ORIGINAL ARTICLE

Eastern Journal of Medicine

East J Med 28(1): 107-114, 2023
DOI: 10.5505/ejm.2023.62558

Comparative Effects of Conventional Physical Therapy, Kinesio Taping and Extracorporeal Shock Wave Therapy in Acute Upper Trapezius Myofascial Pain Syndrome

Volkan Şah

Van Yuzuncu Yil University, Faculty of Medicine, Department of Sports Medicine, Van, Turkey

ABSTRACT

Conservative Physical Therapy (CPT), Kinesio Taping (KT), and Extracorporeal Shock Wave Therapy (ESWT) have been used to treat Upper Trapezius Myofascial Pain Syndrome (UTMPS). In a health center where all three treatments can be performed, it is important to choose the most effective one in UTMPS treatment. The aim of this study was to compare the effects of CPT, KT, and ESWT in the patients with UTMPS. 84 patients with acute UTMPS were randomised into three treatment groups: CPT, KT, and ESWT. All patients were evaluated at baseline (week 0), just after treatment (week 2) and one month after treatment (week 6). Visual Analog Scale (VAS), Neck Disability Index (NDI), Restricted Angel of Cervical Extansion (RACE), Restricted Angel of Cervical Lateral Flexion (RACLF) scores were used as outcome measures. All outcome measures just after treatment (week 2) and one month after treatment (week 6) were found to be significantly lower within the three treatment groups compared with the baseline (week 0) (for all, $p<0.05$). All outcome measures one month after the treatment (week 6) were found to be significantly lower in the ESWT group than in the other two treatment groups (for all, $p<0.05$). CPT, KT, ESWT were found to be effective in the treatment of UTMPS. However, since ESWT has the most positive effect on outcome measures in the evaluation 1 month after the treatment (week 6), it can be preferred over the other two methods (CPT and KT) in the treatment of UTMPS.1 month after the treatment (week 6), it can be preferred over the other two methods (CPT and KT) in the treatment of UTMPS.

Keywords: Upper Trapezius Myofascial Pain Syndrome, Conventional Physical Therapy, Kinesio Taping, Extracorporeal Shock Wave Therapy

Introduction

Myofascial pain syndrome (MAS) is a non-inflammatory syndrome of musculoskeletal origin, characterized by the presence of palpable nodules among skeletal muscle fibers called trigger points, accompanied by pain and muscle stiffness. Myofascial Trigger Points (MTNs) are actually these focal, discrete, hyperirritable nodules located within taut bands of skeletal muscle (1).

In a nationwide study in Germany, 46% of patients admitted to pain clinics had active MTNs on examination (2). It was stated that myofascial pain was the cause of 54.6% of head/neck pain and 85% of low back pain in a review (3).

MTNs occur mostly in the upper trapezius muscle in the human body (4). This muscle is very prone to myofascial trigger point formation as it is in a constant state of contraction to counter gravity and maintain an upright head and neck position (1). MTNs formed in the upper trapezius can cause headache, neck pain, neck stiffness and a decrease in neck joint range of motion (5).

Hotpack, Ultrasound and Transcutaneous Electrical Nerve Stimulation (TENS) are being used as elements of a Conventional Physical Therapy (CPT) in MPS (6). Hotpack is the name given to the packages of different sizes produced by coating a hydrophilic gel content with canvas. It is a superficial thermal treatment method where these packets are applied to the skin of the desired area after being heated in hot water boilers (7). Although it is similar in name to radiologic imaging method, therapeutic ultrasound is used purely for the treatment of musculoskeletal diseases. It has thermal and non-thermal effects. The thermal effect is deeper than the hotpack (up

*Corresponding Author: Volkan Şah, Department of Sports Medicine, Van Yuzuncu Yil University, Van, Turkey
E-mail: volkansah@yyu.edu.tr, Phone: +90 0 (530) 060 32 60
ORCID ID: Volkan Şah: 0000-0002-2853-2266
Received: 09.08.2022, **Accepted:** 14.10.2022

to 5 cm under the skin) and it does not cause a significant temperature increase on the skin, unlike the hotpack. Tissue cavitation and an increase in cell membrane permeability are non-thermal effects of therapeutic ultrasound (7). TENS , the effect of which was tried to be explained by the gate control theory put forward by Melzac and Wall in 1965 (8), has been used for a long time in the treatment of acute and chronic pain (7).

