The forgotten joint score in total and unicompartmental knee arthroplasty : a prospective cohort study

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Factors affecting patients' Forgotten Joint Score in total and unicondylar knee arthroplasty: a prospective cohort study

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Abstract

Aims

We hypothesize unicompartmental knee arthroplasty (UKA) results in improved patient-reported and clinical outcomes as compared to total knee arthroplasty (TKA).

Patients and Methods

Our prospective cohort study compared patients who underwent medial UKA or TKA from February 2014 through June 2015. Forgotten Joint Score (FJS), Knee Injury and Osteoarthritis Outcome Score (KOOS PS), EuroQOL Five Dimensions Questionnaire (EQ-5D), and a clinical questionnaire were completed at 2 weeks, 6 weeks, 3 months, 6 months, and 1 year postoperatively. The KOOS PS and clinical questionnaire were also documented preoperatively.

Results

Fifty-seven patients (57 knees) were randomized to the UKA group and 62 patients (62 knees) to the TKA group. At baseline, no statistically significant differences were observed between groups regarding patient demographics and preoperative scores. Except for FJS at 2 weeks ($p = 0.326$), all postoperative scores revealed significant differences as early as 2 weeks up to 12 months ($p < 0.05$).

Conclusion

Our findings suggest patients with UKA patients are less aware of their joint replacements as compared to patients with TKA for medial osteoarthritis of the knee. Furthermore, UKA conserves more soft tissue and bone than TKA, which may be the reason for differences observed.

Introduction

Osteoarthritis (OA) is a major cause of disability in the aging population, and the lifetime risk of symptomatic knee OA is 50%.[1] Medial OA of the knee with lesser changes to the lateral and patellofemoral compartments affects up to 50% of patients.[2] Surgical options to treat patients with bone on bone medial OA of the knee are total knee arthroplasty (TKA) and unicompartmental knee arthroplasty (UKA). However, the proportion of dissatisfied patients and suboptimal treatment results after TKA remains high, and ranges from 75% to 82%.[3,4] Approximately 30% of TKA patients believe that their expectations were not fully achieved.[5,6]

For select patients, UKA is a viable alternative to TKA.[7] However, UKA is still considered to be a controversial option for the management of unicompartmental arthritis.[7] It has been reported that UKA is more likely to fail than TKA due to aseptic loosening and progression of arthritis in the unresurfaced compartments.[8] This has resulted in TKA being recommended over UKA for the treatment of unicompartmental knee arthritis.[9-11] Clinical outcomes and survival rates for conversion of UKA to TKA are comparable to the results achieved with revision TKA, and significantly inferior than those for primary TKA.[12-15] Nevertheless, compared with TKA, UKA can yield superior functional outcomes, faster recovery, improved patient satisfaction, and reduced risk of perioperative complications.[8,16-23] In addition, several studies have shown that UKA yields clear economic advantages compared with TKA.[24-26] Due of the potential benefits of UKA in terms of functional outcome, as well as the ongoing discussion on postoperative residual complaints following TKA,[27] comparisons of UKA and TKA have become of increasing interest, and there has been a particular focus on how patients perceive functional outcome.

A recent analysis of a large cohort of registry patients found no difference between TKA and UKA in terms of either quality of life (EuroQoL 5D (EQ-5D) or knee-specific (Oxford Knee Score) outcomes.[28] The authors of this paper concluded that the use of UKA should be questioned because the lack of evidence of any significant benefit fails to mitigate the significantly higher revision rates observed in worldwide registries.

Patients' ability to forget their joint replacements in everyday life is an important expectation and goal of the surgery, as it reflects patient satisfaction.[4,29-31] The FJS may for this reason be an important proxy of success of the surgical intervention. However, up to today, the literature has a paucity of outcome studies in which FJS is considered. The purpose of this study was to establish whether UKA results in better patient reported outcome and clinical outcome than TKA. We hypothesized that UKA would lead to a higher forgotten joint score (FJS-12) at 1 year follow-up.

