The Effect of Topical Antibiotic Powder Administration in the Emergency Department on Deep Surgical Site Infection in Type III Lower Extremity Fractures: A Prospective Cohort Pilot Study with Matched Historical Comparison

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Purpose: Severe open lower-extremity fractures have high rates of deep surgical-site infection (DSSI). Early administration of systemic antibiotic therapy is established to lower the risk of DSSI. Recent literature on antibiotic powder applied intraoperatively has shown promising results on reducing DSSI. DSSI rates may be potentially lowered even further by preventing biofilm formation prior to surgery with early topical antibiotic powder. 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: We conducted a prospective cohort trial at our institution that included all patients >18 years with Gustilo-Anderson type III open fractures of the lower extremity. Upon arrival to the ED, patients with type III open fractures were treated in accordance with standardized institutional protocols including removal of gross debris and sterile dressing, administration of broad-spectrum systemic antibiotics, and reduction and splinting. During the trial, patients also had 1 g of vancomycin and 1.2 g of tobramycin powder applied directly to the open fracture wound. The trial group was compared to a matched historical cohort of type III open lower-extremity fractures managed identically except for the powder application. Demographic, treatment, and injury characteristics were analyzed to determine effect on DSSI rate. Patients were followed ≥6 months.

Results: 218 patients were included, with 45 in the prospective trial cohort and 173 patients in the matched historical group. The rates of DSSI were 6/45 (13.3%) with powder, and 38/173 (22%) with no powder (P = 0.19). The mean time to reoperation for DSSI was 2.7 and 3.3 months for the non-powder and powder cohorts, respectively. Multivariate regression analysis demonstrated that patients with a higher body mass index were more likely to develop DSSI (P = 0.047).

Conclusion: Our pilot data suggest a potential decrease in rate of DSSI with administration of intrawound antibiotic powder to type III open fractures in the ED. If confirmed with future larger trials, this may have practice-changing implications given the marginal cost and ease of implementation.