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Correlations Between Functional Knee Outcomes and Health-Related Quality of Life After Total Knee Arthroplasty in an Asian Population

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ABSTRACT

Background: Current literature evaluating postoperative outcomes after total knee arthroplasty for osteoarthritis in the Asian population is sparse. We aimed to evaluate correlations between improvements in knee outcomes vs changes in generic health-related quality of life.
Methods: Postoperative outcomes were collected prospectively for 369 patients and compared at a 2-year follow-up using Short-Form 36 (SF-36), Knee Society Score (KSS), and Oxford Knee Score (OKS). The Spearman correlation coefficient was used to evaluate the strength of correlation between changes in knee scores (KSS and OKS) vs changes in each domain of the SF-36 scores.
Results: All parameters achieved statistically significant improvements ($P < .05$) in postoperative scores at 2-year follow-up with the exception of general health ($P = .221$) component of SF-36. For KSS knee score, there was low correlation with bodily pain (0.32). For KSS function score, there was moderate correlation with physical functioning (0.57) and low correlation with role physical (0.31) and social functioning (0.36). For OKS, there was moderate correlation with physical functioning (0.61) and social functioning (0.54) and low correlation with role physical (0.38) and bodily pain (0.50). All other parameters of SF-36 showed little correlation (<0.3).
Conclusion: Improvements in knee-specific outcomes (KSS and OKS) after total knee arthroplasty correlate well with improvements in physical domains of health-related quality of life (SF-36) but poorly with the mental and social health domains.

Osteoarthritis (OA) of the knee is a common cause of pain and functional impairment worldwide with increased morbidity and utilization of health care resources [1,2]. Total knee arthroplasty (TKA) is an effective surgical treatment option with substantial improvements in quality of life and function [3]. Postoperative outcomes after TKA can be evaluated using various assessment tools [4]. The Short-Form 36 (SF-36) [5], Oxford Knee Score (OKS) [6], and Knee Society Score (KSS) [7] are used locally at our center. The OKS and KSS are disease-specific tools sensitive to improvements in knee symptoms, whereas the SF-36 is a global tool assessing the general health-related quality of life (HRQoL) of the patient [8].

Patient-reported outcome measures have become increasingly important in recent years to assess outcomes after TKA [9]. However, there are inherent difficulties present in assessing patient-reported outcome measures because it is affected by the wide range of domains that determine HRQoL [10,11] which itself is subject to a number of biases. Limitations may exist as to how comprehensive an HRQoL questionnaire can be, giving further difficulties in providing an objective and reliable assessment. Hence, it is common in clinical practice to include both HRQoL and knee-specific outcomes in the holistic assessment of the patient.

There are some studies conducted in the Western population that have examined the correlation between HRQoL and knee-specific outcomes, but the results have been variable and conflicting [11,12]. In addition, the current literature contains little information for Asian patients, who may have different lifestyles

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and expectations concerning the performance of TKA [13,14]. The need to kneel for cultural and religious reasons in Asians may also result in different level of physical demands on the knee [15,16]. Current evidence in comparing a direct correlation between knee outcomes and HRQoL after TKA is limited, and there is a pressing need to obtain more empirical evidence on the utility and strength of their correlation. Therefore, the objectives of this study were to evaluate the correlation between improvements in knee-specific scores (OKS and KSS) vs changes in HRQoL score (SF-36) after TKA.

Methods

Study Design

This study was approved by our institutional review board with a waiver of informed patient consent because of the nature of the study and use of nonidentifiable patient data. A review of prospectively collected data of 369 patients who underwent elective TKA by a single surgeon between 2006 and 2010 from a high-volume tertiary institution was performed. The inclusion criteria consisted of a diagnosis of OA, any degree of genu varum deformity, any degree of fixed flexion deformity, and less than 15 degrees of genu valgum deformity. The exclusion criteria consisted of previous knee surgery that required the removal of metallic implants, revision TKA, active joint infection, postoperative periprosthetic fractures, or bilateral TKA. All patients in this study had a minimum follow-up period of 2 years.

