Randomized Trial

Investigation of Effectiveness of Two Different Kinesiotaping Techniques in Myofascial Pain Syndrome: An Open-Label Randomized Clinical Trial

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Background: Myofascial pain syndrome is a regional musculoskeletal pain syndrome characterized by trigger points. Although there are widely accepted treatment modalities, there is no gold standard treatment. Kinesiotaping represents an interesting modality in the treatment of musculoskeletal disorders and attracts attention with studies emerging in the recent years, but in spite of the proposed benefits of kinesiotaping, its efficacy is still unclear, thus further studies evaluating the effectiveness of kinesiotaping are needed.

Objectives: We aimed to investigate, not only the effectiveness of kinesiotaping applied with the space correction and muscle inhibition techniques (compared to the home exercise program in reducing pain and improving functional status and quality of life in female patients with myofascial pain syndrome related to active trigger points in the upper trapezius), but also to evaluate the superiority of the 2 techniques over each other.

Study Design: An open-label randomized clinical trial with a parallel assignment intervention model.

Setting: The physical medicine and rehabilitation clinics in Istanbul University, Istanbul Faculty of Medicine.

Methods: Seventy-one female patients with the complaint of pain in the upper trapezius region, diagnosed with myofascial pain syndrome, and having at least one active trigger point in the upper trapezius fibers, were randomly assigned by a computer program to 1 of the 3 groups: kinesiotaping with the space correction technique (KSCT, n = 20), kinesiotaping with the muscle inhibition technique (KMIT, n = 24), and the home exercise program alone (control group [CG], n = 27). The patients were evaluated by the numerical rating scale for pain intensity, the neck disability index for functional status, and the 36-Item Short-Form Health Survey for quality of life in the beginning of the study and at the first, second, and sixth weeks (1-month follow-up).

Results: Kinesiotaping was associated with lower pain intensity levels ($P = 0.019$ at the first week and $P = 0.026$ at the second week) and better functional status ($P = 0.011$ at the second week) and it was effective in increasing quality of life by improving physical functions and general health ($P = 0.033$ and $P = 0.003$ at the second week, respectively) earlier than in the CG. Role limitations due to physical factors improved in the KMIT group earlier than in the other groups ($P = 0.022$ at the second week).

Limitations: Being performed in a limited number of female patients only, absence of a placebo group, and lack of blinded assessments.

Conclusion: Both kinesiotaping methods were associated with lower pain intensity levels and better functional status and were effective in increasing quality of life by improving physical functions and general health earlier than the home exercise program. There was no significant difference between the kinesiotaping methods, except for role limitations due to the physical factors domain of SF-36 which was improved in the KMIT group earlier than in the KSCT group and CGs.

Key words: Myofascial pain syndrome, myofascial trigger point pain, trapezius, kinesiotape, muscle inhibition technique, space correction technique

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Myofascial pain syndrome (MPS) is a regional musculoskeletal pain syndrome characterized by trigger points (TPs) in muscle, fascia, or tendinous insertion areas and pain radiating to reference areas with palpation of these points (1).

The diagnosis of MPS is mainly based on detailed history, clinical examination and presence of taut bands, TPs, referred pain, patient pain recognition, and local twitch response (2). The basic criteria developed by Travell and Simons (3) for the diagnosis of MPS include palpation of a taut band when the muscle is in a reachable area, detection of a sensitive point in the taut band, patient recognition of pain caused by pressure applied to this sensitive point, and painfully restricted range of motion during stretching.

Although there are widely accepted treatment modalities, there is no gold standard treatment for MPS (4). Regardless of the treatment modality used (5), TP inactivation to break the vicious cycle of pain, focusing on the elimination of underlying predisposing causes, and patient education are the main objectives of conservative MPS treatment (6,7). For TP inactivation in our study, we aimed to investigate the effects of kinesiotaping (KT) (8), which is a treatment modality designed to facilitate the body's own natural healing process. Although its action mechanism is not fully understood, it is suggested that KT supports muscles, removes congestion through body fluid flow, activates the endogenous analgesic system, and improves joint problems (9). Kinesiotapes can be applied with different shapes and techniques depending on the shape and size of the application area and application purpose. The muscle inhibition technique, which is one of the techniques we have chosen in our study, is applied in clinical practice in order to prevent excessive contraction in acutely damaged or overused muscles (10). It is claimed that with the application on the muscle from its insertion site to the origin, inhibition and relaxation of muscle spasm would be achieved (7). The space correction technique, which is the other technique we used in our study, is claimed to help reduce pain by lifting the skin, fascia, and soft tissue just above the pain area via the tape's elastic properties. It is suggested that by this way, the pressure, under the applied area and on the chemical receptors and nociceptors, decreases and the lymphatic drainage and blood circulation improve leading to removal of the exudates (7,11). Using the center of an I-shaped strip is one of the main ways in the space correction technique. A single tape or multiple tapes can be used (11).

