

Shift to low-impact sports and recreational activities following total knee replacement

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Abstract

Background: A growing number of physically active patients undergoing total knee replacement (TKR) desires to resume their preoperative activity levels and to be able to engage in sports after surgery. The purpose of this study was to assess the sporting and physical activities of patients who had undergone TKR. It was hypothesized that the majority of patients treated by TKR would have been able to return to amateur sports and recreational activity.

Methods: Ninety-seven patients who underwent TKR between 2014 and 2016, were retrospectively reviewed. Mean age was 70.1 years (range 64–83). Average follow-up time was 4.2 years (SD: 1.7). Assessment included Knee Osteoarthritis Outcome Score (KOOS), International Knee Documentation Committee (IKDC), and Tegner activity level. Sporting and physical activities of all patients were reported. Wilcoxon's signed ranks test was used for comparison between pre-operative and follow-up data. Significance was set at $p < 0.05$.

Results: Both KOOS score and IKDC significantly improved after surgery ($p < 0.001$). No statistically significant differences were reported concerning Tegner activity level before and after surgery ($p = n.s.$). After surgery, a total number of 52 patients (53.6%) successfully returned to sporting and recreational activities, such as cycling, hiking, dancing and swimming. A return to activity rate of 81% of patients practicing sport before surgery was reported.

Conclusions: TKR provides a high rate of return to sport postoperatively and confirms improved subjective results and reduced pain compared to preoperative status. However, most patients returned to low-impact activities, while a significant decrease was reported for mid- and high-impact sports.

Keywords

Total knee replacement, return to sports, activity level, outcomes, knee prostheses

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Introduction

Objectives of knee replacement are pain reduction and improved function. However, as life expectancy is increasing, patients are nowadays more likely to return to previous sports activities after surgery.¹

At present, return to physical activity constitutes an important factor after knee replacement surgery, as the capacity of resuming sporting activities comparable to those engaged prior to surgery, represents a major concern among sportsmen undergoing knee prosthesis implantation.² Patients are nowadays more likely to expect to return to sporting activities they practiced prior to impairments due to knee osteoarthritis (OA),^{3–8} and recommendations

for patients with high return to sports expectations after total knee replacement (TKR) remain controversial.^{9,10}

Commonly reported outcome measures following joint replacement are point scales, but limited information exist concerning return to sport rate since at present not much literature exists regarding return to physical activities following knee joint replacement.

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The aim of this study was to retrospectively assess the return to amateur sports, activity level, patient satisfaction, and postoperative functional outcomes of patients undergoing TKR at a minimum follow-up of 2 years. It was hypothesized that the majority of patients treated by TKR would have been able to return to amateur sports and recreational activity.

Patients and methods

Patients recruitment

One-hundred and nine consecutive patients who underwent TKR between 2014 and 2016 were considered for the present study. Inclusion criteria consisted of patients who underwent primary TKA for knee OA, age 55–90 years, absence of septic arthritis, and a minimum 2-year follow up. Exclusion criteria included patients who underwent unicompartamental knee replacement or revision surgery. Seven patients did not meet the inclusion criteria, four were lost at follow-up and have been excluded for the final data analysis. Therefore 97 patients were successfully recontacted and underwent retrospective evaluation at a minimum follow-up of 2 years (Table 1). All the operations were performed by the same well experienced senior surgeon. Knee OA was diagnosed with standard radiographs and long-leg standing radiographs. The mean age was 70.1 years (range 64–83). Average follow-up time was 4.1 years (SD: 1.1). Sixty-four of 97 patients (65.9%) were active in at least one sport before surgery. All the procedures involving human participants in this study were performed in accordance with the ethical standards of the institutional and/or national research committee, as well as the 1964 Helsinki Declaration and its later amendments. The study was conducted following the STROBE checklist for cohort studies. Written informed consent was obtained.

Surgical technique and rehabilitation protocol

Surgery was performed under spinal anaesthesia with the use of a tourniquet. A Cemented posterior stabilized Vanguard Complete Knee System (Zimmer-Biomet Orthopedics, Warsaw, IN, USA) was implanted in all patients using medial parapatellar arthrotomy and without performing patellar resurfacing. A brace-free post-operative rehabilitation protocol including joint motion exercises, immediate regaining of full knee extension and progressive weight-bearing deambulation with crutches was started the day after the operation. For the first 4 weeks, walking with partial weight bearing was allowed with the use of two crutches. Concerning return to sports participation, no specific indications nor restrictions were given to patients, with the exception that they were not encouraged to continue strenuous activities (i.e. alpine skiing).

