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Original article

Which do patients prefer, unicompartmental or total knee arthroplasty?

Nicholas Danford, Matthew Grosso, Matthew S. Heller, Taylor Murtaugh, Roshan P. Shah, H. John Cooper, Akshay Lakra, Jeffrey A. Geller*

Columbia University Medical Center, College of Physicians and Surgeons, Department of Orthopaedic Surgery, Division of Hip and Knee Reconstruction, 622 West 168th Street, Suite PH11-1155, New York, NY 10032, United States

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ABSTRACT

Objective: Unicompartmental knee arthroplasty (UKA) is a viable option for relieving pain and improving function in patients with isolated compartment knee osteoarthritis (OA). Certain surgeons prefer total knee arthroplasty (TKA) over UKA even when patients are candidates for UKA. Therefore, the decision to perform a UKA or a TKA when both are indicated is not straightforward. The goal of this study was to compare pre-operative and post-operative patient-reported outcome (PRO) scores for patients who underwent both a UKA and a contralateral TKA.

Methods: In this study, 17 patients were identified who underwent UKA in one knee and TKA in the contralateral knee either simultaneously or at different time points between 2003 and 2014. All procedures were performed by one of two fellowship trained surgeons at a large academic medical center. Patients were evaluated pre-operatively and then post-operatively using the validated PRO measurements Short Form 12 (SF12), Knee Society Functional Score (KSS), and the Western Ontario and McMaster University Osteoarthritis Index (WOMAC) questionnaires. Student's paired *t*-tests were conducted to compare PRO scores for UKA and TKA pre-operatively and post-operatively.

Results: Post-operatively, mean follow-up was 2.5 years (range, 3 months to 9 years). There was no significant difference in PRO scores between pre-operative values for UKA and TKA, and no significant difference between post-operative values for UKA and TKA (e.g. SF12 pre-operative difference between UKA and TKA mean = 1.6, p = 0.57; SF12 post-operative difference between UKA and TKA mean = 1.9, p = 0.51).

Conclusion: UKA and TKA are comparable in terms of PROs at mid-term follow-up. When choosing between UKA and TKA, the surgeon should expect similar PROs for each, and can therefore take into account other considerations when making a selection.

1. Introduction

Unicompartmental knee arthroplasty (UKA) is a viable option for relieving pain and improving function in patients with knee osteoarthritis (OA). Indications for UKA are unicompartmental disease, intact posterior and anterior cruciate ligaments, absent or slight (<10°) flexion deformity, and absent or slight (<5°) varus deformity.[1–3] This is a significant proportion of the patient population, especially considering that 30% of OA patients have pathology limited to the medial compartment.[4] The procedure is performed with increasing regularity. For example, obese patients who are not morbidly obese, once thought to be poor UKA candidates, now regularly undergo the procedure.[5]

For patients in which surgery is indicated, UKA offers the benefits of preserving either the lateral or medial compartment and the patellofemoral compartment, which in turn preserves attendant physiologic biomechanics. In terms of perioperative morbidity, patients with UKA have less blood loss, shorter hospital stay, and quicker rehabilitation relative to patients with TKA.[6] Other benefits include a higher likelihood of returning to sports and sports-related activities compared to TKA patients.[7] Moreover, a UKA that is revised to a TKA carries a lower morbidity than a TKA that needs revision. This is an important consideration, as 8 to 10% of TKAs fail at 10 years.[8,9] Finally, UKA is more cost-effective than TKA.[6,10] Still, certain surgeons prefer TKA over UKA even when patients are candidates for UKA. The proponents of TKA argue that

* Corresponding author at: Department of Orthopaedic Surgery, Columbia University Medical Center, 622 West 168th Street, PH11-1147, New York, NY 10032, United States.
E-mail address: jg2520@cumc.columbia.edu (J.A. Geller).