In spite of the proposed benefits of KT, the efficacy of KT is still unclear, thus further studies evaluating the effectiveness of KT are needed (12-15). For this reason, we aimed to investigate not only the effectiveness of KT applied with the space correction and muscle inhibition techniques compared to the home exercise program on female patients with MPS related to active TPs in the upper trapezius, but also the superiority of the space correction and muscle inhibition techniques over each other.

Methods

Design

The present study refers to an open-label randomized clinical trial with a parallel assignment intervention model with a 1:1:1 allocation ratio and one-month follow-up.

Patients

We included 93 female patients who attended the physical medicine and rehabilitation clinics in Istanbul University, Istanbul Faculty of Medicine, with the complaint of pain in the upper trapezius region, have been diagnosed with MPS, and had at least one active TP in the upper trapezius fibers. The inclusion criteria for this study were as follows: female gender, age 18-45 years, pain in the upper trapezius region, presence of a taut band with at least one active TP, the pain produced by palpation of this TP is the pain that the patient complained of, painful restriction of cervical lateral flexion, a pain score of ≥ 4 according to the numerical rating scale (NRS-11).

The exclusion criteria were as follows: having major surgery or trauma to the musculoskeletal system (mainly the spine and upper extremity), having a history of head and neck surgery, having a neuromuscular disease, an active rheumatic disease (evaluated by the absence of morning stiffness, joint swelling, and elevated acute phase reactants), a systemic disease (e.g., diabetes, hypothyroidism, infection, malignancy, etc.), and any other pathology that may cause musculoskeletal pain, especially involving the cervical region (e.g., cervical discopathy, cervical spondylosis, pathologies related to the shoulder joint and the surrounding soft tissues, fibromyalgia, etc.).

Before being accepted in the study, detailed medical history was taken and musculoskeletal and neurological system examinations were performed in all patients. MPS was diagnosed based on Travell and Simons' (3)

4 basic criteria of MPS by palpation of the trapezoidal fibers. Prior to inclusion, the patients were tested for any allergy to kinesiotapes by affixing a small piece of tape to the inner surface of the forearm for 15 minutes without stretching. Patients having itching, redness, or discomfort were not included in the study (7).

This study was performed in Istanbul University, Istanbul Faculty of Medicine, Department of Physical Medicine and Rehabilitation. All patients were verbally informed about the terms of the study prior to the enrollment and gave written informed consent in accordance with the Declaration of Helsinki. The study was approved by the Istanbul University, Istanbul Faculty of Medicine Ethics Committee, under file number 2013/1465 and approval number 1569.

Interventions

According to the power analysis that indicated a minimum sample size of 28 patients and considering potential dropouts, 31 patients per group with a total sample size of 93 were recruited in the study. Power analysis was based on a 20% change in the NRS-11 with a power of 80% and an alpha level of 0.05.

Ninety-three patients, who met the inclusion criteria, were enumerated in order of application to the Istanbul Faculty of Medicine physical medicine and rehabilitation clinics. Then, they were randomly assigned by blocked randomization to 1 of the 3 groups by a computer program via their application number by one of the authors (Dilsad Sindel). Another author (Aysegul Ketenci) assigned patients to interventions via closed envelopes used for allocation sequence concealment. The other author (Fatma Merih Akpinar) enrolled the patients.

The KT groups were KT with the space correction technique (KSCT) and KT with the muscle inhibition technique (KMIT) along with the home exercise program. The third group was the control group (CG) and the patients in this group received the same home exercise program as in the 2 KT groups. Patient scheme and interventions are presented in Fig. 1.

