Does the Surgeon-reported Outcome Correlate with Patient-reported Outcome after Total Knee Arthroplasty? A Cohort Study

Abstract

Background: Total knee arthroplasty (TKA) has been proved to be a successful and cost-effective treatment for improving pain and function in patients with knee arthritis. Total knee arthroplasty (TKA) is one of the most common orthopaedic surgeries performed worldwide and advancement in surgical techniques and prosthetic designs have improved the patient outcomes. However, concerns and priorities of patients and surgeons relating to joint replacement may differ. **Materials and Methods:** 306 TKAs in 223 patients were evaluated for functional outcome using surgeon reported American Knee Society Knee Score (KS)/Functional Score (FS) and patient-reported Oxford Knee Score (OKS). We have also assessed the correlation between FS and OKS at midterm follow up. **Results:** The mean preoperative KS, FS, and OKS in 223 patients were 42.76, 42.4, and 38.84 and the midterm mean KS, FS, and OKS were 84.29, 73.40, and 30.26, respectively. There was a statistically significant improvement in the KS, FS, and OKS at midterm follow up in Category A (CAT A) (bilateral TKA or unilateral with asymptomatic contralateral knee), CAT B (unilateral TKA with symptomatic other knee) and CAT C (inflammatory arthritis). Overall, the correlation between the midterm FS and OKS was fair. However, in CAT A and CAT B, there was no significant correlation between FS and OKS, but CAT C had a strong correlation. There was a statistically significant improvement in the KS, FS, and OKS when midterm follow up scores were compared with preoperative scores. However, no significant correlation between the American knee society FS and OKS in osteoarthritic patients at midterm follow up signifies acceptable outcome may vary between patients and physicians. **Conclusion:** All patients should be counseled preoperatively to assess their expectations and sensitize them to information regarding the expected functional outcome following TKA in their cultural context.

Keywords: *Americal knee society knee score, arthroplasty, functional score, Indian, knee, osteoarthritis, Oxford knee score*

MeSH terms: *Prosthesis implantation; arthroplasty; replacement, knee; outcome and process assessment (health care)*

Sivashanmugam Raju[1,2], Karthikeyan Chinnakkannu[3], Ashok Selvaraj[4], Balasubramanian Balakumar[5], Mohan K Puttaswamy[6], PV Jayasankar[2]

[1]Wake Forest University Baptist Medical Center, Department of Orthopedics and Sports Medicine, Medical Center Boulevard, Winston Salem, NC, USA, [2]Department of Orthopaedics Sundaram Medical Foundation Dr. Rangarajan Memorial Hospital, [3]Department of Orthopaedics, Shri Sathya Sai Medical Medical College and Research Institute, Kanchipuram, Tamil Nadu, [4]Department of Orthopaedics, MIOT Hospitals, Chennai, [5]Fellow in Paediatric Orthopaedics, Sheffield Children's Hospital, Western Bank, UK, [6]Consultant Orthopaedic Surgeon, IORI Clinic, Bengaluru, Karnataka, India

Address for correspondence:
Dr. Sivashanmugam Raju,
Department of Orthopedics,
Sundaram Medical Foundation Dr. Rangarajan Memorial Hospital, Shanthi Colony, Anna Nagar, Chennai - 600 040, Tamil Nadu, India.
E-mail: drsivashanmugam.raju@gmail.com

Introduction

Total knee arthroplasty (TKA) is one of the most common orthopaedic surgeries performed worldwide and advancement in surgical techniques and prosthetic designs have improved the patient outcomes.[1] There has been an exponential increase in the TKAs performed in India in the past decade, and further rise is projected.[2]

TKA is not only a successful and cost-effective treatment option for improving pain and function in patients with arthritis but it also improves the overall quality of life.[3-6] The primary focus of clinical outcomes had been based on implant longevity and objective outcomes such as range of motion, knee stability, and radiographic results. However, patient satisfaction and pain relief gained, is of utmost importance in evaluating the improvement of quality of life by a joint arthroplasty.[7,8] The patients and surgeons may have different concerns and priorities regarding the outcome.[9] Hence, there is a growing trend towards the use of patient-reported outcome tools in the evaluation after TKA including assessment of satisfaction.[6]

