Periprosthetic Joint Infection in Patients on Suppressive Antibiotic Therapy Undergoing Primary Total Joint Arthroplasty

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INTRODUCTION:

Periprosthetic Joint Infection (PJI) is one of the most devastating adverse outcomes of total hip arthroplasty (THA) and total knee arthroplasty (TKA), occurring approximately in 1% of cases of primary TJA in the United States. Recently, oral chronic antibiotic suppression therapy (SAT) following surgical management for PJI (i.e., debridement, intravenous antibiotics, and implant retention (DAIR) or 2-stage exchange) has emerged as a potential means to increase rates of infection-free survival in patients deemed to be at high risk for infection relapse or in patients unable to undergo the reimplant of the 2-stage exchange. As the number of patients undergoing primary TJA increases, so too will the incidence of PJI, and by proxy, the number of patients receiving SAT. While it is known that prior PJI increases the risk for PJI in a new primary TJA, there is currently a paucity of data highlighting the PJI risk in primary TJA if a patient is currently on SAT indicated for a different TJA PJI or other chronic infection. The purpose of the present study is to further evaluate the risk of PJI of a new primary TJA in patients on oral SAT through a retrospective matched cohort study. We hypothesized that patients on SAT would have no increased risk of PJI compared to a matched cohort, given the promising results of recent randomized control trials supporting the efficacy of SAT in infection suppression in patients with PJI.

METHODS:

This is an IRB-approved retrospective matched cohort study from 5 hospitals within a large tertiary hospital network in the northeast US. Within our hospital network, we identified all patients who were treated with oral SAT for any indication between January 1, 2000, and December 31, 2021, who subsequently underwent a primary TJA contemporaneously. We queried our institution's Outpatient Antibiotic Therapy database (OPAT), which tracked all patients on chronic antibiotics (both oral and intravenous routes) from August 2006 to October 2012 (n=2,640 patients). In order to obtain data from the years 2000-2006 and 2012-2021, we requested data from our institution's clinical data registry, the Research Patient Data Registry, for all of the patients who had terms related to SAT present in an operative note or clinic note (n=320 patients). All patients were then chart reviewed to determine if they met our study's inclusion criteria: patients over age 18, patients with any order for oral chronic (>6 months duration) SAT that had to have been placed at a maximum of 30 days prior to the date of the TJA, and patients with a minimum of one year clinical follow up from the TJA. This resulted in 45 TJA in 33 patients on oral SAT.

For all of the patients who met inclusion criteria, a chart review was performed to collect the following variables used for matching: age at time of primary TJA, sex, body mass index (BMI) in kg/m^2, joint of primary TJA (hip or knee), type II diabetes mellitus history, smoking history within 6 months of primary TJA, and indication for primary TJA. Age at time of primary TJA and BMI were matched within 5 points of the original cohort, while all other variables were matched for exactly. The 45 TJA were matched 4:1 to a separate database of 47,523 primary TJA patients also from our institutions. Matched controls were confirmed to not have been prescribed SAT. Further comorbidity, infectious, and surgical data were collected for all patients.

Quantitative variables were assessed with sample mean and standard deviation, and independent Student's t-tests were conducted to test for significance between cohorts. Categorical variables were presented as percentages and analyzed using Fisher exact tests and Chi-Square tests as appropriate. P values of <0.05 were considered statistically significant.

A pre-study power analysis was performed to determine the percent incidence of PJI that we could detect in our SAT cohort compared to the matched cohort. We assumed that our 4:1 matched cohort (n=180) would have a PJI incidence similar to our institution's annual PJI incidence of approximately 1%. With a relatively small SAT cohort (n=45), we found that we were powered to detect a 10.5% increase in PJI incidence compared to a 1% baseline rate of PJI at our institution. In essence, we had the ability to significantly detect a PJI rate greater than 11.5% in our SAT cohort.

RESULTS:

We identified 45 TJA in 33 patients who were on oral SAT contemporaneously to their TJA, termed our "SAT" cohort. A matched cohort of 180 patients was also identified, for a total cohort of 225 patients. While our inclusion criteria for the study required a minimum 1 year follow-up duration, the average follow-up duration was over 4 years in both cohorts, with the control group having a longer follow-up duration than the SAT group at 5.50±4.06 years vs. 4.10±3.42 years, p=0.034.

The average age of patients in our SAT cohort was 67.56±11.26 years; there were 53.37% males and 46.66% females, and the average BMI was 32.33±7.07 (kg/m2). The distribution of hips and knees in our study was relatively even (58.78% knees vs. 42.22% hips) and there were a large number of patients who had smoked within 6 months of their TJA at 46.66% in both the SAT cohort and matched cohort.

There was no difference in the rate of development of PJI at any timepoint within follow up between the SAT cohort and control group (2.22% vs. 1.11%, p=0.561).
For patients on SAT, coverage for recurrent urinary tract infections and cellulitis together accounted for 15.56% of the indications for SAT and were categorized as “secondary infectious prophylaxis.” The remaining 84.44% of patients were on SAT for infectious that were presumably ongoing, such as THA and TKA PJI.
DISCUSSION AND CONCLUSION:
This study found that there was a 2.22% rate of PJI in a cohort of patients on SAT identified over a 20-year period in a large tertiary-care hospital network. Given this study's power limitations, we are unable to draw conclusions about statistical difference or risk of PJI in a SAT cohort compared to matched controls. As the clinical scenario of primary TJA while on SAT is rare but potentially devastating for patients, future large-scale studies can be performed to better clarify rates and risk of PJI in this population subset.