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it is a more reliable procedure in the long term, with superior five-year survivorship[11] and superior ten year survivorship compared to UKA.[12]

Patient reported outcomes (PROs) may also help in choosing between UKA or TKA when both procedures are indicated. The current study compares patient-reported outcomes (PROs) for TKA and PROs for UKA in patients who underwent a UKA in one knee and a TKA in the contralateral knee with the goal of discovering if patients prefer UKA to TKA or vice versa.

2. Methods

Seventeen patients were identified who underwent UKA or TKA either simultaneously or at different time points between 2003 and 2014 by two fellowship trained surgeons at a large academic medical center. Patients were evaluated pre-operatively and then post-operatively at 3 months, 1 year, 2 years, and yearly thereafter using Short Form (SF12), Knee Society Functional Score (KSS), and the Western Ontario and McMaster University Osteoarthritis Index (WOMAC) questionnaires. The patients were given the questionnaires after the follow-up appointment for each knee. For example, a patient received a questionnaire at three-month follow up, one-year follow up, and yearly thereafter. The patients were asked to fill out the forms with respect to their overall functional status at a given time point, not with regard to which a specific knee. The goal of the questionnaires was therefore to assess overall quality of life. The SF-12, KSFS, and WOMAC are externally validated patient reported outcome (PRO) assessment forms.[13–15]

Patients enrolled in this study met criteria for UKA, which included presentation of knee pain affecting activities of daily living caused by arthrosis, with pain localized to the compartment being treated. Contraindications to UKA were a significant fixed deformity, previous meniscectomy in the compartment opposite to the one being treated, ACL deficiency, flexion contracture greater than 10°, a history of inflammatory arthritis, and any evidence of tricompartmental arthritis. Indications for TKA included knee pain secondary to osteoarthritis affecting activities of daily living caused by arthrosis.

Tourniquets were sequentially inflated before operating on the affected knee and deflated after component placement, before closure. All TKAs were performed through a medial midvastus approach. Approach to UKA depended on which compartment, medial or lateral, was being replaced. Data were recorded from patients charts and from the outcomes surveys into Excel (Microsoft, Seattle, WA) files. S

3. Statistical analysis

Based on previous literature, power analysis revealed that a sample size of 17 patients, had a power of 0.83 to detect the minimally clinically significant difference in SF-12 scores of 5 points (Clement, MacDonald, Knee Surgery, Sports Traumatology, Arthroscopy 2014). Statistical analysis was performed with RStudio (RStudio, Inc., Boston, MA). Paired *t*-tests were used to determine significance of pre- and post-operative SF12 Physical Function, WOMAC Pain, and KSS. As a primary outcome, we report the mean of the differences between UKA and TKA from pre-operative scores to scores at specified post-operative time points. A p value of 0.05 was used as the threshold for significance.

4. Results

Mean follow-up was 2.5 years (range, 3 months to 9 years). Of the 17 patients, the average age at the time of UKA was 70.0 years (range, 55–83 years) and the average age at the time of TKA was 69.0 years (range, 53–84). There were 11 women and six men. The average BMI at the time of UKA was 31.0 kg/m^2 (range, 22.7–39.1 kg/m^2) while at the time of TKA it was 30.9 kg/m^2 (range, 23.9–45.8). Of the UKA knees, 14 of 17 had a medial compartment replacement. One of the UKA knees had prior surgery, a partial meniscectomy. Two of the patients underwent previous knee surgeries in the knee that received a TKA. One of the patients had a partial meniscectomy and the other a diagnostic arthroscopy. There was one revision from UKA to TKA that took place 4.5 months after the UKA.

There was no difference in pre-operative patient PRO scores between the UKA and TKA groups (Table 1). Both UKA and TKA groups showed a significant improvement from pre-operative PRO scores to post-operative scores (Tables 2 and 3). There was no significant difference when comparing mean differences between UKA pre-operative PRO scores and post-operative PRO scores and TKA pre-operative PRO scores and post-operative PRO scores (Table 4).

5. Discussion

In this paired cohort study for which each patient was their own matched control, we report no significant differences in patient reported outcomes between the UKA group and the TKA groups at an average of 2.5 years follow up.