There are several validated patient-rated subjective outcome measures like generic 36-Item Short-Form Health Survey (SF-36),[10,11] disease-specific Western Ontario and McMaster University Osteoarthritis Index (WOMAC),[12] and joint-specific Oxford Knee Score (OKS).[10] The American Knee Society Score (KS)/Functional Score (FS)[13] is an objective outcome score measured by the clinician. The American knee society

and Oxford questionnaires vary from each other by the method of evaluation and susceptibility to variation due to patient comorbidities. The American knee society KS/FS is scored by the clinician and not affected by comorbidities.[14,15] Oxford questionnaires are patient reported and affected by comorbidities and walking ability. The American knee society KS/FS and the OKS offer independent benefits when evaluating patient outcome after TKA. Both scoring systems' reliability and validity have been proved and are commonly used.[15,16] Using them for outcome evaluation provide a more comprehensive picture of the patient's true level of function and indirectly patient satisfaction.[17]

Patient dissatisfaction rate following TKA ranges from 11% to 20%.[16,18-21] The reasons for patient dissatisfaction is multifactorial. Various factors implicated in patient dissatisfaction are female gender,[16] younger age,[16] older age,[19,20] rheumatoid arthritis,[16,22] associated back pain,[23] pessimistic personality trait,[24] and poor mental health.[20,25] However, patients' expectation before surgery, pain relief, comorbidity, the functional activity, and overall improvement in lifestyle appear to be the most significant predictors of satisfaction in the literature.[18] The aim of our study was to assess the midterm functional outcomes of TKA in the Indian population by comparing surgeon reported American knee society KS and FS with patient-reported OKS.

Materials and Methods

This is a cohort study conducted at our institute after the Institutional Review Board approval. We have reviewed 364 TKAs in 257 patients performed between 2002 and 2007 by a single surgeon (PVJ).

All the patients were called for follow up and their charts were reviewed for preoperative scores. Out of 257 patients, 10 patients (18 TKAs) had died due to unrelated causes and 24 patients (40 TKAs) did not turn up. The remaining 306 knees in 223 patients were available for outpatient follow up. The average follow up period was 6.5 years (range 4–10 years). There were 192 females and 31 males in our study. The mean age at the time of surgery was 63 years (range 34–87 years); mean age was 62 years for females (range 34–86 years) and 68 years for males (range 42–87 years). Preoperative diagnosis was osteoarthritis (OA) in 185 patients and in the remaining 38 patients, it was rheumatoid arthritis. For the patients with OA, the mean age was 64 years (range 47–87 years) and for the inflammatory arthritis, it was 53 years (range 34–72 years).

A medial para-patellar approach was used and the patella was not resurfaced. Implant fixation was carried out with cement and 246 of them were cruciate substituting (PFC sigma CS, Depuy, USA) and the remaining 60 were cruciate retaining (PFC sigma CR, Depuy, USA) TKAs.

All patients were assessed for contractures around the knee, extensor lag, instability in flexion and extension and range of motion in their final follow up in the clinic. Patients

were evaluated for functional outcome using the American knee society KS/FS (0–100 each) by the senior resident and OKS (the best score is 12 and the worst is 60)[10] was completed by the patient. Along with this, we also added three questions to our OA group that were relevant to our patients and separately collected by our nurse [Table 1].

Park *et al.*,[26] stated that when performing a statistical analysis, the statistical independence should be considered, particularly in studies involving bilateral cases. If a data dependency within a subject is not considered, studies involving bilateral cases can bias the results. Apart from that patients with RA may have involvement of other joints which may affect the function and overall outcome. Hence, we have divided our study population into three categories. Category A (CAT A) is bilateral TKA or unilateral with asymptomatic contralateral knee, CAT B is unilateral TKA with symptomatic other knee and CAT C is inflammatory arthritis (rheumatoid arthritis). Although radiologically many OA patients had arthritis on both sides, clinically, they were pain-free and functional.

