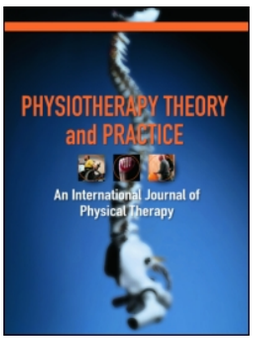

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The effects of pelvic floor muscle training combined with Kinesio taping on bladder symptoms, pelvic floor muscle strength, and quality of life in women with overactive bladder syndrome: A randomized sham-controlled trial

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ABSTRACT

Background: There is insufficient study using Kinesio taping (KT) in bladder problems. **Objectives**: To investigate the effects of pelvic floor muscle training (PFMT) combined with KT on bladder symptoms, pelvic floor muscle strength, and quality of life in women with overactive bladder (OAB) syndrome and compare this combination with PFMT plus sham tape (ST). **Methods**: Women with OAB were randomly allocated into PFMT+KT and PFMT+ST groups. All patients were given PFMT for 6 weeks and applied taping according to groups. Before and after treatment, the OAB symptoms with the Overactive Bladder Assessment Form (OAB-V8) and Patients' Perception of Intensity of Urgency Scale (PPIUS), bladder function with a 3-day voiding diary, pelvic floor muscle strength with the Modified Oxford Scale, and quality of life with the King's Health Questionnaire (KHQ) were assessed. **Results**: OAB-V8, PPIUS, and KHQ scores decreased and the MOS improved in both groups ($P < .05$) after treatment. The intergroup comparisons revealed a further decrease in voids/day, voids/night, incontinence episodes/day, and personal limitation scores of the KHQ in the PFMT+KT group compared to the PFMT+ST group ($P < .05$). **Conclusion**: PFMT+KT was more effective in reducing the OAB symptoms compared to PFMT+ST. KT could be a complementary application for reducing symptoms in OAB.

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KEYWORDS
Overactive bladder; kinesio taping; pelvic floor muscle exercise; randomized controlled trial

Introduction

Overactive bladder (OAB), known as a group of symptoms, refers to a type of a functional disorder in the lower urinary tract. In the 2002 Terminology report of the International Continence Society (ICS), OAB was described as 'urgency, with or without urge incontinence, usually with frequency and nocturia (Abrams et al., 2003; Haylen et al., 2010). OAB is a highly prevalent syndrome (Monteiro et al., 2018) and the prevalence of the syndrome among males and females is around 17% (Monteiro et al., 2018). This rate can be up to 50% for women, which increases with age, and it can be as high as 80% especially in the elderly (Monteiro et al., 2018). Although OAB does not directly threaten women's lives, it is an important public health problem directly affecting their lives in many aspects, such as physical, economic, emotional, sexual, and social (Hill, 2016; Lai, Gardner, Vetter, and Andriole, 2015; Lee et al., 2013).

Several etiologies for OAB have been suggested including: increased receptor sensitivity in the detrusor muscle (Andersson and Hedlund, 2002; Yoshimura and Chancellor, 2002); detrusor excitability (Elbadawi, Yalla, and Resnick, 1993); an imbalance in the autonomic nervous system (Hubeaux et al., 2007); neurologic disease; hypoxia; and pelvic ischemia (Gibbons, Colen, Nelson, and Benoit, 2007; Pinggera et al., 2008). In addition, decreased intraurethral pressure, reduced pelvic floor muscle (PFM) cell count, and PFM weakness have also been observed in OAB (Gunnarsson and Mattiasson, 1994, 1999).

Main therapeutic approaches for the treatment of OAB are conservative therapies (i.e. pharmacological treatment, behavioral therapy, and physiotherapy). Physiotherapy includes a combination of various resources (e.g. pelvic floor muscle training (PFMT), biofeedback, electric stimulation, bladder training, manual therapy, and kinesio taping (KT)) (Arruda et al., 2008; Kafri et al., 2013; Wang, Wang, and Chen, 2004). Pelvic floor muscle training (PFMT) is a preventive and therapeutic physiotherapy approach in OAB and urinary incontinence (Dumoulin, Cacciari, and Hay-Smith, 2018; Moore et al., 2013). The main

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reason for performing PFMT is that pelvic floor muscle contraction inhibits detrusor contraction, thus improving symptoms of detrusor over activity (Lúcio et al., 2019).