Three other studies have been performed on patients who underwent both UKA and TKA in different knees. First, Costa et al. (2011) performed a prospective randomized study of 34 patients who had UKA and TKA done at the same time, reporting no difference in KSS pain or function scores at mean follow-up of 5 years.[17] Costa et al. found a significant difference in survivorship between groups, with 29 out of 34 (85%) of UKAs failing and no TKAs failing (100%; $p = 0.05$). Second, Dalury et al. (2009) retrospectively evaluated 23 patients who underwent UKA in one knee and TKA in the contralateral knee.[18] At mean 3.5 years of follow-up (range, 1–5 years) they found no difference in KSS total score, pain score, or function score. Third, Laurencin et al. (1991) compared UKA to TKA in 23 patients who had both procedures performed in different knees with a mean follow-up of 6.8 years.[19] This study was limited because it lacked validated assessment of patient outcomes, instead inquiring whether patients experienced pain, no pain, or little pain in each knee and which knee they preferred.

Table 1
Mean pre-operative patient reported outcome scores.

	UKA mean	UKA range	TKA mean	TKA range	Difference in means: P value
SF12 Physical	30.6	15.3–54.4	33.6	20.0–54.8	0.40
WOMAC Pain	46.4	10.0–90.0	42.7	0–100	0.27
KSS	50.9	10.0–80.0	51.2	15.0–85.5	0.38

Table 2
UKA, mean difference between pre-operative and post-operative patient reported outcome scores.

	Mean difference	P value	95% CI: mix	95% CI: max
SF12 Physical	−9.3	<0.001	−13.8	−4.8
WOMAC Pain	−37.9	<0.001	−51.3	−24.5
KSS	−18.3	0.018	−33.1	−11.9

Table 3
TKA, mean difference between pre-operative and post-operative patient reported outcome scores.

	Mean difference	P value	95% CI: mix	95% CI: max
SF12 Physical	−9.6	0.004	−13.8	−4.8
WOMAC Pain	−48.0	<0.001	−60.4	−35.6
KSS	−22.5	<0.001	−32.8	−3.8

Table 4
Mean difference between UKA pre-operative PRO scores and post-operative PRO scores and TKA pre-operative PRO scores and post-operative PRO scores.

	Mean difference	P value	95% CI: mix	95% CI: max
SF12 Physical	−0.32	0.91	−6.18	5.54
WOMAC Pain	−4.74	0.37	−15.6	6.09
KSS	−4.08	0.63	−22.2	14.0

Our findings are consistent with the findings of these previous studies. When choosing between UKA and TKA, functional and pain outcomes are similar for both. One advantage of a TKA over UKA may be improved survivorship, as reported not only by Costa et al. but by other groups as well.[11,12]

The strength of this study lies in our comparison of the same patient's functional outcomes after a UKA in one knee relative to a TKA in the other, thereby mitigating confounding variables such as age and BMI. In addition, this study used validated subjective measurements of the patients' health and well-being.

A limitation of this study includes its retrospective design, which may introduce selection bias (e.g., a patient with mild OA of one compartment could be selected for UKA while a patient with more severe disease is selected for TKA). The retrospective design also prevents randomization. This was partially mitigated by comparing results for patients who underwent UKA in one knee and TKA in another. Another limitation of the study is that patients answered questionnaires about overall quality of life, and not about a specific knee. Therefore, it is possible that a patient may experience functional limitation from a single knee, with the other not causing any limitation. As a result, this difference would not be reflected in questionnaire responses because the patient's pain in the knee that causes limitation would outweigh the contralateral side when considering overall quality of life. Finally, a limitation of this study is that patients underwent TKA and UKA at different time points. Two of the patients had the UKA and TKA performed on the same day, while others had the surgeries years apart. This means that a patient who underwent the procedures on the same day may report similar scores at each time point, while a patient who had the procedures done years apart may report a wider range of scores.

Conflict of interest

None.

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