Table 1. Patient demographics and anthropometric data.

No. of patients	97
Gender	
Male	43
Female	54
Age at surgery (range) (years)	70.1 (64–83)
BMI (SD)	23.5 (1.6)
Mean follow-up (SD) (years)	4.2 (1.7)

SD: standard deviation; BMI: Body Mass Index.

Primary outcomes

Each patient was evaluated pre-operatively before surgery and after an average follow-up of 4.1 years (SD: 1.1). Assessment included Knee Osteoarthritis Outcome score (KOOS), International Knee Documentation Committee (IKDC) subjective evaluation score, and Tegner activity level. Sporting and physical activities of all patients were recorded. Sports were classified into low-impact, such as swimming and cycling, mid-impact (hiking and jogging), and high-impact (alpine skiing, dancing).

Statistical analysis

Data extracted were analysed using the programme IBM SPSS Statistics for Windows®, Version 21.0 (IBM Corp., Armonk, NY). Wilcoxon test was utilized to compare the pre-operative and follow-up status. Differences with a p value < 0.05 were considered statistically significant.

Results

The mean overall KOOS score increased from a preoperative value of 49.5 (SD: 6.4) to 84.6 (SD: 8.7, $p < 0.001$) postoperatively. Mean IKDC subjective score improved from 31.2 (SD: 5.7) preoperatively to 87.5 (SD: 6.4) at follow-up. A statistically significant difference was reported between pre- and post-operative status also with regards to VAS score (6.5, SD: 2.5 and 3.8, SD: 1.1 respectively, $p < 0.001$). Median Tegner activity level score changed from 3 (range 1–6) to 4 (range 1–8) at follow-up ($p < 0.001$). A detailed overview of the results of overall primary outcomes is shown in Table 2.

Sixty-four of 97 patients (65.9%) were active in at least one sport before surgery. The most common activities practiced before surgery were hiking and jogging. Overall, a total number of 52 patients (53.6%) was active in at least one sport after surgery, resulting in a return to activity rate of 81% of patients practicing sport before surgery. A 10% increase in people not participating to sports post-operatively compared to pre-operatively was reported (Table 3). Most patients returned to low-impact activities such as swimming and cycling, while a significant decrease was

Table 2. Overview of the results of clinical assessment.

	Pre-operative	Post-operative	p Value
KOOS score (mean, SD)	49.5 (SD: 6.4)	84.6 (SD: 4.9)	$p < 0.001$
IKDC subjective score (mean, SD)	31.2 (SD: 5.7)	87.5 (SD: 6.4)	$p < 0.001$
VAS	6.5 (SD: 2.5)	3.8 (SD: 1.1)	$p < 0.001$
Tegner activity level (median, range)	3 (range 1–6)	4 (range 1–8)	$p < 0.001$

SD: standard deviation.

Table 3. Number of sports practiced before and after surgery.

No. of sport practiced	No. of patients active before surgery (%)	No. of patients active after surgery (%)	Difference %
0	33 (34.0)	43 (44.3)	+10.3
1	50 (51.5)	44 (45.4)	-6.1
2	12 (12.3)	8 (8.2)	-4.1
>2	2 (2.1)	2 (2.1)	0.0

Table 4. Type of sport practiced before and after surgery.

Sport practiced	No. of patients participating before surgery (%)	No. of patients participating after surgery (%)	Difference %
Cycling	12	14	+16
Swimming	11	13	+18
Hiking, log walks	15	17	+13
Jogging	17	9	-35
Skiing	4	0	-100
Dancing	9	6	-33

reported for mid- and high-impact activities such as jogging, skiing and dancing (Table 4). Forty-three patients on 97 (44.3%) remained inactive after surgery (Table 3).

Discussion

The present study showed that a significant percentage of patients was able to return to regular physical activities following TKR and confirms subjective and objective clinical improvement at a mean follow-up time of 4 years after surgery.

