ACTA ORTHOPAEDICA et TRAUMATOLOGICA TURCICA
www.aott.org.tr

Research Article

Which knee replacement do the patients forget? Unicondylar or total knee arthroplasty

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ARTICLE INFO

Article history:
Submitted May 14, 2020
Received in revised form
November 14, 2020
Last revision received
June 10, 2021
Accepted June 10, 2021
Available Online Date
September 9, 2021

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ABSTRACT

Objective: The aim of this study was to determine which type of knee arthroplasty is easier to forget by comparing levels of joint awareness evaluated with the Forgotten Joint Score (FJS-12) after unicondylar versus total knee arthroplasty.

Methods: Patients who underwent either unicondylar or total knee arthroplasty due to primary gonarthrosis were retrospectively identified and then divided into 2 groups: the TKA group (218 patients; mean age = 68.93 ± 7.14 years) and the UKA group (131 patients; mean age = 60.39 ± 7.03 years). The status of joint awareness after knee replacement surgery was assessed using the Turkish version of the FJS-12 at the final follow-up by telephone interview. Also, The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and The EuroQol five-dimensional (EQ-5D) scores were obtained to assess the clinical status of the patients.

Results: The mean follow-up was 2.8 years (range = 24–49 months) in the TKA group and 3.2 years (range = 24–50 months) in the UKA group. The FJS-12 was significantly higher in the UKA group (73.60 ± 9.95) than in the TKA group (64.88 ± 9.47) ($P = .001$). The WOMAC score was significantly better in the UKA group (81.39 ± 9.84) than in the TKA group (74.92 ± 9.99) ($P = .001$). No significant difference in EQ-5D existed between the groups (0.76 ± 0.14 for the TKA group, 0.79 ± 0.17 for the UKA group; $P = .441$). In terms of gender, the FJS-12 showed no differences between the groups; however, more favorable scores were recorded in younger patients with UKA.

Conclusion: The results of this study have demonstrated that UKA may be better than TKA in terms of the patient perception of pain, stiffness, and physical functioning.

Level of Evidence: Level IV, Therapeutic Study

Introduction

Knee osteoarthritis treatment with prosthetic replacement has increased in the last few decades. This has led to an increasing demand for better performing implants, which will enable patients to continue not only daily living activities, but also social activities and some sports.

Surgeons are faced with two different arthroplasty choices of knee arthritis treatment. Unicondylar knee arthroplasty (UKA) for patients with an intact cruciate ligament and unicompartmental disease and total knee arthroplasty (TKA) for those who do not have an intact anterior cruciate ligament or have more advanced disease.[1] Which implant is better is always a dilemma because surgeons have evaluated results according to revision rates or knee scores that evaluate mostly objective findings, but do not consider the subjective thoughts of the patients. However, the general well-being of patients were estimated to be better compared with previous functionality scores since the introduction of patient-reported outcome (PRO) scores. One of these is the forgotten joint concept developed by Behrend et al.[2] This concept and score are appropriate for medium- and long-term follow-up of a prosthetic joint. Consequently, high scores indicate that the prosthetic joint mimics the original joint so well that the patients forget that they have had an operation on it. This questionnaire has been critically scrutinized and validated.[3] Previous studies have shown that the Forgotten Joint Score-12 (FJS-12) improves over time as the patient gets used to the prosthesis, and a plateau starts to form around 12 months with minimum improvement thereafter.[4] Although many comparisons of the functionality scores of unicondylar and total knee designs and PROs exist,[5,6] very few studies have assessed which artificial joint gives the feeling of the original or "natural" joint. Thus, this study hypothesized that a smaller implant that mimics the original anatomy without sacrificing different structures would be easily forgotten and more useful to the patient. This retrospective study aims to understand which patients forget about their prosthetic joint in the long-term, by comparing The Forgotten Joint score in addition to the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and EuroQol five-dimensional (EQ-5D) scales in patients who had unicondylar or total knee arthroplasties with a minimum of 2-year follow up.

