate the strategy of selectively culturing during nonunion surgery (only when a marker is positive) compared to routine culture.

Methods: We retrospectively reviewed patients (age >16 years) treated for long bone nonunion between 2006 and 2021 in 12 large health-care systems, involving multiple surgeons. Demographics, injury characteristics, labs, culture results, and postoperative outcomes were compared among all subgroups with and without intraoperative cultures obtained.

Results: A total of 1227 nonunions were included, of which 78% had preoperative inflammatory labs (white blood cell count, erythrocyte sedimentation rate, C-reactive protein). 457 nonunions (37%) were presumed aseptic (negative screening serum markers); 399 (33%) were presumed septic (positive screening markers). Only 689 (56%) received intraoperative cultures (74% of presumed septic, 45% of presumed aseptic, 51% of patients without markers). 141 of all cultures (20%) resulted positive (25% of presumed septic, 6% of presumed aseptic ["surprise positive"]; 20% of patients without markers). Presumed aseptic with no cultures (n = 250) had similar outcomes to the negative marker/negative culture group (n = 180) with persistent nonunion rates of 15% and 16%, respectively. These 2 groups had the best outcomes. "Surprise positive" patients (n = 27) had similarly bad outcomes to septic nonunions (n = 76) with persistent nonunion rates of 37% and 26%, respectively. Presumed aseptic with no culture outperformed "surprise positive" patients (persistent nonunion 15% vs 37%, P = 0.012).

Conclusion: We demonstrated significant variance in utilization of cultures with more than half of surgeons not obtaining cultures in presumed aseptic cases. These presumed aseptic patients without a culture performed as well as presumed aseptic with negative cultures. "Surprise positive" cultures continue to perplex. While this group was quite small (6% of cultures, 2% overall), their results were among the worst. It is difficult to determine if surprise positive cultures represent a group with higher susceptibility to complication, are the result of nontherapeutic antibiotic presence/pressure, or some other factors. Selective microbial culturing during nonunion surgery based on preoperative clinical suspicion seems to be reasonable, but the possibility of surprise positive cultures remains a concern.