Second Dose of Dexamethasone Reduces Postoperative Opioid Consumption, Pain, and Length of Stay in Primary Total Knee Arthroplasty

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INTRODUCTION:

The optimal administration of dexamethasone for postoperative pain management and recovery following primary, elective total knee arthroplasty (TKA) remains unclear. This study aimed to evaluate the effect of a second intravenous (IV) dose of dexamethasone on postoperative pain scores, inpatient opioid consumption, and functional recovery after TKA.

METHODS:

A retrospective review of 1,951 patients who underwent primary elective TKA between May 2020 and April 2021 was conducted. A total of 399 patients who received two perioperative doses (2D) of dexamethasone 10 mg IV were propensity-matched 1:1 to a control group of 399 patients who received one perioperative dose (1D) of dexamethasone 10 mg IV. To assess the primary outcome of opiate consumption, nursing documented opiate administration events were converted into morphine milligram equivalences (MMEs) for consecutive 24-hour postoperative intervals. Postoperative pain and functional status were also assessed using the Verbal Rating Scale (VRS) for pain and the Activity Measure for Post-Acute Care (AM-PAC) scores, respectively.

RESULTS:

A total of 798 patients were included in the analysis (1D = 399, 2D = 399). Compared to the 1D control group, the 2D group demonstrated significantly lower overall inpatient opiate consumption (33.4±59.3 vs. 54.2±119.0 MME; 38.4% decrease, p=0.004) and lower VRS pain scores at 36-48 hours (4.70±2.03 vs. 5.27±1.84; p=0.021) and 48-60 hours (4.71±2.07 vs. 5.50±2.08; p= 0.020) postoperatively. The 2D cohort also had shorter hospital length of stay (1.61±1.21 vs. 1.87±2.34 days; p= 0.048) than the 1D control group. AM-PAC scores did not significantly differ between cohorts.

DISCUSSION AND CONCLUSION:

The administration of a second perioperative dexamethasone dose significantly decreased opioid consumption in the immediate postoperative period. Length of stay and inpatient opioid administration can be significantly reduced while maintaining a comparable functional recovery and superior pain control.

Table 1. Demographic data for unmatched and match cohorts

	Unmatched Cohorts			Matched Cohorts		
	One Dose (N = 1,552)	Two Doses (N = 399)	P-value	One Dose (N = 399)	Two Doses (N = 399)	P-value
Age	66.0±9.6	65.9±9.6	0.830	65.8±9.1	65.9±9.6	0.898
Female- no. (%)	1,002 (64.6)	244 (61.2)	0.206	263 (65.9)	244 (61.2)	0.162
BMI	32.5±6.3	32.8±6.5	0.878	32.6±6.6	32.6±6.5	0.928
ASA Class- no. (%)			0.701			0.842
1	47 (3.0)	15 (3.8)		13 (3.3)	15 (3.8)	
2	910 (58.6)	230 (57.6)		232 (58.1)	230 (57.6)	
3	580 (37.4)	152 (38.1)		150 (37.6)	152 (38.1)	
4	15 (1.0)	2 (0.5)		4 (1.0)	2 (0.5)	
Smoking Status- no. (%)			0.783			0.148
Never	938 (60.4)	235 (58.9)		242 (60.7)	235 (58.9)	
Former	539 (34.7)	142 (35.6)		146 (36.6)	142 (35.6)	
Current	75 (4.8)	22 (5.5)		11 (2.8)	22 (5.5)	
Race- no. (%)			0.506			0.656
White	933 (60.1)	252 (63.2)		244 (61.2)	252 (63.2)	
Black	280 (18.0)	60 (15.0)		68 (17.0)	60 (15.0)	
Asian	48 (3.1)	14 (3.5)		14 (3.5)	14 (3.5)	
Other	291 (18.8)	73 (18.3)		73 (18.3)	73 (18.3)	
CCI	3.53±2.34	3.42±2.16	0.372	3.43±2.19	3.42±2.16	0.948
Anesthesia Type			0.299			0.733
Spinal	1,404 (90.5)	354 (88.7)		357 (89.5)	354 (88.7)	
General	148 (9.5)	45 (11.3)		42 (10.5)	45 (11.3)	
Surgical time (minutes)	112.0±26.5	110.7±25.7	0.398	112.1±28.1	110.7±25.7	0.482
PT session- no. (%)	1,485 (95.7)	390 (97.7)	0.058	383 (96.0)	390 (97.7)	0.155