KT with the KSCT or KMIT was administered for 2 weeks. Taping was done 2 sessions per week for 2

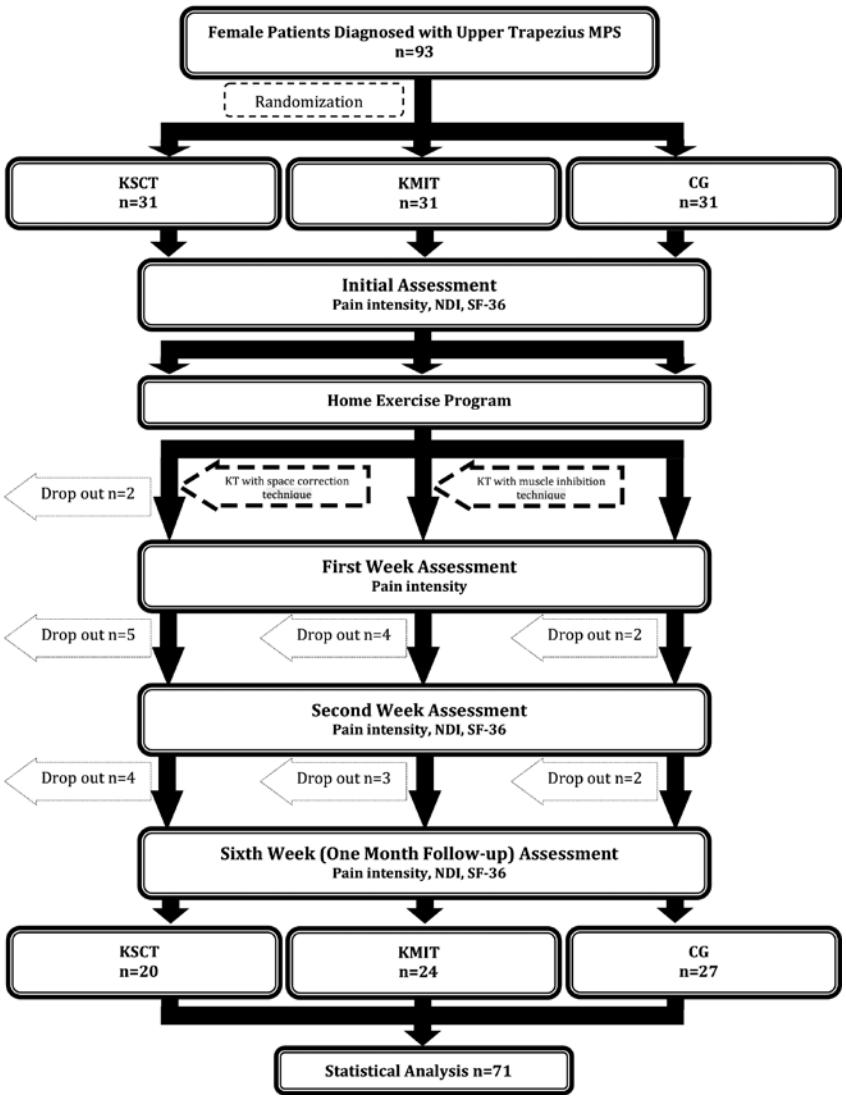

Fig. 1. *Patient flow chart.*
MPS: myofascial pain syndrome; KSCT: kinesiotaping with the space correction technique; KMIT: kinesiotaping with the muscle inhibition technique; CG: control group; NDI: neck disability index; SF-36: short form-36; KT: kinesiotaping

weeks. Tapes were administered on Mondays and Thursdays or on Tuesdays and Fridays to distribute sessions evenly over the course of the week. Standard Kinesio® Tex Classic tapes (Kinesio Holding Corporation, Albuquerque, NM), as a single I-shaped strip, were applied without color preference in all sessions. During KT, the patients sat in an upright position in a chair with a backrest to fix the scapula. After explaining instructions about KT, the patients were asked not to remove the tapes as long as no reaction occurred. The tapes were worn for at least 2 days. In cases of unintentional removal of the tapes, taping was reapplied. Patients who could not be re-taped and remained without tape for at least 3 days within 2 weeks of treatment were excluded from the study.

In the KSCT group, before taping, the patients were positioned with their shoulders in adduction, heads in lateral flexion to the contralateral side, and in rotation toward the taping side. The tape was located as the TP would be at the center of the stretched part with a medium degree (25-35%) stretch in the middle part of the tape. Tips of the tape were administered without stretching (11). In case of multiple TPs, pressure was applied to all the TPs and the patient was asked to point out the most painful TP. Then, taping was applied with the most painful TP being at the center of the stretched part (Fig. 2).