Materials and methods

This study analyzed a prospective cohort of patients from the senior author's surgical arthritis registry. Adult patients who underwent medial UKA or TKA between February 2014 and June 2015 were eligible for the study. Demographics and clinical data, including age, gender and body mass index (BMI) were collected. Patients presenting with degenerative osteoarthritis of the knee requiring unilateral TKA or UKA were eligible for the study. In order to warrant exchangeability of the two groups, the same eligibility criteria were applied to both groups. Exclusion criteria for this study were the presence of anterior knee pain and pre-operative Kellgren and Lawrence grade III–IV of the lateral or patellofemoral compartments, which are considered to be a surgical contraindications for medial UKA. Other contraindications were flexion contractures > 10°, ASA Class III and higher, presence of systemic disease such as rheumatoid arthritis, malignancies, revision arthroplasty, and post-infection. Also excluded from this study were patients with a history of complex knee surgery, inflammatory arthropathy, BMI >40 kg/m^2, trauma and simultaneous bilateral TKA or UKA. Group allocation was based on patients' preference.

The senior author, who has extensive experience in UKA and TKA, performed all of the surgeries.

The uncemented Oxford Phase 3 (Zimmer Biomet, Warsaw, IN) was used for the UKA procedure. The aim was to avoid degenerative progression of the lateral compartment by maintaining a small residual varus of the lower extremity.

The Vanguard Complete Total Knee (Zimmer Biomet) with posterior stabilized insert was used for the TKA procedure. Patella resurfacing was performed in all patients. A tourniquet was not applied.

Walking with full weight-bearing commenced on the day of surgery. A walker was initially used to mobilize patients, and this was replaced with a pair of crutches once sufficient stability was attained. On day 3 after surgery, patients were routinely discharged, with all patients in the UKA and 85% in the TKA group discharged home, and 15% of the TKA group going to an inpatient rehabilitation facility for a further 2 weeks.

All patients were asked to complete the FJS, the KOOS PS, the EQ-5D and a clinical questionnaire at 2 weeks, 6 weeks, 3 months, 6 months and 1 year postoperatively. The KOOS PS and the clinical questionnaire were also documented preoperatively. All PROMs were provided by the patients electronically via a touch-screen device, with the physician not being present during the self-assessment.

The FJS is used to evaluate patients' ability to forget their artificial joint in daily life. It consists of 12 questions and the final score is on a scale from 0 to 100. The higher the score, the more favorable the outcome.

The KOOS-PS is a self-administered questionnaire that was designed for objective measurement of physical function.[32] The assessment form has a score from 0 to 100, with 0 being the optimal score, representing no difficulty in performing specific tasks.

The EQ-5D is a standardized generic instrument for use as a measure of health outcome, with a score from -0.59 to 1.00, where 1.00 is the maximum score representing perfect health.[33]

This study was approved by the ethics committee at our hospital. All patients provided informed consent prior to study commencement.

Statistical analysis

Categorical variables are presented as frequencies and percentages. Continuous data are presented as mean and standard deviation. The Fisher exact test for categorical variables was used to perform univariate analysis.

Treatment comparisons for continuous outcome were based on linear mixed models.[34] Linear mixed models are extensions of the commonly used linear regression models. In linear regression models, independence of all observations is assumed, whereas linear mixed models take into account correlations between successive measurements of the same patient. These models are, therefore, suitable for the analysis of longitudinal data, as they show the development of outcomes over time. We analyzed VAS pain and drop in Hb level. Models were fitted containing the main effects treatment group, time, and their interaction (group–time interaction). Separate intercepts and time terms were estimated for each group. Random effects were included for each group and the time term. Linear contrasts of fitted model estimates were constructed, and Wald tests were used to calculate statistical significance of the differences in outcome for each time point. Two-tailed tests were used throughout. Two-sided p-values < 0.05 were considered to be significant. An independent statistician used Stata/SE 12 (StataCorp, College Station, TX, USA) to analyze all outcome variables.

