Can Antibiotics Be Given Too Close to Time of Incision?

Jamie Heimroth[1], Max Willinger, Nipun Sodhi[2], Veronika Paikin, Alain Emil Sherman, Kiara Nicole Powell, Adam Strigenz, Jonathan Danoff
[1]Northwell Orthopedics, [2]Northwell Health

INTRODUCTION: Timing for antibiotic administration in total knee arthroplasty (TKA) remains controversial. While most preoperative antibiotics are given within one hour of surgery, limited research has been conducted showing ideal preoperative antibiotic timing to minimize the risk of postoperative infections. Therefore, the objective of this study was to determine if the timing of preoperative antibiotics is associated with TKA postoperative infection.

METHODS: A prospectively collected institutional database from a multicenter healthcare system was queried with ICD-10 codes and manually reviewed for patients undergoing primary TKA between March 2020 to December 2020. Patient demographics and comorbidities were recorded (Table 1). The rate of superficial surgical site infection (SSI) and periprosthetic joint infection (PJI) was compared with preoperative antibiotic timing. PJIs were defined based on MSIS criteria, and superficial SSIs were infections that did not meet MSIS criteria (Table 2). Antibiotic timing was separated into 15 minute groupings from zero minutes prior to skin incision to over 120 minutes prior to incision (Table 3, Table 4).

RESULTS: Of the 2,511 patients who underwent primary TKA, 19 were found to have postoperative infections (Table 2). There were 7 SSIs, and 12 PJIs, 15 of the postoperative infections occurred when patients received antibiotics less than 30 minutes prior to incision (Table 4). There were no SSIs or PJIs for patients receiving antibiotics greater than one hour prior to incision. While there was an increased rate of infection within 30 minutes of incision, there was no significant difference in SSIs or PJIs between each time interval of antibiotic administration (p=0.45) (Table 4).

DISCUSSION AND CONCLUSION: Our study demonstrates no difference in postoperative infection regardless of preoperative antibiotic timing, however, most of the infections occurred in patients who received antibiotics within 30 minutes of incision. Although the literature reports the necessity of antibiotics within 60 minutes of surgical incision, our study suggests that this threshold should be 30 minutes to 2 hours prior to surgical incision.

Table 1. Univariate analysis of demographics and comorbidities

	Infection (*n* = 19)	No infection (*n* = 2,492)	*p*-value
Age (years)	63.0 ± 7.2	66.8 ± 9.0	0.07
BMI (kg/m²)	31.8 ± 6.3	32.2 ± 6.4	0.78
Sex Male Female	11 (58%) 8 (42%)	924 (37.1%) 1,568 (62.9%)	0.06
Laterality Right Left Bilateral	13 (68.4%) 6 (31.6%) 0 (0.0%)	1,237 (49.6%) 1,199 (48.1%) 23 (0.9%)	0.28
Operative Time (min)	120.50 ± 31.47	103.44 ± 31.37	**0.02**
Tourniquet Time (min)	78.50 ± 18.44	62.14 ± 24.32	**0.004**
Anemia	6 (31.5%)	332 (13.2%)	**0.02**
Renal Failure	1 (5.3%)	183 (7.3%)	0.59
MRSA (nasal swab)	7 (36.8%)	519 (20.8%)	0.09
Malnutrition	1 (5.3%)	6 (0.2%)	**0.05**
Diabetes	2 (10.6%)	462 (18.5%)	0.29
MI	0 (0.0%)	23 (0.9%)	0.67
PVD	0 (0.0%)	28 (1.1%)	0.64
CVA	0 (0.0%)	32 (1.3%)	0.62
CKD	0 (0.0%)	20 (0.8%)	0.70
COPD	0 (0.0%)	57 (2.3%)	0.51
Peptic Ulcer Disease	0 (0.0%)	18 (0.7%)	0.71
Rheumatoid Arthritis	0 (0.0%)	56 (2.2%)	0.51
Smoking	8 (42.1)	787 (31.6%)	0.33
Anxiety	6 (31.6%)	293 (11.8%)	**0.01**
Depression	5 (26.3%)	252 (10.1%)	**0.02**
ESRD	0 (0.0%)	3 (0.1%)	0.88
Hypertension	12 (63.2%)	1,104 (44.3%)	0.10
Hyperlipidemia	10 (52.6%)	796 (31.9%)	**0.05**
Preoperative COVID	0 (0.0%)	29 (0.9%)	0.64
Postoperative COVID	0 (0.0%)	10 (0.3%)	0.78
Anesthesia General Spinal	4 (21.1%) 15 (78.9%)	917 (31.2%) 2,025 (68.8%)	0.22
Use of cement	15 (78.9%)	2,048 (82.2%)	0.39
Antibiotic Cement	14 (73.7%)	1,464 (58.8%)	**0.05**
Antibiotic Cement Type Gentamicin Tobramycin	11 (78.6%) 3 (21.4%)	1,307 (89.2%) 157 (10.7%)	0.42

Table 2: Infection frequency.

Type of infection	Frequency (%)
Superficial surgical site infection	7 (0.2%)
Periprosthetic joint infection	12 (0.4%)
Total	**19 (0.8%)**

Table 3: Patient distribution of antibiotic administration prior to incision

	0-15 min	16-30 min	31-45 min	46-60 min	> 60 min
***n* (%)**	442 (18.7%)	1,226 (51.8%)	511 (21.6%)	94 (4.0%)	92 (3.9%)

Table 4: Infection distribution within each preoperative antibiotic administration grouping

	0-15 min	16-30 min	31-45 min	46-60 min	> 60 min	*p*-value
Infection	2 (0.5%)	13 (1.1%)	3 (0.6%)	0 (0.0%)	0 (0.0%)	0.45