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The Effect of Video-Assisted Education on Knee Function and Quality of Life after Total Knee Replacement: A Randomized Controlled Trial

Total Diz Protezi Uygulanan Hastalarda Video-Destekli Eğitimin Diz Fonksiyonu ve Yaşam Kalitesine Etkisi: Randomize Kontrollü Çalışma

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ABSTRACT

Objective: This study aims to investigate the effect of video-assisted patient education (VPE) on knee functions, quality of life (QoL) and decrease complications in total knee replacement (TKR) patients.

Methods: This study is designed as a prospective, parallel, two-arm, randomized clinical trial. It included 44 patients who underwent elective TKR at an orthopedics and traumatology clinic. The VPE group received VPE including early postoperative care for TKR, activities of daily living, and gradual exercise program in addition to the existing routine care at the clinic. The control group received only routine care. The results were collected with Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Short Form-36 (SF-36) scores measured at baseline, 1st and 3rd months after TKR.

Results: The mean scores of the VPE group on the pain, stiffness, and physical function of the WOMAC were significantly lower in 3rd month after TKR than the control group. The VPE group had significantly higher scores than the control group on SF-36 of all subcategories except pain, emotional role, and mental health in 3rd month after TKR.

Conclusion: The VPE can improve knee function and QoL in TKR patients. Nurses can use the VPE method in patients to improve knee functions and QoL after TKR.

Keywords: Knee replacement, patient education, knee function, quality of life.

ÖZ

Amaç: Bu araştırmanın amacı, total diz protezi (TDP) uygulanan hastalarda video-destekli hasta eğitiminin (VHE) diz fonksiyonları, yaşam kalitesi (YK) ve komplikasyonların azaltılmasına etkisini belirlemektir.

Yöntemler: Bu araştırma prospektif, paralel, iki kollu, randomize kontrollü çalışmadır. Bu araştırma ortopedi ve travmatoloji kliniğinde elektif TDP uygulanan 44 hasta ile gerçekleştirildi. VHE grubuna kliniğin rutin bakımına ek olarak TDP için erken postoperatif bakım, günlük yaşam aktiviteleri ve kademeli egzersiz programını kapsayan VHE uygulandı. Kontrol grubuna rutin bakım uygulandı. Araştırma verileri başlangıçta, TDP sonrası 1. ve 3. ayda Western Ontario ve McMaster Üniversiteleri Osteoartrit İndeksi (WOMAC) ve Kısa Form-36 (SF-36) ile toplandı.

Bulgular: VHE grubunun WOMAC ağrı, tutukluk ve fiziksel fonksiyon puan ortalamaları TDP sonrası 3. ayda kontrol grubuna göre anlamlı olarak düşüktü. TDP sonrası 3. ayda VHE grubunun SF-36'nın ağrı, emosyonel rol ve mental sağlık hariç tüm alt boyut puanları kontrol grubundan anlamlı olarak daha yüksekti.

Sonuç: VHE, TDP hastalarında diz fonksiyonlarını ve YK'yi arttırabilir. Hemşireler VHE yöntemini TDP sonrası diz fonksiyonlarının ve YK'nin geliştirilmesinde kullanabilir.

Anahtar Kelimeler: Diz protezi, hasta eğitimi, diz fonksiyonu, yaşam kalitesi

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INTRODUCTION

Total knee replacement (TKR) is the most effective treatment modality for correcting knee deformities, increasing knee function (KF), relieving pain, and improving the quality of life (QoL) of patients.[1] According to the health statistics of the Organization for Economic Co-operation and Development (OECD) in 2021, TKR is most commonly used in Switzerland (273/100,000), Finland (260/100,000), and Austria (252/100,000), while this rate is estimated as 90/100,000 in Türkiye.[2] Although it has been increasingly applied in Türkiye and worldwide, it is associated with postoperative pain, restricted range of motion (ROM), and reduced muscle strength, leading to a prolonged recovery process and return to activities of daily living (ADLs) with impaired QoL.[3-6] In addition, inadequate patient education on knee care and ADLs following TKR may result in repetitive and uncontrollable movements and complications such as severe pain and dislocation. Postoperative complications are observed to be associated with rehospitalization and resurgery.[3]

