

## No Association Between Tourniquet Use and Patient-Reported Outcomes Following Total Knee Arthroplasty in Obese Patients: A Propensity Matched Analysis

Isaiah Freeman, BSc<sup>1</sup>; Margaret Arthur<sup>1</sup>; Zhijun Li, PhD<sup>1</sup>; Hahn Kang, BSc<sup>1</sup>; Sina Afzal, MD<sup>1</sup>; Carlo Mannina, BSc<sup>1</sup>; William Sampson, BA<sup>1</sup>; Pengwei Xiao, PhD<sup>1</sup>; Oh-Jak Kwon<sup>1</sup>; Oh-Joon Kwon<sup>1</sup>; Michelle Shimizu, MD<sup>1</sup>; Muhammad Hamza Ilyas, MD<sup>1</sup>; Young-Min Kwon, MD, PhD<sup>1</sup>  
<sup>1</sup>Bioengineering Laboratory, Massachusetts General Hospital/Harvard Medical School, Boston, MA  
 ymkwon@mgh.harvard.edu

**Disclosures:** Isaiah Freeman (N), Margaret Arthur (N), Zhijun Li (N), Hahn Kang (N), Sina Afzal (N), Carlo Mannina (N), William Sampson (N), Pengwei Xiao (N), Oh-Jak Kwon (N), Oh-Joon Kwon (N), Michelle Shimizu (N), Muhammad Hamza Ilyas (N), Young-Min Kwon (5- MicroPort; 5- Depuy; 5-Smith & Nephew; 5- Stryker; 5- Zimmer Biomet; 5- Medacta)

**INTRODUCTION:** Studies have demonstrated that up to 90% of surgeons worldwide report using tourniquets for patients undergoing primary total knee arthroplasty (TKA). However, there is ongoing debate about whether the theoretical benefits of tourniquet use outweigh its potential disadvantages. While applying a tourniquet improves visualization and cement fixation, previous literature has linked its use to increased pain, muscle injury, and reduced range of motion after TKA. It is estimated that approximately 69% of primary TKA in the United States will be performed in patients with obesity by 2029. The impact of tourniquet use on patient outcomes and satisfaction among patients with obesity is of particular interest given the increasing prevalence of the disease and its association with a higher risk for postoperative complications. Therefore, this study investigated the potential association between tourniquet use in obese patients undergoing primary TKA and patient reported outcomes (PROMs) using a propensity score matching analysis.

**METHODS:** A total of 11,210 patients who underwent primary TKA were identified from an institutional database following IRB approval. Patients were included if they had a body mass index (BMI) > 30 kg/m<sup>2</sup> and completed preoperative and postoperative PROMs. The PROMs evaluated for this study were the Physical Function Short Form Survey (SF-10a), Patient-Reported Measurement Information Systems (PROMIS) Global Physical and Mental Survey, and the Knee Disability and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS). Patients were grouped based on whether a tourniquet was used for their surgery. A 1:3 nearest neighbor propensity score match was performed based on age, gender, BMI, diabetes status, Charlson Comorbidity Index (CCI), and ASA score. For each cohort, mean preoperative, postoperative, and delta scores were calculated for each PROM. Minimal clinically important differences for improvement (MCID-I) and worsening (MCID-W) were defined as one-half the standard deviation of the delta scores. Patients who reached either MCID-W or MCID-I were recorded in each cohort. Postoperative complication rates were recorded at 90 days, one year, and two years.

**RESULTS SECTION:** After propensity-matching, 86 non-tourniquet and 258 tourniquet patients remained for analysis, with no differences in demographics (p>0.05). There were no differences in 90-day, one-year, or two-year complication rates between tourniquet users and non-users (p>0.05). Tourniquet TKA was associated with lower preoperative PROMIS Physical scores than TKA without tourniquet (39.97 vs 41.58, p = 0.0122). The preoperative scores for other PROMs demonstrated no significant difference between groups (p>0.05). Delta scores were similar between groups in the SF-10a (p = 0.2785), PROMIS Mental (p = 0.2534), PROMIS Physical (p = 0.8137), and KOOS-PS (p = 0.8973). Proportions of clinically significant improvement, no change, and worsening were similar between tourniquet users and non-users across all PROMs (p>0.05).

**DISCUSSION:** This is one of the first studies to evaluate the association between tourniquet use during primary TKA and the achievement of MCID in PROMs in obese patients. While lower baseline PROM scores were noted in the tourniquet group in the PROMIS Physical, both cohorts exhibited similar postoperative and delta scores. Our findings also demonstrated no differences in the proportion of patients achieving MCID-I in PROMs between the tourniquet and non- tourniquet groups. These results suggest that tourniquet use in TKA among patients with obesity may have no impact on PROMs.

**SIGNIFICANCE/CLINICAL RELEVANCE:** There is no significant difference in patient-perceived outcomes in obese patients undergoing primary total knee arthroplasty with and without tourniquet.

Variable	Tourniquet (N = 258)	No Tourniquet (N = 86)	P-value
Age (years)	67.4 ± 8.3	67.3 ± 7.8	0.95
Body mass index (kg/m <sup>2</sup> )	34.3 ± 3.8	34.3 ± 3.5	0.743
Female	151 (58.5%)	46 (53.5%)	0.173
Diabetes	20 (7.8%)	5 (5.8%)	0.719
CCI distribution			0.497
ASA score distribution			0.769

**Table 1.** Post propensity-matched demographics between tourniquet and no tourniquet total knee arthroplasty cohorts.

Patient-Reported Outcome Measure	Tourniquet	No Tourniquet	P-value
<b>SF-10a</b>	N = 235	N = 80	
Preoperative score	36.21 ± 4.75	37.12 ± 4.31	0.1536
Postoperative score	42.35 ± 7.38	43.39 ± 6.40	0.2833
Delta score	6.14 ± 7.09	6.27 ± 5.81	0.8091
Improved	156 (66%)	59 (74%)	0.2785
<b>PROMIS Mental</b>	N = 237	N = 85	
Preoperative score	49.67 ± 8.73	51.35 ± 8.11	0.1284
Postoperative score	51.90 ± 8.97	52.65 ± 8.19	0.4265
Delta score	2.23 ± 7.61	1.30 ± 5.44	0.2534
Improved	108 (46%)	38 (45%)	0.991
<b>PROMIS Physical</b>	N = 237	N = 85	
Preoperative score	39.97 ± 6.30	41.58 ± 6.59	0.0122
Postoperative score	46.35 ± 8.32	47.72 ± 7.82	0.1257
Delta score	6.38 ± 7.95	6.14 ± 5.77	0.8137
Improved	149 (63%)	62 (73%)	0.1228
<b>KOOS-PS</b>	N = 206	N = 27	
Preoperative score	54.64 ± 13.79	56.77 ± 9.50	0.4662
Postoperative score	69.58 ± 14.84	70.26 ± 14.12	0.9431
Delta score	14.94 ± 17.49	13.49 ± 12.62	0.8973
Improved	127 (62%)	18 (67%)	0.7684

**Table 2.** Patient-Reported Outcome Measure scores for tourniquet and no-tourniquet total knee arthroplasty in obese patients.