Results

Fifty-seven patients (57 knees) were allocated to the UKA group and 62 patients (62 knees) to the TKA group. Baseline data indicated no statistically significant differences between the groups in terms of patient demographics, but the baseline values for KOOS-PS and KS were slightly better for the TKA group (Table 1).

There were significant differences between UKA and TKA in intraoperative objective intraoperative measures. The mean length of incision (± SD) in extension for UKA and TKA were XYZ ± XYZ mm and XYZ ± XYZ mm, respectively (p = XYZ). Mean blood loss was XYZ ± XYZ mL and XYZ ± XYZ mL (p = XYZ). The mean duration of surgery was XYZ ± XYZ and XYZ ± XYZ minutes.

None of the patients was lost to follow-up after surgery. One patient in the TKA group required revision for aseptic loosening of the tibial baseplate XYZ months postoperatively. One additional patient in the TKA group was stented for popliteal artery stenosis XYZ months postoperatively. Finally, one patient in the TKA group experienced a deep venous thrombosis early postoperatively. The number of missed visits at 2 weeks, 6 weeks, 12 weeks, 6 months, and 1 year is presented in Table 2.

Patients in the UKA group had a mean FJS of 6.2 (95% CI, -2.3 – 14.6) at 2 weeks, improving to 18.8 (95% CI, 14.6 – 23.1) at 6 weeks, 48.2 (95% CI, 43.1 – 53.2) at 12 weeks, 79.1 (73.2 –84.9) at 6 months, and 91.2 (85.3– 97.4) at 1 year. Patients in the TKA group had a mean FJS of 0.9 (-5.4 – 7.2) at 2 weeks, 7.5 (3.8 – 11.2) at 6 weeks, 19.1 (14.9 – 23-3) at 12 weeks, 39.6 (34.7 – 44.4) at 6 months, and 54.8 (49.3 – 60.2) at one year (Figure 1). Differences were not significant at 2 weeks ($p = 0.326$), but reached the level of significance at the 6 and 12 weeks, and at the 6 and 12 months follow-up interval ($p < 0.001$ at all successive time points). Similar patterns were also found for KOOS-PS, EQ-5D, KS and FS, with significant differences already as of 2 weeks postoperatively (Figures XYZ, Table XYZ (Appendix)). Radiographic measurements demonstrated reliable implant positioning in both groups without any changes during the follow-up period. XYZ Geert heb je meer details?

Discussion

This study's main findings are that medial UKA is superior to TKA in terms of patients' awareness of their artificial joint, functional outcome, clinical outcome and quality of life. We found that medial UKA resulted in a significantly higher FJS than TKA at the 1-year follow-up. Furthermore, our data suggest that difference in joint awareness was significant as early as the 6 weeks follow-up, and sustained until the 1-year follow-up. The other clinical and PRO outcomes revealed significance as of 2 weeks postoperatively, and the effect sustained until the last follow-up at 1 year.

The literature has no consensus regarding these outcomes for medial UKA compared to TKA. This study's purpose was to compare outcomes for the two procedures using several PROs up to 1-year follow-up. As far as we are aware, there have only been a few comparative studies between UKA and TKA using the FJS. Zuiderbaan et al reported FJS at 1 year of 73.9 ± 22.8 for UKA and 59.3 ± 29.5 for TKA ($p = 0.002$).[35] Thienpont et al, in contrast, found no significant differences in the FJS when comparing UKA and TKA at an average of 2 years following surgery (range, 1–3 years), with score values of 76.4 ± 19 and 73.2 ± 22 for UKA and TKA, respectively ($p = 0.436$).[30] Hence, our score value for TKA is similar to the value found by Zuiderbaan et al and significantly lower than the value reported by Thienpont et al, and our score value for UKA is significantly higher. Whether these differences can be explained by clinical heterogeneity or by methodological variances, remains yet unknown.