ASA, American Society of Anesthesiologists; BMI, body mass index; CCI, Charlson comorbidity index; PT, physical therapy; no., number; SD, standard deviation.
*p<0.05

Table 2. Verbal Rating Scale pain scores during 12-hour postoperative intervals

	One Dose (N = 399)	Two Doses (N = 399)	Percent Change (%)	P-value
0 to 12 hours	2.22±1.81	2.39±1.90	+7.66	0.179
12 to 24 hours	4.84±1.90	4.96±1.85	+2.48	0.415
24 to 36 hours	5.03±1.94	5.10±1.98	+1.39	0.693
36 to 48 hours	5.27±1.84	4.70±2.03	-10.82	**0.021***
48 to 60 hours	5.50±2.08	4.71±2.07	-14.36	**0.020***
60 to 72 hours	4.56±2.88	5.07±1.88	+11.18	0.688

*p<0.05

Table 3. Average opiate administration in morphine milligram equivalents during 24-hour postoperative intervals

	One Dose (N = 399)	Two Doses (N = 399)	Percent Change (%)	P-value
Total	54.2±119.0	33.4±59.3	-38.4	**0.004***
0 to 24 hours	14.0±17.0	11.9±20.7	-15.0	0.149
24 to 48 hours	21.2±37.7	14.2±29.8	-33.0	**0.007***
48 to 72 hours	8.6±23.8	4.4±13.6	-49.3	**0.004***
72 to 96 hours	3.5±17.7	1.7±8.71	-53.4	0.074

*p<0.05

Table 4. Average activity measure for post-acute care scores within 24 hours of procedure completion[1]

	One Dose (N = 383)	Two Doses (N = 390)	Percent Change (%)	P-value
How much difficulty does the patient have with:				
Turning over in bed	3.56±0.55	3.55±0.54	-0.3	0.743
Sitting down and standing up	3.36±0.56	3.37±0.55	+0.3	0.791
Lying down and sitting up	3.38±0.55	3.44±0.50	+1.8	0.920
How much help does the patient need with:				
Moving to and from bed to chair	3.32±0.61	3.36±0.57	+1.2	0.377
Walking	3.23±0.68	3.27±0.63	+1.2	0.364
Climbing 3 to 5 steps with a railing	2.89±0.94	2.86±0.94	-1.0	0.708
Raw Score	19.8±3.46	19.9±3.37	+0.5	0.816

AM-PAC, Activity Measure for Post-Acute Care
[1]AM-PAC scores are as follows: (1) unable, (2) a lot, (3) a little, and (4) none. Higher scores indicate improved functional recovery.
*p<0.05

Table 5. Clinical outcomes of included patients

	One Dose (N = 399)	Two Doses (N = 399)	P-value
LOS (days)	1.87±2.34	1.61±1.21	**0.048***
Discharge Disposition- no. (%)			0.386
Home	382 (95.7)	380 (95.2)	0.733
Skilled Nursing Facility	16 (4.0)	17 (4.3)	0.859
Acute Rehab Center	0 (0.0)	2 (0.5)	0.157
Other	1 (0.3)	0 (0.0)	0.317
90-day readmission- no. (%)	14 (3.5)	9 (2.3)	0.290
90-day complications- no. (%)			0.247
Infection	5 (1.3)	2 (0.5)	0.255
Superficial wound infection	0 (0.0)	1 (0.3)	0.317
PJI	3 (0.8)	1 (0.3)	0.316
Cellulitis	1 (0.3)	0 (0.0)	0.317
Other	1 (0.3)	0 (0.0)	0.317
Delayed wound healing	1 (0.3)	0 (0.0)	0.317
PPF	0 (0.0)	1 (0.3)	0.317
Patellar tendon tear	1 (0.3)	0 (0.0)	0.317
Traumatic wound dehiscence	1 (0.3)	3 (0.8)	0.316
Non-orthopedic	6 (1.5)	3 (0.8)	0.315
90-Day Reoperation- no. (%)	6 (1.5)	6 (1.5)	1.000
rTKA	5 (1.3)	4 (1.0)	0.737
I&D	1 (0.3)	1 (0.3)	1.000
ORIF	0 (0.0)	1 (0.3)	0.317

LOS, hospital length of stay; PJI, periprosthetic joint infection; PPF, periprosthetic fracture; rTKA, revision total knee arthroplasty; I&D, Irrigation and debridement; ORIF, Open reduction internal fixation; no., number; SD, standard deviation
*p<0.05