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The Effectiveness of Kinesio Taping on Pain and Function in Patients with Knee Osteoarthritis: A Randomized, Single-Blind, Controlled Study

Kinezyo Bantlamanın Diz Osteoartritli Hastalarda Ağrı ve Fonksiyon Üzerine Etkinliği: Randomize, Tek Kör, Kontrollü Bir Çalışma

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This study was prepared based on the findings of Serhat Metin DÖNER"s thesis study titled "Evolution of effectiveness of kinesiotaping in patients with knee osteoarthritis" (İzmir: Dokuz Eylül University; 2016).

ABSTRACT Objective: The study aimed to determine the effects of additional kinesio taping (KT) over the home exercise program on pain and functionality in patients with knee osteoarthritis. **Material and Methods:** A total of 60 (47 female, 13 male) adult patients with knee osteoarthritis were included in the study. Patients were randomized into 2 groups; Group I (n=30, KT and home exercises) and Group II (n=30, home exercises only). Both groups received the same home exercise program and the treatment group additionally received KT 3 times at 3-day intervals. Participants were assessed before treatment, at 9 days and 30 days from the beginning of treatment. Pain intensity at rest and during walking was assessed by a 10 cm visual analog scale (VAS). Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the Timed Up and Go Test were used for functional evaluation. **Results:** The study ended with 55 (n=29 in Group I and n=26 in Group II) patients. Both groups displayed significant improvements concerning VAS-pain during walking and Timed Up and Go test scores at the 9th and 30th days of treatment (p<0.001). WOMAC total scores improved significantly at the 30th day of treatment in both groups (p=0.002). No significant differences were found between the 2 groups in any of the outcome measures (p>0.05). **Conclusion:** This study demonstrated that the addition of KT to a home exercise program in knee osteoarthritis is not superior to the home exercise program only.

Keywords: Knee osteoarthritis; kinesio taping; exercise program

ÖZET Amaç: Bu çalışmanın amacı, diz osteoartritli hastalarda ev egzersiz programı üzerine ek olarak yapılan kinezyo bantlamanın [kinesio taping (KT)] ağrı ve fonksiyonellik üzerine etkilerini belirlemektir. **Gereç ve Yöntemler:** Çalışmaya, diz osteoartriti olan toplam 60 (47 kadın, 13 erkek) erişkin hasta dâhil edildi. Hastalar randomize olarak 2 gruba ayrıldı; Grup I (n=30, KT ve ev egzersizleri) ve Grup II (n=30, sadece ev egzersizleri). Her iki grup da aynı ev egzersiz programını aldı ve tedavi grubu ek olarak 3 gün arayla 3 kez KT aldı. Katılımcılar tedaviden önce, tedavinin başlangıcından 9 gün ve 30 gün sonra değerlendirildi. İstirahat ve yürüme sırasındaki ağrı şiddeti 10 cm vizüel analog skala (VAS) ile değerlendirildi. Fonksiyonel değerlendirme için Batı Ontario ve McMaster Üniversitesi Osteoartrit [Western Ontario and McMaster Universities Osteoarthritis (WOMAC)] indeksi ve kalk-yürü testi kullanıldı. **Bulgular:** Çalışma 55 (Grup I'de n=29 ve Grup II'de n=26) hasta ile tamamlandı. Her iki grupta da 9 ve 30. günlerde yürüme sırasındaki VAS-ağrısı ve kalk-yürü testi puanlarında anlamlı iyileşmeler görüldü (p<0,001). WOMAC indeksi toplam skorları, her iki grupta da 30. günde anlamlı olarak iyileşti (p=0,002). Sonuç ölçütlerinin hiçbirinde ise 2 grup arasında anlamlı fark bulunmadı (p>0,05). **Sonuç:** Bu çalışma, diz osteoartritinde ev egzersiz programına KT eklenmesinin sadece ev egzersiz programından üstün olmadığını göstermiştir.

