

# A Cohort Study Predicts Better Functional Outcomes and Equivalent Patient Satisfaction Following UKR Compared with TKR

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**Abstract** *Background:* Total knee replacement (TKR) is considered the gold standard treatment for advanced osteoarthritis of the knee (Choong and Dowsey, *Int J Rheum Dis* 14:167–74, 2011; Satku, *Singapore Med J* 44:554–556, 2003). Unicompartamental disease can be treated with unicompartamental knee replacement (UKR) or TKR. Some surgeons prefer the proven track record of TKR, while others prefer the more normal joint kinematics, enhanced proprioception and range of movement achieved with UKR (Hopper and Leach, *Knee Surg Sports Traumatol Arthrosc* 16:973–9, 2008; Satku, *Singapore Med J* 44:554–556, 2003). However, there is reported low satisfaction amongst younger patients undergoing UKR (Robertson et al., *Acta Orthop Scand* 71:262–7, 2000). *Questions/Purposes:* The purpose of this study is to compare patient-reported outcomes, satisfaction and perception of knee normality in age-matched groups of postoperative TKR and UKR patients aiming to answer the following question: Does UKR have lower patient satisfaction than TKR in younger patients? *Methods:* Sixty-eight patients were recruited from the care of a single surgeon. Patients with isolated medial compartment osteoarthritis, stable ACL and less than grade 3 lateral patellar disease underwent UKR. All other patients underwent TKR. Patients were assessed with validated knee scores. Satisfaction was assessed with a visual analogue scale. *Results:* There was no statistical difference in patient satisfaction or perception of knee normality scores between the two groups, despite better functional scores including

WOMAC, SF-36 and Oxford knee in the UKR group. *Conclusion:* Patient satisfaction is similar amongst TKR and UKR patients despite better functional outcome in terms of recreation and sport with UKR. This may reflect higher preoperative expectations in patients undergoing UKR. Further work is needed to assess this.

**Keywords** osteoarthritis · total knee arthroplasty · unicompartamental knee arthroplasty

## Introduction

Total knee replacement (TKR) is considered the gold standard treatment for advanced osteoarthritis of the knee unresponsive to medical management [2, 14]. However joint registry data suggest that at least 20% of patients undergoing TKR may have isolated unicompartamental disease [14], which can be suitably treated by TKR or unicompartamental knee replacement (UKR). The number of patients who could be adequately treated with UKR may be even higher, particularly with less stringent inclusion criteria [8, 12] which now include full thickness medial cartilage loss and anterior arthritis with preserved posterior bone, preserved lateral cartilage and intact anterior cruciate ligament. The original limitations of age, weight, patellofemoral disease and range of movement have been discarded [1]. While TKR and UKR have been performed in many patients, with proven efficacy and durability, some surgeons prefer the longer track record of TKR, while others prefer the benefits afforded by UKR including restoration of more normal joint kinematics, better range of movement and faster recovery compared to TKR, resulting in lower morbidity and higher cost-effectiveness [1, 5, 10, 11]. It has also been shown that patients undergoing UKR are more likely to return to sporting activities postoperatively than following a TKR [6].

**Level of evidence:** Therapeutic study level II. See levels of evidence for a complete description.

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Some studies show low patient satisfaction with UKR in younger cohorts [13]; however, studies of joint registry and nationally collated patient-reported outcome measures data show UKR patients typically undergo revision with a higher satisfaction level compared to TKR patients [3, 4, 7]. Overall, UKR patients have higher satisfaction scores yet undergo three times more revisions than TKR groups [3, 4, 7]. There is little information about patient satisfaction between TKR and UKR in age-matched populations.

The aim of our study was to compare patient-reported outcomes, satisfaction and perception of knee normality in age-matched groups of postoperative UKR and TKR patients to answer the following questions: Does UKR have lower patient satisfaction when compared to TKR in younger patients? If there is a lower satisfaction amongst younger UKR patients, is this due to a reduced functional outcome?

## Patients and Methods

A prospective cohort study was performed from a single surgeons practice within a single unit. Sixty-eight patients requiring surgical management of knee osteoarthritis were assessed clinically and via standard radiographs without the use of stress views. Patients with isolated medial compartment osteoarthritis, intact anterior cruciate ligament and less than grade 3 lateral patellar changes according to the Outerbridge classification underwent UKR. All other patients underwent TKR. All procedures were performed by the lead surgeon, who performs 350–400 knee arthroplasty procedures a year. Patients were assessed preoperatively and 2 years postoperatively using WOMAC score, SF-36, Oxford knee, Knee Society and the Total Knee Function Questionnaire scores. Patient satisfaction and perception of knee normality were assessed postoperatively using a visual analogue scale composed of a numeric scale of 0–10 and corresponding facial expressions of happiness and sadness. Patients were also asked if they felt they could perform activities as though they had forgotten they had a prosthesis in situ. Assessments were undertaken by two of the authors. Patients and researchers were not blinded to the procedure performed.

