Robotic-Assisted Total Knee Arthroplasty is Associated With Shorter Surgical Time and Length of Stay and Decreased Risk for Revision

Nicolas Aycardi, BS, Akeem Williams, MS, Linda Park, BS, Logan E. Finger, MD, Kenneth Urish, MD, PhD, Michael O'Malley, MD, Brian Klatt, MD and Johannes F. Plate, MD, PhD

UPMC LIFE CHANGING MEDICINE

Department of Orthopaedic Surgery

University of Pittsburgh

Disclosures

My Co-Authors and I have no relevant disclosures

Purpose and Hypothesis

- While robotic total knee arthroplasty is regarded for its precision and potential to improve surgical outcomes, longer surgical times had been reported with greater associated costs.

- The purpose of this study was to examine the utilization and impact of robotic-assisted surgery (RAS) versus manual TKA on surgical outcomes and PROMs to provide a clearer understanding of RAS effectiveness.

Methods

- Retrospective study at a large regional health system from the joint replacement database to identify patients who underwent primary RAS and manual TKA between 2017 and 2024.
- Statistical analysis: Chi-square, student's t-test, and multiple regression analysis with statistical significance defined as $p<0.05$.

Demographics	Robotic TKA	Manual TKA	P Value	Sample Size (Robotic : Manual)
Age (years)	67.96 ± 8.85	67.91 ± 8.89	0.83	n = 16,113 (1,642 : 14,471)
Implant Type (% Triathlon)	99.09	30.25	<0.05	n = 16,113 (1,642 : 14,471)
Gender (Percent female)	56.58	62.01	<0.05	n = 16,113 (1,642 : 14,471)
BMI (Kg/m^2)	34.5 ± 6.65	35.75 ± 7.33	<0.05	n = 16,113 (1,642 : 14,471)
ELIXHAUSER	1.75 ± 1.39	2.37 ± 1.64	<0.05	n = 16,113 (1,642 : 14,471)

Results

- The RAS TKA group demonstrated lower EBL, shorter surgical time, and length of stay.
- Overall, all-cause revision rate was also lower following RAS TKA.
- While there were statistical differences in KOOS and PROMIS10 scores between RAS and manual TKA, these did not meet the minimal clinically important difference (MCID).

TABLE 2	ROBOTIC	MANUAL	P Value	Sample Size (Robotic : Manual)
Est Blood Loss (mL)	31.68 ± 39.43	49.36 ± 73.5	<0.05	n = 16,113 (1,642 : 14,471)
Duration of Surgery (min.)	75.79 ± 19.94	84.47 ± 24.65	<0.05	n = 16,113 (1,642 : 14,471)
Revision Rate per 1000	8.53	21.77	<0.05	n = 16,113 (1,642 : 14,471)
LOS (Days, 2020 onwards)	0.90 ± 1.13	2.02 ± 4.81	<0.05	n= 7,991 (1,641 : 6,350)

Conclusion

- When controlling for gender, BMI and Elixhauser Comorbidity Index score, RAS TKA had shorter surgical time, shorter length of stay and decreased risk of all-cause revision compared to manual TKA while maintaining similar PROMs.
- While previous studies reported longer surgical times due to RAS setup and registration, the current study revealed a mean of 10-minute shorter surgical duration.
- RAS may be a better alternative to manual TKA.

References

- Saber AY, Marappa-Ganeshan R, Mabrouk A. Robotic-Assisted Total Knee Arthroplasty. [Updated 2023 Aug 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK564396/

- Joo PY, Chen AF, Richards J, Law TY, Taylor K, Marchand K, Clark G, Collopy D, Marchand RC, Roche M, Mont MA, Malkani AL. Clinical results and patient-reported outcomes following robotic-assisted primary total knee arthroplasty : a multicentre study. Bone Jt Open. 2022 Aug;3(8):589-595. doi: 10.1302/2633-1462.37.BJO-2022-0076.R1. PMID: 35848995; PMCID: PMC9350694.

- Jeffrey M, Marchand P, Kouyoumdjian P, Coulomb R. Short-term functional outcomes of robotic-assisted TKA are better with functional alignment compared to adjusted mechanical alignment. SICOT J. 2024;10:2. doi: 10.1051/sicotj/2024002. Epub 2024 Jan 18. PMID: 38240728; PMCID: PMC10798231.