What is the Probability that Intrawound Vancomycin Powder Reduces Infections in Patients with High-Risk Tibial Plateau or Pilon Fractures? A Bayesian Analysis of the VANCO Trial

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Purpose: In the recently published VANCO trial, the 2 P values (0.04 and 0.06) for the primary outcome of intrawound vancomycin powder in preventing deep surgical-site infections straddled the conventional threshold of 0.05. The purpose of this study was to reanalyze the VANCO trial data with more clinically intuitive Bayesian techniques, enabling calculations of the probability of treatment benefit at varying magnitudes of effect.

Methods: In this study, we reanalyzed data from VANCO, a randomized trial performed at 36 trauma centers in the US. The original trial included 980 adult patients (mean age, 46 years [standard deviation (SD), 14]; 63% male) with a tibial plateau or pilon fracture deemed at high risk of infection and definitively treated with plate and screw fixation. Patients were randomly allocated to receive 1000 mg of intrawound vancomycin powder at their definitive fixation or to a control group that received no topical antibiotics. The primary outcome was a deep surgical-site infection requiring operative treatment within 6 months of definitive fixation. Secondary outcomes included gram-positive deep surgical-site infections and gram-negative-only deep surgical-site infections. Using Bayesian models, we calculated the relative risk (RR) reduction, the probability of any treatment benefit (RR <1.0), and the probability of an effect greater than 35% (RR <0.65) with intrawound vancomycin powder.

Results: The Bayesian analysis indicates a 98% probability that intrawound vancomycin powder reduces infections in this population (RR, 0.66; 95% credible interval [CrI], 0.46 to 0.98). In addition, there is a 99% chance intrawound vancomycin powder reduces gram-positive infections (RR, 0.52; 95% CrI, 0.33 to 0.84) and an 80% probability the magnitude of this risk reduction exceeds 35%. However, it is unlikely (44%) that intrawound vancomycin powder prevents gram-negative surgical-site infection (RR, 1.06; 95% CrI, 0.48 to 2.45).

Conclusion: Based on this Bayesian analysis, there is a very high probability (98%) that intrawound vancomycin powder prevents deep surgical-site infections in patients with tibial pilon or plateau fractures with an elevated risk of infection. The original trial demonstrated a reduction in gram-positive infections of 50% (P = 0.02), and this Bayesian analysis indicates a 99% probability of benefit for deep infections with gram-positive pathogens. The chance that this benefit exceeds a 35% RR reduction is 80%, demonstrating the type of clinically useful information gained from a Bayesian analysis.