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Total diz protezli hastalarda ameliyat öncesi diz fleksiyon derecesi ameliyat sonrası diz fleksiyonu ve fonksiyonlarını etkiler mi?

The Does preoperative knee flexion angle affect postoperative knee flexion angle and function in patients with total knee arthroplasty?

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ÖZ

GİRİŞ ve AMAÇ: *Bilateral Total Diz Artroplasti'li (TDA) hastalarda, ameliyat öncesi diz fleksiyon derecesinin, ameliyat sonrası diz fleksiyon derecesi ve HSS (Hospital for Special Surgery) diz skoru üzerine olan etkisinin incelenmesi amacı ile planlandı.*

YÖNTEM ve GEREÇLER: *Çalışmaya primer TDA uygulanan 59 hasta dâhil edildi. Hastaların ameliyat öncesi ve ameliyat sonrası 6.ayda gonyometre ile diz hareket açıklıkları, HSS diz skorlaması ile diz fonksiyonları değerlendirildi.*

BULGULAR: *TDA'lı hastaların diz fleksiyon derecelerinde ameliyat sonrası dönemde, ameliyat öncesine döneme göre anlamlı bir artış olduğu belirlendi ($p<0.05$). Ameliyat sonrası HSS diz skorlarının karşılaştırmasında, ameliyat öncesi döneme göre anlamlı bir artma olduğu bulundu ($p<0.05$). TDA'lı hastaların ameliyat öncesi ve sonrası diz fleksiyon dereceleri arasında zayıf korelasyon bulunurken ($r=0.142$, $p=0.126$), benzer şekilde ameliyat öncesi diz fleksiyonu ile ameliyat sonrası HSS diz skoru arasındaki ilişki bakımından zayıf bir korelasyon olduğu saptandı ($r=0.424$, $p=0.633$).*

TARTIŞMA ve SONUÇ: *TDA uygulamalarında ameliyat öncesi diz fleksiyon derecesinin ameliyat sonrası dönemde gerek diz fleksiyonu gerekse HSS diz fonksiyon skor gelişimi üzerine bir etkisi bulunmamaktadır.*

Anahtar Kelimeler: *Normal eklem hareketi, artroplasti, diz, diz artroplastisi*

ABSTRACT

INTRODUCTION: *The aim of this study was to investigate the effects of preoperative and postoperative knee flexion angle and HSS knee score in patients with bilateral total knee arthroplasty (TKA).*

METHODS: *The study included 59 patients who underwent primary TKA. The participants' preoperative and postoperative knee movements were assessed with the goniometer and their preoperative and postoperative knee functions were assessed with the HSS scoring.*

RESULTS: *The comparison of the preoperative and postoperative knee flexion scores of the patients with TKA revealed a significant increase ($p<0.05$). The postoperative HSS knee scores of the patients were significantly higher than their preoperative HSS knee scores ($p<0.05$). There was a weak correlation between the preoperative and postoperative knee flexion HSS scores of patients with TKA ($r=0.142$, $p=0.126$), and the correlation between their preoperative knee flexion and postoperative HSS knee scores was also weak ($r=0.$**424, $p=0.633$**).*

DISCUSSION AND CONCLUSION: *In TKA, the preoperative knee flexion angle has no effect on the postoperative knee flexion or development of the knee functions.*

Keywords*: Range of motion, arthroplasty, knee, knee arthroplasty*

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INTRODUCTION

Total knee arthroplasty (TKA) is the operation performed most commonly in orthopedic surgery (1). Among the most important goals of TKA are providing adequate range of motion to reduce pain and fulfill functional activities. In particular, an important indicator of the success of TKA is the increase in normal joint range of motion (2,3). The adequate range of motion of the joints meets the patient's expectation from the surgical intervention and increases the level of independence needed to perform physical activities (3). The knee range of motion in patients undergoing TKA is also an important parameter in assessing early hospital outcomes (4). Since the range of knee flexion should be 60 degrees while walking, 93 degrees while standing up from a chair, and 90 degrees while climbing down the stairs, ensuring sufficient range of knee flexion after TKA enables the person to achieve functional activities and meets discharge criteria from the hospital (5,6).

