Cementless Total Knee Arthroplasty is a Risk Factor for Early Aseptic Loosening in a Large National Database

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INTRODUCTION:

Despite excellent longevity demonstrated in institutional studies, outcomes after cementless total knee arthroplasty (TKA) on a population level remain unknown. The purpose of this study was to compare short-term outcomes between cemented and cementless TKA using a large national database.

METHODS:

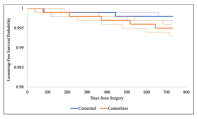
Using fixation-specific International Classification of Disease, 10th Revision (ICD-10) procedure codes, 294,485 patients undergoing primary TKA between 2015-2018 were identified within a large insurance database (Table 1). Patients with a diagnosis of osteoporosis or inflammatory arthritis were excluded. Cementless TKA patients were matched one-to-one with cemented TKA patients based on age, Elixhauser Comorbidity Index (ECI), gender, and year to yield matched cohorts of 10,580 patients. Outcomes at 90 days, 1 year, and 2 years postoperatively were compared between groups, and Kaplan-Meier analysis was used to evaluate implant survival rates.

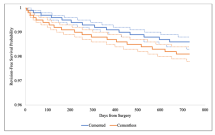
RESULTS:

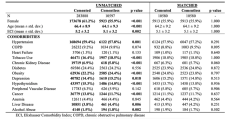
Cementless TKA was associated with a shorter average length of stay (2.94 ± 2.29 days vs. 3.05 ± 2.57 days, p=0.001) compared to cemented TKA, with no significant differences in 90-day adverse events (Table 2). At one year postoperatively, cementless TKA was associated with an increased rate of any reoperation (odds ratio [OR] 1.47, 95% confidence interval [CI] 1.12-1.92, p=0.005) compared to cemented TKA (Table 3). At two years postoperatively, there was an increased risk of revision for aseptic loosening (OR 2.34, CI 1.47-3.85, p<0.001) and any reoperation (OR 1.29, CI 1.04-1.59, p=0.019) after cementless TKA (Figures 1 and 2). Two-year revision rates for infection, fracture, and patella resurfacing were similar between cohorts.

DISCUSSION AND CONCLUSION:

In this large national database, cementless fixation is an independent risk factor for aseptic loosening requiring revision and any reoperation within two years after primary TKA. Although associated with a shorter length of stay, the small difference observed is unlikely to be clinically important. While long-term data is needed, surgeons should select implants carefully based on their individual design features and track record.







	UNMATCHED			MATCHED		
	Cemented	Cementless	p value	Cemented	Cementless	p value
N	147,242	147,242		10,580	10,580	
Female	174178 (61.1%)	9921 (59.9%)	<0.001	5913 (55.9%)	5913 (55.9%)	1.000
Age (mean ± std. dev.)	66.4 ± 9.9	64.1 ± 9.3	<0.001	64.2 ± 9.2	64.1 ± 9.2	1.000
ECI (mean ± std. dev.)	3.1 ± 3.3	3.1 ± 3.2	0.002	3.1 ± 3.2	3.1 ± 3.2	1.000
COMORBIDITIES						
Hypertension	169656 (59.4%)	6325 (57.0%)	0.001	6134 (57.9%)	6047 (57.2%)	0.291
CHF	10253 (3.5%)	1014 (5.8%)	0.874	922 (8.8%)	1003 (9.5%)	0.095
Heart Failure	7706 (1.3%)	220 (1.3%)	0.333	180 (1.8%)	177 (1.5%)	0.600
COPD	25719 (8.8%)	1538 (8.7%)	0.001	1387 (13.1%)	1387 (13.1%)	1.000
Chronic Kidney Disease	19735 (6.5%)	618 (5.8%)	<0.001	607 (6.3%)	601 (5.7%)	0.860
Diabetes	69500 (24.4%)	2563 (24.3%)	0.338	2525 (23.9%)	2526 (24.0%)	0.872
Obesity	65556 (23.2%)	2589 (24.4%)	<0.001	2340 (24.9%)	2322 (23.9%)	0.707
Depression	49782 (16.4%)	1618 (15.2%)	0.001	1696 (17.2%)	1577 (16.4%)	0.116
Liver Disease	8727 (2.9%)	1638 (15.4%)	<0.001	1691 (15.7%)	1577 (14.9%)	0.316
Peripheral Vascular Disease	17705 (5.7%)	686 (5.9%)	0.142	630 (6.0%)	605 (5.7%)	0.596
Cancer	36779 (13.0%)	1344 (13.7%)	<0.001	1314 (14.3%)	1277 (13.7%)	0.637
Anemia	30151 (10.6%)	1102 (11.2%)	0.001	1102 (12.0%)	1102 (11.8%)	1.000
Liver Disease	10011 (3.5%)	901 (9.4%)	0.006	812 (8.9%)	847 (9.2%)	0.253
Alcohol Abuse	4148 (1.5%)	394 (4.0%)	0.002	390 (4.3%)	384 (4.7%)	0.102

