

Appendix

TABLE E-1 Baseline Characteristics of the Study Groups by Surgical Strategy, with Population Standardized Bias (PSB) Values*

Characteristic	Surgical Strategy			P Value	PSB			PSB with IPTW†		
	Staggered (N = 368)	Staged (N = 265)	Simultaneous (N = 820)		Staggered	Staged	Simultaneous	Staggered	Staged	Simultaneous
Demographics										
Age (yr)	69.5 ± 6.7	69.9 ± 7.1	68.6 ± 5.9	0.004	0.064	0.136	0.073	0.011	0.015	0.045
Female sex	355 (96.5)	252 (95.1)	786 (95.9)	0.692	0.030	0.039	0.001	0.014	0.017	0.019
BMI (kg/m^2)	27.0 ± 3.3	27.1 ± 3.7	27.0 ± 3.4	0.929	0.013	0.018	0.000	0.045	0.021	0.004
ASA PS score				<0.001	0.146	0.105	0.135	0.031	0.066	0.020
1	19 (5.2)	11 (4.2)	46 (5.6)							
2	325 (88.3)	240 (90.6)	763 (93.1)							
3	24 (6.5)	14 (5.3)	11 (1.3)							
Diabetes mellitus	62 (16.9)	45 (17.0)	72 (8.8)	<0.001	0.138	0.142	0.108	0.013	0.146	0.039
Hypertension	150 (40.8)	125 (47.2)	169 (20.6)	<0.001	0.222	0.361	0.216	0.039	0.064	0.004
Ischemic heart disease	53 (14.4)	39 (14.7)	25 (3.1)	<0.001	0.233	0.245	0.184	0.007	0.096	0.008
Cerebrovascular disease/accident	36 (9.8)	16 (6.0)	30 (3.7)	<0.001	0.179	0.017	0.086	0.024	0.032	0.020
Pulmonary disease	20 (5.4)	15 (5.7)	31 (3.8)	0.281	0.043	0.054	0.037	0.017	0.000	0.006
Smoking history	16 (4.4)	10 (3.8)	30 (3.7)	0.081	0.080	0.149	0.015	0.020	0.088	0.037
Adrenal insufficiency	1 (0.27)	9 (3.4)	9 (1.1)	0.003	0.091	0.184	0.018	0.052	0.019	0.038
Medications										
CCBs	164 (44.6)	126 (47.6)	317 (38.7)	0.018	0.057	0.117	0.063	0.031	0.005	0.025
ACE inhibitors or ARBs	155 (42.1)	100 (37.7)	281 (34.3)	0.033	0.108	0.018	0.054	0.046	0.039	0.023
Beta blockers	78 (21.2)	63 (23.8)	112 (13.7)	0.001	0.100	0.168	0.099	0.017	0.004	0.030
Aspirin	94 (25.5)	76 (28.7)	173 (21.1)	0.025	0.046	0.119	0.059	0.048	0.031	0.027
Antiplatelet agents	43 (11.7)	19 (7.2)	45 (5.5)	0.001	0.165	0.007	0.072	0.014	0.070	0.009
Statins	140 (38.0)	81 (30.6)	186 (22.7)	<0.001	0.223	0.057	0.119	0.027	0.013	0.006
Antibiotics	0 (0)	1 (0.4)	5 (0.6)	0.457	0.064	0.006	0.031	0.064	0.002	0.002
NSAIDs	31 (8.4)	16 (6.0)	82 (10)	0.135	0.016	0.100	0.039	0.004	0.119	0.013
Selective COX-2 inhibitors	147 (40.0)	53 (20.0)	178 (21.7)	<0.001	0.318	0.137	0.098	0.089	0.085	0.104
Non-NSAID analgesics	142 (38.6)	66 (24.9)	92 (11.2)	<0.001	0.443	0.105	0.233	0.069	0.013	0.036