Kinesiotaping (KT) is a new flexible and adhesive taping method that was introduced to the literature by Kenzo Kase in 1996 and is a technique of taping the muscle without restricting the movements of the individual, which is widely used in musculoskeletal diseases (9). Kinesiotapes are elastic-cotton adhesives that do not contain latex and can be stretched up to 140% of their original length (10). Although the mechanism of action is not fully understood, it is suggested that Kinesio Taping supports muscles, relieves congestion, activates the endogenous analgesic system, and improves joint problems (11).

Extracorporeal shock wave therapy (ESWT) is based on the application of acoustic waves generated outside the body to the desired surface of the body through a probe (12). ESWT has been used in many musculoskeletal diseases in recent years (13). Although the effectiveness of ESWT in reducing pain has not been clearly explained, it may be due to stimulation analgesia and increased tissue regeneration (14).

Studies have shown that the use of hotpack, therapeutic ultrasound and TENS are effective in the treatment of upper trapezius myofascial pain syndrome (UTMPS) (15,16). In a review combining the results of six studies, it was revealed that kinesiotaping alone or in combination with other physical therapy agents caused a significant reduction in pain level in UTMPS (17). Clinical trials examining the efficacy of ESWT in UTMPS revealed the significant improvement in patients' pain (18).

For UTMPS treatment, no study has yet been found in which these different treatments (CPT, KT, ESWT) are compared together and within the same study. Therefore, this study focused on the efficacy comparison of three treatment options in UTMPS patients. We tried to demonstrate that it is necessary to prefer the most appropriate treatment or treatments for UTMPS in a health institution where all three application possibilities are available.

Materials and Methods

Ethical Considerations: This study was carried out in Van Yüzüncü Yil University, Faculty of Medicine, Department of Sports Medicine. All patients were informed verbally before the study and all of them filled in written informed consent forms in accordance with the Declaration of Helsinki. Van Yüzüncü Yil University Clinical Research Ethics Committee approval was obtained (Decision No: 07; Date: March 02, 2022) and the study was registered on 'Clinicaltrials.gov' with the number NCT05277259.

Study Design: This is a prospective, open-label, randomized clinical trial with three parallel treatment groups (CPT, KT and ESWT). The study lasted for six weeks, of which the first two weeks were the treatment period. All three patient groups were given home exercises program (range of motion and stretching exercises) until the last evaluation of the study (week 6). Patients were evaluated with Visual Analog Scale (VAS), Neck Disability Index (NDI), restricted angel of cervical extension (RACE) and, restricted angel of cervical lateral flexion (RACLF) before treatment (baseline), just after treatment (week 2), and one month after the end of treatment (week 6). In patients with bilateral pain, treatments were applied to both sides, but evaluations were made based on the most painful side.

Sample Size Estimation: The sample size was calculated using the G*Power statistical program (ver.3.1.9.4). Type-1 error was taken as 5% and Power was calculated as 93% for 60 patients in total, with at least 20 patients in each group. However, the patients who met the criteria for inclusion in the study and who could come to the final control reached the number of 84, thus increasing the sample size and study power even more.

Participants: 120 patients who were referred to the Van Yüzüncü Yil University Sports Medicine outpatient clinic with the complaint of mechanical pain in the unilateral or bilateral upper trapezius region were evaluated in terms of inclusion and exclusion criteria.

The inclusion criteria for the study were: Female gender, age of 18-45 years, having acute pain (duration of less than one month) in the upper trapezius region, stating that the Visual Analog Scale (VAS) value is 4 or more severe, not using painkillers and/or muscle relaxants since the beginning of the complaint, not having used any physical therapy modality for the upper trapezius

region before and meeting the basic criteria of Travell and Simons (1). The Travell and Simons criteria are as follows: Palpation of the tight band within the muscle, presence of at least one sensitive point in this band, the patient's feeling of pain by pressing this point(s), and painful limitation of cervical range of motion (ROM) (mainly cervical extension and cervical lateral flexion) during stretching.

The exclusion criteria for the study were: major head, neck or upper extremity surgery, neuromuscular disease, active rheumatologic disease, active infection, any malignancy, and pain or numbness radiating to the arm suggestive of nerve root lesion. The patients in both three groups did not have co-morbidities and regular drug use. They were warned that they should not receive any other treatment until the last control. Activity restriction were suggested to all patients during the study.

Since fibromyalgia, pregnancy, psychiatric diseases such as somatization disorders and depression can also cause musculoskeletal pain (19), patients with these disorders were excluded from the study.