Another physiotherapy approach is KT application. The general effects of KT applications are that blood-lymph circulation increases with the removal of compression by the elevation of skin, fascia, and subcutaneous tissues, fascia correction is attained, inflammation and pain decreases, range of motion increases, neuromuscular reeducation improves by mechanoreceptor stimulation, and recovery is stimulated (Cho, Kim, Kim, and Yoon, 2015; Kase, Wallis, and Kase, 2003; Morris, Jones, Ryan, and Ryan, 2013). Moreover, according to several studies, KT application could stimulate the cutaneous-visceral reflexive mechanism related to Head's zones (Krajczy, Bogacz, and Luniewski, 2012; Morris, Jones, Ryan, and Ryan, 2013). Thus, this application, which has a wide range of indications (Kase, Wallis, and Kase, 2003), may be used in bladder problems; especially application on the sacral region which is the reflex zone of the bladder and possibly could be effective in the treatment of the OAB syndrome (Kase, Wallis, and Kase, 2003; Krajczy, Luniewski, Bogacz, and Szczegielniak, 2018).

A limited number of studies exist related to KT applications in the treatment of urinary incontinence (Krajczy, Luniewski, Bogacz, and Szczegielniak, 2018). To the best of our knowledge, there exists no study related to KT in the treatment of OAB. Therefore, the present study aimed to investigate the effects of PFMT combined with KT on bladder symptoms, pelvic floor muscle strength, and quality of life in women with OAB syndrome and compare this combination with PFMT combined with sham tape (ST). The following hypotheses were investigated: PFMT combined with KT would be more effective on bladder symptoms, pelvic floor muscle strength, and quality of life in women with OAB syndrome in comparison to PFMT combined with ST.

Method

Study design

This study was designed as a single blind, randomized, controlled trial. It was conducted at the Department of Physiotherapy and Rehabilitation. This study was performed in accordance with the rules of the Declaration of Helsinki. The study was approved by the Ethics Committee of Ankara Yildirim Beyazit University, Yenimahalle Training Research Hospital (Approval #: 2018/08/05) and also registered at http://clinicaltrials.gov (NCT03817203).

Participants

The study included women aged between 20 and 65 years who were diagnosed with OAB having wet and dry type based on the presence or absence of incontinence and volunteered to participate in the study. Exclusion criteria were: pregnancy, only stress incontinence, malignant condition, a history of acute infection, neurological problems, mental problems to prevent evaluation and cooperation, and having allergy to KT. Patch test was performed for allergy diagnosis. All women were informed related to the study and signed informed consent forms were obtained.

Intervention

The PFMT+KT group received KT and PFMT; while, the PFMT+ST group received ST and PFMT. Moreover, women with OAB did not use any bladder-related drugs during the treatment.

Pelvic floor muscle training

The PFMT was conducted as a progressive, high-intensity home-based exercise program under the supervision of a physical therapist (Kaya, Akbayrak, Gursen, and Beksac, 2015; Turkan, Inci, and Fazli, 2005) to increase muscle strength and endurance in both groups. The program was designed based on previous studies (Kaya, Akbayrak, Gursen, and Beksac, 2015; Turkan, Inci, and Fazli, 2005). Women kept an exercise diary. The physical therapist regularly checked the diary one day per week to increase the adherence to the exercise training protocol. Following the KT application, one set of exercise, which involved ten fast and ten slow contractions, was performed with the supervision of a physical therapist. The fast contractions were defined as 'tap exercise', where women were asked to contract and relax the PFM quickly. The slow contractions were defined as 'elevator exercise', where women were asked to contract the PFM slowly, hold the contraction, and relax it slowly. The time of contraction hold and relaxation progressively increased. PFMT was performed every day of the week for 6 weeks. During week one, women were asked to perform five sets of exercises per day (50 fast and 50 slow contractions daily), which was progressively increased by five sets/week: Ten sets per day at week 2; 15 sets at week 3; 20 sets at week 4; 25 sets at week 5; and 30 sets at week 6 (total: 300 fast and 300 slow daily). Women were advised to exercise in the supine, sitting, standing,

and squat positions, and besides, to integrate these exercises into their daily activities (Turkan, Inci, and Fazli, 2005).

