

# Intraosseous Vancomycin for Primary Total Knee Arthroplasty is Associated with a Lower Rate of Postoperative Acute Kidney Injury Compared to Intravenous Vancomycin

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**INTRODUCTION:** Vancomycin administration as a perioperative antibiotic can be difficult to time and can lead to adverse systemic effects. Intraosseous vancomycin (IOV) is becoming increasingly utilized for total knee arthroplasty (TKA) prophylaxis. The primary purpose was to compare the rate of acute kidney injury (AKI) following primary TKA that utilized IOV or intravenous vancomycin (IVV).

## METHODS:

This is a single-institution retrospective review of primary TKA cases from 32 surgeons that received either IOV or IVV antibiotic prophylaxis. All included patients had a basic metabolic panel on postoperative day one. Patients were excluded if they had a solid organ transplant, were on hemodialysis, or received a blood transfusion following TKA. Acute kidney injury was defined as a creatinine increase of 0.3 mg/dL from baseline. Patient demographics, comorbidities, and operative characteristics were compared between groups. Data was analyzed using independent samples t-tests and chi-square analyses. Logistic regression was used to identify significant risk factors for AKI.

**RESULTS:** There were 4,184 primary TKAs identified from July 2016 to November 2024 that received IOV (1,297 cases) or IVV (2,887 cases) as part of antibiotic prophylaxis with 37.4% male, 62.6% female, and an average age of  $68.5 \pm 9.0$  years. The rate of AKI was lower in the IOV compared to the IVV group (1.9% versus 3.3%,  $P=0.017$ ). Patients who developed AKI had longer hospitalizations ( $59.9 \pm 39.1$  hours versus  $42.1 \pm 33.3$ ,  $P<0.001$ ) and higher likelihood of discharge to skilled nursing facilities (10.1% versus 3.0%,  $P<0.001$ ) compared to non-AKI patients. Logistic regression demonstrated that IVV (odds ratio [OR]: 1.87; 95% confidence interval [CI] 1.09-3.21), Body Mass Index (BMI) (OR 1.09; 95% CI 1.05-1.13), and postoperative blood urea nitrogen (OR 1.29; 95% CI 1.24-1.35) were significantly associated with AKI. No adverse events were observed due to the IO technique.

## DISCUSSION AND CONCLUSION:

The use of IOV was associated with a significantly lower rate of AKI following primary TKA when compared to IVV. Administering vancomycin with an IO technique may help eliminate logistical vancomycin administration difficulties prior to incision as well as certain dreaded side effects, like AKI.

Table 1. AKI vs No AKI Patient Characteristics

	No AKI (N = 4065)	AKI (N = 119)	P-value
Age (years)	68.5 ± 9.0	69.9 ± 8.8	0.075
BMI (kg/m <sup>2</sup> )	32.1 ± 6.3	35.6 ± 7.0	<b>P &lt; 0.001</b>
<b>Labs</b>			
Pre-Op GFR	76.3 ± 18.5	67.5 ± 21.0	<b>P &lt; 0.001</b>
CKD Stage 1	1197 (29.4%)	24 (20.2%)	<b>0.028</b>
CKD Stage 2	1928 (47.4%)	47 (39.5%)	0.087
CKD Stage 3A	553 (13.6%)	28 (23.5%)	<b>0.002</b>
CKD Stage 3B	185 (4.6%)	17 (14.3%)	<b>P &lt; 0.001</b>
CKD Stage 4	29 (0.7%)	1 (0.8%)	0.581
Baseline Creatinine (mg/dL)	0.9 ± 0.3	1.0 ± 0.3	<b>P &lt; 0.001</b>
Pre BUN (X)	17.8 ± 6.4	20.5 ± 8.0	<b>P &lt; 0.001</b>
Post BUN (X)	15.8 ± 6.1	26.1 ± 9.8	<b>P &lt; 0.001</b>
<b>Medical Comorbidities</b>			
ASA	2.6 ± 0.5	2.8 ± 0.4	<b>P &lt; 0.001</b>
CCI	2.4 ± 3.0	3.4 ± 3.6	<b>0.004</b>
ECT	3.9 ± 3.1	5.1 ± 3.7	<b>0.001</b>
Diabetes	1293 (31.8%)	54 (45.4%)	<b>0.002</b>
Congestive Heart Failure	332 (8.2%)	16 (13.4%)	<b>0.040</b>
Peripheral Vascular Disease	1460 (35.9%)	49 (41.2%)	0.239
Hypoalbuminemia	111 (2.7%)	7 (5.9%)	<b>0.041</b>
<b>Operative Details</b>			
IV Vanc Used?	2793 (68.7%)	94 (79.0%)	<b>0.017</b>
IO Vanc Used?	1301 (31.3%)	25 (21.0%)	
Procedure Time (hours)	96.3 ± 37.1	104.1 ± 49.3	0.088
Estimated Blood Loss (mL)	80.2 ± 65.1	106.9 ± 121.5	<b>0.026</b>
Length of Stay (hours)	42.1 ± 33.3	59.9 ± 39.1	<b>P &lt; 0.001</b>
Pre-operative NSAID Use (%)	2399 (59.0%)	63 (52.9%)	0.184
<b>Discharged to:</b>			
Home + Home Health	3781 (93.0%)	100 (84.0%)	<b>P &lt; 0.001</b>
SNF	124 (3.1%)	12 (10.1%)	<b>P &lt; 0.001</b>
Rehab	158 (3.9%)	7 (5.9%)	0.270