Out of the 223 patients (306 TKAs), 111 patients (172 TKAs) were CAT A, 74 patients (74 TKAs) were CAT B and 38 patients (57 TKAs) were CAT C. TKA was offered only to the patients with stage IV arthritis, including CAT B patients with bilateral symptoms. All the bilateral cases were staged or sequential and more symptomatic side with stage IV arthritis was operated first and symptomatic but without advanced arthritis on radiographs (CAT B) were treated conservatively. For all the patients preoperative and midterm follow up American knee society KS and FS were obtained along with OKS. All the data obtained was analyzed statistically using SPSS software version 22 (IBM corp, Armonk, NY, USA).

The preoperative KS, FS, and OKS were compared with the midterm follow up scores by paired sample *t*-tests. We have calculated a 95% confidence interval and a *P* value for each difference, a 95% confidence interval that does not include zero is approximately equivalent to a *P* = 0.05.

Pearson correlation coefficient was used to assess the correlation between FS and OKS values derived at the mid-term follow up. We considered the Pearson correlation to be high (strong) if it was >0.7, moderate if it was 0.4–0.7, and fair (weak) if it was <0.4.

Results

The mean preoperative and midterm followup KS, FS, and OKS for 223 patients are shown in Figure 1. There was a significant improvement in the KS, FS, and OKS when follow up scores were compared with preoperative scores.

Table 1: Our questionnaire

1. Are you able to sit on the floor? - Yes/No
2. Are you able to squat? - Yes/No
3. Are they really bothered about it? Yes/No

The mean preoperative and mid-term follow up KS, FS, and OKS for all the three categories are depicted in Figure 2. There was a statistically significant improvement ($P < 0.001$) between preoperative and midterm values in all the three categories [Table 2] even though the overall improvement was slightly less in CAT C.

The midterm mean KS, FS, and OKS were 84.29, 73.40, and 30.26, respectively [Figure 1]. In CAT A (bilateral TKA or unilateral with asymptomatic contralateral knee)
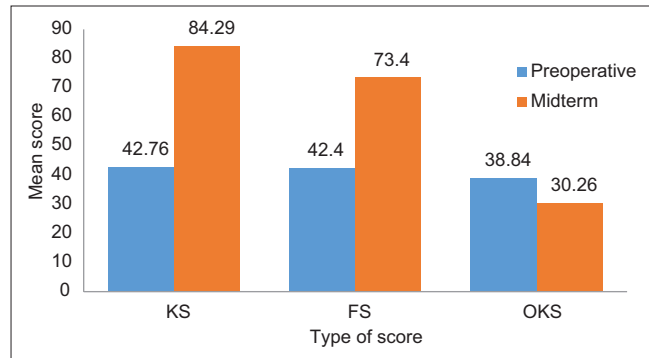

Figure 1: A bar diagram showing the preoperative and midterm follow up American Knee Society Knee Score (KS), Functional Score (FS) and Oxford Knee Score (OKS) (Note: In OKS, high score implies poor function and vice versa)
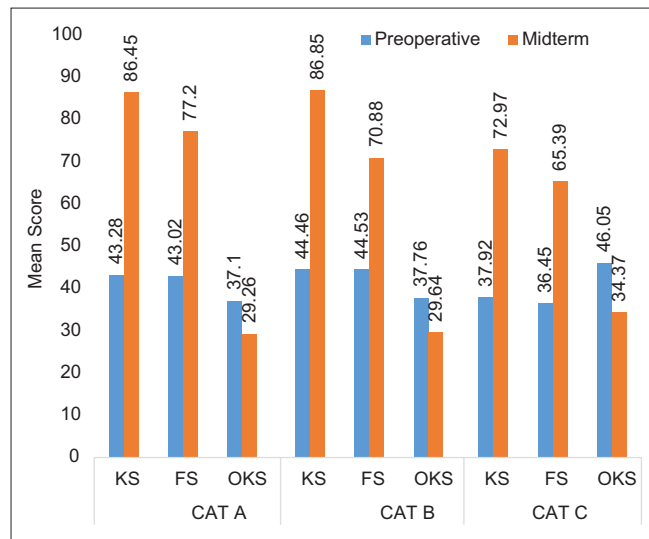