The KMIT was applied from insertion to origin of the upper trapezius fibers (from lateral third of the clavicle to processus spinosus of the C1-C5 vertebrae). Before taping, the patients were positioned with their shoulders in adduction and their heads in lateral flexion to the contralateral side. Insertion region of the upper trapezius fibers were palpated by asking patients to abduct their shoulders against resistance. The tip of the tape (first 2-3 cm part) was applied to the lateral side of the acromion without stretching. From the insertion region of the upper trapezius fibers, 2-3 cm part of the tape was applied with full (100%) stretching. Then, the patient's head was rotated toward the painful side and the rest of the tape was applied throughout the upper trapezius fibers up to the hairline of the patient without stretching (Fig. 3) (16,17).

Outcome Measures

Pain

The NRS-11, which is one of the single-item pain assessment methods, was used for evaluating pain intensity. The patients were asked to rate the intensity of pain at the beginning of the study (18) (IA: initial assessment), first week (FW), and second week (SW) of the study, and one month after the treatment (FA: follow-up assessment) by giving a score between 0 to 10 with 0, indicating no pain, and 10, the strongest or worst pain imaginable.

Functional Assessment

Disability related to neck pain was evaluated with the Neck Disability Index (NDI). The NDI, a 10-item questionnaire, is the most widely used, translated, and oldest scale evaluating disability related to nonspecific mechanical neck pain (19,20). It is considered the gold standard for evaluating the impact of neck pain (21). Each question is measured on a scale from 0 (no disability) to 5 (total disability). Total score ranges from 0 (no disability) to 50 (complete disability) or 0% to 100%, respectively, with a higher NDI score indicating the greater a patient's perceived disability due to neck pain (19, 20). The Turkish version of the modified NDI,

Fig. 2. *Kinesiotaping with the space correction technique.*

Fig. 3. *Kinesiotaping with the muscle inhibition technique.*

which was shown to be reliable and valid by Kesiktas et al (19), was used in our study. Functional assessment was done at the IA, SW, and FA.

Health-Related Quality of Life

Health-related quality of life (22) was evaluated using the 36-Item Short-Form Health Survey (SF-36). The SF-36 consists of 8 domains which are physical functioning, role limitations due to physical problems, role limitations due to emotional problems, vitality, mental health, social functioning, bodily pain, and general health. For each tested domain, the answers to the questions are coded and converted into a score with a range of 0-100 by using standard SF-36 scoring algorithms. Higher scores indicate a better health status (22,23). Health-related quality of life was evaluated during the IA, SW, and FA.

Statistical Analysis

Statistical analysis was done using the IBM SPSS (Statistical Package for the Social Sciences) Statistics for Windows, Version 22.0 (Armonk, NY: IBM Corp.). Distributions of the variables were investigated using the Kolmogorov-Smirnov test. ANOVA was used in the analysis of quantitative data with normal distribution. The Kruskal-Wallis and Mann-Whitney U tests were used in the analysis of quantitative data with non-normal distribution. The Wilcoxon signed rank test was used in the analysis of repeated measures. The chi-square test was used in analysis of qualitative data. A P value of less than 0.05 was considered statistically significant.

Results

Dropouts

A total of 93 patients [KSCT group (n = 31), KMIT group (n = 31), CG (n = 31)] were recruited from December 2013 to July 2014. Follow-up assessments were completed by September 2014. The study was terminated after reaching the planned number of patient recruitment.

Twenty-two patients [KSCT group (n = 11), KMIT group (n = 7), CG (n = 4)] were excluded due to skin reactions (2 in the KMIT group), treatment noncompliance (3 in the KSCT group and one in the KMIT group), nonattendance or delayed attendance to the scheduled follow-up visit appointments (7 in the KSCT group, 3 in the KMIT group, and 4 in the CG), not being eligible for pain assessment because of fever related to upper respiratory tract infection within the taping period (one per KSCT and KMIT groups) (Table 1). Although we ran an allergy test before inclusion, during the study, 2 patients had red, itchy folliculitis-like pustules in the taping area, which regressed spontaneously within 2-3 days after cessation of taping.

After dropouts, statistical analysis was done with a total of 71 patients [(KSCT group (n = 20, 28.2%), KMIT group (n = 24, 33.8%), CG (n = 27, 38%)] at the end of the study.

Demographic Features and Baseline Evaluation

There was no significant difference across the 3 groups in terms of age (P = 0.802), body mass index (BMI, P = 0.497), and duration of pain defined by days (P = 0.461) at baseline. There was no significant difference between the 3 groups at baseline in terms of all outcome measurements (P > 0.05). Comparisons of the demographic features and baseline outcome measurements are shown in Table 2.