Patients need a long rehabilitation period after TKR and it is also expensive.[1] Comprehensive nursing care and patient education are essential to gain independence and return ADLs for patients undergoing TKR.[7] Patient education after TKR increases the success of the operation, improves the treatment process[3,8,9], and prevents or minimizes postoperative complications after discharge.[3] All these improve the KF and QoL of the patients.[3,8] Patients are usually discharged on the first postoperative day if no complication occurs. Thus, patient education can be instructed within a very limited period, mostly without repetition. Furthermore, patients and/or their relatives may be anxious after TKR and before discharge, leading to difficulties in fully understanding or remembering the education given at the hospital. As a result, the use of new technological education tools (such as telephone, video or virtual reality) is inevitable to utilize nurses' time effectively.[10-12] In recent years, disease-specific video-assisted patient education (VPE) has been increasingly used for patient education.[10,12] Video-supported patient education is more advantageous than written material-supported or only verbal ~~on~~.[11] VPE has a higher recall rate than verbal education, can be watched repeatedly by patients whenever and wherever they desire[10-12], increases patient satisfaction while decreasing their anxiety levels, and allows patients to actively participate in their care.[13] Patient education supported by multimedia is also more useful for those with limited literacy.[11] Considering all these, the use of VPE prepared by nurses to reduce knee problems and increase function in patient education after TKR can be considered a cost-effective approach that can also improve the quality of care.

Especially during the COVID-19 pandemic, the number of elective orthopedic surgeries decreased by 50-75%, and teleconsultation and telerehabilitation were preferred by 30% of the surgeons.[14] Orthopedic postoperative telerehabilitation programs (postoperative management, including dressing and suture removal, and evaluation of the surgical wound, etc.) for the TKR have been proved to be a useful[15] and cost-effective option in improving patient outcomes.[16,17] VPE can be an effective educational method in terms of ensuring that patients after TKR receive uninterrupted rehabilitation in the postoperative period without coming to the hospital during the COVID-19 pandemic and subsequent pandemics.

In the literature, a limited number of studies in which VPE was given by nurses or other health professionals after orthopedic surgical interventions for joints such as total hip replacement [9,18-20], total knee replacement[11], and rotator cuff repair have been found.[12]

AIM

In the present study, we hypothesized that VPE could improve the KF, QoL and decrease complications following TKR. Using a holistic approach, we, therefore, aimed to investigate the effect of VPE on KF, QoL and complications in patients undergoing TKR.

METHODS

Study Design and Setting

This two-arm [1:1], parallel-group, prospective, randomized-controlled clinical study was designed to investigate the effect of VPE on KF, QoL and complications in patients undergoing TKR. 44 patients in total who underwent elective TKR at an orthopedics and traumatology clinic of a university hospital in Türkiye between July 2018 and March 2019 were included in this study.

Sample Size and Sampling

The sample size was calculated according to the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Short Form-36 (SF-36) scores with a type I error rate of 0.05% and 90% power described in a previous study by Chen et al.[8] Each group should have at least 22 individuals and there should be a total of 44 patients (VPE group=22; control group=22). Inclusion criteria were as follows: age ≥18 years; being conscious, orientated, and cooperative; undergoing unilateral and elective TKR for the first time; having a Standardized Mini-Mental Test (SMMT) score of ≥23. The study flow chart is depicted in Figure 1.

