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Original article

French adaptation of the new Knee Society Scoring System for total knee arthroplasty

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ABSTRACT

Introduction: In November 2011, the Knee Society published its new KSS score to evaluate objective clinical data and also patient expectations, satisfaction and knee function during various physical activities before and after total knee arthroplasty (TKA). We undertook the French cross-cultural adaptation of this scoring system according to current recommendations.
Hypothesis: The French version of the new KSS score is a consistent, feasible, reliable and discriminating score.
Patients and methods: Eighty patients with knee osteoarthritis were recruited from two centers: one group of 40 patients had a TKA indication, while the other group of 40 patients had an indication for conservative treatment. After the new KSS score was translated and back-translated, it was compared to three other validated instruments (KOOS, AMIQUAL and SF-12) to determine construct validity, discriminating power, feasibility in terms of response rate and existence of floor or ceiling effect, internal consistency with Chronbach's alpha and reliability based on reproducibility and sensitivity to change (responsiveness).
Results: Due to missing data, two cases were eliminated. We found that the score could discriminate between groups; it had a nearly 100% response rate, a ceiling effect in the "expectations" domain, satisfactory Chronbach's alpha, excellent reproducibility and good responsiveness.
Discussion: These results confirm that the French version of the new KSS score is reliable, feasible, discriminating, consistent and responsive. The novelty of this scoring system resides in the "expectations" and "satisfaction" domains, its availability as a self-assessment questionnaire and the evaluation of function during various activities.
Level of proof, type of study: Level III.

1. Introduction

Functional evaluation after knee arthroplasty remains challenging. The survival analysis that is typically used provides important information, but has its limitations: a patient may suffer from pain and functional limitation but not have undergone a revision. The classical evaluation scores [1], which are considered objective, often provide overly-optimistic results, for example the Knee Society score (KSS) [2] or the Hospital for Special Surgery (HSS) score [3]. For tumor surgery, general quality of life scores such as the SF36 and its short form, SF12 [4] were first used in the late 1980s and are seeing increased used. The WOMAC (Western Ontario Mc Master University Osteoarthritis Index) [5] was the first, orthopedic-specific quality of life score to be used. The Knee injury and Osteoarthritis Outcome Score (KOOS) [6–8] was then introduced in 2003; it provides a more precise and complete analysis of the patient's quality of life and sports abilities. In order to simply outcomes, the Knee Society's scientific committee developed a new score that included the previous objective evaluation, but also took into consideration the patient's expectations, satisfaction level and quality of life during recreational and/or sports activities [7,9].

This new scoring system consists of an "objective" score, which reuses the "knee" score from the previous KSS and a completely new

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"subjective" score. The latter comes in the form of patient-reported outcome measures (PROMS) to assess knee function during activities specific to each patient [7,9]. Patient-reported outcomes (PRO) [10,11] are reliable methods now widely used to evaluate functional outcomes, for example the Oxford score [12,13].

The functional evaluation in the new KSS analyses various activities performed by today's patient [14], who is often more active and athletic than before and wants to continue doing these activities after the TKA procedure [15,16].

Before it can be used in France, this scoring system must be translated and adapted to the French speaking population and then its psychometric properties validated with patients [17,18]. All of these steps make up the transcultural validation of the scoring system; although this process is complex, it is well standardized [19–22]. We hypothesized that the French adaptation of the new KSS score is a consistent, feasible, reliable and discriminating score. The goal of this study was to validate the psychometric properties of the French version of the new Knee Society Scoring System.

2. Patients and methods

2.1. New KSS

This new score has two components, an objective one and a subjective one (Appendix A). The objective component corresponds to the previous version of the "knee" score but the "pain" item has been improved by replacing it with a "symptoms" item. The latter consists of two visual analogue scales completed by the patient. The subjective component is a self-evaluation questionnaire with three domains: expectations (15 points), satisfaction (40 points) and functional activity (100 points). The "expectations" score consists of pain relief, ability to carry out activities of daily living and ability to perform leisure, recreational, or sport activities. The "satisfaction" score consists of pain level while sitting or lying in bed and knee function while getting out of bed, performing light household duties and performing leisure or recreational activities. The "function" score consists of walking and standing, standard activities (standing from seated position, going up and down stairs), advanced activities (squatting down, going up a ladder or running) and discretionary activities (18 sports activities listed). The score in each domain is calculated by adding the points for each item and is considered independent from the other domains. There is a postoperative version of the questionnaire to take into account the changes for the "expectations" domain.

