Differences in Postoperative Patient-Reported Outcome Measures in Cemented and Cementless Primary Total Knee Arthroplasty: A Propensity-Matched Study

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INTRODUCTION: Cementless fixation primary total knee arthroplasty (TKA) is increasing in prevalence, from less than 2% in 2012 to over 20% in 2023. While cemented fixation TKA has been the standard, cementless fixation has gained attention for its potential benefits, including biologic fixation and reduced operative time. Previous research has investigated differences in outcomes following cemented and cementless fixation with no consensus supporting one fixation method over the other. One previous Patient-Reported Outcome Measures (PROMs) study reported that the Knee Injury and Osteoarthritis Physical Function Shortform (KOOS-PS) demonstrated a greater 6-month improvement in cemented fixation. However, this improvement was less than the Minimum Clinically Important Difference (MCID). Previous studies have been limited by the number of included PROMs and lack of PROMs that evaluate both physical and mental health. Therefore, this study aims to compare PROMs that evaluate physical and mental health following cemented and cementless primary TKA using a propensity-matched analysis.

METHODS: A total of 11,210 consecutive patients who underwent primary TKA were evaluated using an institutional database following IRB approval. Our inclusion criteria were the completion of preoperative and postoperative PROMs. Nearest neighbor propensity-controlled matching was conducted in a 1:3 ratio, controlling for age, sex, body mass index, diabetes, chronic kidney disease, heart failure, osteoporosis, alcohol use, smoking status, and American Society of Anesthesiologists score. Patient-Reported Outcomes Measurement Information System Physical Function Short Form 10-a (SF10-a), PROMIS Global-Mental, PROMIS Global-Physical, and KOOS-PS were the PROMs of interest. Absolute preoperative and postoperative scores, delta scores, and distribution-based MCID were assessed and compared for each PROM type. Ninety-day medical and one- and two-year surgical complications were recorded.

RESULTS SECTION: The propensity-match yielded 162 cementless and 486 cemented primary TKA patients with no differences in demographics ($p>0.05$). No differences were observed in 90-day postoperative medical complication rates between cementless and cemented TKA patients ($p>0.05$). One- and two-year surgical complication rates were also similar regardless of cement use ($p>0.05$). No significant differences were observed in absolute preoperative or postoperative scores in any PROMs ($p>0.05$). The PROMIS Physical was significantly greater in the cementless group (6.49) than in the cemented group (5.41; $p = 0.048$). The delta scores in other PROMs were similar between cohorts ($p>0.05$). Greater proportions of improvement were seen in the cementless group in both the SF10-a (74% vs 62%; $p = 0.0082$) and PROMIS Physical (73% vs 63%; $p = 0.0325$). Cemented patients were more likely to achieve no change in the SF10-a postoperatively (12% vs 26%; $p = 0.0003$). The proportions of improvement and no change were equal in other PROMs.

DISCUSSION: Cementless fixation primary TKA is increasingly utilized due to benefits involving biologic fixation when compared to cemented fixation. No differences were observed in complication rates at multiple timepoints, aligning with existing studies. While absolute PROMs scores were comparable, greater rates of increase were seen in the SF10-a and PROMIS Physical in the cementless cohort, indicating potentially greater general physical health recovery among these patients. However, similar PROMs in the PROMIS Mental and KOOS-PS indicate that no significant differences in mental or knee-specific health statuses were seen regardless of cement use. Patients should be counseled on their expectations prior to undergoing cementless or cemented primary TKA.

SIGNIFICANCE/CLINICAL RELEVANCE: Although patients with cementless fixation may see a greater improvement in general physical status Patient-Reported Outcome Measures than cemented patients postoperatively, there was no significant differences in mental or knee-specific health status outcomes.

Patient-Reported Outcome Measure	**Cementless**	**Cemented**	**P-Value**
SF10-a	N = 155	N = 453	
Postoperative Score	42.89 ± 7.47	43.04 ± 7.76	0.9848
Delta Score	6.17 ± 6.14	6.19 ± 6.96	0.4062
Improved	115 (74%)	281 (62%)	0.0082
No Change	18 (12%)	118 (26%)	0.0003
PROMIS Mental	N = 157	N = 471	
Postoperative Score	51.75 ± 8.03	51.59 ± 8.86	0.8931
Delta Score	1.56 ± 6.44	1.19 ± 6.73	0.5321
Improved	74 (47%)	218 (46%)	0.9264
No Change	33 (21%)	113 (24%)	0.5128
PROMIS Physical	N = 157	N =471	
Postoperative Score	47.44 ± 7.47	46.72 ± 8.42	0.2918
Delta Score	6..49 ± 6.38	5.41 ± 7.08	0.048
Improved	115 (73%)	299 (63%)	0.0325
No Change	28 (18%)	106 (23%)	0.2607
KOOS-PS	N = 119	N = 375	
Postoperative Score	70.57 ± 14.46	69.84 ± 14.32	0.8814
Delta Score	15.02 ± 14.80	14.70 ± 15.71	0.6059
Improved	87 (73%)	251 (67%)	0.2503
No Change	24 (20%)	86 (23%)	0.6134

Table 1. Patient-Reported Outcome Measures for patients who underwent cementless and cemented primary total knee arthroplasty following propensity-matching.