Anahtar Kelimeler: Diz osteoartriti; kinezyo bantlama; egzersiz programı

Knee osteoarthritis is a common degenerative disease that seriously affects the quality of life by causing pain and gait disturbance, especially in the elderly population. Pain is the major symptom of knee osteoarthritis. Restricted joint motion, stiffness, swelling, and loss of function are other common

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symptoms.[1] The goals of osteoarthritis treatment are to control pain and other symptoms, increase patients' quality of life, protect joint functions and prevent injuries.[2] Treatment approaches in knee osteoarthritis include patient education, weight control, exercises, oral and topical nonsteroidal anti-inflammatory drugs, intra-articular glucocorticoid injections, and physical therapy. Recently, kinesio taping (KT) has also gained popularity as a treatment option for knee osteoarthritis.[3] Japanese acupuncturist and chiropractor Dr. Kenzo Kase developed KT in 1973.[4] It is a waterproof, elastic adhesive material that does not restrict the joint range of motion.[1,5] KT creates folds in the skin in the applied area, raises the skin, increases the space between the skin and muscles, and relieves the pressure in the area. The mechanism of the hypoalgesic effect of KT is mostly attributed to the gate control theory.[6] Some randomized controlled studies have shown that KT can be beneficial for pain and function in patients with knee osteoarthritis.[2,7] Also in current systematic reviews, it has been reported that KT has significant effects on pain, physical function, range of motion, and quadriceps muscle strength in patients with knee osteoarthritis.[8-10] However, some recent articles and meta-analyses suggest that further studies are needed because of conflicting results regarding the effectiveness of KT on pain and function in knee osteoarthritis.[5,8,11,12]

The study aimed to determine the effects of additional KT over the home exercise program on pain and functionality in patients with knee osteoarthritis.

MATERIAL AND METHODS

STUDY DESIGN AND POPULATION

Sixty patients with knee osteoarthritis diagnosed according to the diagnostic criteria of the American College of Rheumatology were included in the study.[13] The study was conducted as a single-blind, randomized controlled trial. Approval for the protocol of the study was obtained from the Dokuz Eylül University Ethics Committee (date: March 12, 2015, protocol no: 2015/08-14), and all patients signed an informed consent form. All procedures were performed in accordance with the Helsinki Declaration.

Inclusion criteria were age between 45 and 75 years, having a diagnosis of knee osteoarthritis, and having a knee pain score of 3/10 or above on the visual analog scale (VAS) during walking.

Exclusion criteria were systemic inflammatory arthritis, oral steroid treatment in the last 3 months, history of physical therapy or corticosteroid injections at the knee in the last 6 months, previous knee surgery, neurological deficits in the lower extremities, central or peripheral nervous system disease, the cardiopulmonary disease that would prevent exercise, and any contraindication for KT (extensive and severe skin injuries, open wounds with risk of infection, allergic reactions, and pregnancy).

Patients enrolled in the study were randomized into a KT treatment group (Group I) and a control group (Group II). The block randomization method was used with a block size of 4. The researcher chose the first block by drawing lots. Beginning from this block, a list for randomization was generated for 60 people. Researcher assigned the patients into the groups in line with the list generated.

Age, gender, occupation, education level, symptom duration, weight, and height parameters of the participants were recorded at baseline. The staging of knee osteoarthritis was carried out using the Kellgren-Lawrence staging system on standing anteroposterior and lateral knee radiographs.

INTERVENTIONS

Patients in the KT group (Group I) received a standard KT application and a home exercise program. Patients in the control group (Group II) received only a home exercise program.

Kinesio Tape Application

Kinesio tape application was performed by a physician, according to the manual by Kase et al. Two Y tapes with a length of 25 cm and a thickness of 0.5 mm were used.[4] For the first tape application, the knee was slightly flexed. Beginning from the quadriceps muscle, the strip was laid down with light tension until the superior pole of the patella. Then, the knee was placed into maximum flexion. The tails of the Y strip were laid down around the medial and lateral borders of the patella with light tension, and

ended on the tibial tuberosity with no tension. The second taping was started with the knee slightly flexed. Starting from just below the tibial tuberosity, the tape was applied until the inferior pole of the patella with light tension. Then, the knee was placed into maximum flexion. The tails of the Y strip were applied around the medial and lateral borders of the patella with light tension. The medial tail ended on the vastus medialis muscle, while the lateral tail ended on the vastus lateralis muscle (Figure 1).[4] KT was applied 3 times, once every 3 days (by staying on the skin for 3 days).