Kinesio taping

The KT was applied by an experienced physical therapist (STC) according to Kenzo Kase's Kinesio Taping Method (Kase, Wallis, and Kase, 2003). Four I-shaped Kinesio tapes (Kinesio Tex® Gold) with a width of 5 cm and thickness of 0.5 mm were used. Star-shaped KT was applied on the sacral region (S2-S4), which is a reflex area of the bladder, along with the ligament technique (75-100% stretch) in standing position by an experienced physical therapist (Figure 1). KT was performed 2 days per week for 6 weeks.

Sham taping

Two I-shaped Kinesio tapes (Kinesio Tex® Gold) with a width of 5 cm and thickness of 0.5 mm were used. Sham tape application was in the form of plus and applied in standing position on the right greater trochanter of femur with no tension and technique (Figure 2). Sham KT was performed 2 days per week for 6 weeks.

Outcomes

Physical characteristics, such as age, height, body weight, education, obstetric and medical history, and smoking and alcohol use status were recorded via face-to-face interviews. All assessments were carried out before and after the treatment by the same physical therapist (ZK), who was blind to group interventions.

Figure 1. Kinesio tape application.

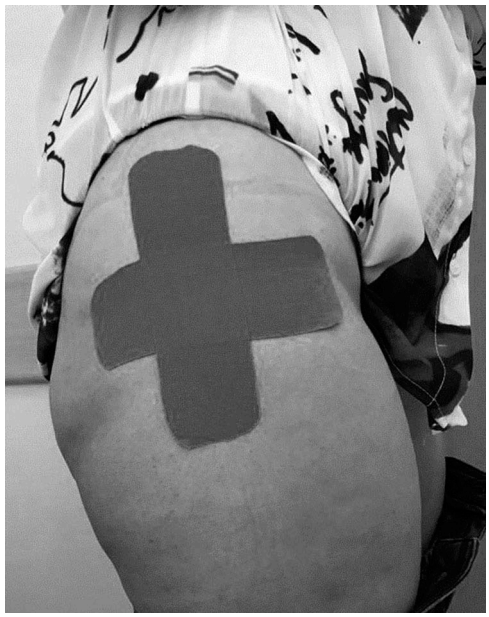

Figure 2. Sham Kinesio tape application.

Primer outcomes

Bladder function was evaluated with a voiding diary for 3 nonconsecutive days because work or home environment can cause patients to change their daily life and especially fluid consumption. All women were instructed not to alter their fluid intake or voiding habits while completing this diary. In the diary, women were asked to record some parameters such as voiding time and volume, number of urinary incontinences, and the amount and type of fluid intake. The mean of the 3 days of these parameters were obtained for analysis.

Secondary outcomes

The severity of the symptoms related to OAB was evaluated with the Turkish version of the Overactive Bladder-Version 8 (OAB-V8) form (Tarcan, Mangır, Ozay, and Akbal, 2012). This questionnaire is comprised of eight items and each answer is scored between "0"and "5". The total score ranges from 0 to 40 with higher numbers indicating higher severity of OAB symptoms.

The feeling of urgency, one of the OAB symptoms, was evaluated with the Patients' Perception of Intensity of Urgency Scale (PPIUS), whose validity and reliability were established by Cartwright, Srikrishna, Cardozo, and Robinson (2011). This scale measures the intensity of urgency at each void with a score ranging between 0 and 5: "0" no feeling of urgency, "1" low-urgency level, "2" middle-urgency level, "3" severe-urgency level, "4" emergency level and urge incontinence.

The strength of PFM was assessed by digital palpation, using the Modified Oxford Scale (MOS),

(Laycock, 1994) in which muscle contractions are graded from 0 to 5. The MOS was developed by Laycock (1994) to measure PFM strength. In the assessment, the women were in a lithotomy position. In this position, the physiotherapist places the 2nd and 3rd fingers through the posterior vaginal wall. For correct PFM contraction, women were asked to breath normally and then to squeeze and lift PFM as if preventing the escape of urine or flatus. We instructed the women to contract the PFM as hard as possible, thus squeezing her fingers. It was rated on a six-point scale:0 = no contraction, 1 = flicker, 2 = weak, 3 = moderate (with lift), 4 = good (with lift), and 5 = strong (with lift) (Laycock, 1994).