ECI, Elixhauser Comorbidity Index; COPD, chronic obstructive pulmonary disease

	Cemented	Cementless	p value	OR (95% CI)	Adjusted p value
Length of Stay	3.05 ± 2.57	2.94 ± 2.29	0.001	NA	NA
ADVERSE EVENTS					
Superficial Site Infection	163 (1.4%)	151 (1.5%)	0.321	1.08 (0.86 - 1.37)	0.476
Periprosthetic Joint Infection	221 (2.1%)	196 (1.9%)	0.278	0.88 (0.73 - 1.08)	0.220
VTE	203 (2.2%)	276 (2.6%)	0.068	0.94 (0.81 - 1.14)	0.658
Acute Kidney Injury	391 (3.7%)	374 (3.5%)	0.668	0.96 (0.83 - 1.11)	0.618
Cardiac Arrest	1 (0.01%)	4 (0.04%)	0.371	4.0 (0.35 - 78.5)	0.214
Wound Dehiscence	151 (1.3%)	135 (1.3%)	1.000	0.91 (0.78 - 1.24)	0.958
Hematoma	81 (0.8%)	48 (0.5%)	0.355	0.86 (0.58 - 1.24)	0.431
Pneumonia	91 (0.9%)	107 (1.0%)	0.284	1.18 (0.89 - 1.57)	0.241
Transfusion	1,111 (10.5%)	1,102 (10.4%)	0.844	0.99 (0.91 - 1.08)	0.844
Urinary Tract Infection	524 (5.1%)	557 (5.4%)	0.213	1.13 (0.95 - 1.29)	0.202
Reoperation	67 (0.6%)	74 (0.7%)	0.612	1.11 (0.79 - 1.52)	0.549
ED Visit	331 (3.3%)	339 (3.4%)	0.849	1.02 (0.87 - 1.18)	0.838
Readmission	434 (4.1%)	428 (4.1%)	0.917	1.00 (0.87 - 1.13)	1.000
Any Complication	1,008 (13.1%)	1,025 (13.4%)	0.419	1.03 (0.94 - 1.05)	0.760

OR, odds ratio, expressed as cementless relative to cemented; CI, confidence interval; VTE, venous thromboembolic event; ED, Emergency Department

	Cemented	Cementless	p value	OR (95% CI)	Adjusted p value
1-YEAR OUTCOMES					
Periprosthetic Joint Infection	33 (0.3%)	49 (0.5%)	0.057	1.49 (0.96 - 2.34)	0.077
Periprosthetic Fracture	34 (0.3%)	51 (0.5%)	0.418	1.50 (0.78 - 2.23)	0.339
Aseptic Loosening	26 (0.3%)	23 (0.2%)	1.000	0.96 (0.52 - 1.74)	0.903
Manipulation Under Anesthesia	60 (0.6%)	57(0.5%)	0.373	0.94 (0.78 - 1.41)	0.348
Any Revision*	93 (0.9%)	106 (1.0%)	0.267	1.14	0.267
Any Reoperation*	93 (0.9%)	133 (1.3%)	0.005	1.47 (1.12 - 1.92)	0.005
Excluding patella resurfacing*	92 (0.9%)	133 (1.3%)	0.007	1.46 (1.11 - 1.89)	0.007
2-YEAR OUTCOMES					
Periprosthetic Joint Infection	85 (0.8%)	89 (0.8%)	0.755	0.92 (0.67 - 1.23)	0.387
Periprosthetic Fracture	41 (0.4%)	51 (0.5%)	0.347	1.22 (0.81 - 1.90)	0.339
Aseptic Loosening	24 (0.2%)	56 (0.5%)	0.001	2.34 (1.47 - 3.85)	<0.001
Manipulation Under Anesthesia	64 (0.6%)	70 (0.7%)	0.500	1.09 (0.78 - 1.53)	0.615
Patella Resurfacing	78 (0.7%)	91 (0.9%)	0.400	1.16 (0.87 - 1.55)	0.306
Any Reoperation*	157 (1.5%)	202 (1.9%)	0.019	1.29 (1.04 - 1.59)	0.019
Excluding patella resurfacing*	157 (1.5%)	202 (1.9%)	0.025	1.28 (1.03 - 1.58)	0.034

* "Any reoperation" was defined as any patient with at least 1 reoperation
OR, odds ratio, expressed as cementless relative to cemented; TKA, CI, confidence interval; NA, not applicable, due to 0 patients in the control group