The statistical results of 84 patients who accepted to participate in the study, met the criteria and were able to be evaluated at the last control were analyzed.

Randomisation: After calculating that there should be at least 20 samples in each group; A total of 84 patients were assigned to the groups as "simple (random)" by "block randomisation" with the help of the "Random Allocation Software (ver.1.0)" package program.

Interventions: A total of 10 sessions (within two weeks, excluding weekends) were applied to the patients in the conventional physical therapy group in the order of Hotpack, Therapeutic Ultrasound, and TENS. Hotpack was applied to the patient lying in the prone position with arms by side for 20 minutes, covered with a cotton towel after it was kept in the hydrocollator tank (Fizyopack 7000®) at 75-80 degrees for 30 minutes. 30x30 cm size was used for unilateral UTMPS patients and 30x60 cm size was used for bilateral UTMPS patients. Therapeutic ultrasound and TENS were applied to patients in a sitting position with a combined electrotherapy device (BTL-4000 Premium®). Therapeutic ultrasound was applied to trigger points with circular movements for 5 minutes at a continuous frequency of 3 MHz and an intensity of 1.4 w/cm^2 in the muscle relaxation mode. TENS was applied with constant frequency (182Hz), constant pulse (50 microseconds) and constant current (CC) for 15 minutes with the number of electrodes selected according to the trigger point number and distribution.

The patients in the kinesiotape group were taped four times (on Mondays and Thursdays for two weeks) using the muscle inhibition technique with single I-shaped strips (Kinesio® Tex Classic tapes, Kinesio Holding Corporation, Albuquerque, NM) and without color choice. The taping was applied after the patient's head was lateral flexed to the contralateral side while the patient was sitting in an upright position on the chair. The taping direction was from the insertion of the muscle (lateral of the clavicle) to its origin (spinous processus of the 1th-5th cervical vertebrae). The first 3 cm of the tape was adhered to the insertion without stretching, the next 3 cm of the tape was adhered with full stretching and the last part was adhered to the origo without stretching. The patient was asked not to remove the kinesiotape until the next taping day.

A total of four sessions (on Mondays and Thursdays in two weeks) shock wave therapy was applied to the patients in the sitting position using a radial probe in the ESWT group. Both focused ESWT and radial ESWT has been used in the treatment of soft tissue and musculoskeletal disorders (20,21) however the radial shock wave systems are especially popular because of its applicability and lower costs (22). The ESWT probe was applied to the skin using ultrasound gel and without using local anesthesia. In each session, a sequential two-part treatment protocol, which the electro-pneumatic device (Elettronica Pagani®, Italy) automatically determined for 'myofascial trapezius syndrome', was applied. In the first part, 1500 pulses shock wave was applied for 6 minutes and 57 seconds at a pressure of 1.3 bar, a frequency of 6.0 Hz and an energy density of 0.156 mj/mm2. In the second part, 1500 pulses shock wave was applied for 2 minutes and 30 seconds at 1.5 bar pressure, a frequency of 10.0 Hz and energy density of 0.180 mj/mm2.

Outcome Measures

Pain: VAS is a commonly used scale for the assessment of pain intensity. This scale consists of a horizontal line, with the value of 0 (zero) at the beginning of the line, and the value of 10 (ten) at the end. The patient is asked to mark the intensity of pain at rest or during activity on this scale. A value of 0 is considered to mean no pain, numbers that go up to 10 represent an increase in pain level, and a value of 10 is considered unbearable

pain. This scale was first used in psychology by Freyd in 1923 (23).

Functional Assessment: The Neck Disability Index (NDI) is a scale marked by the patient that consists of a total of 10 titles. These titles are; pain intensity, personal care, lifting weights, reading, headaches, concentration, work (work), driving, sleeping, resting (leisure time) activities. Each item was scored from 0 (no disability) to 5 (complete disability). The total score ranges from 0 (no disability) to 50 (total disability). NDI was developed by Howard Vernon and published in 1991 (24). The Turkish version of the NDI, the validity and reliability of which was demonstrated by Kesiktaş et al. (25), was used in our study.

The cervical extension angles and the lateral flexion angles that the patients could make to the opposite side of the painful muscle were measured with a manual plastic goniometer (Jamar®) by the same physiatrist. For both cervical extension and lateral flexion, the normal range of motion was accepted as 45 degrees, and the difference between the measured angles and 45 degrees was recorded as restricted angels. In patients with bilateral involvement, the side with the lower lateral flexion angle was taken as the basis.