The quality of life was assessed with the Turkish version of the King's Health Questionnaire (KHQ) (Kaya et al, 2015). The KHQ consists of two parts and 32 subheadings. The first part includes two general questions titled as General Health Perception and Incontinence Impact. There are seven subheadings in the follow-up: 1) Role Limitation; 2) Physical Limitation; 3) Social Limitation; 4) Personal Limitation; 5) Sleep/Energy Disturbance; 6) Emotional Problems; and 7) Severity Measures related UI. The second part consists of the 11-item Symptom Severity Scale (SSS), which is scored from "0" best to "30" worst. KHQ domains scores range from 0 to 100, where higher scores of indicate greater impairment in quality of life.

Sample size

The sample size calculation used was the G*Power package software program (G*Power Version 3.0.10, Franz Faul, Universität Kiel, Germany). Five women from each group were randomly recruited for a pilot study. According to the number of voids/day results of the pilot study, it was calculated that a sample consisting of 32 patients (16 per group) was needed to obtain 80% power with d = 1.02 effect size, $\alpha = 0.05$ type I error, and $\beta = 0.20$ type II error.

Randomization

The women were divided into two groups as PFMT +KT and PFMT+ST groups with block randomization by an independent statistician prior to the beginning of the study. Individual, sequentially numbered cards with a random assignment were prepared. The cards were folded and placed in sealed, opaque envelopes for concealed allocation. A physical therapist (STC) opened the envelope and applied KT according to the group assignment.

Statistical analyzes

The variables were investigated using visual (histograms, probability plots) and analytical methods (Shapiro-Wilk test) to determine whether they were normally distributed. Descriptive statistics were calculated for all variables and normally distributed data are presented as mean ± standard deviation (SD), non-normal distributions are presented as median (minimum-maximum), and ordinal variables are indicated as frequency (n) and percentage (%). Paired Samples t-test and Wilcoxon test were used for comparison of the strength of PFM, OAB symptoms, bladder functions, and the quality of life parameters before and after the treatment. Independent samples t-test, Mann Whitney U test, and Chi-squared test/Fisher's Exact testwere used for comparison of differences between groups. IBM SPSS Statistics 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) was used for data analysis. An overall p-value of less than 0.05 was considered to show a statistically significant result.

Results

Forty-two women with OAB participated in the study. The study was completed with 34 women. The flow chart depicting the inclusion and exclusion criteria is shown in Figure 3. At baseline, the physical characteristics were statistically similar between the two groups ($P > .05$) (Table 1).

There were no differences between groups in terms of the voiding diary, OAB-V8, PPIUS, MOS, and KHQ scores before the treatment ($P < .05$). After the treatment, the OAB-V8, PPIUS and KHQ scores decreased, and the MOS scores increased in both groups ($P < .05$) (Table 2). In addition, in the PFMT+KT group, the number of voids/days, voids/night, and incontinence episodes/day decreased; whereas, voiding volume increased ($P < .05$) (Table 2).

The intergroup comparison demonsrated significant differences in some parameters in favor of the PFMT+KT group ($P < .05$) (Table 3). There was a further decrease in the number of voids/days, voids/night, and incontinence episodes/day, and the personal limitation scores of the KHQ in the PFMT+KT group compared to the PFMT +ST group ($P < .05$) (Table 3). No differences were found in the other parameters between the groups ($P > .05$) (Table 3). No adverse events occurred during the treatment program.

Discussion

The results of the present study demonstrated that PFMT with KT and ST decreased the severity of the