Materials and Methods

Approval of the study was granted by the Institutional Review Board (Ministry of Health, Medical Sciences

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Cite this article as: *Ateş Y, Akdoğan M, Atilla HA. Which knee replacement do the patients forget? Unicondylar or total knee arthroplasty. Acta Orthop Traumatol Turc 2021; 55(5): 417–421.*

DOI: 10.5152/j.aott.2021.20173

University Dışkapı Yıldırım Beyazıt Hospital Ethical committee approval No: 81/03 (dated 2 March 2020), and all the procedures were applied following the principles of the Helsinki Declaration. The study initially recruited all patients who underwent surgery for primary knee osteoarthritis between January 2016 and December 2017 at the Ministry of Health, Medical Sciences University Dışkapı Yıldırım Beyazıt Hospital Orthopedic Clinic. Patients were excluded from the study if they had complications that required further surgery, any other underlying conditions (neurologic or rheumatologic), previous knee surgery, or revision surgery. Patient data (e.g., age, sex, side, weight, and height) at the time of the operation were retrieved from medical records. During the study period, 226 TKS and 137 UKA patients were identified.

All the operations were performed in the hospital by a team of surgeons. Clinical UKS indications were isolated medial compartment disease, intact cruciate ligaments, flexion contracture (<10°), and preoperative flexion deficit (>90°). Moreover the operating surgeon intraoperatively decided on the condition of the lateral compartment and performed unicondylar or decided to convert to TKA. TKA was performed on all patients not qualifying for a UKA and on those with apparent lateral and patellafemoral arthritis on preoperative X-rays and grades II-IV on Kellgren-Lawrence scale. The implant used during the study was either cruciate sacrificing cemented fixed bearing total knee (NexGen Zimmer Biomet Warsaw IN USA) through a standard medial parapatellar approach with no patellar resurfacing or a mobile-bearing unicondylar knee (Oxford, Zimmer-Biomet, Warsaw, IN) applied using a parapatellar medial short incision (41 cases applied cementless and the rest with cemented components).

All the patients underwent similar preoperative, operative, and postoperative protocols. All the patients received preoperative antibiotics and tranexamic acid infusion. Moreover, a tourniquet was used in some patients, and postoperative suction drainage and appropriate pain control were used in all the patients. On one hand, UKA patients were generally discharged after 24 hours. On the other hand, TKA patients were generally discharged on postoperative day 3 after ambulation and attaining a minimum of 90° flexion. Low-molecular-weight heparin and low-dose aspirin were administered for 2 weeks and until full independent ambulation, respectively. All the patients were followed up at postoperative week 6, 3 months, and annually thereafter.

Patients who had a minimum follow-up period of 2 years were invited for a telephone interview between February and March 2020. Moreover, the patients were asked questions regarding the WOMAC, FJS-12, and EQ-5D. The replies were then documented. Both the WOMAC (0–100, 100 being the highest score) and FJS-12 (High scores indicate a high degree of "forgetting" the artificial joint, that is, a low degree of awareness 0–100, 100 being the highest) score forms were filled out. Both scales have validation for use in Turkey.[7,8] The EQ-5D questionnaire was applied to determine the general health status of the patient. EQ-5D provides a score between −0.59 and 1.00 with maximum point of 1.00 indicating perfect health. The EQ-5D, WOMAC, and FJS-12 results were compared to assess any differences according to age, gender, and BMI.

At the final follow-up examination, 8 (2 patients with early infection and insert exchange, 1 with periprosthetic fracture, 1 with neuropathic pain, 4 patients who could not be reached) of 226 TKA were excluded. Thus, an analysis of the 218 patients in the TKA group was made. Six (1 patient with early infection, 3 with early revision for persisting pain, and 2 who could not be reached) of the 137 UKA patients were excluded. Thus, an analysis of the 131 patients in the UKA group was made.

Statistical analyses

The demographic data, functional scores, and forgotten joint scores of the two groups were statistically compared. Data obtained in the study were statistically analyzed using Statistical Package for the Social Sciences (SPSS) for Windows version 20.0 software (IBM SPSS Corp.; Armonk, NY, USA).

Descriptive statistics for categorical variables were stated as number (n) and percentage (%), and numerical variables were given as mean ± standard deviation (SD) and minimum–maximum values.

The data conformity to normal distribution was assessed using the "Kolmogorov Smirnov" and "Shapiro–Wilk" tests. The median difference between the two independent groups was analyzed using the "Mann–Whitney *U*-test" because none of the variables showed normal distribution. Categorical variables were analyzed using the chi-square test. Correlation analysis between two numerical variables was examined with the "Spearman test". The confidence limit was 95% and $P < .05$ value was accepted as statistically significant.

