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The Study of Functional Outcomes Using Oxford Knee Score and Pain Visual Analog Scale Among Osteoarthritic Knee Patients Undergoing Total Knee Replacement

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Abstract

Background: Use of a patient-based outcome scoring systems has been advised to evaluate the contentment and quality of life led post knee replacement surgery. However, there exists a large number of scoring systems which obscures a clinician's outlook while choosing an appropriate tool of evaluation.

Objective: To equate the functional outcomes pre- and post-operatively using oxford knee score (OKS) system and visual analog scale (VAS) in total knee replacement (TKR) of osteoarthritic patients.

Methodology: All patients above the age of 50 years with moderate to severe osteoarthritis (according to OKS) with uni-/bi-lateral osteoarthritis were involved. Patients were assessed pre- and post-operatively for functional outcome and pain using the OKS and VAS, respectively. Patients were followed-up at 1st, 3rd, and 6th month post-surgery for evaluation. All data were analyzed using MS Excel 2007 and R-software 1.2.5001.

Result: An overall of 20 patients mostly consisting of females (65%) with a median age of 68.95±4.09 years were predominantly diagnosed with bilateral knee osteoarthritis (50%). Most of the patients underwent right TKR (55%). Score obtained during the 1st, 3rd, and 6th month follow-up post-operatively using OKS and VAS were statistically significantly different (*P*-value <0.0001) compared to pre-operative score. The association of TKR surgery with OKS and VAS was statistically insignificant (*P*-value >0.05).

Conclusion: Both OKS and VAS provided consistent functional outcomes suggesting improved management of pain and better functional movement in TKR of osteoarthritic patients.

Keywords: Arthroplasty; Knee replacement; Osteoarthritis; Quality of life; Visual analog scale; Patient reported outcome measures.

Introduction

Total knee arthroplasty (TKA), a joint replacement surgery performed to provide relief from pain with enhanced quality of life (QoL) and functional restoration. TKA has provided consistent outcomes to patients experiencing end-stage, degenerative, tri-compartmental osteoarthritis. (1) Evaluation of outcomes being the crucial aspect of the management was conventionally assessed based on revision surgery, pain, complications, etc. However, this outcome did not accentuate the patients' functions, QoL and contentment. (2,3)

Patient reported outcome measures scores (PROMs) was instituted to weigh the effects of TKA in place of the conventional surgeon-based assessment, keeping patient's satisfaction as the core conclusion. (4) Numerous evaluation outcome scoring systems exist such as the OKS; Knee injury and osteoarthritis outcome score (KOOS); Knee Society Clinical Rating System (KSS); VAS; Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), nevertheless not all scoring systems provide good quality outcomes. The key is selecting the appropriate scoring system for an evaluation of a specific surgical procedure. A good

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scoring system should be accessible, reliable with validity and effortless for patients. (5)

In the current analysis, functional outcomes of TKA in osteoarthritic patients was assessed using OKS and VAS scoring system. The study intended to compare the functional outcome score using these two methods pre- and post-operatively.

Sample size calculation

For effective size of 0.70, significance level of 95% and power of 80%, the sample size was ~ 20. Therefore, a sum of 20 patients encompassed this study.

Methodology

This observational analysis was performed between June 2018 to February 2020 at a tertiary care hospital. All patients above 50 years with moderate to severe osteoarthritis according to OKS, stiffness of knee with decreased range of motion and unilateral or bilateral osteoarthritis were involved in the study. Patients unfit for anesthesia, active infection of knee joint, peripheral vascular diseases, knee implants, secondary osteoarthritis (post traumatic/ post inflammatory / post infection) and revision TKR were omitted from the study. Patients were provided with the OKS questionnaire and VAS pre-operatively. Patients underwent TKA and assessed at four-weeks post-operatively for any surgical site infection and functional effects and advised for follow-ups at third month and sixth month for clinical and functional effect assessment.

Statistical analysis

All analysis was conducted using R-software 1.2.5001. Wilcoxon-Sign-Rank was employed to examine the significant difference pre-operatively and post-operative of the two functional outcomes. Univariate logistic regression was employed to understand the association of procedure with the two functional outcomes.

Result

Collectively 20 patients with 68.95±4.09 years of average age were part of the study. Females included 65% (N=13) of the sample. Bilateral knee osteoarthritis was diagnosed in 50% cases followed by left (25%) and right (25%) knee osteoarthritis; 55% cases (N=11) underwent right TKR.

Table 1 – Mean analysis of functional outcomes (Oxford knee scoring system and visual analogue scale).