Thirty-four patients underwent UKR and 34 underwent TKR. The groups were well matched for demographics; there were ten male patients in the UKR group and 14 males in the TKR group. The average ages in the TKR and UKR groups were 69 (range 48–75) and 67 (range 43–75) years, respectively. BMI for the UKR and TKR groups were 28.6

**Table 1** Patient demographics

	UKR Mean ± SD (range)	TKR group Mean ± SD (range)
Gender (male/female)	10:24	14:20
Age	67.3±9.1 (43–75)	69.2±7.7 (48–75)
BMI (kg/m <sup>2</sup> )	28.6±8.1 (20–40.6)	28.1±6.6 (18–38.9)

**Table 2** Preoperative functional scores

	UKR Mean ± SD (range)	TKR Mean ± SD (range)
Range of motion	106.6±12.0 (90–138)	105.3±15.3 (81–135)
AKSS		
Clinical	46.4±14.9 (12–85)	45.0±13.5 (14–82)
Function	46.8±20.0 (10–90)	45.6±14.3 (9–80)
WOMAC		
Total	51.8±17.5 (15–88)	52.0±17.9 (14–93)
OKS	36.7±8.9 (23–52)	36.6±9.5 (25–51)
SF-36		
Physical component	24.7±7.7 (16–45.9)	25.0±7.8 (14.5–44.4)
Mental component	50.5±10.3 (30–70.6)	49.9±11.5 (29.5–70.5)
TKQF		
Activities of daily living	3.3±2.1 (0.7–7.2)	2.9±2.3 (0.5–7.1)
Sport and exercise	2.8±2.3 (0–6.1)	2.8±1.9 (0–5.2)
Movement and lifestyle	3.1±1.9 (0–5.3)	3.2±1.7 (0–6.0)
Composite	2.9±1.8 (0.6–4.8)	2.6±1.5 (0.4–5.1)

(20–40.6) and 28.1 (18–38.9), respectively (Table 1, patient demographics).

Preoperative range of motion was 106 (90–138) and 105 (81–135) in the UKR and TKR groups respectively. Patients in both groups had equivalent preoperative clinical and functional knee scores (Table 2, preoperative functional scores).

All patients had the same routine postoperative care, including physiotherapy and occupational therapy starting the day after surgery. Discharge criteria were met when pain was adequately controlled; patients could safely mobilise with crutches and could manage stairs. Follow-up was carried out on an outpatient bases at 6 weeks, 6 months and 1 year after the procedure. Further follow-up was then set at yearly intervals. There were no postoperative complications, re-operations or implant failures.

Clinical and functional scores were compared using paired *t* tests. Statistical significance was set at *p*=0.05.

## Results

Overall, there was no difference in satisfaction between postoperative UKR and TKR patients when matched for age. Patient satisfaction scores as assessed by a visual analogue scale amongst the UKR group were 89 (0–99) compared with 87 (46–99) amongst the TKR cohort. Although the mean satisfaction score was higher in the UKR group,

**Table 3** Patient satisfaction scores

	UKR group Mean ± SD (range)	TKR group Mean ± SD (range)	<i>p</i> value
	2 years		
Satisfaction	89.1±28.8 (0–99)	86.5±13.3 (46–99)	0.41
Normal	69.5±31.3 (0–99)	67.7±18.6 (33–95)	0.99
Forgotten prosthetic knee	15	10	

there was no statistical difference ( $p=0.41$ ). Perception of knee normality was again higher amongst the UKR group 69 (0–99) compared to the TKR group 68(33–95), yet again statistical significance was not met ( $p=0.99$ ). A higher number of patients with a UKR felt that they had forgotten they had a prosthetic knee in situ compared to the TKR group (Table 3, patient satisfaction scores).

There was a higher functional outcome amongst the UKR group compared to the TKR group. Patients in both groups had equivalent preoperative clinical and functional knee scores (Table 2, preoperative functional scores). Postoperative range of motion was 125 (105–141) and 110 (90–140) in the UKR and TKR groups respectively. The UKR group had better WOMAC ( $p=0.003$ ), SF-36 (physical  $p<0.001$ ; mental  $p=0.25$ ), Oxford knee ( $p<0.001$ ), American Knee Society (clinical  $p=0.002$ ; function  $p<0.001$ ) and Total Knee Function Questionnaire scores (ADL  $p=0.002$ ; sport and exercise  $p=0.02$ ; movement and lifestyle  $p=0.02$ ) (Table 4, postoperative functional scores).