Evaluation of Outcome Measures

NRS-11 Pain Intensity

All 3 groups showed a statistically significant reduction in mean NRS-11 pain intensity scores throughout the follow-up period (P < 0.01). Within-group changes are shown in Table 3. NRS-11 pain intensity scores at the first and second weeks were significantly higher in the CG than in the KSCT and KMIT groups (P = 0.019 and P = 0.026, respectively). Between-group comparisons are shown in Table 4.

Neck Disability Index

All 3 groups showed a statistically significant re-

Table 1. *Patients excluded from the study and reasons for their exclusions.*

Group	Total Count	Reasons			
		Skin Reaction	Noncompliance with Treatment	Incomplete Follow-up	Fever
KSCT	11	-	3	7	1
KMIT	7	2	1	3	1
CG	4	-	-	4	-
Total	22	2	4	14	2

Abbreviations: KSCT, kinesiotaping with the space correction technique; KMIT, kinesiotaping with the muscle inhibition technique; CG, control group.

Table 2. *Comparisons of the demographic features and outcome measurements of the patients at baseline.*

	KSCT (n = 20)		KMIT (n = 24)		CG (n = 27)		P*
	Mean ± SD	Median	Mean ± SD	Median	Mean ± SD	Median	
Age (years)	31.5 ± 6.3	32.0	32.2 ± 6.9	32.0	32.8 ± 6.3	33.0	0.802$^{\beta}$
BMI (kg/m^2)	22.7 ± 2.7	22.4	21.9 ± 2.8	21.6	21.9 ± 2.7	21.1	0.497$^{\beta}$
Pain Duration (d)	714 ± 940	198	640 ± 930	225	515 ± 729	60	0.461$^{\gamma}$
NRS-11 Pain Intensity	4.7 ± 1.8	4.0	5.0 ± 1.3	5.0	5.3 ± 1.6	6.0	0.353$^{\gamma}$
Neck Disability Index	11.8 ± 4.4	11.0	13.7 ± 5.7	13.0	15.5 ± 6.7	14.0	0.142$^{\gamma}$
SF-36 Physical Functioning	70.0 ± 18.8	70.0	66.9 ± 24.9	70.0	72.6 ± 19.4	75.0	0.696$^{\gamma}$
SF-36 Role Physical	56.3 ± 37.9	62.5	49.0 ± 37.2	50.0	50.9 ± 38.9	50.0	0.805$^{\gamma}$
SF-36 Role Emotional	48.3 ± 39.7	50.0	45.8 ± 37.8	66.7	61.7 ± 42.1	66.7	0.255$^{\gamma}$
SF-36 Vitality	47.0 ± 19.2	40.0	46.3 ± 18.3	50.0	46.7 ± 20.7	50.0	0.955$^{\gamma}$
SF-36 Mental Health	57.2 ± 18.1	50.0	59.3 ± 12.9	60.0	57.8 ± 17.3	56.0	0.780$^{\gamma}$
SF-36 Social Functioning	68.1 ± 24.5	62.5	63.5 ± 21.5	62.5	67.1 ± 23.3	62.5	0.691$^{\gamma}$
SF-36 Bodily Pain	50.2 ± 21.0	51.0	46.1 ± 21.7	46.0	45.3 ± 14.9	41.0	0.740$^{\gamma}$
SF-36 General Health	59.5 ± 15.7	62.0	51.0 ± 21.2	58.5	60.0 ± 16.8	62.0	0.260$^{\gamma}$

Abbreviations: KSCT, kinesiotaping with the space correction technique; KMIT, kinesiotaping with the muscle inhibition technique; CG, control group; BMI, body mass index; d, days; NRS-11, numerical rating scale; SF-36, short form-36; SD, standard deviation.
* $P > 0.05$, 95% confidence interval, $\alpha = 0.05$. $^{\beta}$: ANOVA. $^{\gamma}$: Kruskal Wallis.

