Does Topical Antibiotic Powder Administration in the Emergency Department Reduce Deep Surgical Site Infection in Type III Lower Extremity Fractures? A Multicenter Study With Matched Historical Comparison

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Purpose: Deep surgical site infections (DSSIs) are a cause of morbidity in orthopaedic trauma. Prophylactic antibiotic administration has been shown to reduce the incidence of DSSI. Antibiotic powders prevent biofilm formation and deliver a higher antibiotic concentration compared to systemic administration. The purpose of this study was to determine if application of antibiotic powder to type III open lower-extremity fracture wounds upon presentation to the emergency department (ED) reduces the rate of DSSI.

Methods: This is a multicenter retrospective cohort study at 4 Level I trauma centers that included patients >18 years with Gustilo-Anderson type III open fractures of the lower extremity with >6 months of follow-up. In addition to the standard of care management for type III open fractures, antibiotic powder comprising 1 g of vancomycin and 1.2 g of tobramycin was applied directly to the open fracture wound. The intervention cohort (A) was compared to a matched historical cohort (B) of type III open lower-extremity fractures with identical management except for the ED powder application.

Results: 261 patients were included in the study. The rates of DSSI were significantly lower (P = 0.016) in patients who received ED antibiotic powder (Group A = 10/124 [8.1%]), versus those with no powder (Group B = 25/137 [18.2%]). Patients in group A additionally had a lower incidence of superficial infection (2.4% vs 7.3%), acute kidney injury (6.5% vs 11.7%), pulmonary embolism (0.8% vs 2.2%), nonunion (10.5% vs 15.3%), and amputation (0.8% vs 3.6%), and a longer time to reoperation for DSSI (A = 5.85 months, B = 5 months). Multivariate regression analysis demonstrated that patients with ED antibiotic powder were 65.2% less likely to develop DSSI (P = 0.010), and for every unit increase in body mass index, the likelihood of developing DSSI increased by 6.7% (P = 0.003).

Conclusion: Antibiotic powder application to type III open fracture wounds in the ED significantly reduced the incidence of DSSI. This low cost and easily implemented intervention warrants further large-scale study.