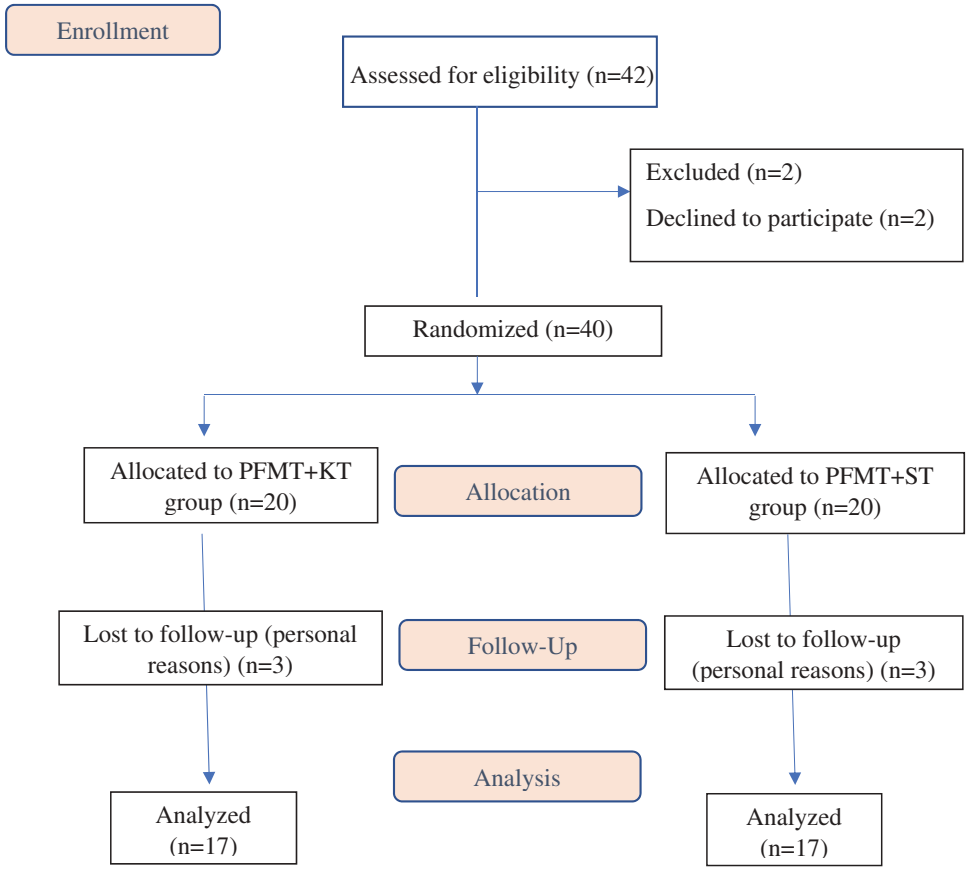

Figure 3. The flowchart diagram of the patients.

Table 1. Physical characteristics of the participants.

Physical characteristics	PFMT+KT group (n = 17)	PFMT+ST group (n = 17)	*P*
Age (years, X ± SD)	42.4 ± 11.4	44.8 ± 12.7	0.556[a]
BMI (kg/m2, X ± SD)	27.7 ± 6.9	28.8 ± 5.4	0.600[a]
Education (years, X ± SD)	9.7 ± 4.2	8.4 ± 4.8	0.395[a]
Parity, Median [(Min); (Max)]	2.0 [(0.0)-(6.0)]	2.0 [(0.0)-(7.0)]	0.920[b]
Gravidity, Median [(Min); (Max)]	2.0[(0.0)-(4.0)]	2.0 [(0.0)-(6.0)]	0.903[b]
Menopausal Statue (n, %)			
Yes	5, 29.4	6, 35.3	0.469[c]
No	12, 70.6	11, 64.7	
Smoking (n, %)			
Yes	8, 47.1	5, 29.4	0.290[c]
No	9, 52.9	12, 70.6	
Alcohol (n, %)			
Yes	1, 5.9	2, 11.8	1.000[d]
No	16, 94.1	15, 88.2	

* $P < 0.05$; X: Mean; SD: Standarddeviation, BMI: Body mass index, PFMT: Pelvic floor muscle training, KT:Kinesio taping, ST: Sham taping, [a] Independent sample *t* test, [b] MannWhitney U test, [c]Chi-squared test, [d]Fisher's Exact test

symptoms related to OAB and the feeling of urgency and increased the PFM strength and quality of life. In addition, in the PFMT+KT group, it was seen that bladder function improved by decreasing the number of voids/days, voids/night, and incontinence episodes/day and increasing the voiding volume. Moreover, it was found that the number of voids/days, voids/night, and incontinence episodes/day decreased and personal limitation subscale of the quality of life improved significantly in the PFMT+KT group in comparison to the PFMT+ST group.