Figure 2: A bar diagram showing the preoperative and midterm follow up scores for the three Categories A, B and C. (Note: In OKS, high score implies poor function and vice versa)

($n = 111$), the mean KS and FS were 86.45 and 77.2 and the OKS was 29.26. In CAT B (unilateral TKA with symptomatic other knee) ($n = 74$), the mean KS, FS, and OKS were 86.85, 70.88, and 29.64, respectively. In CAT C (inflammatory arthritis) ($n = 38$), the mean KS was 72.97 with the FS of 65.39 as against the OKS of 34.37 [Figure 2]. Overall, the correlation between the midterm FS and OKS was fair ($r = -0.369$, $P < 0.0001$) [Table 3]. In CAT A and CAT B, there were no statistically significant correlation between FS and OKS ($r = -0.146$; $P = 0.132$, and $r = 0.032$; $P = 0.784$, respectively), but in CAT C, they had strong negative correlation ($r = -0.848$; $P < 0.0001$) [Figures 3-5]. The negative correlation between FS and OKS is because OKS is scored from best to worst while FS scored from worst to best.

There was a definite difference between surgeon reported FS and patient-reported OKS in OA patients (Cat A and Cat B). When answering for our own questionnaire 95% of them reported that they have never attempted squatting and floor sitting, but interestingly 72% were least bothered about that [Table 4].

Discussion

In the recent times, there has been an increased interest in assessment of quality of life improvement and patient satisfaction following TKA. There are many validated scoring systems available to assess them and all of them have their own advantages and disadvantages. There are hardly any studies from India where they have looked at satisfaction from a patient's perspective. We have compared surgeon measured functional outcome score with patient-reported outcome score using the two commonly used scoring systems.

We have used OKS because it is easy to understand and translate into our local language. Since the majority of our patients had sedentary lifestyle, we felt that OKS had relevance in comparison to other questionnaires including SF-36 which had redundant questions from an Indian perspective. Moreover, OKS has been proved to be more comprehensive and it has been routinely used in countries like the United Kingdom.[16]

We divided the patients into three categories with the thought that symptomatic non-operated knee would have a significant bearing on the functional outcome and would skew the overall analysis of functional outcome.

Table 2: Overall preoperative and midterm scores							
Type of score	Period	*n*	Minimum	Maximum	Mean	SD	*P*
KS	Preoperative	223	18.00	57.00	42.76	8.78	<0.0001
	Midterm	223	45.00	97.00	84.29	10.82	
FS	Preoperative	223	20.00	50.00	42.40	7.44	<0.0001
	Midterm	223	50.00	90.00	73.40	8.37	
OKS	Preoperative	223	30.00	58.00	38.84	6.55	<0.0001
	Midterm	223	18.00	48.00	30.26	7.20	

KS=Knee score, FS=Functional score, SD=Standard deviation, OKS=Oxford knee score

Table 3: Pearson correlation between American society functional score (FS) and Oxford knee score (OKS)

Category	n	Correlation coefficient	P	Correlation
Total patients	223	−0.369	<0.0001	Fair; significant
A	111	−0.146	0.132	Poor; not significant
B	74	−0.032	0.784	Poor; not significant
C	38	−0.848	<0.0001	Strong; significant

Table 4: Responses to our questionnaire

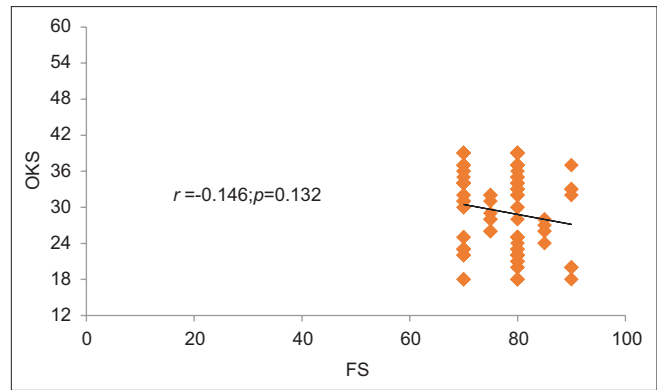| Question	Yes (%)	No (%)
Sitting on floor	5	95
Squatting	5	95
Are they really bothered?	28	72