Table 3. *Within-group changes in NRS-11 pain intensity scores of the 3 groups from baseline to follow-up assessment.*

Group		NRS-11 Pain Intensity			
		IA	FW	SW	FA
KSCT	Mean ± SD	4.7 ± 1.8	-1.9 ± 1.3	-2.5 ± 1.6	-3.1 ± 1.1
	Med	4.0	-2.0	-2.0	-3.0
	Wilcoxon Signed Rank Test		$P < 0.001$**	$P < 0.001$**	$P < 0.001$**
KMIT	Mean ± SD	5.0 ± 1.3	-1.8 ± 1.6	-2.7 ± 1.6	-2.8 ± 1.9
	Med	5.0	-2.0	-3.0	-3.0
	Wilcoxon Signed Rank Test		$P < 0.001$**	$P < 0.001$**	$P < 0.001$**
CG	Mean ± SD	5.3 ± 1.6	-0.9 ± 1.4	-2.0 ± 1.7	-2.8 ± 1.9
	Med	6.0	-1.0	-2.0	-2.0
	Wilcoxon Signed Rank Test		$P = 0.005^{\varepsilon}$	$P < 0.001$**	$P < 0.001$**

Abbreviations: NRS-11, numerical rating scale; IA, initial assessment; FW, first week; SW, second week; FA, follow-up assessment; KSCT, kinesiotaping with the space correction technique; KMIT, kinesiotaping with the muscle inhibition technique; CG, control group; SD, standard deviation; med, median.
**$P < 0.001$. $^{\varepsilon}P < 0.01$, 95% confidence interval, $\alpha = 0.05$.

duction in mean NDI scores throughout the follow-up period (P < 0.001). Within-group changes are shown in Table 5. NDI scores at the SW were significantly higher in the CG than in the KSCT and KMIT groups (P = 0.011). Between-group comparisons are shown in Table 6.

Short Form-36

In within-group comparisons of SF-36, bodily pain scores showed a significant increase in all comparisons of all groups. Physical functioning and general health scores showed significant improvements in all comparisons except between the IA and SW in the CG. Role limitations due to physical problems scores showed significant increase in all groups in the FA, but only in the KMIT group in the SW assessment (P = 0.011). Role limitations due to emotional problems, vitality, and mental health scores did not show any improvement in any of the groups at the SW assessment, but there were significant improvements in all of the groups in the FA. The social functioning scores made significant progress at the SW assessment in all of the groups, but this progress did not last until the FA.

In between-group comparisons of SF-36, the change in the mean physical functioning and general health scores in the SW assessment compared to the IA was significantly lower in the CG than in the KSCT and KMIT groups (P = 0.033 and P = 0.003, respectively). The increase in the mean role limitations due to physical problems scores in the SW assessment compared to the IA was significantly higher in the KMIT group than in the CG and the KSCT group

Table 4. *Between-group comparisons of NRS-11 pain intensity scores of the 3 groups from baseline to follow-up assessment.*

		NRS-11 Pain Intensity			KW& M-WU
		KSCT	KMIT	CG	*P*
IA	Mean ± SD	4.7 ± 1.8	5.0 ± 1.3	5.3 ± 1.6	0.353
	Med	4.0	5.0	6.0	
FW	Mean ± SD	2.8 ± 1.8	3.2 ± 1.8	4.4 ± 1.8	0.019*
	Med	2.5	3.0	4.0	
SW	Mean ± SD	2.2 ± 1.5	2.3 ± 1.8	3.3 ± 1.7	0.026*
	Med	2.0	2.0	4.0	
FA	Mean ± SD	1.6 ± 1.4	2.3 ± 1.7	2.5 ± 1.5	0.132
	Med	1.5	2.0	2.0	

Abbreviations: NRS-11, numerical rating scale; IA, initial assessment; FW, first week; SW, second week; FA, follow-up assessment; KSCT, kinesiotaping with the space correction technique; KMIT, kinesiotaping with the muscle inhibition technique; CG, control group; SD, standard deviation; med, median; KW, Kruskal Wallis; M-WU, Mann-Whitney U.
*$P < 0.05$, 95% confidence interval, α=0.05.

Table 5. *Within-group changes in Neck Disability Index scores of the 3 groups from baseline to follow-up assessment.*

Group		Neck Disability Index		
		IA	SW	FA
KSCT	Mean ± SD	11.8 ± 4.4	-4.9 ± 3.7	-5.9 ± 4.3
	Median	11.0	-5.0	-6.5
	Wilcoxon Signed Rank Test		$P < 0.001$**	$P < 0.001$**
KMIT	Mean ± SD	13.7 ± 5.7	-6.7 ± 6.3	-5.3 ± 5.5
	Median	13.0	-5.5	-5.0
	Wilcoxon Signed Rank Test		$P < 0.001$**	$P < 0.001$**
CG	Mean ± SD	15.5 ± 6.7	-4.9 ± 5.1	-7.5 ± 7.5
	Median	14.0	-3.0	-6.0
	Wilcoxon Signed Rank Test		$P < 0.001$**	$P < 0.001$**

Abbreviations: IA, initial assessment; SW, second week; FA, follow-up assessment; KSCT, kinesiotaping with the space correction technique; KMIT, kinesiotaping with the muscle inhibition technique; CG, control group; SD, standard deviation.
** $P < 0.001$, 95% confidence interval, α=0.05.