Several factors affect the range of motion of the knee joint after TKA. Among them are age, body weight, pain level, pre-operative physical activity level, surgical technique, implant designs, and post-operative physiotherapy and rehabilitation applications (7-9). Within this context, the preoperative knee flexion degree can be another important factor affecting postoperative range of motion. While in some studies, it is reported that the postoperative knee flexion degree is related to the pre-operative knee flexion degree, in some other studies, it is stated that the pre-operative knee flexion degree does not lead to any changes; thus, it is not an effective factor (2,3). The present study was planned to determine the effects of the preoperative knee flexion levels on postoperative knee function scores and knee range of motion in patients undergoing bilateral TKA.

MATERIAL AND METHODS

In the present study, the data were obtained retrospectively from the patient files of 59 patients (6 males, 53 females) who underwent consecutive primary TKA performed by the same surgeon in the same operation session using the paramedian approach.

All the patients who had bilateral TKA indications underwent bilateral TKA on the basis of their preference. All the patients underwent a standard physiotherapy program implemented by the same physiotherapist (SB). The program included isometric-isotonic exercises, continuous passive motion exercises, active-assisted and active range of motion exercises, walking, and climbing up and down the stairs exercises. Patients who were able to perform active knee extension, had sufficient knee flexion, and could walk and climb up and down the stairs during the postoperative period were discharged. Patients were followed up with regular home exercise programs and outpatient clinic controls, and evaluated postoperatively in terms of their knee range of motion and Hospital for Special Surgery (HSS) knee scores.

The patients' preoperative and postoperative knee flexion ranges were measured with a 30-cm-long plastic-universal goniometer having a 360-degree dial. Goniometric measurements were performed by placing the pivot point of the goniometer on the lateral epicondyle of the femur, aligning the stationary arm with the lateral midline of the femur and aligning the moving arm with the lateral midline of the fibula (10). The patients were asked to make an active knee flexion in the prone position within the normal motion plane without producing a compensatory hip and waist movements.

The Hospital for Special Surgery (HSS) knee scoring system was used for the assessment of knee functions in patients with TKA. The maximum HSS knee score is 100 and the scores for the sub-parameters are as follows: pain (30 points), function (22 points), joint range of motion (18 points), muscle strength (10 points), deformity (10 points) and instability (10 points). If a walking assist device is used up to 3 points, if extension insufficiency exists up to 5 points and if there is varus / valgus deformity, for each 5° of deformity, 1 point is removed. If the score obtained is ≥85, it is classified as 'excellent', if 70-84, as 'good', if 60-69, 'moderate' and if ≤59 as 'bad' (11).

Statistical Analysis

The data were analyzed using the SPSS for Windows (SPSS Inc., Chicago, Illinois, USA) 20.0

version. Whether the data were normally distributed was tested using the Kolmogorov-Smirnov test. The correlation between preoperative knee flexion degree and postoperative knee flexion degree was assessed using the Spearman's correlation analysis test. For the comparison of pre- and post-knee flexion degrees and HSS knee scores, the Wilcoxon signed-rank test, one of non-parametric tests, was used. P<0.05 was considered as statistically significant.

RESULTS

The mean age of the patients with TKA was 66.59 ± 8.08 (45-85). Their mean length of hospital stay was 7.33 ± 1.66 days **(Table 1).**

Table 1. Descriptive characteristics of patients with total knee arthroplasty

	Bilateral TKA (n=59)
Age (years)	66.59±8.08 (45-85)
Height (cm)	157.00±7.05 (142-175)
Weight (kg)	79.35±14.19 (57-126)
Body mass index (kg/m^2)	32.30±6.05 (19.72-46.85)

TKA, Total Knee Arthroplasty

The patients' mean postoperative knee flexion degrees (115°) were significantly higher than their preoperative knee flexion degrees (100°) (p<0.05). Their mean postoperative HSS knee function scores (88 points) were also significantly higher than their preoperative knee function scores (54 points) (p<0.05) **(Table 2).**

Table 2. Comparison of preoperative and postoperative 6th month knee flexion degrees and HSS knee scores of the patients with total knee arthroplasty

	Bilateral TKA (n=59)		
	Preoperative	**Postoperative (6th month)**	
HSS knee scores	54.54±10.03	88.89±9.38	0.000*
Knee Flexion Degrees (◦)	100.45±14.74	115.02±11.49	0.000*

TKA, Total Knee Arthroplasty; **HSS,** Hospital for Special Surgery Score, ***p<0.001**

There was a weak correlation between the patients' pre- and post-operative knee flexion levels (r=0.142, p=0.126), and between their preoperative knee flexion levels and postoperative HSS knee function scores (r = 0.424, p = 0.633) **(Table 3).**