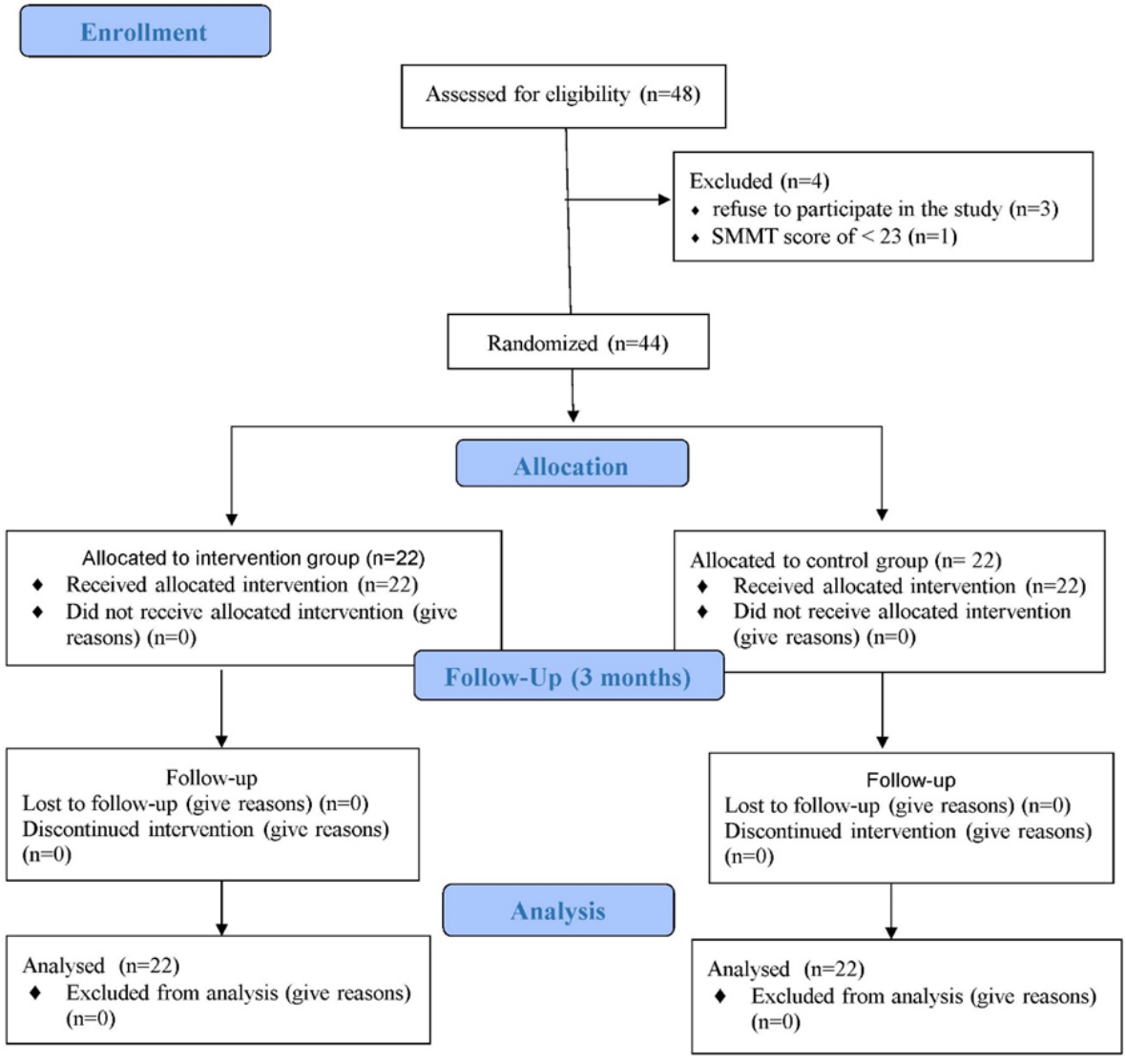

Figure 1. The CONSORT Flow Diagram of the Groups Enrollment, Allocation, Intervention, Follow-Up, and Analysis

The eligible patients were randomly assigned to either VPE or control group, according to the arrival sequence in blocks of two with a 1:1 ratio using the stratified randomization method (sex). Age is the strongest predictor of the development and progression of osteoarthritis. It is more common in women, increasing after the age of 50, especially in the hand and knee. The main indication for hip and knee replacement (joint replacement surgery) is osteoarthritis.[2] Therefore, sex-based block randomization was performed in this study. The randomization sequence was developed using a computer-generated table of random numbers, assigned by a biostatistician who was not associated with the study. Group allocation was concealed using individual sealed opaque envelopes that were numbered in sequential order. As individuals were enrolled in the study, the next envelope in the sequence was extracted and the participant was assigned to the groups accordingly. When the patient was admitted to the orthopedic clinic, the researcher notified the clinic nurse about each patient, who agreed to participate in the study and signed the informed consent form. The clinic nurse who was not involved in the study assigned the patient to one of the groups according to the list in the envelope and informed the researcher. The nurse then opened the opaque envelope to assign the patient to a group. All the researchers except for the clinical nurse, positioned the patients according to the randomization list, and patients were not aware of the group assignment. The researchers involved in the data and statistical analyses were also unaware of the group allocation.

Outcome Measures and Measurement

The primary outcome measure was the effect of VPE on

improved KF and QoL, while the secondary outcome measure was the effect of VPE on reduced complications. Data were collected using the Patient Information Form, WOMAC, and SF-36.

