



# Unicompartmental knee arthroplasty over total knee arthroplasty: a more cost-effective strategy for treating medial compartment arthritis

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Worldwide, the demand for total knee arthroplasty (TKA) is projected to increase largely due to an aging population, an increase in the prevalence of osteoarthritis (OA), and the overwhelming success of arthroplasty (1,2). In the United States, the prevalence of TKA was 0.80% in 2000 and nearly doubled to 1.52% a decade later, corresponding to 4,700,621 people living with TKAs in 2010 (2). Furthermore, with the remarkable success of TKAs and the increasing incidence of OA in younger patients, the number of young patients that may require surgical management for their arthritis is increasing, further contributing to the overall projected increase in arthroplasty volumes (3-6).

TKA is the gold standard treatment for patients with end-stage knee OA who have failed nonoperative management. Unicompartmental knee arthroplasty (UKA) is an attractive alternative surgical option for patients who have end-stage knee OA limited to one knee compartment, most commonly the medial side. Previous studies have demonstrated conclusively certain benefits of UKA over TKA, including decreased length of hospital stay, quicker recovery related to less invasive surgery, and superior knee range of motion and kinematics with patient satisfaction equal to or higher than that of TKA patients (7-10). Despite the benefits of UKA over TKA, the utilization of UKA has remained low when compared to TKA. The key challenges to overcome are patient selection, the need for a more precise surgical intervention (less commonly done than TKA for most surgeons), and

historically increased cumulative revision and reoperation rates when compared to TKA in all comers (7,11,12). The benefits of UKA however cannot be ignored, and for some surgeons, it is the treatment of choice for patients with medial compartment arthritis independent of age. We have previously reported no differences in clinical outcomes or survivorship between UKA and TKA in patients older than 75 who were candidates for either UKA or TKA (13). With improved UKA designs, navigation and robotics improving surgical accuracy, and an increased pressure to deliver cost-effective health care, we should continue to see an increase in the utilization of UKA. Beard *et al.*'s randomized trial unequivocally supports the use of UKA over TKA in select patients who are candidates for either surgery.

Beard *et al.* (14) studied 528 patients at 27 sites across the UK and randomized them to either UKA or TKA performed by 68 surgeons. Five-year analyses were available for 233 patients randomized to the UKA group and 231 patients randomized to the TKA group. The authors demonstrated that, at 5-year follow-up, there was no difference in Oxford Knee Scores between the two groups. The satisfaction rate was higher for UKA patients, noted by the number of UKA patients that would go through surgery again. In addition, UKA was associated with decreased complication rates, reduced length of stay, and equal reoperation and revision rates when compared to TKA. Most importantly, this study showed that UKA was less expensive and more effective than TKA during the 5 years

of follow-up.

Previous studies have illustrated that many patients eligible for a primary TKA could also be a candidate for UKA (as high as 40%), but the utilization of UKA remains relatively low (15,16). This presents a significant opportunity for cost savings for both patients and health care systems. Many previous studies have reported the benefits of UKA over TKA, but very few in such a robust way as Beard *et al.*'s randomized trial (7-13). Previous studies have described the cost-effectiveness of UKA compared to TKA and have demonstrated that, as long as complication and revision rates approximate those of TKA, UKA is superior (17,18). Beard's trial, including multiple centers in the UKA and multiple surgeons, makes these results generalizable to the arthroplasty surgeon with experience in both techniques. Therefore, if the correct patient can be identified, UKA presents a significant opportunity in the delivery of cost-effective health care.

While the study performed by Beard *et al.* provides important data in the form of a Level 1 randomized controlled trial, it will be important to see if the results of this study stand the test of time (14). While early failures may contribute to early health care expenditure, the goal of surgery is for the implants to be durable and provide patients with long-term functional and quality of life improvements. Unfortunately, previous papers have shown relatively high rates of non-implant reoperations for UKA patients at 10 and 15 years (11,12,15). Further follow-up of this cohort will provide invaluable data as to the superiority of one surgery over the other.

So, who should get a UKA versus a TKA? This 5-year data supports UKA in patients with isolated medial compartment arthritis. Although this debate is not settled in the young patient, this data, as well as ours, seems to support UKA in the older patient, where the competing risk of death is evident and delivering the most cost-effective treatment is paramount. Needless to say, the data presented in this study contributes to the increasingly popular belief that the utilization of UKA should be increased.

