Risk of Acute Kidney Injury After Antibiotic Prophylaxis with Piperacillin and Tazobactam

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Purpose: Kidney dysfunction is known to cause significantly worse outcomes and increase mortality in critically injured patients. Current guidelines recommend gram-negative coverage for high-grade open fractures, and aminoglyocosides have historically been the most commonly used despite the growing evidence that these drugs are associated with acute kidney injury (AKI). Piperacillin / tazobactam (PT) has been proposed as an alternative broad-spectrum antibiotic; however, some evidence in the critical care literature has shown PT and vancomycin in combination increase rates of AKI. The aim of this study is to evaluate if PT was associated with increased rate of inpatient AKI in patients with open fractures.

Methods: A retrospective cohort study was performed on Gustilo-Anderson type II and III open fractures that presented to a single Level I trauma center over a 5- year period (2015-2019). All patients received open fracture prophylactic antibiotics upon arrival to the hospital. In the initial 2 years of the study period, antibiotics protocols were not standardized but included cefazolin for type II open fractures and the addition of gram-negative coverage in type III open fractures. In the second 2 years the protocol was standardized and consisted of cefazolin for type II open fractures and PT for type III open fractures. Due to the low interobserver agreement in Gustilo classification there were a large number of type II open fractures that received PT (68 patients) and these patients were included. Adequate laboratory values during the patients' hospital stay (including basic metabolic panel [BMP] preoperatively and postoperatively) were required for inclusion. Two groups were created: a PT group consisting of any patient who received PT for open fracture antibiotic prophylaxis, and a control group consisting of any patient with an open fracture who received any other antibiotic for open fracture prophylaxis. Patient demographics, number of contrasted studies performed, fracture characteristics, rates of AKI, and fracture-related infection (FRI) rates were assessed. AKI was defined as an increase in creatinine greater by than 50% during the patient's admission compared to the initial admission creatinine.

Results: The PT group contained 191 patients and the control group contained 213 patients. Between groups, there were no differences in age, sex, race, body mass index, American Society of Anesthesiologists class, smoking status, or number of contrasted studies. There was no difference in the rate of AKI between the PT and control groups (4.6% vs 3.9%, $P = 0.79$). There was no difference in rate of AKI between the PT and control groups when substratified by Gustilo-Anderson fracture type (type II: 8.3% vs 3.3%, $P = 0.27$; type III: 2.2% vs 4.4, $P = 0.38$).

Conclusion: The use of PT in prophylactic antibiotic treatment of type II and III open fractures does not affect the rate of AKI in patients and can be used as monotherapy without increased risk of renal injury.