The Patient Information Form: This form consisted of descriptive and clinical information about the patient's age, sex, marital status, education status, and physiotherapy status after TKR.

Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC): The KF was evaluated using the WOMAC. The Turkish validity and reliability studies were performed previously.[21] It consists of a total of 24 items, including pain (5 items), stiffness (2 items), and physical function (17 items). Items are rated on a five-point Likert scale as follows: 0=none, 1=mild, 2=moderate, 3=severe, 4=extreme. The highest possible scores that can be obtained are 20 for pain, 8 for stiffness, and 68 for physical function (difficulties experienced when engaging in ADLs). The total score ranges from 0 (the best) to 96 (the worst). Higher scores indicate worse KF, while lower scores indicate better KF.[22] The Cronbach alpha of the WOMAC was calculated as 0.85 in this study.

Short Form-36 (SF-36): The QoL was evaluated using the Turkish version of SF-36.[23] This scale measures eight subscales using 36 self-rating questions including physical functioning, role limitations due to physical problems, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health. The higher scores indicate better QoL, while lower scores mean worse QoL.[24,25] The Cronbach-alpha of the SF-36 was calculated as 0.80 in this study.

Intervention and Data Collection

Prior to the study, the Patient Information Form, WOMAC, and SF-36 were filled out by the researchers.

The control group received routine treatment and care by the physicians and nurses of the clinic. It consists of verbal information about surgery by the physician and nurse of the clinic before TKR, cold pack application and the use of analgesics after TKR for pain management, knee positioning with a pillow to prevent flexion and ensure smooth motion of the knee, verbal patient education at the time of discharge including the use of medications, home-based exercises, and follow-up visits, and discharge on the first postoperative day if no complication occurs. In addition, the patient is scheduled for follow-up on a weekly basis and informed about how to do exercises at home. At the physician's discretion, the patient may be referred to physiotherapy.

The VPE group also received routine treatment and care per protocol. Additionally, this patient group watched patient education through video via tablet in the patient room before TKR. Patient rooms in the clinic were for two people. In cases where the patients in the VPE and control groups were hospitalized in the same room, it was planned to show the educational video to the patient in the clinic seminar room in order not to affect the results of the study, but this was not the case during the study. The contents of the VPE that consist of three sections were developed by the researchers and included (1) early postoperative care for TKR (knee positioning, early mobilization, pain control, and cold application), (2) ADLs at home (bathing and toileting, eating, sleeping, vehicle driving, housekeeping, sexual life, praying, and maintaining home safety), and (3) gradual exercise at home (for the first 90 days after discharge) (Figure 2). The VPE was approximately 20 minutes long. At the end of the education, VPE was given to the patients in the way they preferred (CD-ROM, flash disc, uploading the video to the computer or mobile phone). The VPE was prepared by the researchers in line with the literature.[26-31]

Before starting the study, a team of an orthopedic physician, two orthopedic nurses, and a physiotherapist, working in the clinic where the research was conducted, but not involved in this study, evaluated the content and clarity of the VPE, and necessary revisions were made in accordance with their suggestions. The final version of VPE was administered to four patients (10% of the sample) as a pilot study to assess its intelligibility and applicability, and these patients were not included in this study. The nurse researcher contacted the patients once a week by telephone to check the status of the patients, specifically whether they watched the training video, how often they watched it, and whether they practiced the exercises. All patients underwent the same VPE, but no patient reported being unable to perform the exercise or having problems during the study.

The WOMAC and SF-36 were filled out by the researchers and postoperative complications at 1st and 3rd month after TKR were evaluated during follow-up visits in the outpatient setting.

Statistical Analyses

Statistical analysis was performed using the STATA/MP (version 11.0). Descriptive data were presented in mean±standard deviation (SD), median (min-max), or number and percentage, where applicable. The independent Student's t-test was used to compare continuous variables, while the Pearson chi-square or

Fisher's exact test was used to compare categorical variables between the groups. Repeated-measures analysis of variance (ANOVA) was performed to assess pre- and postoperative WOMAC and SF-36 scores at one and three months. The contrast test was used for multiple intra-group comparisons (post-hoc). P value of <.05 was considered statistically significant.