Depending on the OAB symptoms, patients generally try to control their feelings of urgency and frequency of voiding with perineo-detrusor reflex effect by contracting the pelvic floor musculature (Mahony, Laferte, and Blais, 1980). In these patients, over activity and inadequate relaxation of the pelvic floor muscles occur and thus pelvic floor musculature function diminishes and intraurethral pressure decreases (Messelink et al., 2005). Therefore, PFMT is one of the commonly used conservative treatment approaches and has been recommended as a treatment method of OAB in clinics (Angelini, 2017; Rizvi, Chughtai, and Kapadia, 2018; Sand et al., 2006; Wang, Wang, and Chen, 2004). However, the number of studies in the literature investigating the effects of only PFMT on OAB symptoms is limited (Fitz, Sartori, Girão, and Castro, 2017; Kafri et al., 2013; Kulaksızoğlu et al.,

Table 2. Comparison of voiding diary, OAB-V8, PPIUS, MOS and KHQ of groups' before and after the treatment.

	PFMT+KT group (n = 17)			PFMT+ST group (n = 17)		
Parameters	Before Median [(min);(max)] X ± SD	After Median [(min);(max)] X ± SD	*P*	Before Median [(min);(max)] X ± SD	After Median [(min);(max)] X ± SD	*P*
Voiding diary (3 days)						
Number of voids/day (24 h)	9.6 [(5.6);(17.0)]	7.0 [(3.6);(11.0)]	<0.001* [a]	10.0 [(6.3);(22.5)]	8.0 [(5.0);(22.0)]	0.066 [a]
Number of voids/night (24 h)	1.0 [(0.0);(3.3)]	0.0 [(0.0);(2.5)]	0.001* [a]	1.0 [(0.0);(4.0)]	1.0 [(0.0);(3.3)]	0.753 [a]
Voiding volume (ml)	184.6 [(65.1);(534.0)]	250.6 [(57.1);(560.0)]	0.009* [a]	193.5 [(79.0);(472.0)]	178.8 [(82.1);(496.7)]	0.193 [a]
Number of incontinence episodes/day	1.6 [(0.0);(12.5)]	0.0 [(0.0);(2.6)]	0.003* [a]	0.6 [(0.0);(12.0)]	0.0 [(0.0);(13.5)]	0.058 [a]
OAB-V8	23.3 ± 8.1	9.4 ± 6.5	<0.001*[b]	26.1 ± 7.8	11.1 ± 6.7	<0.001*[b]
PPIUS	3.0 [(2.0);(4.0)]	1.0 [(0.0);(3.0)]	<0.001* [a]	3.0 [(2.0);(4.0)]	2.0 [(1.0);(3.0)]	<0.001*[a]
MOS	3.0 [(2.0);(4.0)]	4.0 [(3.0);(5.0)]	<0.001* [a]	3.0 [(2.0);(4.0)]	4.0 [(2.0);(5.0)]	<0.001*[a]
KHQ						
General health	50.0 [(25.0);(75.0)]	25.0 [(0.0);(50.0)]	0.015* [a]	50.0 [(25.0);(75.0)]	25.0 [(0.0);(75.0)]	0.001* [a]
Incontinence Impact	66.6 [(0.0);(100.0)]	33.3 [(0.0);(100.0)]	0.004*[a]	100.0 [(0.0);(100.0)]	50.0 [(0.0);(100.0)]	0.001*[a]
Role Limitation	66.6 [(0.0);(100.0)]	0.00 [(0.0);(100.0)]	0.004*[a]	66.6 [(0.0);(100.0)]	33.3 [(0.0);(83.3)]	0.001* [a]
Physical Limitation	50.0 [(0.0);(100.0)]	16.6 [(0.0);(83.3)]	0.002* [a]	66.6 [(0.0);(100.0)]	33.3 [(0.0);(83.3)]	0.003* [a]
Social Limitation	33.3 [(0.0);(100.0)]	0.0 [(0.0);(66.6)]	0.006*[a]	44.4 [(0.0);(100.0)]	25.0 [(0.0);(50.0)]	0.008*[a]
Personal Limitation	25.0 [(0.0);(100.0)]	0.0 [(0.0);(83.3)]	0.035*[a]	0.0 [(0.0);(33.3)]	0.0 [(0.0);(50.0)]	0.109 [a]
Emotional Problems	33.3 [(0.0);(100.0)]	0.0 [(0.0);(55.5)]	0.005* [a]	66.6 [(0.0);(100.0)]	22.2 [(0.0);(100.0)]	0.001*[a]
Sleep/energy Disturbance	50.0 [(0.0);(100.0)]	16.6 [(0.0);(83.3)]	0.001*[a]	50.0 [(0.0);(100.0)]	33.3 [(0.0);(83.3)]	0.002*[a]
Severity Measures	40.0 [(−25.0);(100.0)]	20.0 [(−25.0);(80.0)]	0.002*[a]	50.0 [(0.0);(73.3)]	10.0 [(0.0);(60.0)]	0.001*[a]
Symptom Severity	12.4 ± 3.7	4.6 ± 2.4	<0.001*[b]	14.3 ± 4.1	6.4 ± 4.5	<0.001*[b]

