

Do Superficial Surgical Site Infections Lead to Deep Surgical Site Infections After Fracture Surgery? A Secondary Analysis of the VANCO Trial

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Purpose: Surgical site infections (SSIs) after fracture surgery result in significant morbidity and cost to patients and society. It is unknown if patients who develop a superficial SSI (cellulitis) are at increased risk for developing a deep SSI requiring a formal irrigation and debridement. We hypothesized that a superficial SSI increases the likelihood of a subsequent deep SSI.

Methods: This study is a secondary analysis of the prospective data obtained from the METRC VANCO study (n = 980 patients enrolled at 36 centers). The study population consisted of patients aged 18 to 80 years with tibial plateau or pilon (tibial plafond) fractures and definitively treated with plate and screw fixation. To ensure a population with higher risk of infection, fractures had to be either open (Gustilo-Anderson Types I, II, or IIIA) or treated initially with external fixation due to swelling and/or a high-risk fracture pattern. Follow-up was scheduled for 2 weeks, 3 months, and 6 months after fixation. Superficial (treated with antibiotics only) and deep (treated with debridement surgery and antibiotics) SSIs were adjudicated based on Centers for Disease Control and Prevention criteria. We used a Cox proportional hazards model with the occurrence of a superficial SSI as a time-dependent covariate with a single irreversible transition.

Results: 30 superficial SSIs and 80 deep SSIs were observed. Six of the superficial SSIs were succeeded by deep SSIs. The risk of developing a deep SSI within 90 days of a superficial infection was 13.3%. For the 30 observed superficial SSI times, the average risk of developing a deep SSI within 90 days among those on-study and uninfected at those times was 4.1%. In the time-dependent Cox proportional hazard model, the occurrence of a superficial SSI was associated with a 4-fold increase in the likelihood of a deep SSI (hazard ratio: 4.2, 95% confidence interval: 1.8 to 9.7; P <0.01).

Conclusion: Utilizing a large data set from a prospective, multicenter orthopaedic trauma infection study, we noted a 4-fold increase in the likelihood of developing a deep infection if a superficial SSI was diagnosed previously. It is important to note that a majority of deep infections rarely present first as superficial infection (7.7%). Furthermore, it is unknown if the cases where superficial infections present later as deep infections represents misdiagnosis of a deep infection initially or simply represent confounding of 2 infection outcomes that are both more likely in patients who are at increased risk for infection in general.