Results

The average follow-up was 2.9 years (3.2 years for UKA (range 24–50 months) and 2.8 years for TKA (range 24–49 months).

The UKA group was significantly younger than the TKA group ($P < .001$) when the basic demographic data was compared. Moreover, female patients were noted in the UKA group ($P < .02$). No significant differences were determined between groups concerning height, weight, and BMI (Table 1).

The evaluation of WOMAC, EQ-5D, and FJS-12 scores is summarized in Table 2. No significant difference was determined between the groups concerning the EQ-5D. Furthermore, no significant difference

Table 1. Demographic Data of the Groups

	TKA	UKA	*p*
Age	68.93 ± 7.14	60.39 ± 7.03	**0.001***
Height (cm)	161.36 ± 7.22	161.49 ± 3.85	0.478
Weight (kg)	83.69 ± 12.79	83.46 ± 4.72	0.378
BMI	32.22 ± 4.93	32.03 ± 1.95	0.984

Numbers are given as average standard deviation and range.
*Statistically significant value.

Table 2. Results of the Scoring Systems

Test	TKA	UKA	*P*
WOMAC	74.92 ± 9.99	81.39 ± 9.84	**0.001***
EQ-5D	0.76 ± 0.14	0.79 ± 0.17	0.441
FJS	64.88 ± 9.47	73.60 ± 9.95	**0.001***

Numbers are given as mean ± standard deviation and range.
*Statistically significant value.

HIGHLIGHTS

- Patients are more easily accustomed to Unicondylar replacement compared to the total knee (Forgetting their joint).
- This acceptance is more pronounced in patients with lower BMI between the ages of 50-70.
- There is no difference after the age of 70 regarding the choice of implant.

Table 3. Comparison of Age Groups and the FJS

Age groups (years)	FJS			
	TKA	UKA	Total	*P*
40–49	81.26 ± 0.00 (3)	82.50 ± 5.63 (5)	82.03 ± 4.30 (8)	0.167
50–59	59.61 ± 6.72 (17)	74.92 ± 6.72 (56)	71.35 ± 10.67 (73)	**<0.001**
60–69	66.05 ± 8.90 (101)	74.61 ± 10.48 (51)	68.92 ± 10.26 (152)	**<0.001**
70–79	64.34 ± 9.56 (79)	64.64 ± 6.52 (19)	64.40 ± 9.02 (98)	0.648
80–89	62.96 ± 11.33 (18)		62.96 ± 11.33 (18)	

Number are given as mean ± standard deviation and (number of cases). Statistically significant value.

Table 4. Comparison of Age Groups and the WOMAC Score

Age groups (years)	WOMAC Scores			
	TKA	UKA	Total	*P*
40–49	87.90 ± 0.00 (3)	90.32 ± 2.23 (5)	89.41 ± 2.10 (8)	0.121
50–59	75.31 ± 11.89 (17)	82.92 ± 9.00 (56)	81.15 ± 10.19 (73)	**0.040**
60–69	75.98 ± 9.82 (101)	81.71 ± 10.31 (51)	77.90 ± 10.31 (152)	**<0.001**
70–79	72.82 ± 9.64 (79)	73.68 ± 7.96 (19)	72.99 ± 9.31 (98)	0.525
80–89	75.61 ± 9.55 (18)		75.61 ± 9.55 (18)	

Number are given as mean ± standard deviation and (number of cases).

was determined between FJS-12 results of the groups according to gender. The patients' results were separated into age groups (in decades: Tables 3 and 4) to examine the effect of the age on the results. Significant higher rates of acceptance of the joint as natural as determined in the patients of age 50–69 years with UKA compared to the age groups in the TKA group. The WOMAC scores also showed better outcome for patients of this age with UKA.