Corticosteroids	6 (1.6)	10 (3.8)	13 (1.6)	0.073	0.026	0.127	0.029	0.086	0.039	0.034
Laboratory										
Hemoglobin (g/dL)	12.7 ± 1.1	12.6 ± 1.1	12.7 ± 1.1	0.303	0.028	0.085	0.015	0.038	0.016	0.007
Platelets ($\times 10^3/\mu\text{L}$)	241.1 ± 59.1	254.7 ± 66.5	245.5 ± 61.0	0.022	0.080	0.140	0.009	0.005	0.011	0.035
WBC ($\times 10^3/\mu\text{L}$)	6.3 ± 1.6	6.6 ± 1.6	6.4 ± 1.7	0.225	0.052	0.086	0.004	0.009	0.014	0.002
CRP (mg/dL)	0.2 ± 0.5	0.3 ± 0.7	0.2 ± 0.3	0.109	0.002	0.112	0.035	0.010	0.015	0.007
AST (IU/L)	22.3 ± 8.1	22.1 ± 7.3	23.3 ± 10.2	0.069	0.058	0.076	0.051	0.006	0.034	0.001
ALT (IU/L)	19.6 ± 11.4	18.6 ± 9.9	20.3 ± 11.9	0.024	0.019	0.105	0.043	0.009	0.042	0.014
Serum albumin (g/dL)	3.9 ± 0.3	3.9 ± 0.3	3.9 ± 0.3	0.200	0.088	0.027	0.031	0.084	0.019	0.011
sCR (mg/dL)	0.7 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.052	0.053	0.114	0.061	0.024	0.004	0.074
GFR (mL/min/BSA)	68.7 ± 12.2	74.6 ± 14.3	72.3 ± 13.4	<0.001	0.233	0.211	0.036	0.033	0.038	0.025
Uric acid (mg/dL)	4.7 ± 1.3	4.9 ± 1.3	4.6 ± 1.2	0.001	0.051	0.181	0.081	0.034	0.014	0.069
Serum sodium (mmol/L)	141.3 ± 2.4	141.3 ± 2.5	141.0 ± 2.4	0.021	0.080	0.073	0.059	0.045	0.005	0.013
Abnormal preop. echocardiography	53 (14.4)	32 (12.1)	56 (6.8)	<0.001	0.159	0.080	0.097	0.015	0.051	0.004
Anesthesia				<0.001	0.440	0.172	0.142	0.045	0.025	0.089
General	266 (72.3)	246 (92.8)	753 (91.8)							
Spinal	102 (27.7)	19 (7.2)	67 (8.2)							

*The baseline data are presented as the number, with the percentage in parentheses, except for age, BMI, and laboratory values, which are presented as the mean and standard deviation. BMI = body mass index, ASA PS = American Society of Anesthesiologists physical status, CCBs = calcium channel blockers, ACE = angiotensin-converting enzyme, ARBs = angiotensin II receptor blockers, NSAIDs = nonsteroidal anti-inflammatory drugs, COX = cyclooxygenase, WBC = white blood cell, CRP = C-reactive protein, AST = aspartate aminotransferase, ALT = alanine aminotransferase, sCR = serum creatinine, GFR = glomerular filtration rate, and BSA = body surface area. The PSB was used to determine balance after propensity analysis. †All weighted PSB values using inverse probability of treatment weighting (IPTW) were <0.2.

TABLE E-2 Univariate Analysis of Factors Influencing the Development of Acute Kidney Injury (AKI)*

	Univariate		
	OR	95% CI	P Value
Preop. variables			
Age	1.065	1.033-1.098	<0.001
BMI	1.055	1.002-1.110	0.040
CCB use	1.543	1.070-2.226	0.020
ACE inhibitor/ARB use	1.569	1.087-2.226	0.016
Beta-blocker use	2.046	1.354-3.092	0.001
Antiplatelet agent use	1.976	1.122-3.479	0.018
Antibiotic use	5.335	0.967-29.417	0.055
Non-NSAID analgesic use	0.575	0.339-0.975	0.040
Corticosteroid use	0.709	0.490-1.024	0.067
Platelet count	0.996	0.992-0.999	0.007
Creatinine level	3.184	1.195-8.484	0.021
GFR	0.983	0.969-0.996	0.013
Uric acid level	1.220	1.059-1.406	0.006
Sodium level	0.936	0.870-1.007	0.077
Abnormal preop. echocardiography	1.881	1.126-3.141	0.016
Type of anesthesia			0.002
General	1		
Spinal	0.204	0.074-0.558	
Surgical strategy			<0.001
Staggered	1		
Staged	3.085	1.476-6.444	0.003
Simultaneous	4.101	2.167-7.763	<0.001
Intraop./postop. variables			
Lowest MBP	0.979	0.956-1.002	0.069
Anesthesia time	1.004	1.000-1.008	0.028
Operative time	1.005	1.000-1.009	0.039
Tourniquet time	1.010	1.004-1.015	<0.001
Intraop. transfusion	1.152	1.004-1.321	0.044
Periop. transfusion	1.295	1.191-1.408	<0.001
Postop. drainage	1.000	1.000-1.001	0.018
Postop. lowest albumin level	0.420	0.267-0.662	<0.001
Postop. GFR of <60 mL/min/BSA	172.218	41.539-714.006	<0.001
Postop. highest CRP level	1.093	1.063-1.124	<0.001
Postop. NSAID use	4.251	2.134-8.470	<0.001

*Among patients who underwent bilateral total knee arthroplasty, with AKI assessed on the basis of the Kidney Disease Improving Global Outcomes (KDIGO) criteria. OR = odds ratio, CI = confidence interval, BMI = body mass index, CCB = calcium channel blocker, ACE = angiotensin-converting enzyme, ARB = angiotensin II receptor blocker, NSAID = nonsteroidal anti-inflammatory drug, GFR = glomerular filtration rate, MBP = mean blood pressure, BSA = body surface area, and CRP = C-reactive protein.