Perioperative Details

All patients underwent conventional TKA by a single surgeon. The surgical technique used by the senior author has been described previously [16,17]. All patients received standardized postoperative care. These included appropriate analgesia, mechanical prophylaxis against venous thromboembolic events with pneumatic calf pumps and thromboembolic deterrent stockings, continuous passive motion from first postoperative day, and daily physiotherapy assessment. All patients began ambulation on the second postoperative day. None of the patients received oral chemoprophylaxis against venous thromboembolic events because a previous study originating from our institution showed a very low incidence of venous thromboembolic events in patients undergoing TKA without prophylactic anticoagulation [17]. Patients were discharged to their homes when they were able to ambulate a distance of 20 m with or without an aid and climb stairs, when required. Patients who were assessed to require additional rehabilitation or assistance were referred to the community hospital. Patients were followed up by the surgeon at the outpatient setting at 1 month, 3 months, 6 months, and yearly thereafter. Individual scores of the SF-36 questionnaire, OKS, and KSS were collected prospectively from the patients at 6-month and 2-year follow-up.

Outcomes and Questionnaires

Postoperative TKA outcome scores were collected prospectively in all patients by our Orthopedic Diagnostic Centre at 6 months and 2 years postoperatively. This was conducted by a physiotherapist who sat with the patients and went through each of the questions in the relevant questionnaires in the native language of the patient.

The SF-36 has 8 subscales that measure physical functioning (PF), role limitations due to physical problems (RP), bodily pain (BP), general health (GH), vitality, social functioning (SF), role limitations due to emotional problems (RE), and mental health (MH) [5]. The subscale scales are used to produce a mental component summary and physical component summary, normalized to a scale ranging from 0 to 100, with a higher score reflecting a better health status. The SF-36 has been validated as an overall health status measurement tool in our country despite the diverse population [18].

The OKS has 12 items assessing an individual's pain and physical disability with an overall score ranging from 12 (no pain or limitation) to 60 (severe pain or limitation) [6].

The KSS consists of 2 scores, a knee score (KSKS) and a function (KSFS) score, both ranging from 0 (worst health or functioning) to 100 (best health or functioning) [7].

Statistical Analyses

The Spearman rank correlation coefficient was used to compare the strength of correlation between changes in knee scores (KSS and OKS) vs changes in each domain of the SF-36 scores. The categorical breakdowns and interpretations in strength of correlation were very high (0.9-1.0), high (0.7-0.9), moderate (0.5-0.7), low (0.3-0.5), and little/nil (<0.3). Paired *t* tests were used to compare preoperative and postoperative scores at 2 years with a *P* value of <.05 considered significant. All statistical analyses were performed using Statistical Package for the Social Sciences, version 22.0 (SPSS Inc, Chicago, IL).

Results

Patient Demographics

A total of 397 patients underwent TKA. The clinical data of the 369 patients included in the study are reported in Table 1. The remaining 28 patients did not meet the inclusion criteria and were excluded. The mean age was 66 years (range, 42-83 years), and the mean body mass index (BMI) was 28.2 ± 5.7. Females make up the majority at 296 (80%), as compared to males at 73 (20%).

Comparison of Postoperative Outcomes at 2-Year Follow-Up

Changes in mean outcome scores were compared preoperatively and at 2-years postoperatively (Table 2). All parameters show statistically significant improvement ($P < .05$) with the exception of GH component of SF-36 achieving only a mean difference of 2 points ($P = .221$). In addition, it is noted that even though statistical

Table 1
Patient Demographics and Operative Details.

Characteristics	Total = 369
Demographics	
Mean age (range)	66 (42-83)
Gender	
Male	73 (20%)
Female	296 (80%)
Race	
Chinese	328 (89%)
Malay	21 (6%)
Indian	15 (4%)
Others	5 (1%)
Body mass index (kg/m^2)	
Normal (18.5-22.9)	97 (26%)
Overweight (23.0-24.9)	158 (43%)
Obese (25.0-29.9)	87 (24%)
Severely Obese (≥ 30)	27 (7%)
Operative information	
Type of anesthesia	
General	125 (34%)
Regional	244 (66%)
Mean operative time (min)	48 ± 17
Mean length of stay (d)	5.2 ± 2.8