Figure 3: Scatter plot depicting no significant correlation between midterm FS and OKS in CAT A
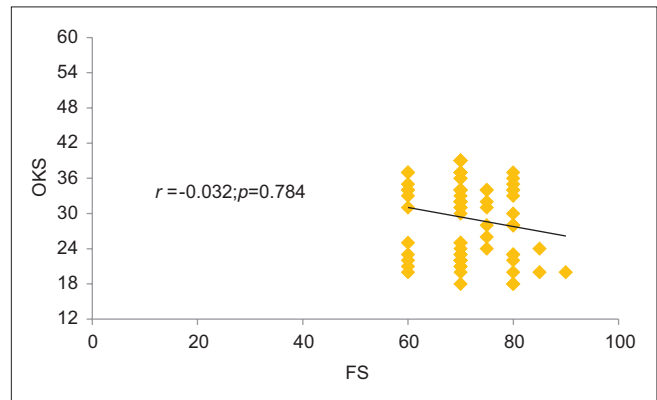

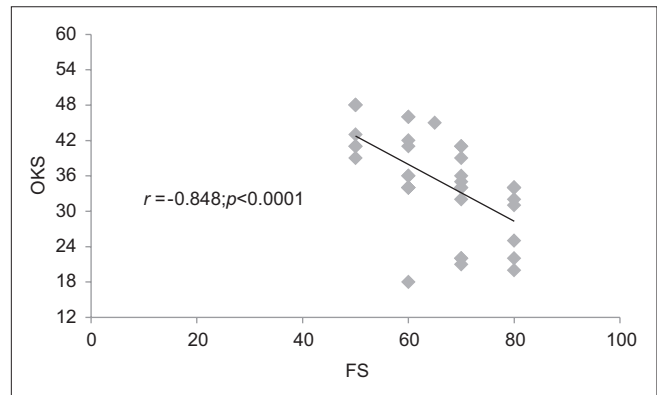Figure 4: Scatter plot depicting no significant correlation between midterm FS and OKS in CAT B

Figure 5: Scatter plot depicting a strong correlation between midterm FS and OKS in CAT C

However, our study shows that KS, FS, and OKS in CAT A and CAT B were similar. Both KS and FS has shown significant improvement in all the categories, but the American knee society score (KS/FS) is independent of patients overall health status and this should be cautiously interpreted. OKS is likely to affected by patient age, body mass index, and walking distance if comorbidities exist.[13,27]

In our study, American knee society (KS/FS) and OKS questionnaires were completed at the patient's clinical visit, rather than a postal questionnaire and thus, we had 100% compliance with the questionnaires. We were also able to compare the OKS and FS scores because the data were collected during same clinical visit ruling out any bias due to difference in symptoms or disease activity in case of RA over different periods.

There was a statistically significant improvement in the KS, FS, and OKS when follow up scores were compared with preoperative scores (*P* < 0.001). Overall (*n* = 223) mean midterm clinical score (KS) and functional score (FS) were 84.29 and 73.40 as against the preoperative KS and FS of 42.76 and 42.40, respectively. The improvement between pre-op and midterm values in all three categories is statistically significant (*P* < 0.001).

Even though, American knee society KS and FS have improved at midterm as compared to the preoperative scores in all the categories, the increase was more in CAT A and CAT B as compared to CAT C. This indicates that the unilateral or bilateral involvement had no bearing on the outcome scores and the underlying disease pathology like rheumatoid or OA has significant effect on the functional outcome scores. CAT C patients had inferior functional outcome score compared to OA group.