Home Exercise Program

As a home exercise program for all patients; isometric exercises for quadriceps and hip adductors, terminal knee extension, straight leg lift (in four directions), isotonic hamstring strengthening, mini-squats, single leg stand, and stretching exercises for hamstring, gastrocnemius, and iliotibial band were given. The exercises were given every day of the week, 2 times a day, with 15 repetitions. Patients were instructed to perform the exercises during the whole study period (30 days).

All patients were allowed to take only paracetamol tablets for pain relief when needed. They were asked to keep a medication and exercise diary.

OUTCOME MEASURES

Assessments and data collection were done by a physician unaware of group assignments. Participants were assessed before treatment, at 9 days from the beginning of treatment, and at 30 days from the beginning of treatment. A 10 cm VAS was used for the assessment of pain intensity at rest and during walking. Western Ontario and McMaster Osteoarthritis Index (WOMAC) was used for functional evaluation. Additionally, the Timed Up and Go Test was applied as a performance-based physical function test.

VAS-Pain

At each control, pain at rest and pain during walking of the patients were questioned and recorded on a 10 cm VAS. VAS is a 10 cm line with 2 endpoints representing “no pain” at the beginning (score of 0) of the scale and “unbearable pain” at the other end (score of 10).[14] After the scale was verbally explained to the patient, he was asked to mark the point on the scale corresponding to the severity of his pain, and the distance from zero to the point marked by the patient was measured in centimeters and recorded.

FIGURE 1: Kinesio tape application for patients.

Western Ontario ve McMaster Universities Osteoarthritis Index

This assessment scale consists of 3 sub-sections. Part A assesses pain, part B assesses joint stiffness, and part C evaluates physical function. It includes 5 items for pain grade, 2 items for joint stiffness, and 17 items for physical function. Scores for each item range between 0 and 4, which corresponds to; 0: none, 1: mild, 2: moderate, 3: severe, 4: extreme. The scores for each sub-section are summed up. Low scores show good disease status, high scores show severe disease status. The total score for section A is scored between 0 and 20, for section B between 0 and 8, for section C between 0 and 68, and the total WOMAC score is scored between 0 and 96.[15,16]

Timed Up and Go Test

It is a functional mobility, balance, and performance test widely used in rehabilitation units, geriatrics, and

neurophysiology. For this test, the participant is placed in an upright sitting position on a standard chair of approximately 45 cm in height, with feet on the ground. With the "Start" command, the participant stands up, walks to a mark 3 meters away, turns around, walks back to the chair, and sits down. The entire time is measured using a stopwatch and the score is recorded in seconds.[17] The test evaluates basic mobility skill and strength, balance, and agility.[18]

STATISTICAL ANALYSIS

SPSS (Version 24.0, Armonk, NY: IBM Corp.) statistical program was used for the data analysis. The normality of the distribution of the data was tested by the Kolmogorov-Smirnov test. Fisher's exact test was used for categorical variables. For comparison of the 2 groups, the independent samples t-test was used for the data with normal distribution, and the Mann-Whitney U test was used for the data with non-normal distribution. The Friedman test was used for comparing the measurements within groups. For intra-group binary comparisons, the paired t-test was used for the data with normal distribution, and the Wilcoxon test was used for the data with non-normal distribution. Bonferroni correction was applied for multiple testing. The variance analysis (ANOVA) test which was corrected according to non-parametric tests was used for repeated measurements and between-group comparisons. All analyzes were performed according to per-protocol and intention-to-treat principles. The significance level was set at $p<0.05$. G-Power 3.0.8 software was used for sample size calculation. The power and significance levels were set at 0.80 and 0.05, respectively. The required sample size was calculated as 26 patients for each group, based on analysis from a previous study; and 30 patients were used in each group to allow for dropouts.[19]

RESULTS

A total of 72 patients were screened. Eight patients did not meet the criteria and 4 did not agree to take part in the study. Sixty (47 female, 13 male) patients included were randomized into 2 groups. One patient from the first group and 4 patients from the 2nd group dropped out off the study because they did not attend the control examinations. Thus, the study ended with 29 patients in the first group and 26 patients in the 2nd group. The flowchart of the study is presented in Figure 2. Baseline demographic, clinical, and radiological characteristics of the patients are given in Table 1. The groups were similar in terms of these characteristics ($p>0.05$).

