

## **Surgical Site Infections in Patients with Type III Open Fractures: Comparing Antibiotic Prophylaxis with Cefazolin Plus Gentamicin versus Piperacillin/Tazobactam**

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**Background/Purpose:** Infections after open fractures remain problematic, with rates as high as 50% reported for Gustilo Anderson Type III (GAIII) injuries. Administration of prophylactic antibiotics in the setting of open fractures is a cornerstone of treatment and in GAIII open fractures has historically consisted of a cephalosporin and aminoglycoside, the latter of which has a significant side-effect profile, including ototoxicity and nephrotoxicity. The purpose of this analysis is to report on a single institution's results on surgical site infections (SSIs) utilizing a novel antibiotic prophylaxis regimen, piperacillin / tazobactam, in the treatment of Gustilo Anderson Type III open fractures.

**Methods:** A retrospective review of all patients over 18 years of age with GAIII open fractures who presented to a single Level I trauma center between 2004 and 2012 was performed. All patients were initially treated by an on-call team comprised of an orthopaedic attending surgeon and orthopaedic resident(s) utilizing accepted practices. These included early antibiotic administration, early and adequate debridement within 6-8 hours when possible, dead space management, and soft-tissue management. While only one-third of cases were initially staffed by an orthopaedic traumatologist, ultimately all were managed by one of two full-time orthopaedic traumatologists. Patients were stratified into two groups: those who received cefazolin and gentamicin (group CG; 2004-2009) and those who received piperacillin / tazobactam (group PT; 2009-2012) as antibiotic prophylaxis for open fractures. Patient data were collected from hospital records, including GA classification, OTA fracture classification, age, sex, diabetes, smoking history, ISS, and duration of antibiotic administration. The primary outcome measure was SSI at 1 year, with secondary outcome measures of SSI at 30 days, nonunions, mortality and rehospitalization at 1 year.

**Results:** 766 patients presented with open fractures over the study time period, 134 of whom were identified with GAIII open fractures. 72 patients met inclusion criteria--37 (51%) in group CG and 35 (49%) in group PT. Loss to follow-up prior to 1 year (35.5%, n = 22) and prophylactic antibiotics used outside of the studied medications (35.5%, n = 22) were the most common reasons for exclusion. There was no difference in GAIII subtypes, OTA classification, age, incidence of diabetes, smoking status, ISS, or duration of antibiotic therapy between groups. While there was no statistically significant difference in SSI at 30 days between groups, the rate was higher in the cefazolin plus gentamicin group (21.6% vs 11.4%;  $P = 0.246$ ). The 1-year SSI rate was 32.4% (12/37) and 31.4% (11/35) for group CG and PT, respectively ( $P = 1.000$ ). There were also no significant differences in the rates of nonunion at 1 year (28.9% group CG vs 14.3% group PT;  $P = 0.130$ ), death at 1 year (2.6% group CG vs 0.0% group PT;  $P = 0.334$ ), and rates of rehospitalization related to the initial

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.

injury (37.8% group CG vs 31.4% group PT;  $P = 0.715$ ) between groups. Two separate post hoc analyses of 8 patients followed for a minimum 30 days but less than 1 year and of 9 patients with uninfected nonunions (which might indicate the presence of a culture-negative infection) also found no differences in infection rates.

**Conclusion:** Piperacillin/tazobactam provides equivalent infection prophylaxis for Gustilo Anderson Type III open fractures when compared to the current gold standard, a cephalosporin and aminoglycoside combination. With its ease of use as a single agent, superior safety profile, and superior bone penetration, piperacillin/tazobactam should be considered as an option for antibiotic prophylaxis in patients with Type III open fractures.