Regarding the functional differences between UKA and TKA, our findings contrast to those from the Norwegian Arthroplasty Register, in which the PRO scores between the two procedures were compared. 972 TKAs and 372 UKAs were compared at a minimum 2 years follow-up (mean, 6.5 years).[36] Three outcome questionnaires were used: the Knee Injury and Osteoarthritis Outcome Score (KOOS), the visual analogue scale (VAS) and the EQ-5D. The authors found some significant differences that favored the UKA group, but they were too small to be considered clinically relevant. The National Registry of England and Wales compared 23,393 TKAs and 505 UKAs (median follow- up of 6.6 months), and found no differences for either the Oxford Knee Score or the EQ-5D.[28] However, patients were assessed 6 months postoperatively only, and no assessment of the development of the score over time was made. A retrospective study recently published by Siman et al found no significant differences in terms of KSS between UKA and TKA, with follow-up times of 3.5 and 4.6 years for UKA and TKA, respectively.[37]

Our study has a number of limitations. First, although the aim of multiple regression is to adjust for differences in baseline variables and to create exchangeability of study cohorts, residual confounding by indication cannot be excluded. All observational studies have a certain amount of unmeasured bias, so the results of the multivariable model must be treated with caution. We have tried to minimize the impact of confounding by including only patients eligible for UKA, but patients were not randomized.

Second, the senior author, who has considerable experience with UKA implantation, performed all of the procedures. Liddle et al[38] and Hamilton et al[39] have shown that a small UKA caseload is inversely correlated with a high revision rates, and we hypothesize the same principle holds true for clinical outcome.

Therefore, it is possible that results are influenced by the issues specific to the respective surgical techniques and may not be readily generalizable to different surgical settings.

In conclusion, our data suggest that patients undergoing UKA are less aware of their artificial joints in daily life compared to patients undergoing TKA for medial OA of the knee. Compared with TKA, UKA is a more soft-tissue and bone-conserving surgical procedure, and we speculate that this could be the reason for the differences observed in this study. We therefore suggest that joint-conserving surgical strategies be considered in order to optimize outcomes following knee arthroplasty.

References

1. Murphy L. Lifetime Risk of Symptomatic Knee Osteoarthritis. 2008;59:1207-13.

2. Willis-Owen CA, Brust K, Alsop H, Miraldo M, Cobb JP. Unicondylar knee arthroplasty in the UK National Health Service: an analysis of candidacy, outcome and cost efficacy. *Knee* 2009;16:473-8.

3. Choi YJ, Ra HJ. Patient Satisfaction after Total Knee Arthroplasty. *Knee Surg Relat Res* 2016;28:1-15.

4. Bourne RB, Chesworth BM, Davis AM, Mahomed NN, Charron KD. Patient satisfaction after total knee arthroplasty: who is satisfied and who is not? *Clin Orthop Relat Res* 2010;468:57-63.

5. Bullens PH, van Loon CJ, de Waal Malefijt MC, Laan RF, Veth RP. Patient satisfaction after total knee arthroplasty: a comparison between subjective and objective outcome assessments. *J Arthroplasty* 2001;16:740-7.

6. Suda AJ, Seeger JB, Bitsch RG, Krueger M, Clarius M. Are patients' expectations of hip and knee arthroplasty fulfilled? A prospective study of 130 patients. *Orthopedics* 2010;33:76-80.

7. Chatellard R, Sauleau V, Colmar M, Robert H, Raynaud G, Brilhault J, Societe d'Orthopedie et de Traumatologie de lO. Medial unicompartmental knee arthroplasty: does tibial component position influence clinical outcomes and arthroplasty survival? *Orthop Traumatol Surg Res* 2013;99:S219-25.