Table 6. *Between-group comparisons of Neck Disability Index scores of the 3 groups from baseline to follow-up assessment.*

		Neck Disability Index			KW& M-WU
		KSCT	KMIT	CG	*P* value
IA	Mean ± SD	11.8 ± 4.4	13.7 ± 5.7	15.5 ± 6.7	0.142
	Median	11.0	13.0	14.0	
SW	Mean ± SD	6.9 ± 4.7	7.0 ± 5.6	10.6 ± 4.4	0.011*
	Median	6.0	5.0	11.0	
FA	Mean ± SD	5.9 ± 4.9	8.4 ± 5.5	8.0 ± 4.7	0.146
	Median	5.5	8.0	7.0	

Abbreviations: IA, initial assessment; SW, second week; FA, follow-up assessment; KSCT, kinesiotaping with the space correction technique; KMIT, kinesiotaping with the muscle inhibition technique; CG, control group; SD, standard deviation; KW, Kruskal Wallis; M-WU, Mann-Whitney U.
*$P < 0.05$, 95% confidence interval, α=0.05.

(P = 0.022). The changes in mean role limitations due to emotional problems, vitality, mental health, social functioning, and bodily pain scores did not differ in any of the between-group comparisons. Within- and between-group comparisons are shown in Table 7.

Discussion

Pain

Recently, a great number of studies investigating the effects of KT on MPS related to upper trapezius TPs have emerged (24-32). Most of these studies compares KT with another treatment or with a sham KT (31) and have conflicting results regarding the effectiveness of KT. Also, the sham KT application is criticized by some authors due to the possibility of bringing therapeutic effects of KT by using the same tape and because the degree of stretching/tension is considered a subjective measure causing bias (14, 33). Our study is the only study investigating the effectiveness of 2 different techniques of KT and we found that KT, with the space correction and muscle inhibition techniques applied to female patients with MPS related to active TPs in the upper trapezius, was associated with lower pain intensity levels within but not beyond the treatment period compared to the home exercise program alone, without any superiority between the techniques applied. Our results supports the results of systematic review performed by Kalron et al (13) and systematic review and meta-analyses performed by Zhang et al (15) and Alotaibi et al (34). These systematic reviews and meta-analyses found KT to be effective in reducing pain in the short term and in MPS of the upper trapezius muscle.

Functional Assessment

TPs have been shown to affect patients' functions (4,35). Cervical myofascial pain has also been shown to be one of the causes of disability in patients with chronic neck pain. The duration of the disease has been shown as one of the most important predictors of disability. Therefore, early treatment of the disease may

Table 7. *Within-group and between-group comparisons of Short Form-36 domain scores of the 3 groups from baseline to follow-up assessment.*

SF-36 Domains	Groups	Within-Group Comparisons (Wilcoxon Signed Rank Test)		Between-Group Comparisons (Kruskal Wallis & Mann-Whitney U)	
		IA-SW	IA-FA	IA-SW	IA-FA
Physical Functioning	KSCT	0.038*	0.014*	0.033*	0.734
	KMIT	0.004ε	0.002ε		
	CG	0.705	0.015*		
Role-Physical	KSCT	0.803	0.009ε	0.022*	0.996
	KMIT	0.011*	0.032*		
	CG	0.520	0.028*		
Role-Emotional	KSCT	0.210	0.009ε	0.217	0.493
	KMIT	0.567	0.016*		
	CG	0.515	0.034*		
Vitality	KSCT	0.836	0.004ε	0.690	0.839
	KMIT	0.095	0.015*		
	CG	0.464	0.005ε		
Mental Health	KSCT	0.060	0.030*	0.866	0.618
	KMIT	0.175	0.012*		
	CG	0.141	0.002ε		
Social Functioning	KSCT	0.021*	0.165	0.965	0.676
	KMIT	0.022*	0.076		
	CG	0.005ε	0.385		
Bodily Pain	KSCT	0.048*	0.002ε	0.199	0.943
	KMIT	0.004ε	0.001ε		
	CG	0.001ε	<0.001**		
General Health	KSCT	0.008ε	0.022*	0.003ε	0.243
	KMIT	<0.001**	0.002ε		
	CG	0.619	0.015*		