Ethical Considerations

The study protocol was approved by the Clinical Research Ethics Committee of Mersin University (Date: 21.09.2017, No: 266) and by the hospital management (Date: 09.10.2017; No:74419321-903.99). The study was conducted in accordance with the principles of the Declaration of Helsinki.[32]

RESULTS

The baseline demographic and clinical characteristics of the patients are presented in Table 1. There was no statistically significant difference in the demographic and clinical characteristics between the patient groups (P>.05) (Table 1).

Figure 2. Images of Video-Assisted Education Content

Table 1. Descriptive and Clinical Characteristics of the Patients (n=44)

Characteristics	Control Group	VPE Group	t-test or X^2 or Fisher's exact test (*P*)
Age, mean (SD) (min=33 max=81)	66.4 (7.8)	66.1 (10.5)	0.114 (.910)
Gender			
Female	19 (86.4%)	19 (86.4%)	0.000 (1.000)
Male	3 (13.6%)	3 (13.6%)	
Marital Status			
Married	21 (95.5%)	22 (100 %)	1.410 (.235)
Single	1 (4.5%)	0 (0%)	
Level of Education			
Elementary Education	20 (90.9%)	17 (77.3%)	1.572 (.210)
Higher Education	2 (9.1%)	5 (22.7%)	
Receiving Physiotherapy Status			
Yes	1 (4.5%)	2 (9.1%)	0.364 (.546)
No	21 (95.5%)	20 (90.9%)	

Abbreviation VPE, Video-assisted Patient Education; SD, Standard deviation

The pre- and postoperative WOMAC scores of the patients are summarized in Table 2. Compared to baseline, the postoperative WOMAC pain, physical function, and total scores were significantly lower in the VPE group, while the postoperative WOMAC physical function and total scores were significantly lower in the control group (*P*<.001). In addition, the WOMAC stiffness scores were significantly lower in the VPE group at 1st and 3rd month following TKR, whereas the WOMAC pain and stiffness scores were significantly lower in the control group at 1st and 3rd month after TKR, compared to baseline (*P*<.001). The WOMAC pain and total scores were higher in the control group than the VPE group before TKR (respectively, *P*=.015; *P*=.043) and these scores were significantly found to be higher at 1st (respectively, *P*=.021; *P*=.026) and 3rd month after TKR, as well (respectively, *P*=.002; *P*=.007). Compared to the control group, the WOMAC stiffness scores of the VPE group were significantly lower at 1st (*P*=.005) and 3rd month after TKR (*P*=.020), while the WOMAC physical function scores were significantly lower at 3rd month after TKR (*P*=.010) (Table 2).

Table 2. Comparison of the Patients WOMAC Score (n=44)

Evaluation time		Control Group Mean (SD)	VPE Group Mean (SD)	t-test (*P*)
Pain	Before TKR[a]	16.6 (2.8)	13.9 (2.2)	2.525 (.015)
	1st month after TKR[b]	6.2 (2.5)	4.5 (1.9)	2.413 (.021)
	3rd month after TKR[c]	4.5 (4.6)	1.0 (1.8)	3.350 (.002)
	F test (*P*)	97.843 (<.001)	299.659 (<.001)	
	Contrast post test	a>b,c	a>b>c	
Stiffness	Before TKR[a]	5.4 (1.9)	4.6 (1.8)	1.483 (.146)
	1st month after TKR[b]	2.5 (1.5)	1.3 (0.8)	3.014 (.005)
	3rd month after TKR[c]	1.7 (2.0)	0.6 (0.8)	2.471 (.020)
	F test (*P*)	46.339 (<.001)	78.576 (<.001)	
	Contrast post test	a>b,c	a>b,c	
Physical function	Before TKR[a]	51.8 (4.6)	48.5 (6.4)	1.444 (.156)
	1st month after TKR[b]	26.9 (8.8)	19.7 (7.1)	1.997 (.052)
	3rd month after TKR[c]	16.6 (16.4)	6.0 (7.3)	2.765 (.010)
	F test (*P*)	83.821 (<.001)	296.792 (<.001)	
	Contrast post test	a>b>c	a>b>c	
Total score	Before TKR[a]	73.8 (6.6)	67.0 (8.9)	2.088 (.043)
	1st month after TKR[b]	35.6 (12.2)	25.5 (9.1)	2.322 (.026)
	3rd month after TKR[c]	22.9 (22.6)	7.6 (9.7)	2.902 (.007)
	F test (*P*)	96.479 (<.001)	328.490 (<.001)	
	Contrast post test	a>b>c	a>b>c	

Abbreviation VPE, Video-assisted Patient Education; SD, Standard deviation; TKR,Total knee replacement; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index

The pre- and postoperative SF-36 scores of the patients are presented in Table 3. Compared to baseline, the SF-36 physical functioning, physical role, pain, and vitality scores were significantly higher in the VPE group and the SF-36 physical functioning scores were significantly higher in the control group after TKR (*P*<.001).