8. Arirachakaran A, Choowit P, Putananon C, Muangsiri S, Kongtharvonskul J. Is unicompartmental knee arthroplasty (UKA) superior to total knee arthroplasty (TKA)? A systematic review and meta-analysis of randomized controlled trial. *Eur J Orthop Surg Traumatol* 2015;25:799-806.

9. Lyons MC, MacDonald SJ, Somerville LE, Naudie DD, McCalden RW. Unicompartmental versus total knee arthroplasty database analysis: is there a winner? *Clin Orthop Relat Res* 2012;470:84-90.

10. Koskinen E, Eskelinen A, Paavolainen P, Pulkkinen P, Remes V. Comparison of survival and cost-effectiveness between unicondylar arthroplasty and total knee arthroplasty in patients with primary osteoarthritis: a follow-up study of 50,493 knee replacements from the Finnish Arthroplasty Register. *Acta Orthop* 2008;79:499-507.

11. Murray DW, Liddle A, Dodd CA, Pandit H. Unicompartmental knee arthroplasty: is the glass half full or half empty? *Bone Joint J* 2015;97-b:3-8.

12. Pearse AJ, Hooper GJ, Rothwell A, Frampton C. Survival and functional outcome after revision of a unicompartmental to a total knee replacement: the New Zealand National Joint Registry. *J Bone Joint Surg Br* 2010;92:508-12.

13. Wynn Jones H, Chan W, Harrison T, Smith TO, Masonda P, Walton NP. Revision of medial Oxford unicompartmental knee replacement to a total knee replacement: similar to a primary? *Knee* 2012;19:339-43.

14. Hooper N, Snell D, Hooper G, Maxwell R, Frampton C. The five-year radiological results of the uncemented Oxford medial compartment knee arthroplasty. *Bone Joint J* 2015;97-B:1358-63.

15. Thienpont E. Conversion of a unicompartmental knee arthroplasty to a total knee arthroplasty: can we achieve a primary result? *Bone Joint J* 2017;99-b:65-9.

16. Newman J, Pydisetty R, Ackroyd C. Unicompartmental or total knee replacement: the 15-year results of a prospective randomised controlled trial. *J Bone Joint Surg Br* 2009;91:52-7.

17. Murray D, Goodfellow J, O'Connor J. The Oxford medial unicompartmental arthroplasty: a ten-year survival study. *J Bone Joint Surg Br* 1998;80:983-9.

18. Felts E, Parratte S, Pauly V, Aubaniac J, Argenson J. Function and quality of life following medial unicompartmental knee arthroplasty in patients 60 years of age or younger. *Orthop Traumatol Surg Res* 2010;96:861-7.

19. Noticewala M, Geller J, Lee J, Macaulay W. Unicompartmental knee arthroplasty relieves pain and improves function more than total knee arthroplasty. *J Arthroplasty* 2012;27:99-105.

20. Wiik AV, Aqil A, Tankard S, Amis AA, Cobb JP. Downhill walking gait pattern discriminates between types of knee arthroplasty: improved physiological knee functionality in UKA versus TKA. *Knee Surg Sports Traumatol Arthrosc* 2015;23:1748-55.

21. Lewold S, Robertsson O, Knutson K, Lidgren L. Revision of unicompartmental knee arthroplasty: outcome in 1,135 cases from the Swedish Knee Arthroplasty study. *Acta Orthop Scand* 1998;69:469-74.

22. Brown NM, Sheth NP, Davis K, Berend ME, Lombardi AV, Berend KR, Della Valle CJ. Total knee arthroplasty has higher postoperative morbidity than unicompartmental knee arthroplasty: a multicenter analysis. *J Arthroplasty* 2012;27:86-90.

23. Liddle AD, Judge A, Pandit H, Murray DW. Adverse outcomes after total and unicompartmental knee replacement in 101,330 matched patients: a study of data from the National Joint Registry for England and Wales. *Lancet* 2014;18:1437-45.