Statistical Analysis: Shapiro-Wilk ($n<50$) and Skewness-Kurtosis tests were used to check whether the continuous measurements in the study were normally distributed. Parametric tests were applied because the measurements were normally distributed. Descriptive statistics for continuous variables in the study were expressed as mean and standard deviation; for categorical variables, they were expressed as numbers (n) and percentages (%). One-Way "Analysis of Variance (ANOVA)" was performed to compare outcome measures according to treatment groups. "Duncan post-hoc multiple comparison test" was used to identify the difference between groups following ANOVA. Separately in the treatment groups, ANOVA in repeated measures was used to compare outcome measures according to measurement times, and the "Bonferroni post-hoc multiple comparison test" was used to determine the measurement times that made the difference following this test. Pearson correlation coefficients were calculated to determine the relationships between continuous measurements. Statistical significance level (a) was taken as 5% in the calculations and SPSS (IBM SPSS for Windows, ver.26) statistical package program was used for analysis.

Results

The flowchart of the study is shown in figure 1. The data of 84 female UTMPS patients were evaluated. There was no statistical difference between the three treatment groups in terms of baseline characteristics (for all, $p>0.05$) (table 1).

Intra-group Comparisons of Outcome Measures: All outcome measures (VAS and NDI scores, RACE and RACFL) just after treatment (week 2) were found to be significantly lower within the three treatment groups compared with the baseline (week 0) (for all, $p<0.05$) (Tables 2-5). All outcome measures one month after treatment (week 6) was found to be significantly lower within the three treatment groups compared to baseline (week 0) (for all, $p<0.05$) (Tables 2-5).

Inter-group Comparisons of Outcome Measures: There was no significant difference between the 3 groups in terms of all outcome measures just after treatment (week 2) (for all, $p>0.05$) (Tables 2-5). However, when the baseline-week 2 changes were examined, it was found that the VAS and RACFL decreased mostly in the CPT group, while the NDI and RACE decreased mostly in the ESWT group (Tables 2-5).

All outcome measures one month after the treatment (week 6) were found to be significantly lower in the ESWT group than in the other two treatment groups (for all, $p<0.05$) (Tables 2-5).

No treatment-related adverse events were observed in any of the groups.

Discussion

The aim of this open-label, randomized clinical trial is to compare the immediate- and short-term efficacy of CPT, KT and ESWT in the treatment of UTMPS.

According to the results, all three treatment modalities significantly decreased (improved) the outcome measures just after the treatment (week 2) and 1 month after the treatment (week 6) of the UTMPS patients. However, at week 6, all of these outcome measures were significantly lower (better improved) in the ESWT group than in the other two treatment groups (CPT and KT).

Hotpack, tens and therapeutic ultrasound are conventional agents that can be applied in different combinations in physical therapy units. In the literature, there are studies demonstrating the efficacy of these conventional physical therapy agents in the treatment of UTMPS. In a clinical trial evaluating 30 patients with latent myofascial

Table 1. Baseline Characteristics of Treatment Groups

	CPT* + Exercise		KT* + Exercise		ESWT* + Exercise		*p
	Mean	SD	Mean	SD	Mean	SD	
Age	32,45	9,54	34,37	9,95	33,82	11,10	0,768
BMI* (kg/m2)	32,87	6,30	31,91	6,73	31,82	6,27	0,791
Pain Duration(day)	12,79	7,47	11,30	6,01	11,96	6,03	0,694
VAS*	6,66	1,97	6,56	2,06	6,46	1,84	0,934
NDI*	24,28	9,96	23,26	11,62	24,00	8,17	0,926
RACE*	14,03	10,20	11,26	6,97	11,14	5,69	0,299
RACLF*	13,66	8,55	12,04	8,48	13,43	9,32	0,761

**CPT: Conventional Physical Therapy *KT: Kinesio Tape: *ESWT: Extracorporeal Shock Wave Therapy *One Way ANOVA statistics *BMI: Body Mass Index *VAS: Visual Analog Scale *NDI: Neck Diasbility Index *RACE: Restricted Angel of Cervical Extansion *RACLF: Restricted Angel of Cervical Lateral Flexion*

Table 2. Intra-group and Inter-group changes of Visual Analog Scale (VAS)

