

## Rates and Outcomes of Periprosthetic Joint Infection after Primary Total Joint Arthroplasty in People with Injection Drug Use

Tyler James Humphrey, Alexander Mitchell Tatara, Hany S Bedair<sup>1</sup>, Kyle Alpaugh, Christopher Michael Melnic, Sandra Bliss Nelson<sup>1</sup>

<sup>1</sup>Massachusetts General Hospital

**INTRODUCTION:** Substance use disorder (SUD) is becoming increasingly common and presents unique challenges in total joint arthroplasty (TJA). People who inject drugs (PWID) are prone to infectious complications, including a sixteen-fold higher risk of invasive methicillin-resistant *Staphylococcus aureus* (MRSA) infection, including musculoskeletal infections. Given the concern for increased periprosthetic joint infection (PJI) risk, the 2018 International Consensus Meeting on Periprosthetic Joint Infection recommended that patients with active injection drug use (IDU) not be offered elective arthroplasty. While it is acknowledged that PJI risk is higher in PWID, reported rates are from small case series and demonstrate high variance, ranging from 31-87%. The largest published collection of arthroplasty case outcomes in PWID included 27 joints but did not include a comparison to matched controls. The purpose of this study is to assess PJI risk in PWID using a case-control matched methodology, and to describe PJI outcomes and factors associated with improved PJI outcomes in this population.

### **METHODS:**

We conducted a retrospective matched cohort study within a large tertiary hospital system in the northeast United States. We first identified all patients with a history of IDU (subcutaneous, intramuscular, intravenous) who underwent primary TJA from January 2000 to March 2020. In total, 99 patients were identified. After additional chart review, patients were included if they had a history of IDU prior to primary hip or knee TJA, were over 18 years of age at index TJA, and had a minimum of 2 years clinical follow up. Fifty-eight TJAs in 41 PWID met inclusion criteria. The 58 primary TJA patients with IDU were matched 1:4 on the following variables: age ( $\pm 5$  years), body mass index ( $\pm 5$ ), gender, joint (hip or knee), and TJA indication. Chart review was performed to confirm that none of the matched patients had any history of IDU. Demographic, comorbidity, and surgical factors related to both the primary TJA and PJI were collected for all patients. PJI outcome was classified as described by Fillingham et al (JBJS 2019). We defined treatment success as a Tier 1 outcome and treatment failure as a Tier 2 through 4 outcome.

Simple descriptive statistics such as means, standard deviations, and percentages were calculated for continuous and categorical variables within groups. Comparisons between groups were performed using student's T tests for continuous variables; Chi-square and Fisher exact tests were utilized as appropriate for categorical variables. A multivariate logistic regression was performed to determine predictors of PJI diagnosis using variables showing some association in Table 5, defined as  $p < 0.20$ . Odds ratios and 95% confidence intervals (CIs) were calculated for this regression. P values  $< 0.05$  were considered statistically significant.

### **RESULTS:**

Fifty-eight TJA performed in 41 PWID were matched to 232 TJAs in 232 patients (Table 2). The average follow-up duration among PWID was  $7.23 \pm 4.94$  years and among controls was  $7.21 \pm 4.79$  years ( $p = 0.977$ ). Among PWID, the average age was  $53.12 \pm 11.12$  years and the average BMI was  $32.19 \pm 6.74$  kg/m<sup>2</sup>.

Compared to matched controls, in univariate analysis PWID were more likely to have higher ASA physical score ( $p < 0.001$ ). PWID were also more likely to have a history of CHF (22.41% vs. 6.03%  $p < 0.001$ ), previous septic arthritis in a non-TJA joint (10.34% vs. 1.29%  $p < 0.001$ ), pulmonary disease (51.72% vs. 24.13%  $p < 0.001$ ), mood disorder (72.41% vs. 31.03%  $p < 0.001$ ), viral hepatitis (67.24% vs. 2.15%  $p < 0.001$ ), HIV infection (5.17% vs. 0.43%  $p = 0.005$ ), regular alcohol use (46.55% vs. 31.07%  $p = 0.025$ ), any smoking history (89.65% vs. 42.67%  $p < 0.001$ ), and homelessness (24.14% vs. 0%  $p < 0.001$ ). There were no significant differences between groups for MRSA/MSSA nasal screening results at the time of the primary TJA.

Following the index TJA, patients in the IDU cohort were more likely to be discharged to a rehabilitation (17.24% vs. 4.74%,  $p = 0.001$ ) or skilled nursing (12.06% vs. 1.29%  $p < 0.001$ ) facility, compared to the matched cohort. PWID were also more likely to present to the ED within 90 days (32.75% vs. 9.91%  $p < 0.001$ ), suffer early PJI (10.34% vs. 2.58%  $p = 0.007$ ), have 1-year joint-related readmission (20.68% vs. 8.62%  $p = 0.008$ ), 1-year all-cause readmission (36.20% vs. 15.51%  $p < 0.001$ ), any-cause revision within 1 year (24.13% vs. 7.32%  $p < 0.001$ ), and PJI diagnosis during follow up (29.31% vs. 3.44%  $p < 0.001$ ).

In multivariate analysis, osteoarthritis as the indication for the index TJA was associated with a decreased risk of PJI (OR 0.255, 95%CI 0.075-0.866,  $p = 0.028$ ). An ASA physical score of 3 and any history of IDU had significantly increased odds of PJI (OR 4.934, 95%CI 1.251-19.469,  $p = 0.023$  and OR 9.605, 95% CI 2.781-33.175,  $p < 0.001$ , respectively). Presence of viral hepatitis, mood disorder, HIV, and recent IDU (within 6 months of TJA) could not be included in the regression as they displayed collinearity with any prior IDU history.

Of patients who had treatment failure of their PJI, IDU history was more common compared to those with treatment success, but this was not statistically significant due to underpowering (75% vs. 40%,  $p=0.283$ ).

**DISCUSSION AND CONCLUSION:**

Injection drug use is an important risk factor for PJI following total joint arthroplasty. We believe this to be the largest study of TJA in PWID to date and this study is further strengthened by the use of matched controls. PJI occurred in 29.3% of persons with a history of IDU, a more than 8-fold higher risk than in matched controls. PWID also had worse PJI outcomes, though not statistically significant. Implementation of such interventions as Addiction Medicine consultation, medication-assisted treatment, and multidisciplinary care teams may facilitate durable abstinence and provide needed social support, thereby reducing morbidity and improving TJA outcomes in this vulnerable population.