Table 3. Comparison of the Patients SF-36 Score (n=44)

	Evaluation time	Control Group Mean (SD)	VPE Group Mean (SD)	t-test (*P*)
Physical functioning	Before TKR[a]	7.0 (5.9)	9.8 (7.0)	-1.399 (.169)
	1st month after TKR[b]	35.5 (19.3)	44.5 (1.1)	-1.831 (.074)
	3rd month after TKR[c]	50.9 (27.3)	65.7 (2.3)	-2.181 (.036)
	F test (*P*)	45.362 (<.001)	143.897 (<.001)	
	Contrast post test	c>b>a	c>b>a	
Physical role	Before TKR[a]	2.3 (10.7)	0.0 (0.0)	1.000 (.329)
	1st month after TKR[b]	40.9 (44.7)	56.8 (43.1)	1.202 (.236)
	3rd month after TKR[c]	64.8 (48.0)	95.5 (21.3)	-2.741 (.010)
	F test (*P*)	14.883 (<.001)	65.850 (<.001)	
	Contrast post test	b,c>a	c>b>a	
Pain	Before TKR[a]	3.0 (1.4)	3.0 (1.2)	-0.151 (.880)
	1st month after TKR[b]	9.8 (14.4)	10.5 (11.9)	-0.161 (.873)
	3rd month after TKR[c]	45.2 (8.7)	49.7 (10.0)	-1.592 (.119)
	F test (*P*)	119.432 (<.001)	169.994 (<.001)	
	Contrast post test	c>a,b	c>b>a	
General health	Before TKR[a]	44.0 (17.9)	48.2 (17.2)	-0.799 (.429)
	1st month after TKR[b]	47.1 (14.5)	61.3 (11.2)	-3.619 (.001)
	3rd month after TKR[c]	51.6 (20.8)	70.9 (13.9)	-3.621 (.001)
	F test (*P*)	2.581 (.110)	20.360 (<.001)	
	Contrast post test	-	b,c>a	
Vitality	Before TKR[a]	21.8 (11.7)	26.4 (13.3)	-1.204 (.235)
	1st month after TKR[b]	34.8 (13.9)	47.3 (9.4)	-3.495 (.001)
	3rd month after TKR[c]	38.9 (17.4)	58.4 (10.5)	-4.513 (<.010)
	F test (*P*)	18.219 (<.001)	110.977 (<.001)	
	Contrast post test	b,c>a	c>b>a	
Social functioning	Before TKR[a]	30.1 (29.0)	27.8 (21.1)	0.297 (.768)
	1st month after TKR[b]	60.2 (24.9)	72.6 (11.5)	-2.040 (.050)
	3rd month after TKR[c]	64.4 (14.6)	68.1 (10.3)	-0.986 (.330)
	F test (*P*)	21.174 (<.001)	69.537 (<.001)	
	Contrast post test	b,c>a	b,c>a	
Emotional role	Before TKR[a]	21.2 (36.4)	3.0 (9.8)	-2.260 (.033)
	1st month after TKR[b]	68.2 (44.2)	93.9 (22.1)	-2.443 (.020)
	3rd month after TKR[c]	71.2 (44.0)	98.5 (7.1)	-2.870 (.009)
	F test (*P*)	9.941 (<.001)	300.546 (<.001)	
	Contrast post test	b,c>a	b,c>a	
Mental health	Before TKR[a]	41.8 (19.5)	45.3 (16.0)	-0.643 (.524)
	1st month after TKR[b]	52.4 (17.1)	65.6 (11.7)	-3.000 (.005)
	3rd month after TKR[c]	65.5 (60.1)	74.9 (10.8)	-0.726 (.475)
	F test (*P*)	2.161 (0.124)	29.790 (<.001)	
	Contrast post test		b,c>a	