According to our findings, cycling, swimming and hiking were the most common activities practiced after TKR. Sports participation before surgery was 65.9%, while return to sport rate reached 53.6% at follow-up, with 81% of patients practicing sport before surgery who returned to activity.

The rate of sports participation following TKR differs among studies. While some authors observed an increase in sporting and physical activities,^{11–15} other studies reported a decrease in participation to sports activities.^{16,17}

According to a recent systematic review, overall return to sports after TKR varied from 36% to 89%, with mean numbers of sports per patient postoperatively of 0.2–1.0 after TKR, with low-impact types of sports in more than

90% of cases.¹⁸ In the paper by Magan et al.,² 87.9% of patients returned to sports after TKR; mean time to return to sport was 14 months (range 3–36 months).

In our case series we observed a shift in sports and recreational activities from high- to low-impact sports 4 years after surgery. A preference for low-impact sports such as swimming and cycling was noted, as patients are more likely to return to lower-impact types of sport following joint replacement.¹⁸ The decrease in high-impact sports is consistent with the results reported in previous studies.^{7,11,12} The shift from high- to low-impact activities might explain the increase in Tegner score rather than the TKR being the main influencing factor.

In our cohort of patients, a 10% increase in people not participating to sports post-operatively compared to pre-operatively was observed. Thus, it would appear that, in spite of improvements in symptoms and functional outcomes, a significant percentage of patients does not adopt a more active lifestyle but remains less active after surgery.

The preservation of the implant could be one of the main reasons for a limitation of activities following TKR. Since wear and potential dislocations are related to use, high-demand patients may be at increased risk for TKR failure. Other reasons could be fear of pain or loss of motivation.

Overall, the number of sport practiced reduced at follow-up, whereas the number of subjects practicing two or more sports remained unchanged.

Argenson et al. prospectively evaluated 445 consecutive patients having 516 TKRs 3 years after surgery. Postoperative mean Knee Society function and knee scores were 91 (SD: 6) and 96 (SD: 3) respectively. Eighty-six percent of patients returned to their previous level of activity or a higher level than that prior to surgery.¹¹ In the study by Schneider et al.,⁷ 25 patients on 46 (54.3%) returned to sports at the same or higher level of impact after TKR, with 67.4% satisfied after surgery. In the study by Hepperger et al.¹⁹ on 200 patients who underwent TKR, sport participation and Tegner activity level significantly increased 2 years after surgery compared to preoperative status. In a cohort of 369 patients who underwent TKR, no differences in mean activity level were observed before and after surgery (UCLA score = 4.5 and 4.8 respectively) by Chang et al. Walking, swimming and cycling were the three most commonly practiced sports both before and after TKR. According to their findings, the frequency of moderate types of physical activities increased after surgery.¹²

Apart from returning to regular physical activities, TKR aims to improve knee function and reduce patients' perceived symptoms. In our case series a postoperative improvement in KOOS and IKDC subjective score, as well as a decrease in VAS score compared to pre-operative status were reported, thus confirming the proved long-term efficacy of TKR in patients suffering from severe knee OA. The improvement in activity level recorded postoperatively may therefore be related to pain reduction and improvement in knee function.

Limitations of the present study include its retrospective nature, the relatively small sample size, and the lack of clinical and radiological data. In addition, relying on subjective questionnaires could potentially bias the results through an overestimation of patients' physical activities. Eventually, pre-symptomatic activity levels were not assessed in the present investigation. An improvement in activity level compared to pre-operative demonstrates the ability of patients to participate in activities to the same or higher degree as they could with a damaged knee prior to surgery. We acknowledge that returning closer to pre-symptomatic activity levels would indicate a more successful outcome.

In clinical practice, this study may help physicians to manage the expectations of patients regarding the level of physical activity following TKR. Even though patients are nowadays more likely to expect to return to sporting activities they practiced prior to impairments due to knee OA, the present investigation suggests that although a relatively high percentage of subjects returned to physical activities, patients are more likely to return to low-impact sports following TKR.

Long-term prospective follow-up studies with larger cohorts are required to verify prosthesis survivorship over time.

Conclusions

In patients with knee OA, TKR provides a high rate of return to sport postoperatively and confirms improved subjective results and reduced pain compared to preoperative status. However, most patients returned to low-impact activities, while a significant decrease was reported for mid- and high-impact sports.

Declaration of conflicting interests

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