Table 3. The relationship between preoperative and postoperative 6th month knee flexion degrees and HSS knee scores of the patients with total knee arthroplasty

		Postoperative (6th month) Knee Flexion Degrees	Postoperative (6th month) HSS knee scores
Preoperative Knee Flexion Degrees	**r**	0.142	0.424
	p	0.126	0.633

HSS, Hospital for Special Surgery Score

DISCUSSION

There are many factors affecting postoperative knee flexion levels and knee function in patients undergoing total knee arthroplasty (6,7). Among them, age, gender, implant type, preoperative functional level, postoperative range of motion of knee and limitation level of knee extension are the leading ones. The improvement in preoperative functional parameters in patients with TKA is important in achieving the functional gains of the patient in a shorter period in the postoperative period. Therefore, patients should be encouraged to participate in the physiotherapy programs even during the preoperative period (12,13).

Gaining sufficient knee flexion movement after total knee arthroplasty is an important criterion for the independent achievement of functional activities (walking, standing up from the chair, climbing up and down the stairs) and patient satisfaction. The adequacy of the range of motion ensures that discharge criteria are met and that early in-hospital outcomes are better assessed (3). Therefore, during the planning and implementation stages of rehabilitation programs, it should be ensured that patients gain knee flexion movement as early as the preoperative period.

In the literature, while some studies report that the pre-operative knee flexion degree affects the improvement of the postoperative knee flexion degree (14,15), some other studies state that it has

no effect on the postoperative knee flexion degree or it even reduces it (2,3). Therefore, there is no consensus on the effect of the preoperative level of knee flexion on the postoperative knee flexion level. However, studies have reported that individual traits such as obesity, gender, and age may affect the postoperative knee flexion level (16,17). In the present study, it was determined that the participants' postoperative knee flexion levels were significantly higher than their preoperative knee flexion levels. The mean postoperative knee flexion range of motion in the participants was 115°. This value was sufficient for the participants to perform functional activities although they were obese (body mass index: 32.30 kg/m2). We think that the patients whose knee flexion levels were good or adequate should be followed up with regular home exercise programs and policlinic controls. In the current study, the comparison of the preoperative knee flexion level with the postoperative 6th month knee flexion level revealed that there was a positive but weak correlation between them, which suggests that the preoperative range of motion did not affect the postoperative range of motion. In their study conducted with patients with TKA two years after the surgery Pasquier et al. (18), found that the patients whose preoperative knee flexion was restricted had better postoperative results and that preoperative knee flexion gains did not provide an advantage for the postoperative period. Unlike Pasquier et al.'s study (18), in the present study, the patients were assessed during the acute phase (6th month). Therefore, we think that assessments to be performed in the future during the postoperative 1st and 2nd years may lead to clearer and more definite results.

Valid measurement methods are important for clinicians to make effective clinical interpretations.

There are different scales used in the assessment of physical and functional competence levels in specific pathological conditions of the knee joint (19). One of them is the HSS knee scoring. It was particularly developed for the analysis of treatment outcomes in TKA patients and is commonly used by physiotherapists and orthopedists (19). Thus, in the present study, the HSS knee scoring system was used. However, in the literature, there are some studies in which different scoring systems such as Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and Knee Injury and Osteoarthritis Outcome Score (KOOS) are used to investigate functional levels of patients with TKA (20,21). In the current study, the patients' post-operative 6th-month mean HSS knee score (88.89) was much higher than their preoperative score. In their study investigating the effects of the preoperative knee flexion levels on the postoperative knee scores, Miner et al. (22) found that at the end of the 1st year, WOMAC scores of the patients with TKA whose flexion degrees were ≥95° were higher than those whose flexion degrees were (□95°). On the other hand, Devers et al. (14) reported that postoperative functional limitations increased as the knee flexion degree decreased. In the present study, there was a positive but weak correlation between the patients' preoperative knee flexion level and their postoperative HSS knee scores, and that preoperative range of motion had no effect on postoperative knee scores.

In conclusion, in TKA, preoperative knee flexion levels have no effect on the improvement of knee flexion level or knee function in the post-operative period. However, other factors such as obesity, preoperative varus / valgus deformities, limitation level of knee extension and implant types likely to affect the postoperative knee flexion degree should also be investigated. We think that a good analysis and determination of these factors will accelerate the rehabilitation process and facilitate the achievement of functional gains.

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