2.2. Study design

This prospective cohort study was performed in two centers. Eighty patients were recruited during an orthopedic surgery consultation in two French centers between February and July 2012: Centre Albert-Trillat at the Hôpital de la Croix-Rousse in Lyon and the Institut du mouvement et de l'appareil locomoteur at the Hôpital Sainte-Marguerite in Marseille. Inclusion criteria were age above 40 years, primary knee osteoarthritis, and good ability to speak and understand French. At the end of this visit, patients were distributed according to the indication for surgical or conservative treatment into two groups: "surgery" group of 40 patients with a TKA indication and "non-surgery" group of 40 patients with an indication for conservative treatment and no treatment changes during the next 15 days.

The first step consisted of the translation and transcultural adaptation of the scoring system. This phase was performed in Marseille. Few changes were introduced relative to the original scoring system. The second step consisted of evaluating the psychometric parameters of the scoring system including feasibility (can patients fill out the scoring system?), repeatability between two evaluations 15 days apart, and sensitivity to changes measured between the preoperative and postoperative evaluations in the surgery group. The new KSS was compared to the KOOS, SF-12 and AMIQUAL [23] using methodology previously used to validate the HOOS and KOOS [8,24].

2.3. Statistical analysis

The various psychometric parameters that are essential for the validation of the French version of the new KSS were measured [7,20–22]. Feasibility was evaluated based on the response rate (good if less than 2.5% of responses are missing), presence of a floor or ceiling effect (more than 15% of patients reach the minimum or maximum score), time required to complete the questionnaires (number of questions) and time needed for grading (time needed to calculate score) [8,24].

The reliability of the new KSS was assessed by determining reproducibility 15 days apart without any treatment changes [25]. An analysis of variance (Anova) was used to estimate the intraclass correlation coefficient (ICC) with 95% confidence intervals [26]. An ICC above 0.8 was considered excellent [27]. The second set of score obtained after surgery in the "surgery" group was used to determine the sensitivity to changes (responsiveness) based on the magnitude of effect size. The magnitude of effect size was estimated using the average of the differences in the postoperative results minus the preoperative results, divided by the standard deviation of the preoperative results. In terms of the discriminating ability, it was assumed that the results of the "surgery" group would be significantly worse than the one of the "non-surgery" group.

Chronbach's alpha [28] was used to measure the internal consistency of the test. Consistency was deemed satisfactory if this coefficient was 0.7 or higher.

Construct validity was estimated using the correlation between the domains of the new KSS and the domains of other questionnaires with Spearman's coefficient. These coefficients could either be converging (positive) or diverging (negative). The correlation was considered as strong, moderate or weak if the coefficient was greater than 0.5, between 0.5 and 0.35 and below 0.35, respectively. Convergence and divergence hypotheses were generated a priori according to how domains evaluated similar or dissimilar concepts. Based on the observations made during the validation of the English version, it was expected that all domains of the new KSS except the "expectation" domain would be moderately or strongly correlated with the five domains of the KOOS, the "physical" domain of the SF-12 score and the "physical activity" and "pain" domains of the AMIQUAL score. The "expectations" domain of the new KSS was also expected to be weakly correlated to all domains of the KOOS and AMIQUAL score, and that all domains of the new KSS score would be weakly correlated to the "mental" score of the SF-12.

Statistical analyses were performed in the Biostatistics Laboratory of the Hospices Civils de Lyon by a statistician (DMB) using the software "R" [29]. A significance threshold of $P < 0.05$ was used for all the results.

3. Results

In the "non-surgery" group, 23 patients (57.5%) were women (average age 65 ± 15 years) and 17 (42.5%) were men (average age 67 ± 19 years). In the "surgery" group, 25 patients (62.5%) were women (average age 68 ± 18 years) and 15 (42.5%) were men (average age 71 ± 13 years). There were no significant differences between these two groups. Two patients in the "surgery" group were excluded from the study because we could not collect all the data, given that they were reviewed three months after the surgical procedure.