Abbreviation SD, Standard deviation; VPE, Video-assisted Patient Education; TKR, Total knee replacement; SF-36, Short Form-36 Scale

In addition, the SF-36 general health, social functioning, emotional role, and mental health scores of the VPE group and the SF-36 physical role, vitality, social functioning, and emotional role scores of the control group significantly increased at 1st and 3rd month after TKR (*P*<.001). The SF-36 pain scores of the control group were significantly higher at 3rd month after surgery than baseline and 1st month scores (*P*<.001). At baseline, the SF-36 emotional role scores of the VPE group was significantly lower than the control group (*P*=.033); however, the SF-36 general health (*P*<.001), vitality (*P*<.001), social functioning (*P*=.050), emotional role (*P*=.020) and mental health scores (*P*=.005) were significantly higher at 1st month and the SF-36 physical functioning (*P*=.036), physical role (*P*=.010),

general health (*P*<.001), and vitality scores (*P*=.010) were significantly higher at 3rd month after surgery than the control group (Table 3).

Following TKR, edema was seen in only one patient (4.5%) and four patients (18.2%) in the control group at 1st and 3rd month, respectively. There was only one patient in whom complication developed in the VPE group. There was no statistically significant difference in the complication rates between the groups (*P* >.05) (Table 4).

Table 4. Comparison of Complication Development in Patients (n=44)

Complications	Control Group	VPE Group	Fisher's exact test (*P*)
Complication development in the first one month after TKR			
Yes (Edema)	1 (4.5%)	0 (0.0%)	1.410 (.235)
No	21 (95.5%)	22 (100.0%)	
Complication development in the first three months after TKR			
Yes	4 (18.2%)	1 (4.5%)	2.031 (.154)
*Edema**	1 (4.5%)	1 (4.5%)	
*Fracture***	1 (4.5%)	0 (0.0%)	
Infection	2 (9.1%)	0 (0.0%)	
No	18 (81.8%)	21 (95.5%)	

Abbreviation SD, Standard deviation; VPE, Video-assisted Patient Education; TKR, Total knee replacement
*+3 edema developed with cellulitis around the wound.
**Periprosthetic fracture after a fall

DISCUSSION

Although TKR has been applied to increase the mobility of the patient, it is associated with knee pain and KF impairment, leading to impaired QoL.[1,3] The previous studies have shown that preoperative patient education[11,33,34] and postoperative exercise programs[6,8,35,36] improve the KF and QoL. However, there is a limited number of studies investigating the effectiveness of VPE.[8,11,37] Unlike the previous studies, in the present study, we developed a VPE consisting of early postoperative care, ADLs, and a progressive exercise program and examined its effect on KF and QoL in the patients undergoing TKR. Our study showed that the VPE improved KF and QoL in this patient population as early as three months after TKR.

Effect of VPE on KF

In this study, the KF after TKR was measured using the WOMAC. The WOMAC scores were significantly lower after surgery than the baseline scores, indicating improved KF with time. This finding is an expected consequence of TKR, consistent with the previous studies.[4,8,11,37-40] However, the WOMAC total and subscale scores tended to decrease from the 1st month of TKR up to the 3rd month in the VPE group than the control group, suggesting that VPE is an effective method in improving the KF in patients undergoing TKR. On the other hand, the preoperative WOMAC pain and total scores were significantly higher in the control group than in the VPE group, suggesting that the control group experienced more pain with worse KF.

Furthermore, the WOMAC stiffness scores of the VPE group significantly decreased in 1st month and the physical functioning scores significantly increased in 3rd month than the control group. The patients in the VPE group were able to move their knees and gained their physical functioning earlier than the control group. Similar to our study, Chen et al. provided a standard rehabilitation protocol manual and video to discharged patients undergoing TKR and reported that the stiffness scores significantly decreased from the third postoperative month.[8] In another study, a six-week physical therapy protocol was applied to the patients undergoing TKR, and a significant improvement in the stiffness scores was achieved.[4] Several studies have also confirmed the effectiveness of exercise education following TKR in improving physical functions.[8,11,34-36] The exercise program is recommended to be maintained for 14 to 26 weeks to regain the KF of the patients and to prevent postoperative complications.[31] In a meta-analysis, low- or moderate-quality evidence showed no clinically important difference between clinic and home-based programs for mobility, patient-reported pain, and function at 10 weeks after TKR.[41] Therefore, more cost-effective methods have been used for rehabilitation after TKR. In a recent feasibility study investigating the effects of two different home-based programs on patient outcomes after TKR, conventional face-to-face sessions and a digital intervention performed through an artificial intelligence-powered biofeedback