There was a statistically significant decrease in VAS values of walking pain in both groups compared to baseline, both on the 9th-day and the 30th-day controls ($p<0.05$). No significant between-group differences were observed ($p=0.310$) (Table 2, Table 3).

While there were significant improvements in WOMAC C (physical function) at the 9th day in the KT group, no significant difference was observed in the control group (Table 2, Table 3). At 30 days from the beginning of treatment, there were significant improvements in WOMAC C (physical function) and WOMAC total scores in both groups ($p<0.05$), and there was no significant difference between the groups ($p>0.05$) (Table 2, Table 3). Although there were significant improvements in the scores of the Timed Up & Go Test compared to baseline in both groups, no difference was found between the groups (Table 2, Table 3). There was no statistically significant difference between the 2 groups in terms of the number of exercise sets performed and the number of paracetamol tablets taken during the application of KT and the 3-week follow-up period ($p>0.05$). The results of the intention-to-treat analysis were not different from the per-protocol analysis (Table 2).

DISCUSSION

The results of this study indicated that KT applied to patients with knee osteoarthritis did not have an additional benefit over the home exercise program in terms of pain and functionality. There is no consensus in the literature about the effectiveness of KT treatment. Results of the studies evaluating the effectiveness of KT in knee osteoarthritis are inconsistent. In a study by Aydoğdu et al., patients were randomized into 2 groups: KT along with conventional treatment and conventional treatment alone.[20] Outcome measures included pain intensity, range of