24. Peersman G, Jak W, Vandenlangenbergh T, Jans C, Cartier P, Fennema P. Cost-effectiveness of unicondylar versus total knee arthroplasty: a Markov model analysis. *Knee* 2014;21 Suppl 1:S37-42.

25. Ghomrawi HM, Eggman AA, Pearle AD. Effect of age on cost-effectiveness of unicompartmental knee arthroplasty compared with total knee arthroplasty in the u.s. *J Bone Joint Surg Am* 2015;97:396-402.

26. Soohoo N, Sharifi H, Kominski G, Lieberman J. Cost-effectiveness analysis of unicompartmental knee arthroplasty as an alternative to total knee arthroplasty for unicompartmental osteoarthritis. *J Bone Joint Surg Am* 2006;88:1975-82.

27. Peersman G, Taeymans K, Jans C, Vuylsteke P, Fennema P, Heyse T. Malrotation deformities of the lower extremity and implications on total knee arthroplasty: a narrative review. *Arch Orthop Trauma Surg* 2016;136:1491-8.

28. Baker PN, Petheram T, Jameson SS, Avery PJ, Reed MR, Gregg PJ, Deehan DJ. Comparison of patient-reported outcome measures following total and unicondylar knee replacement. *J Bone Joint Surg Br* 2012;94:919-27.

29. Behrend H, Giesinger K, Giesinger JM, Kuster MS. The "forgotten joint" as the ultimate goal in joint arthroplasty: validation of a new patient-reported outcome measure. *J Arthroplasty* 2012;27:430-6 e1.

30. Thienpont E, Opsomer G, Koninckx A, Houssiau F. Joint awareness in different types of knee arthroplasty evaluated with the Forgotten Joint score. *J Arthroplasty* 2014;29:48-51.

31. Noble PC, Conditt MA, Cook KF, Mathis KB. The John Insall Award: Patient expectations affect satisfaction with total knee arthroplasty. *Clin Orthop Relat Res* 2006;452:35-43.

32. Perruccio AV, Stefan Lohmander L, Canizares M, Tennant A, Hawker GA, Conaghan PG, Roos EM, Jordan JM, Maillefert JF, Dougados M, Davis AM. The development of a short measure of physical function for knee OA KOOS-

Physical Function Shortform (KOOS-PS) - an OARSI/OMERACT initiative. *Osteoarthritis Cartilage* 2008;16:542-50.

33. Rabin R, de Charro F. EQ-5D: a measure of health status from the EuroQol Group. *Ann Med* 2001;33:337-43.

34. Verbeke G, Molenberghs G. *Linear Mixed Models for Longitudinal Data.* New York: Springer, 2000.

35. Zuiderbaan HA, van der List JP, Khamaisy S, Nawabi DH, Thein R, Ishmael C, Paul S, Pearle AD. Unicompartmental knee arthroplasty versus total knee arthroplasty: Which type of artificial joint do patients forget? *Knee Surg Sports Traumatol Arthrosc* 2015.

36. Lygre SH, Espehaug B, Havelin LI, Furnes O, Vollset SE. Pain and function in patients after primary unicompartmental and total knee arthroplasty. *J Bone Joint Surg Am* 2010;92:2890-7.

37. Siman H, Kamath AF, Carrillo N, Harmsen WS, Pagnano MW, Sierra RJ. Unicompartmental 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.

38. Liddle AD, Pandit H, Judge A, Murray DW. Effect of Surgical Caseload on Revision Rate Following Total and Unicompartmental Knee Replacement. *J Bone Joint Surg Am* 2016;98:1-8.

39. Hamilton TW, Rizkalla J, Kontochristos L, Marks B, Mellon S, Dodd CAF, Pandit HG, Murray DW. The interaction of caseload and usage in determining outcomes of unicompartmental knee arthroplasty: A meta-analysis. *J Arthroplasty* 2017.