All the UKA patients were within the 25–40 BMI range, and 28 of 218 TKA patients were outside of the 25–40 BMI range. A statistically significant difference was determined in the overall groups of UKA and TKA between the BMIs of 30–35 (78.39 ± 10.20) and 35–40 (74.45 ± 11.30; Table 5). No other differences were determined within or between other groups. The overall comparison of the FJS-12 revealed differences between BMI groups of 20–25 and 35–40, 25–30 and 40–45, 30–35, and 35–40, as well as between 30–35 and 40–45. A statistically significant difference was observed between the TKA and UKA of the BMI groups of 25–30 and 30–35, respectively ($P < .05$; Table 6).

Discussion

The result of this study demonstrated that UKA is more easily forgotten compared to TKA especially in patients younger than 70 years. The score for the evaluation of the artificial joints is very effective in determining how well the surgery was applied and how good the implant is compared to a normal joint.[9,10] The current study results are similar to those of other studies where FJS has also been found to be better in patients with UKA.[11,12] The additional points to the current study results are that the FJS results were shown to be parallel with

Table 5. WOMAC Scores and BMI Comparison

BMI	Total n	Mean SD	TKA, n	Mean SD	UKA, n	Mean SD
20–25	11	73.31 ± 6.88	11	73.31 ± 6.88		
25–30	70	76.99 ± 9.84	54	76.09 ± 10.11	16	80.00 ± 8.46
30–35	199	78.39 ± 10.20	93	74.67 ± 9.01	106	81.65 ± 10.11
35–40	52	74.45 ± 11.30	43	73.12 ± 11.27	9	80.83 ± 9.52
40–45	17	78.05 ± 12.61	17	78.05 ± 12.61		
Total	349	77.34 ± 10.40	218	74.91 ± 9.99	131	81.39 ± 9.84

Table 6. FJS-12 and BMI Comparison

BMI	Total n	Mean SD	TKA n	Mean SD	UKA n	Mean SD	*P*
20–25	11	70.44 ± 14.72	11	70.44 ± 14.72			
25–30	70	67.05 ± 10.24	54	65.59 ± 10.57	16	71.98 ± 7.35	0.007
30–35	199	69.67 ± 10.78	93	64.73 ± 9.18	106	74.01 ± 10.23	**<0.001**
35–40	52	65.80 ± 7.96	43	64.60 ± 6.76	9	71.55 ± 10.94	0.101
40–45	17	60.53 ± 7.88	17	60.53 ± 7.88			
Total	349	68.15 ± 10.52	218	64.88 ± 9.47	131	73.59 ± 9.95	

The overall comparison revealed differences between 20–25 and 35–40, 25–30 and 40–45, 30–35 and 35–40 groups as well as between 30–35 and 40–45.
No difference was noted within the TKA and UKA group.
A significant difference was observed between the 25–30 and 30–35 groups when TKA and UKA are compared.

WOMAC in the evaluation of outcomes and that UKA was seen to be superior in younger patients in terms of joint awareness. However, a shortcoming of this study is that only one evaluation was made with a minimum follow-up of 2 years while Zuiderbaan et al. reported two evaluations made in the first and second postoperative years, although no significant difference was determined between the years.[11] In a cross-sectional observational study by Dai et al., a plateau effect was observed at around 1 year and a slight improvement thereafter.[4] Therefore, a minimum follow-up of 2 years would be sufficient to evaluate a more global patient population in the current study. Rosinsky et al. also used the FJS and determined that the score provided a better result at 2 years compared with that at the end of the first year in determining patient outcomes.[13]

Differing views on the appropriate age at which a patient should have a prosthesis and no fixed date exists as disease progression depends on the individual. Moreover, Dai et al. reported better results in the UKA performed after 60 years old. However, this contrasts the current study finding that patients aged 50–69 years fared better.[4]

The BMI of the patients undergoing knee replacements is another point of interest. BMI was seen to influence the WOMAC and FJS-12 scores when all the patients were evaluated. A BMI increase was seen to negatively affect joint awareness, and the patients were less satisfied with their joint as their BMI increased. The BMI effect is also demonstrated between patients in UKA and TKA groups (Tables 5 and 6). Higher BMI has been reported to not only result in higher infection rates and inferior implant survival[9,11] but also to have less favorable results according to the patient's perception. Baker et al. stated that morbidly obese patients had significantly lower postoperative scores than nonobese patients.[14,15] Current study results show a more stratifying effect because the results deteriorated as the BMI increases independent of the replacement type. Further studies of larger patient groups may also show differences between prosthesis types. Dai et al. reached a similar conclusion stating that patients with higher BMI have more difficulty forgetting their joints.[4] In contrast, Murray et al. showed no BMI effect on the results in UKA patients.[16] Outliers have been eliminated in other studies. Thus, a conclusion could not be reached.[11]