Abbreviations: SF-36, short form-36; IA, initial assessment; SW, second week; FA, follow-up assessment; KSCT, kinesiotaping with the space correction technique; KMIT, kinesiotaping with the muscle inhibition technique; CG, control group.
*$P < 0.05$. ε$P < 0.01$. **$P < 0.001$, 95% confidence interval, $\alpha = 0.05$.

play an important role in the prevention of disability (36). Our results showed that both KT techniques were associated with better functional status earlier than the home exercise program alone.

There are controversial opinions about the relationship between the NDI and pain intensity. There are studies suggesting that the NDI was related to pain intensity measured with the Visual Analog Scale (VAS) along with studies suggesting no significant correlation between the NDI and the pain VAS considering that clinical recovery was more complex than pain intensity alone (20). In our study, it was determined that both the NDI and NRS-11 pain intensity scores were lower in KT groups than in controls at the SW evaluation without any difference between the techniques.

There are several studies that evaluated KT efficiency in the management of neck pain via the NDI as outcome measurement. Ay et al (37) found a significant difference in VAS values in favor of KT, but this result was not obtained in the NDI and there was no improvement in disability during the treatment period of 2 weeks. It is possible that this result is due to the short period of time between their assessments (2 weeks) but Azatcam et al (26) showed a significant reduction in pain intensity with KT, but not in disability similarly with Ay et al (37) with a long duration of follow-up time (3 months) and we showed a significant reduction in the NDI values at the exact time period (SW) as in the study by Ay et al. These controversial findings support the opinion of a more

complex relationship between pain and disability. To support this opinion, Abd El-Azeim et al (30) found no significant difference between KT and the control groups in the VAS values, but a significant difference in the NDI scores in favor of KT. There are some other studies (27,29,38-40) that showed a significant reduction both in pain and disability with KT similar to that in our study.

Health-Related Quality of Life

MPS can affect quality of life significantly due to associated pain and functional disability (4). However, there are only a few studies investigating how KT affects quality of life in patients with MPS or neck pain. We found that KT applied to active TPs in the upper trapezius with the space correction and muscle inhibition techniques made significant improvements in physical functioning and general health domains and KT with the muscle inhibition technique in role limitations due to the physical problems domain at the SW assessment compared to the home exercise alone. These findings suggest that KT may have a positive effect on the physical aspect of health-related quality of life in MPS. Although it is not possible to entirely compare our results because of the different study population and measurement tool they used, Ata et al (41) found that the 12-Item Short-Form Health Survey physical component summary scores at post-treatment evaluations improved more in favor of KT, similar with our results. On the contrary, Puerma-Castillo et al (42) obtained no evidence of additional benefits from the use of KT for quality of life of patients with neck pain and Hayta and Umdu (27) found both KT and dry needling to be effective in improving health perception in patients with MPS with superiority of dry needling.

Limitations

There are some limitations of the current study. First of all, a larger sample of patients than the calculated amount was excluded from the study, thus statistical analysis was performed with a sample size below the number of patients determined by the power analysis performed before the study. Being careful about the timing of the KT sessions within a certain standard procedure and performing follow-up evaluations in a timely manner are among the reasons why there were too many dropouts. The small number of patients may have precluded a significant difference in some results. Another limitation of this study is the fact that it was performed only in female patients in order to create a more homogeneous group since MPS is more common in women and our number of female patients was higher. In addition, the placebo effect of KT was not excluded because of the absence of a placebo group in our study. Again in our study, because a single researcher performed both KT and evaluations, our assessments were not blind. It is important to consider these limiting factors when interpreting the results obtained from our study.

Conclusion

KT applied, using the space correction and muscle inhibition techniques along with the home exercise program, was found to be associated with lower pain intensity and better functional status and increased quality of life by improving physical functions and general health perception within the treatment period compared to the home exercise program alone in female patients with MPS related to active TPs in the upper trapezius. There was no significant difference between the KT methods, except for role limitations due to the physical factors domain of SF-36 which was improved in the KMIT group earlier than in the KSCT group and the CGs.

Author Contributions

All authors equally contributed to the design, conduct, analyses, writing of the manuscript, and approved the final version of the article.

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