* $P < .05$; X: Mean; SD: Standart deviation; OAB-V8: Overactive Bladder Questionnaire; PPIUS: Patient's Perception of Intensity of Urgency Scale; MOS: Modified Oxford Scale; KHQ:King's Health Questionnaire, PFMT: Pelvic floor muscle training, KT:Kinesio taping, ST: Sham taping, [a]Wilcoxon test; [b] Paired sample t test

Table 3. Comparison of differences between groups' after the treatment.

Parameters	PFMT+KT group (n = 17) Median [(min);(max)] X ± SD	PFMT+ST group(n = 17) Median [(min);(max)] X ± SD	*P*
Voiding diary (3 days)			
Number of voids/day (24 h)	−0.5[(−2.3); (0.0)]	−0.0[(−1.3); (2.5)]	0.009*[a]
Number of voids/night (24 h)	−0.6[(−2.3); (0.0)]	−0.0[(−1.3); (2.5)]	0.009*[a]
Voiding volume (ml)	60.0[(−86.2); (231.8)]	1.5[(−44.9); (126.2)]	0.174[a]
Number of incontinence episodes/day	−1.0[(−12.5); (0.0)]	−0.1[(−2.0); (1.5)]	0.038*[a]
OAB-V8	−13.8 ± 5.9	−15.0 ± 9.3	0.680[b]
PPIUS	−1.0[(−4.0); (−1.0)]	−1.0[(−2.0); (−1)]	0.119[a]
MOS	1.0 [(1.0); (3.0)]	1.0 [(0.0); (3.0)]	< 0.001*[a]
KHQ			
General health	0.0[(−50.0); (0.0)]	−25.0[(−50.0); (0.0)]	0.289 [a]
Incontinence Impact	−33.3[(−100.0); (50.0)]	−33.3[(−100.0); (0.0)]	0.916[a]
Role Limitation	−16.6[(−100.0); (50.0)]	−33.3[(−83.3); (0.0)]	0.626[a]
Physical Limitation	−33.3[(−100.0); (25.0)]	−33.3[(−83.3); (0.0)]	0.507 [a]
Social Limitation	−22.2[(−100.0); (25.0)]	−5.5[(−44.4); (0.0)]	0.324 [a]
Personal Limitation	0.0[(−100.0); (25.0)]	0.0[(0.0); (50.0)]	0.005* [a]
Emotional Problems	−22.2[(−100.0); (22.2)]	−33.3[(−77.7); (0.0)]	0.664 [a]
Sleep/energy Disturbance	−25.0[(−100.0); (0.0)]	−16.6[(−66.6); (0.0)]	0.364 [a]
Severity Measures	−7.0[(−12.0);(−4.0)]	−6.5[(−16.0; 0.0)]	1.000[a]
Symptom Severity	−7.0[(−14.0); (−4.0)]	−7.0[(−16.0); (−0.0)]	0.891 [b]

P < 0.05; X: Mean; SD: Standart Deviation; OAB-V8: Over Active Bladder Questionnaire; PPIUS: Patient's Perception of Intensity of Urgency Scale; MOS: Modified Oxford Scale; KHQ:King's Health Questionnaire, PFMT: Pelvic floor muscle training, KT:Kinesio taping, ST: Sham taping, [a] Mann Whitney U test, [b] Independent sample t-test