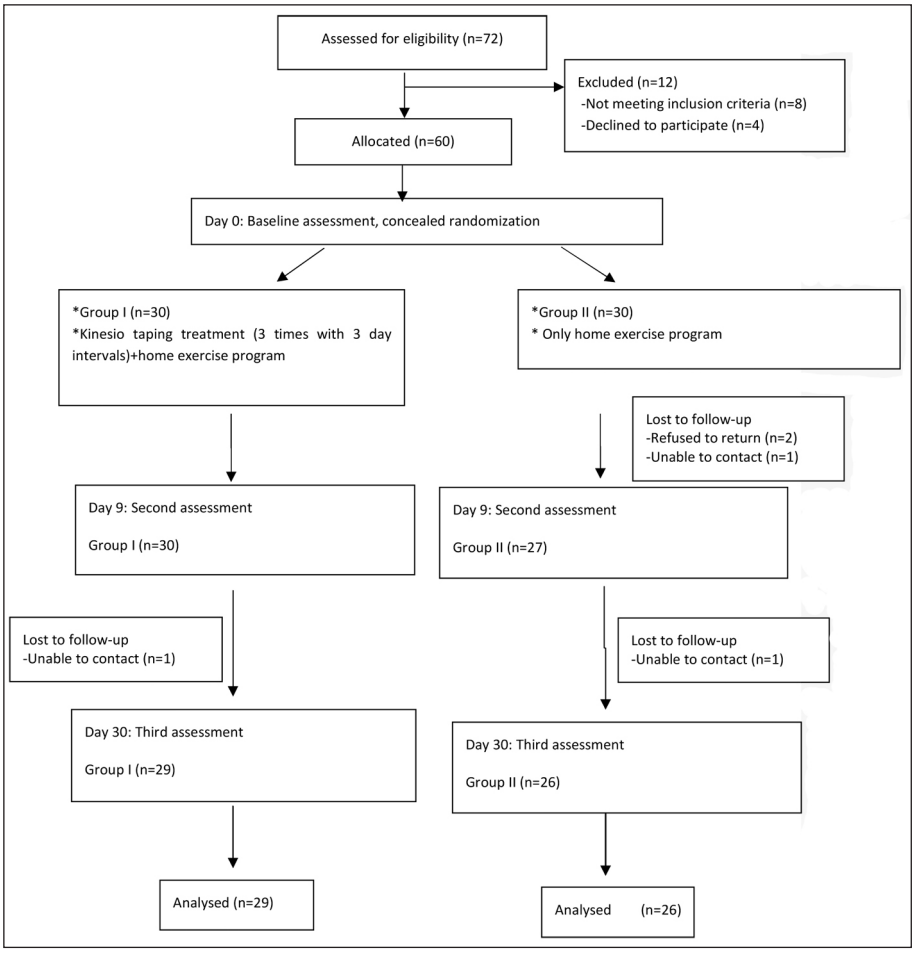

FIGURE 2: Study flowchart according to CONSORT.

TABLE 1: Baseline characteristics of patients.

Variables	Group I (n=30)	Group II (n=30)	p value
Age (years), mean±SD	60.3±8.1	59.5±7.2	0.701
Female gender, n (%)	21 (70)	26 (86.7)	0.117
Body mass index (kg/m²)	28.7±4.4	29.7±4.3	0.369
Duration of pain (months), median (IQR)	13 (6-34.5)	16 (7.5-60)	0.923
Educational status			0.436
Primary and secondary school, n (%)	15 (50)	18 (60)	
High school or higher, n (%)	15 (50)	12 (40)	
Knee Osteoartrtitis Kellgren Lawrence Grade[27]			0.904
Grade 1	9	11	
Grade 2	15	14	
Grade 3	4	4	
Grade 4	2	1	
Use of paracetamol tablets			
First 10 days	2.7±3.2	4.14±3.15	0.065
Last 20 days	2.3±3.0	3.61±3.40	0.117

Student's t-test for continuous data and chi-square test for categorical data, $p<0.05$;
Group I: Kinesio taping group; Group II: Control group; n: Number of patients; SD: Standard deviation.

TABLE 2: Comparison of pain and function between groups.

Item, mean±SD	Baseline	9th day	30th day	p value	P-int
VAS at rest (cm)					
Group I (n=29)	3.31±2.47	2.58±1.95	1.89±2.14 β	0.510	0.542
Group II (n=26)	3.53±2.78	2.92±2.56	2.76±2.47		
VAS during walking (cm)					
Group I (n=29)	6.13±1.90	4.31±2.33 α	3.96±2.29 β	0.310	0.305
Group II (n=26)	6.30±1.84	5.00±2.60 α	3.30±2.61 β		
Timed up and go test (s)					
Group I (n=29)	14.08±6.29	12.24±3.90 α	11.11±3.38 β	0.263	0.223
Group II (n=26)	13.02±3.60	11.48±3.79 α	11.25±3.04 β		
WOMAC-A (pain)					
Group I (n=29)	8.06±2.96	7.96±3.34	6.86±3.98	0.740	0.879
Group II (n=26)	7.50±3.10	7.42±4.30	5.65±3.73 β		
WOMAC-B (stiffness)					
Group I (n=29)	2.72±1.84	2.34±1.71	2.00±2.18	0.877	0.629
Group II (n=26)	2.00±1.85	1.88±2.19	1.46±1.55		
WOMAC-C (function)					
Group I (n=29)	29.65±12.13	24.79±12.32 α	21.06±11.12 β	0.440	0.343
Group II (n=26)	25.61±8.40	23.92±13.02	19.73±11.67 β		
WOMAC total score					
Group I (n=29)	40.44±15.86	35.10±15.92	29.93±16.01 β	0.667	0.461
Group II (n=26)	35.11±12.62	32.84±18.18	26.84±15.78 β		

Group I: Kinesio taping group; Group II: Control group; VAS: Visual analog scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index; SD: Standard deviation; n: Number; P: Intergroup evaluation, per protocol analysis; P-int: Intergroup evaluation, intention to treat analysis (In-group comparison and group effect comparison was performed by repeated measures ANOVA test.)