Oxford knee scoring system			
Follow-up period	**Mean**	**Standard deviation**	***P*-value**
Pre-operative	10.25	2.43	-
1st month	29	4.23	<0.0001 *
3rd month	37.5	2.33	<0.0001 *
6th month	44.8	1.88	<0.0001 *
Visual analogue scale			
Pre-operative	8.7	0.86	-
1st month	6.8	0.83	<0.0001 *
3rd month	4.9	0.85	<0.0001 *
6th month	2.2	0.52	<0.0001 *

*Note: * denotes statistically significant P-value (<0.0001).*

The mean±SD values (Table 1) of pre-operative scoring was compared with all the follow-up (1st, 3rd, and 6th month) mean values. The mean values of OKS were found to increase over the follow-up period. The mean follow-up values of 1st, 3rd

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and 6th month of OKS was statistically significantly different (P-value <0.005) from pre-operative mean value of OKS. The mean values of VAS decreased over the three follow-up period and were also statistically significantly different (P-value <0.005) from pre-operative mean value.

Table 2 – Association of total knee replacement procedure with functional outcomes

Follow-up	Oxford knee score *P*-value	Visual analogue scale *P*-value
1st month	0.168	0.509
3rd month	0.0558	0.627
6th month	0.258	0.487

On analyzing the association of the two functional outcomes with TKR procedure using univariate logistic regression, values were found to be statistically insignificant (*P*-value >0.05) with the procedure.

Figure 1: Patients who under TKR: x-rays performed pre-operatively and post-operatively follow-up at 1st month, 3rd month and 6th month.

Figure 2: Patients who under TKR: x-rays performed pre-operatively and post-operatively follow-up at 1st month, 3rd month and 6th month.

Discussion

TKR has offered substantial pain relief over the years. A study highlighted the mean score of intensity of pain among 595 patient's pre- and post-operative to be 7/10 and 3/10 with TKA, respectively. (6) Despite providing improved pain management, dissatisfaction with TKR is seen in approximately 20% and was directly co-related to the physical, social, behavioral, and psychological factors which were not considered in the traditional scoring system. (7) It was crucial to develop standards to assess outcomes combined with selective reporting for study validations. However, this has perplexed the clinicians and researchers in narrowing the appropriate scoring system for their work. Orthopedic literature is saturated with various scoring systems particularly with reverence to knee and hip replacement surgery. (8) Therefore, the current research evaluated two PROM's measurement outcomes namely, OKS and VAS to comprehend the functional results and level of satisfaction of the patients pre- and post-operatively.

The OKS system was instituted in 1998 to reflect patient's knee associated health status. (9,10) Originally the scoring was 1-5, where score of one indicated best outcome. This system of scoring was reported confusing during clinical practicing and thus a new version of scoring of 0-4, where score of four indicated best outcome and the total scoring range was 0 (considered worst outcome) to 48 (provided best outcome). (11,12) Alternatively, VAS is a unidimensional system with continuum of values measuring the intensity of the symptom/s (pain). The highest score implies greater intensity of the symptoms. It is extensively applied owing to its adaptability and sensitivity towards small clinical changes with simple patient approachable descriptive scale. The scoring requires less than one-minute for completion with no prior training and minimal translational difficulty. (13,14)

In the current research, the mean±SD OKS pre-operatively was 10.25±2.43; scores post-operatively during all three follow-ups (1st, 3rd, and 6th month) was statistically significantly different (*P*-value <0.0001) from pre-operative score. The OKS value at the finish of 6th month post-operative follow-up was 44.8±1.88 which corresponding to the grading system of OKS implies satisfactory joint functioning with no further requirement of formal treatment. The mean±SD of VAS in the current report pre-operatively was 8.7±0.86; scores post-operatively during all three follow-ups (1st, 3rd, and 6th month) was statistically significantly different (*P*-value <0.0001) from pre-operative score. The patients' symptom of pain also drastically improved over the period of 6 months (2.2±0.52) implying very little distress.

A systematic evaluation by Theodoulou A et al. compared 438 clinical studies reporting 86 different scoring systems. (15) The study reviewed five of the scoring systems which were stated in more than 10% of the incorporated studies. The study concluded that OKS demonstrated internal consistency, constructive validity, reliability (test-retest) and satisfactory levels of sensitivity towards clinical changes. Similarly, Harris et al. on reviewing the literature identified OKS system as a quality criterion in providing complete outcome of management evidence. (16) OKS provided good evidence in favor of reproducibility, validity, internal consistency, acceptability, and construct, responsiveness, while interpretability and floor/ceiling precision provided some good evidence.

VAS was identified to provide satisfactory responsiveness, reliability (test-retest) and validity among distinct studies (16). Alghadir et al. studied the validity, test-retest reliability, and minimum detectable change of three regularly employed pain assessing systems (numerical rating scale, verbal taking scale and VAS) in osteoarthritic knee pain. (17) The author concluded that VAS provided excellent stability, reliability, and the smallest error in evaluating osteoarthritis knee pain.

There exists a sizable number of scoring systems which require evidence of measurement to aid in finding and assessing its utilization in clinical practice. Studies assist clinical practitioners in narrowing and implementing the right scoring procedure to provide good evidence-based understanding of the protocol as well as patient satisfaction.

Conclusion

In conclusion, scoring system i.e., OKS and VAS provided significantly consistent results pre-and post-operatively suggesting that TKR of osteoarthritic patients provided improve QoL, reduced pain, better functional mobility and patient fulfillment.

Conflict of interest: None

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