The FJS introduced a simple method of determining patient satisfaction with the operation they have undergone. The FJS scores in this study were parallel with those of WOMAC in considering outcomes. Moreover, Giesinger et al. showed a better effect but stressed that FJS is better in determining the specific joint surgery outcomes.[17]

The type of prosthesis used has also been shown to affect FJS. Thienpont et al. demonstrated that fix bearing TKA is superior to mobile-

bearing TKA with respect to FJS.[18] The same author also reported differences between joints and showed that FJS is a better outcome predictor after knee replacements rather than the hips.[19] This was attributed to the focus of FJS more on activities of daily living in which the knees were used more than hips.

Two articles by Peersman et al. and French et al. exist to determine if a single series outcome can be extrapolated to a wider patient database.[12,20] Peersman et al., reported superior results in FJS in UKA compared with cruciate-retaining TKA (91.3–54.8) at 1 year postoperative.[12] The UKA scores in that study were better than those of the current study (73.6–91.3 in UKA) but the TKA scores were lower (64.8–54.8 in TKA). In a single surgeon series by French et al., better results were obtained with medial-stabilized TKA (FJS 79.9) compared with cruciate-retaining TKA (FJS 63.8;20). These discrepancies show that cruciate-sacrificing TKA provides better FJS-12 scores in patients compared with cruciate-retaining knee prosthesis. Similar results were obtained in the current study, even though a head-to-head comparison was not possible with different surgeons. However, similar overall results were seen denoting that the UKA is better than the TKA concerning FJS-12 using the same implant. These results show that despite criticism of its high revision rate and no significant benefit of UKA, as emphasized by Baker et al., superior patient satisfaction obtained in function can be considered to justify the UKA use.[15] Low case volumes have a higher revision rate. Thus, the UKA revision rate will also be lower in centers with similar operative loads.[21] Thus, UKA seems to be both economical and provides better health outcomes than TKA in elderly[22] and provides better results in younger patients in respect to daily living activities.

One of the shortcomings of this article was the lack of evaluation of the possible future effect of the arthrosis type on the results. Jessing et al. stated that medial osteoarthritis patients had an overall better outcome after knee replacement surgery.[23] Moreover, Liebensteiner et al. compared UKA and TKA in patients with medial osteoarthritis and found no difference between the groups. However, only registry evaluation was used and the Forgotten Joint Score was not applied in the evaluation of the results.[24] The results of the current study were not evaluated concerning whether the knee had global arthritis or more medial degeneration. Thus, further studies are needed to determine whether medial arthrosis patients fare better after a prosthetic implant.

Another limitation of the study was that all UKA applications were not the same, despite the same prosthesis design (some fixed with cement and the others without cement). However, authors in the current study have previously published results denoting that uncemented UKA provided similar results (with those of cemented prosthesis).[25] Moreover, the focus of this study was not a survival but a patient-perceived outcome analyses. The Forgotten Joint Score can be considered to help surgeons to view the results from the patient's point of view in the quest for the ideal degenerative knee treatment.

In conclusion, the results of this study demonstrated that UKA is better than TKA concerning patient perception. Moreover, the FJS-12 was developed to identify the awareness of an artificial joint (knee) during various daily life activities and is an effective tool that correlates well with WOMAC. Furthermore, UKA in patients aged 50–70 years with a lower BMI provides the best patient-oriented outcome in the treatment of medial osteoarthritis of the knee.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ministry of Health, Medical Sciences University Dışkapı Yıldırım Beyazıt Hospital Ethical Committee approval No: 81/03 (dated 2 March 2020), and all the procedures were applied following the principles of the Helsinki Declaration.

Informed Consent: Informed consent was obtained from all patients. Consent was obtained orally for those that were reached by telephone.

Author Contributions: Data Collection and/or Processing - M.A., H.A.A.; Literature Review - H.H.A., Y.A.; Writing - Y.A. Statistics and/or Graphs - M.A., H.A.A.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

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