α: Within-group difference between baseline and 9th days (Wilcoxon signed-rank test: $p<0.05$).

β: Within-group difference between baseline and 30th day (Wilcoxon signed-rank test: $p<0.05$).

motion, muscle strength, and functional status. After 3 weeks of KT, significant improvements were detected in both groups, but no significant difference was found between the groups. Similarly, in our study, although improvements were found in both groups in VAS-pain during walking, the Timed Up and Go test, and WOMAC physical function scores; no statistically significant difference was found between the groups.

Dhanakotti et al. investigated the efficacy of KT added to a conventional physiotherapy program in 30 patients with knee osteoarthritis in another study.[21] Patients were randomized into 2 groups KT with conventional physiotherapy program and conventional physiotherapy program only. Significant improvements were observed in pain, muscle strength, and functional performance in both groups; while improvements were found to be significantly better in the KT group than in the control group after 3 weeks of treatment. The authors reported that the addition of kinesio tape therapy to traditional physiotherapy programs can reduce pain, and increase muscle strength and knee functional capacity in patients with knee osteoarthritis.[21] Unlike our study, Dhanakotti et al. performed KT every 3 days for 3 weeks. In addition, the exercises were performed under supervision, not as a home exercise program. The longer duration of KT application and supervised exercises may have played a role in the effectiveness of KT.

In another study by Kocyigit et al., 41 patients with knee osteoarthritis were divided into 2 groups.[1] KT was applied to the first group, and sham KT was applied to the 2nd group. KT was applied every 4 days, for a total of 3 times in both groups. Patients were evaluated at baseline and at the 12th day. Evaluation parameters were; VAS for activity and nocturnal pain, lequesne index, and Nottingham Health Profile questionnaire. At the 12th day, VAS scores,

TABLE 3: Comparison of pain and function within groups.

Item, mean±SD	Baseline	9th day	30th day	P	P1	P2
VAS at rest (cm)						
Group I (n=29)	3.31±2.47	2.58±1.95	1.89±2.14 β	0.075	0.190	0.009
Group II (n=26)	3.53±2.78	2.92±2.56	2.76±2.47	0.073	0.190	0.069
VAS during walking (cm)						
Group I (n=29)	6.13±1.90	4.31±2.33 α	3.96±2.29 β	<0.001	<0.001	<0.001
Group II (n=26)	6.30±1.84	5.00±2.60 α	3.30±2.61 β	0.002	0.008	<0.001
Timed up and go test (s)						
Group I (n=29)	14.08±6.29	12.24±3.90 α	11.11±3.38 β	<0.001	<0.001	<0.001
Group II (n=26)	13.02±3.60	11.48±3.79 α	11.25±3.04 β	<0.001	<0.001	<0.001
WOMAC-A (pain)						
Group I (n=29)	8.06±2.96	7.96±3.34	6.86±3.98	0.275	0.716	0.194
Group II (n=26)	7.50±3.10	7.42±4.30	5.65±3.73 β	0.013	0.646	0.010
WOMAC-B (stiffness)						
Group I (n=29)	2.72±1.84	2.34±1.71	2.00±2.18	0.108	0.237	0.023
Group II (n=26)	2.00±1.85	1.88±2.19	1.46±1.55	0.666	0.665	0.179
WOMAC-C (function)						
Group I (n=29)	29.65±12.13	24.79±12.32 α	21.06±11.12 β	0.003	0.007	<0.001
Group II (n=26)	25.61±8.40	23.92±13.02	19.73±11.67 β	0.010	0.210	0.004
WOMAC total score						
Group I (n=29)	40.44±15.86	35.10±15.92	29.93±16.01 β	0.152	0.018	0.002
Group II (n=26)	35.11±12.62	32.84±18.18	26.84±15.78 β	0.006	0.274	0.002

Group I: Kinesio taping group; Group II: Control group; VAS: Visual analog scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index; SD: Standard deviation; n: Number; P: In-group comparison was performed by Friedman test (p<0.05).