2015; Wang, Wang, and Chen, 2004) and also a systemic review related to the effectiveness of PFMT in OAB presented heterogeneous and inconclusive results. Fitz, Sartori, Girão, and Castro (2017) showed that only PFMT decreased urinary leakage, incontinence severity, nocturia, and the severity of OAB symptoms, and improved the function of the PFMs and the quality of life. Kulaksızoğlu et al. (2015) demonstrated that PFMT increased functional bladder capacity, reduced the OAB symptoms, and did not change the maximum and average flow rate in women with OAB. Wang, Wang, and Chen (2004) compared PFMT, biofeedback-assisted PFMT, and electrical stimulation in the management of OAB. They explained that PFMT and biofeedback-assisted PFMT showed significantly greater post-treatment changes in PFM functions. Moreover, the subjective improvement/cure rate of OAB was 51.4% for the electrical stimulation, 50.0% for the biofeedback-assisted PFMT, and 38.2% for the PFMT. In a single-blind randomized controlled trial by Kafri et al. (2013) drug therapy, bladder training, PFMT, and combined pelvic floor rehabilitation including bladder training, PFMT and behavioral advice were compared to determine the long-term efficacy in the baseline and 3- and 12-month follow-ups in patients with urgency urinary incontinence (UUI). In the result of the study, urinary frequency, UUI episodes, and quality of life improved in all four groups after 3 and 12 months. Furthermore, the PFMT group showed similar rates of effect compared to the other groups. PFMT has been used in patients with OAB in clinics due to these positive effects. However, in the present study, we investigated the effectiveness of PFMT plus different KT applications.

In the literature, KT is currently a very popular method in physiotherapy, and there are several studies related to KT usage in different conditions (Celenay and Kaya, 2017; Harput et al., 2017; Kalichman et al., 2016; Kuni et al., 2016; Orhan et al., 2018) as well as in healthy individuals (Karahan et al., 2017; Torres, Trindade, and Gonçalves, 2016; Vithoulka et al., 2010). However, to the best of our knowledge, there is scarce literature available on the effects of KT in urologic disorders. Krajczy, Luniewski, Bogacz, and Szczegielniak (2018) investigated the efficacy of KT on the number of incontinences in children with night urinary incontinence and frequent daytime incontinence. Children were randomly allocated into the research (KT) and control groups (placebo). In the research group, KT was applied to two different regions (i.e. on the lower abdominal region with 25% stretch and on the sacrum with 50%-75% stretch) for reflex action; whereas, in the placebo group, KT was applied to cross over the greater trochanter of the femur with the "I" technique (50%-75% stretch) for 23 days. Apart from KT, parents of the children received instructions regarding the promotion of regular physical activity and specified liquid intake. In the research group, the number of incontinences significantly decreased; however, the placebo group did not experience a significant reduction. In the present study, the effects of PFMT combined with KT on bladder symptoms, pelvic floor muscle strength, and quality of life in women with OAB were investigated and this combination was compared with PFMT plus ST. It was detected that the severity of OAB symptoms, urgency feeling, PFM strength, bladder function, and the quality of life

improved in the PFMT+KT group. In addition, the number of voids/days, voids/night, and incontinence episodes/day decreased and personal limitation subscale of the quality of life improved significantly in the PFMT+KT group compared to the PFMT+ST group. Further improvement in the PFMT+KT group compared to the PFMT+ST group might be originated from regulating the tone of the musculofascial system on the bladder reflex region with KT. According to these results, KT might especially be a complementary method in the treatment of the OAB symptoms. Moreover, improvement in parameters related to PFM strength, OAB symptoms, and quality of life in the PFMT +ST group might also be resulted from PFMT.

The present study had some limitations. First of all the study was designed to observe the short-term effects. Long-term effects might also be investigated in future studies. Moreover, further studies might investigate the effects of KT compared to other physical therapy applications and PFMT with long-term follow-ups. Secondly, in the present study, urodynamic evaluation was not made before and after the treatment. Therefore, the effects of PFMT+KT on the detrusor activity was not detected; however, in the present study it was found that PFMT+KT was effective in improving the OAB symptoms. This condition regarding the urodynamic outcome can be investigated in further studies.

In conclusion, the severity of the OAB symptoms, urgency feeling, PFM strength, and the quality of life improved in both groups. In addition, the number of voids/days, voids/night, and incontinence episodes/day decreased; while, the voiding volume increased in the PFMT+KT group. Moreover, the number of voids/days, voids/night, and incontinence episodes/day, and personal limitation subscale of the quality of life decreased more in the PFMT+KT group in comparison to the PFMT+ST group.

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Disclosure statement

All authors declare that they have no conflict of interest.

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