The overall correlation between the FS and OKS was fair (Pearson correlation coefficient *r* = −0.369). In CAT A and CAT B, there was no significant correlation (*P* > 0.05), but in CAT C, they had a strong correlation [Figures 3-5]. This suggests that there is a definite difference between surgeon reported FS and patient-reported OKS in OA patients. The difference in correlation means that important points of patient satisfaction were not being addressed in objective questionnaires like the American knee society KS/FS and surgeon interpreted outcomes might not necessarily translate into a good functional outcome. Patients often have higher expectations of relief from pain when compared to disability. Hence, there is a stronger impact of pain on the level of satisfaction than functional impairment depending on patient expectations.[16,18]

A total of 60 patients in the CAT A had sequential bilateral replacements, and the surgeries were spaced between 6 months to 5 years. This indirectly explains that they had pain relief good enough to have the other side done. Medalla *et al.*, compared patient reported OKS and American knee society KS/FS at medium-term follow up after TKAs and found a good correlation between scores at 2 years follow up which diminished at 5 and 10 years.[28] In our study, we found there was no significant correlation between the OKS and American knee society score (FS) at midterm follow up (6.5 years) in CAT A and B (OA group). This may partially explain the poor correlation between the scores at midterm follow up in our study as the scores tend to decrease after 5 years. In CAT C (rheumatoid group), there was a strong correlation of FS with OKS in rheumatoid knee patients and it may be attributed to multiple joint involvement and low functional expectations of rheumatoid patients. This concurs with the study by Bullens *et al.*, but they had used visual analog scale system for patient satisfaction.[22]

We do not think surgical factors as a contributing factor for this difference because the senior author (PVJ) is an experienced surgeon and he had performed all the surgeries in standardized uniform technique with the residents. This factor negates any possible bias from technique related issues and any other confounding factors as would happen if multiple surgeons had participated in the study. Moreover, the American knee society KS/FS showed statistically significant improvement postoperatively which supports this. Based on the OKS score in OA group (Cat A and B), with regard to daily activities, >75% of the patients had difficulty getting into the car at one point or other. Almost 50% of them had stopped using public transport (bus and train) and would need help to use them. One-fourth of these patients needed some walking aid to get into the vehicle. More than 60% of the patients had difficulty in climbing down the flight of stairs without any railing. Based on our questionnaire, 95% of them have never attempted squatting and floor sitting in the OA group however, 72% were least bothered about that [Table 4].

Pre surgical patient expectation is an important factor in the level of satisfaction after surgery.[18,19] Media exposure, inadequate information coupled with poor understanding due to language barrier and cultural beliefs, are other factors that could have possibly influenced the expectations of the outcome.

The drawbacks of this study are, it is a small cohort from one geographic area and from a single private hospital catering to a specific population (affluent) and does not represent a wider section of the population. It should be noted that low socioeconomic status is associated with poor OKS and dissatisfaction following total knee arthroplasty (TKA).[29] It will be interesting to study the low socioeconomic to middle-class patients who depend on their knees for the basic needs of their life. We do not have morbidity data including BMI and preoperative deformity however any confounding factors would have been reflected in the OKS. We also did not have any follow up score in between the preoperative score and the most recent follow up hence we could not analyse the trend over the years. Larger number of patients with different mix and longer duration of follow up would enlighten the patient expectations better. However, our study is the first of the sort which looked into the patient reported outcome in the Indian population and we have calculated all scores (KS, FS and OKS) at same follow up visit thus excluding the bias that may occur due to difference in manifestation of symptoms.

Patient satisfaction is an essential indicator of success of any surgery. Results of TKA should be assessed not only by clinical and radiological parameters but also by patient-oriented functional outcome tools. In a concept review by Graham *et al.*[30] in orthopedic surgery the importance of patient-reported outcome tools and their necessities is reiterated. Recent scoring systems including the American knee society KS/FS have incorporated this and proper preoperative counselling regarding the expected outcome would go a long way in improving the patient's perception of the results.

Conclusion

There was a statistically significant improvement in the KS, FS, and OKS when midterm follow up scores were compared with preoperative scores. However, no significant correlation between the American knee society FS and OKS in OA patients at midterm follow up signifies acceptable outcome may vary between patients and physicians. More research is necessary to assess the patient satisfaction after TKR with appropriate scoring modalities specific to the population. All patients should be counseled preoperatively to assess their expectations and sensitize them to information regarding expected functional outcome following TKA in their cultural context.

Declaration of patient consent

The authors certify that they have obtained all appropriate patients' consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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