Table 1 Baseline characteristics of the study cohorts

	TKA (n = 62)	UKA (n = 57)	p-value
Age	66.5 ± 9.4	64.0 ± 9.9	0.168
Women (%)	42 (67.7)	30 (47.3)	0.092
KOOS-PS	61.1 (57.8 – 64.5)	56.6 (53.9 – 59.4)	0.041
EQ-5D	0.35 (0.32 – 0.39)	0.34 (0.30 – 0.38)	0.660
KS	45.4 (43.4 – 47.4)	41.1 (38.0 – 44.2)	0.025
FS	38.0 (35.6 – 44.4)	37.8 (33.4 – 42.2)	0.503

Table 2 Number of patient assessments and missed visits

	TKA		UKA	
	N assessed	Missed visits	N assessed	Missed visits
Included	62		57	
2 weeks	59	3	57	0
6 weeks	58	4	56	1
12 weeks	57	5	55	2
6 months	57	5	57	0
1 year	58	4	54	3

Table XYZ Postoperative outcome

		TKA	UKA	p-value
FJS	2 weeks	0.91 (-5.4 – 7.2)	6.2 (-2.3 – 14.6)	0.326
	6 weeks	7.5 (3.8 – 11.2)	18.8 (14.6 – 23.1)	< 0.001
	12 weeks	19.1 (14.9 – 23.3)	48.2 (43.1 – 53.2)	< 0.001
	6 months	39.6 (34.7 – 44.4)	79.1 (73.2 – 84.9)	< 0.001
	1 year	54.8 (49.3 – 60.2)	91.3 (85.3 – 97.3)	< 0.001
KOOS-PS	2 weeks	72.7 (66.6 – 78.8)	44.7 (38.2 – 66.6)	< 0.001
	6 weeks	61.5 (56.4 – 66.6)	44.8 (41.4 – 48.2)	< 0.001

		TKA	UKA	p-value
	12 weeks	48.6 (43.5 – 53.7)	30.5 (27.1 – 34.0)	< 0.001
	6 months	38.4 (33.2 – 43.6)	14.0 (10.5 – 17.4)	< 0.001
	1 year	28.2 (22.7 – 33.7)	5.3 (1.8 – 8.8)	< 0.001
EQ-5D	2 weeks	0.30 (0.23 – 0.37)	0.54 (0.46 – 0.62)	0.001
	6 weeks	0.40 (0.34 – 0.46)	0.57 (0.52 – 0.61)	< 0.001
	12 weeks	0.55 (0.49 – 0.61)	0.71 (0.66 – 0.76)	< 0.001
	6 months	0.69 (0.62 – 0.76)	0.83 (0.79 – 0.89)	0.009
	1 year	0.80 (0.72 – 0.87)	0.92 (0.87 – 0.97)	0.074
KS	2 weeks	36.7 (30.7 – 42.8)	50.5 (44.6 – 56.3)	< 0.001
	6 weeks	38.7 (33.6 – 57.7)	54.2 (50.8 – 57.7)	< 0.001
	12 weeks	57.2 (52.2 – 62.3)	70.9 (67.6 – 74.3)	< 0.001
	6 months	74.3 (68.6 – 80.0)	89.2 (85.6 – 92.8)	0.001
	1 year	87.3 (81.1 – 93.4)	96.0 (92.4 – 99.7)	0.007
FS	2 weeks	16.9 (8.2 – 25.6)	35.7 (25.9 – 45.5)	0.005
	6 weeks	26.9 (20.2 – 33.6)	43.1 (39.1 – 48.9)	< 0.001
	12 weeks	45.0 (38.5- 51.6)	66.5 (61.5 – 71.5)	< 0.001
	6 months	66.1 (59.3 – 72.8)	86.1 (81.1 – 91.1)	< 0.001
	1 year	79.0 (72.0 – 85.9)	93.1 (88.0 – 98.1)	0.001

Figure 2 Postoperative Forgotten Joint Score