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*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/atm.2020.01.24>).

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## References

1. Inacio MCS, Graves SE, Pratt NL, et al. Increase in Total Joint Arthroplasty Projected from 2014 to 2046 in Australia: A Conservative Local Model With International Implications. *Clin Orthop Relat Res* 2017;475:2130-7.
2. Maradit Kremers H, Larson DR, Crowson CS, et al. Prevalence of Total Hip and Knee Replacement in the United States. *J Bone Joint Surg Am* 2015;97:1386-97.
3. Nguyen US, Zhang Y, Zhu Y, et al. Increasing prevalence of knee pain and symptomatic knee osteoarthritis: survey and cohort data. *Ann Intern Med* 2011;155:725-32.
4. Pennington DW, Swienckowski JJ, Lutes WB, et al. Unicompartmental knee arthroplasty in patients sixty years of age or younger. *J Bone Joint Surg Am* 2003;85:1968-73.
5. Parratte S, Argenson JN, Pearce O, et al. Medial unicompartmental knee replacement in the under-50s. *J Bone Joint Surg Br* 2009;91:351-6.
6. Goh GS, Liow MHL, Bin Abd Razak HR, et al. Patient-Reported Outcomes, Quality of Life, and Satisfaction Rates in Young Patients Aged 50 Years or Younger After Total Knee Arthroplasty. *J Arthroplasty* 2017;32:419-25.
7. Lyons MC, MacDonald SJ, Somerville LE, et al. Unicompartmental versus total knee arthroplasty database analysis: is there a winner? *Clin Orthop Relat Res* 2012;470:84-90.
8. Akizuki S, Mueller JK, Horiuchi H, et al. In vivo

- determination of kinematics for subjects having a Zimmer Unicompartamental High Flex Knee System. *J Arthroplasty* 2009;24:963-71.
9. Hopper GP, Leach WJ. Participation in sporting activities following knee replacement: total versus unicompartamental. *Knee Surg Sports Traumatol Arthrosc* 2008;16:973-9.
  10. Price AJ, Webb J, Topf H, et al. Rapid recovery after oxford unicompartamental arthroplasty through a short incision. *J Arthroplasty* 2001;16:970-6.
  11. Newman J, Pydisetty RV, Ackroyd C. Unicompartamental or total knee replacement: the 15-year results of a prospective randomised controlled trial. *J Bone Joint Surg Br* 2009;91:52-7.
  12. Niinimäki T, Eskelinen A, Mäkelä K, et al. Unicompartamental knee arthroplasty survivorship is lower than TKA survivorship: a 27-year Finnish registry study. *Clin Orthop Relat Res* 2014;472:1496-501.
  13. Siman H, Kamath AF, Carrillo N, et al. Unicompartamental Knee Arthroplasty vs Total Knee Arthroplasty for Medial Compartment Arthritis in Patients Older Than 75 Years: Comparable Reoperation, Revision, and Complication Rates. *J Arthroplasty* 2017;32:1792-7.
  14. Beard DJ, Davies LJ, Cook JA, et al. The clinical and cost-effectiveness of total versus partial knee replacement in patients with medial compartment osteoarthritis (TOPKAT): 5-year outcomes of a randomised controlled trial. *Lancet* 2019;394:746-56.
  15. Wilson HA, Middleton R, Abram SGE, et al. Patient relevant outcomes of unicompartamental versus total knee replacement: systematic review and meta-analysis. *BMJ* 2019;364:l352.
  16. Liddle AD, Judge A, Pandit H, et al. Adverse outcomes after total and unicompartamental knee replacement in 101,330 matched patients: a study of data from the National Joint Registry for England and Wales. *Lancet* 2014;384:1437-45.
  17. Soohoo NF, Sharifi H, Kominski G, et al. Cost-effectiveness analysis of unicompartamental knee arthroplasty as an alternative to total knee arthroplasty for unicompartamental osteoarthritis. *J Bone Joint Surg Am* 2006;88:1975-82.
  18. Slover J, Espehaug B, Havelin LI, et al. Cost-effectiveness of unicompartamental and total knee arthroplasty in elderly low-demand patients. A Markov decision analysis. *J Bone Joint Surg Am* 2006;88:2348-55.

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