## Discussion

The aim of this study was to assess whether there is a lower patient satisfaction amongst younger UKR patients when compared to those of a similar age undergoing TKR. The second aim of this study was to assess whether any difference observed in patient satisfaction was due to a difference in functional outcome. On average, patient satisfaction scores amongst the UKR group were higher than the TKR group; however, statistical significance was not met. This study found that a UKR procedure confers better functional outcome in terms of recreation and sport compared to TKR procedures.

Limitations of this study include relatively low patient numbers. A retrospective power analysis reveals a Cohen's  $d$  effect size of 0.12. Although this was a prospective study, patients could not be randomised to treatment arms due to the nature of the disease and inclusion criteria required for

surgery. The researchers were not blinded to the treatment received by each patient.

Previous studies examining UKR procedures have reported low satisfaction among younger patient cohorts [13]. However, there have not been any studies examining satisfaction in age-matched populations. This study reveals satisfaction is similar amongst postoperative UKR and TKR groups when matched for age. In keeping with published literature [6, 14], this study found that a UKR procedure confers better functional outcome in terms of recreation and sport compared to TKR procedures.

Published literature shows that UKR is an appropriate choice in the elderly yet active patient with unicompartmental knee osteoarthritis [9]. In the younger patient with unicompartmental disease, UKR confers a functional advantage over TKR whilst achieving similar levels of satisfaction. As each cohort of patients had similar preoperative functional scores, the larger improvement within the UKR group highlights this fact. Patient expectation is likely to be higher amongst UKR cohorts, perhaps choosing the less invasive procedure over TKR with improved postoperative functionality in mind. This may explain why postoperative UKR satisfaction levels are similar to TKR cohorts despite higher clinical, functional and lifestyle scores. The range of satisfaction scores found in this study was very large in the UKR group (0–99). As there were no implant failures or revisions in the 2 years of this study, these results may reflect the level of expectation of the patients, declaring themselves very unhappy despite scoring higher in functional outcome tests compared to their preoperative status as well as their TKR counterparts. Given the effect size of this study, small differences in patient satisfaction between UKR and TKR groups cannot be excluded and statistical validity may be seen with a more highly powered study. This highlights the need for further investigation into satisfaction scores between these two procedures in age-matched populations as well as an assessment of preoperative expectations amongst TKR and UKR patients.

**Table 4** Postoperative functional scores

	UKR group Mean $\pm$ SD (range)	TKR group Mean $\pm$ SD (range)	<i>p</i> value
		2 years	
Range of motion	125.1 $\pm$ 15.9 (105–141)	109.8 $\pm$ 12.8 (90–140)	
AKSS			
Clinical	85.6 $\pm$ 19.4 (40–99)	69.3 $\pm$ 15.5 (52–100)	0.002
Function	88.0 $\pm$ 24.8 (10–100)	71.4 $\pm$ 15.8 (50–100)	<0.001
WOMAC			
Total	19.9 $\pm$ 23.1 (3–90)	29.1 $\pm$ 13.4 (8–50)	0.003
OKS	20.1 $\pm$ 7.0 (13–41)	26.2 $\pm$ 9.1 (16–44)	<0.001
SF-36			
Physical component	45.8 $\pm$ 12.6 (10.9–55.6)	39.5 $\pm$ 12.8 (15.6–61.4)	<0.001
Mental component	53.4 $\pm$ 14.1 (18.4–65.2)	46.3 $\pm$ 8.3 (28.5–63.1)	0.25
TKQF			
Activities of daily living	6.0 $\pm$ 1.7 (2.7–8.3)	5.2 $\pm$ 1.4 (4.5–8.3)	0.002
Sports and exercise	6.2 $\pm$ 1.6 (2.9–8.0)	5.0 $\pm$ 1.0 (2.8–7.0)	0.02
Movement and lifestyle	5.7 $\pm$ 1.3 (3.2–7.1)	4.8 $\pm$ 0.9 (3.8–7.1)	0.02
Composite	6.1 $\pm$ 1.5 (2.4–6.9)	4.6 $\pm$ 1.0 (3.9–7.4)	

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Each author certifies that his or her institution has approved the reporting of these cases, that all investigations were conducted in conformity with ethical principles of research and that informed consent for participating in the study was obtained.

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