Assessing the Efficacy of Topical Antibiotic Powder Administration in the Emergency Department on Reducing Deep Surgical Site Infection in Type III Open Lower Extremity Fractures: A Multi-Center Study with Matched Historical Comparison

Mir Ibrahim Sajid, Whisper Marie Grayson, Mitchell John, Bradley John Lauck, Zohair Zaidi[1], Alex Savage[2], Nicole Griffin[3], Mohamed E Awad[4], Andrew Chen[5], John S Hwang, Nicholas Alfonso[3], Hassan Riaz Mir[6]
[1]UNC Department of Orthopaedics, [2]Mount Carmel Health System, [3]University of Colorado SOM, [4]University of Colorado, [5]UNC Orthopaedics, [6]University of South Florida

INTRODUCTION:
Deep Surgical Site Infections (DSSI) are a significant cause of morbidity in orthopaedic trauma and can lead to debilitating pain and disability. Early prophylactic antibiotic administration has shown to reduce the incidence of DSSI. Intra-wound antibiotic powder can deliver a higher local 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 multi-center retrospective cohort study at four level 1 trauma centers that included all patients >18 years with Gustilo-Anderson type III open fractures of the lower extremity, with a minimum of six-months of follow up. In addition to the standard of care management for type III open fractures, antibiotic powder (1g 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 standard of care management except for the powder application.

RESULTS: A total of 261 patients (A= 124, B= 137) were included in the study. The rates of DSSI were significantly lower in patients who received antibiotic powder (A= 10/124 (8.1%), B= 25/137 (18.2%), p= 0.016). Patients in group A additionally had a lower incidence of superficial infection (2.4% vs. 7.3%), nonunion (10.5% vs. 15.3%), and amputation (0.8% vs. 3.6%). Patients in Group A were noted to have a lower incidence of acute kidney injury (6.5% vs. 11.7%), and pulmonary embolism (0.8% vs. 2.2%). Multivariate regression analysis demonstrated that patients with antibiotic powder were 65.2% less likely to develop DSSI (p= 0.010), and for every unit increase in BMI, the likelihood of developing DSSI increased by 6.7% (p= 0.003).
DISCUSSION AND CONCLUSION: Antibiotic powder application to type III open fracture wounds in the ED significantly reduced the incidence of DSSI in our study. Further large-scale studies are warranted to explore the efficacy, safety, and long-term implications.