system under remote clinical monitoring were compared.[39] At the end of the eight-week program, the clinical outcomes were found to be superior in the digital intervention group with reduced symptoms and pain and improved ADLs and QoL at three months. Although we did not use a digital biofeedback system in this study, we found similar improvements in the KF scores in the VPE group from the postoperative month. The implementation of a progressive home-based exercise program through video for 3rd month after TKR and phone calls on a weekly basis to evaluate patient compliance were helpful in regaining the physical function and ability of the patients within a short period of time following TKR.

Effect of VPE on QoL

In the present study, we evaluated QoL after TKR using the SF-36. In all patients, the QoL improved after TKR compared to baseline. This finding is an expected consequence of TKR, consistent with previous studies.[4,8,11,36,38,39,42] In addition, the SF-36 physical health scores, except for pain, were significantly higher in the VPE group than in the control group at 3rd month after surgery, indicating improved QoL in the VPE group. In the previous studies using different tools to evaluate KF and QoL, the physical functioning significantly improved at 1st month[36] and at three months postoperatively.[39,42] There are also several reports that exercise education after TKR increased physical functions[8,11] and physiotherapy programs significantly improved the physical limitation at 3rd month.[4] All these findings are consistent with our results. Unlike a previous study[11], we found that general health perception scores significantly improved in the VPE group from the 1st postoperative month. Lower WOMAC physical functioning scores at three months in the VPE group suggest that the VPE group regained their physical functions earlier and ensured smooth knee motion, leading to an improved general health perception. This can be also attributed to the fact that no complication was seen in any of the patients at 1st month and in only one patient at 3rd month in the VPE group.

Furthermore, higher SF-36 subscale scores, except for mental role, at 1st month after TKR in the VPE group than in the control group indicate that VPE can improve the QoL of these patients. In a study using a similar patient education tool, the SF-36 vitality, social functioning, and mental health scores were found to be significantly higher at six weeks in the intervention group, compared to the controls.[11] In another study using VPE, the SF-36 mental health scores were significantly higher in 3rd month after TKR.[8] Based on these findings, we can speculate that the VPE group felt full of life and energetic and returned to social life earlier with better mental health and without having physical or emotional difficulties.

Effect of VPE on Complications

In our study, the number of patients developing postoperative complications was higher in the control group than the VPE group. Although this result is important, there was no statistically significant difference between the groups. Therefore, further studies are needed to gain a better understanding of the effect of VPE in preventing postoperative complications in patients undergoing TKR.

Study Limitations

Nonetheless, there are some limitations to this study. Although post-TKR rehabilitation is recommended for about one year, KF and QoL were evaluated as early as 3rd month after surgery. Although favorable clinically relevant results in the KF and QoL were seen in the VPE group than the control group, early assessment of QoL may have precluded the statistical significance of these results. Additionally, we couldn't utilize a feedback method such as a mobile application or web page to check the patient compliance with VPE and to check the home-based exercises.

In conclusion, these study results suggest that VPE increases KF and QoL in patients undergoing TKR. In addition, postoperative complications were observed in only five patients in this study; therefore, one cannot speculate whether VPE can prevent postoperative complications. Early discharge of the patients after TKR leads nurses to provide patient education within a limited period of time. Also, the VPE method of education will be beneficial during times like the COVID-19 pandemic when resources are limited. We recommend that further studies be conducted to investigate the effect of VPE on QoL in the long term, considering the rehabilitation period takes about one year in patients undergoing TKR. In addition, variables such as blood transfusion requirement during TKR, ambulation time, use of narcotic analgesics after TKR, and duration of hospitalization may affect the QoL and KF of the patients, so it may be suggested to take these variables into consideration in future studies.

Video-assisted patient education prepared specifically for TKR, improves KF and QoL in TKR patients. Nurses can easily integrate cost-effective VPE methods in patient education into clinical practice after TKR. Therefore, a TKR-specific VPE allows nurses to use their time more effectively, ensures patients maintain self-care after discharge, and continues patient education at home, resulting in favorable patient outcomes.

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