α P1: Within-group difference between baseline and 9th day (Wilcoxon signed-rank test: αp<0.016).

β P2: Within-group difference between baseline and 30th day (Wilcoxon signed-rank test: βp<0.016).

Bonferroni correction was applied for multiple testing (p<0.016).

and lequesne index scores improved significantly in both groups; but there was no significant difference between the groups. Authors reported that KT is not superior to sham taping. Although there was no sham KT group in our study, KT application was performed 3 times, similarly. Two other studies evaluating the effects of KT on pain and functionality in knee osteoarthritis also reported that there were no statistically significant effects of KT application on any parameter.[12,22] In our study, an additional benefit of KT to exercises was not shown in patients with knee osteoarthritis in terms of pain and functionality.

In a study by Rahlf et al., 141 patients with knee osteoarthritis were included in the study.[2] Patients were divided into 3 groups: the KT group, sham KT group, and control group. KT was applied for 3 consecutive days. WOMAC scores, walking speed, balance, and isometric quadriceps strength were compared between groups. At the end of the study, only WOMAC scores significantly improved in the KT group compared to the other 2 groups. In our study, while there were significant improvements in WOMAC physical function and WOMAC total scores at the 9th-day evaluation in the KT group; improvements in terms of these parameters were not significant in the control group. Although this improvement seen after 9 days of KT application suggests that KT in combination with exercise is effective on physical performance in the short-term; the absence of a significant difference between the groups suggests that this benefit is limited.

Some studies reported that KT may be effective on pain, range of motion, and proprioception in the short term.[19,23] In a study by Cho et al. evaluating the effectiveness of KT in knee osteoarthritis, 46 patients were divided into 2 group as KT and placebo-KT groups.[19] Evaluations were made before the application and 30 minutes after KT. Significant improvements were observed in all parameters in favor of the KT group. In a similar study, Anandkumar et al. eval-

uated VAS for pain and isokinetic quadriceps muscle torque at the 30th minute after a single KT application in knee osteoarthritis patients.[23] Significant improvements were observed in the KT group compared to the control group. The authors concluded that KT has an immediate effect on reducing pain and improving peak quadriceps torque.[23] In our study, we could not have an opinion about the rapid effects of KT because the patients were not evaluated immediately after the first KT application.

Kaya Mutlu et al. included 42 patients with knee osteoarthritis in their study and divided them into 2 groups as KT and placebo KT groups.[7] KT was applied 3 times with 3 to 4-day intervals between each application. The patients were evaluated before treatment, after the 1st and 3rd KT application, and 1 month later. Evaluation parameters were Aggregated Locomotor Function score, WOMAC scale, VAS for pain, muscle strength, and active range of motion. Short-term positive effects of KT on walking tasks, pain and knee flexion range of motion were shown, while no difference was found between the groups in terms of muscle strength and range of motion besides knee flexion.[7] In our study, Timed Up and Go test scores evaluating walking tasks improved significantly in both groups at the 9th day and 30th day compared to the baseline, but there was no significant difference between the groups.

Exercise therapy in knee osteoarthritis is a safe non-pharmacological treatment. It delays disease progression, relieves pain, and improves knee function. Current guidelines recommend regular aerobic, muscle strengthening, and range of motion exercises for knee osteoarthritis.[3] Many studies have shown the positive effects of home exercises on pain and function in knee osteoarthritis patients.[24-26] Although there was no difference between the groups in our study, the improvements in pain and functional scores in both groups were evaluated as the positive effects of exercise on knee osteoarthritis.

The strengths of this study are as follows: It is a randomized controlled study and the number of patients is higher compared to the other studies in the literature. The limitations of this study are there was no sham KT or only KT groups, and we did not evaluate the immediate effects of KT. In addition, although it is better than the existing literature, the small sample size for knee osteoarthritis disease can still be expressed as a limitation of the study.

CONCLUSION

The results of this study demonstrated that the addition of KT to a home exercise program in knee osteoarthritis is not superior to the home exercise program only. Variability in the duration of treatment and intervals, and the number of applications in the articles published up to now may have caused heterogeneous results regarding KT efficiency.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

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