	CPT* + Exercise		KT* + Exercise		ESWT* + Exercise		**p
	Mean	SD	Mean	SD	Mean	SD	
Base VAS*	6,66	1,97	6,56	2,06	6,46	1,84	0,934
Week2 VAS	4,83	1,93	5,44	2,15	4,96	1,79	0,474
Week6 VAS	3,83a	2,16	4,78a	1,91	2,82b	1,79	0,002
*p (0-2)	0,001		0,001		0,001		
*p (0-6)	0,001		0,001		0,001		
Change (0-2)	1,83		1,12		1,50		
Change (0-6)	2,83		1,78		3,64		

**CPT: Conventional Physical Therapy *KT: Kinesio Tape: *ESWT: Extracorporeal Shock Wave Therapy *VAS: Visual Analog Scale *Paired Sample T-test statistics ↓ (Shows intra-group comparisons) **One way ANOVA test statistics→ (a,b: Shows inter-group comparisons)*

Table 3. Intra-group and Inter-group changes of Neck Disability Index (NDI)

	CPT* + Exercise		KT* + Exercise		ESWT* + Exercise		*p.
	Mean	SD	Mean	SD	Mean	SD	
Base NDI*	24,28	9,96	23,26	11,62	24,00	8,17	0,926
Week2 NDI	19,55	10,22	20,30	11,11	18,32	7,04	0,744
Week6 NDI	14,76[a]	10,22	17,37[a]	10,40	7,57[b]	6,24	0,001
*p (0-2)	0,001		0,001		0,001		
*p (0-6)	0,001		0,001		0,001		
Change (0-2)	4,73		2,90		5,68		
Change (0-6)	9,52		6,25		16,43		

**CPT: Conventional Physical Therapy *KT: Kinesio Tape: *ESWT: Extracorporeal Shock Wave Therapy *NDI: Neck Diasbility Index *Paired Sample T-test statistics ↓ (Shows intra-group comparisons) **One way ANOVA test statistics→ (a,b: Shows inter-group comparisons)*

Table 4. Intra-group and Inter-group changes of Restricted Angel of Cervical Extansion (RACE)

	CPT* +Exercise		KT* + Exercise		ESWT* + Exercise		*p.
	Mean	SD	Mean	SD	Mean	SD	
Baseline RACE*	14,03	10,20	11,26	6,97	11,14	5,69	*0,299*
Week2 RACE	10,59	8,67	9,67	6,02	6,93	4,77	*0,111*
Week6.RACE	6,34[a]	6,88	7,59[a]	5,73	2,61[b]	3,58	*0,004*
**p (0-2)*	*0,001*		*0,002*		*0,001*		
**p (0-6)*	*0,001*		*0,001*		*0,001*		
Change (0-2)	*3,44*		*1,53*		*4,21*		
Change (0-6)	*7,69*		*3,67*		*8,53*		

**CPT: Conventional Physical Therapy *KT: Kinesio Tape: *ESWT: Extracorporeal Shock Wave Therapy *RACE: Restricted Angel of Cervical Extansion *Paired Sample T-test statistics ↓ (Shows intra-group comparisons) **One way ANOVA test statistics→ (a,b: Shows inter-group comparisons)*

trigger points in the upper trapezius (15), HP and Therapeutic US were applied within 24-48 hours and only immediate responses to treatment were evaluated. It has been shown that all these parameters were significantly more positively affected in the group in which the hotpack was applied first, compared to the group in which the therapeutic ultrasound was applied first. Another single-blind, randomized, controlled study demonstrated that TENS + home exercise

Table 5. Intra-group and Inter-group changes of Restricted Angel of Cervical Lateral Flexion (RACLF)

	CPT* + Exercise		KT* + Exercise		ESWT* + Exercise		*p.
	Mean	SD	Mean	SD	Mean	SD	
Baseline RACLF*	13,66	8,55	12,04	8,48	13,43	9,32	0,741
Week2 RACLF	9,43	8,64	9,85	6,85	9,25	7,46	0,957
Week6 RACLF	6,00a	7,34	7,26a	5,88	2,71b	3,41	0,013
*p (0-2)	0,001		0,024		0,001		
*p (0-6)	0,001		0,001		0,001		
Change (0-2)	4,23		2,19		4,18		
Change (0-6)	7,66		4,78		10,72		

**CPT: Conventional Physical Therapy *KT: Kinesio Tape: *ESWT: Extracorporeal Shock Wave Therapy *RACLF: Restricted Angel of Cervical Lateral Flexion *Paired Sample T-test statistics ↓ (Shows intra-group comparisons) **One way ANOVA test statistics→ (a,b: Shows inter-group comparison*

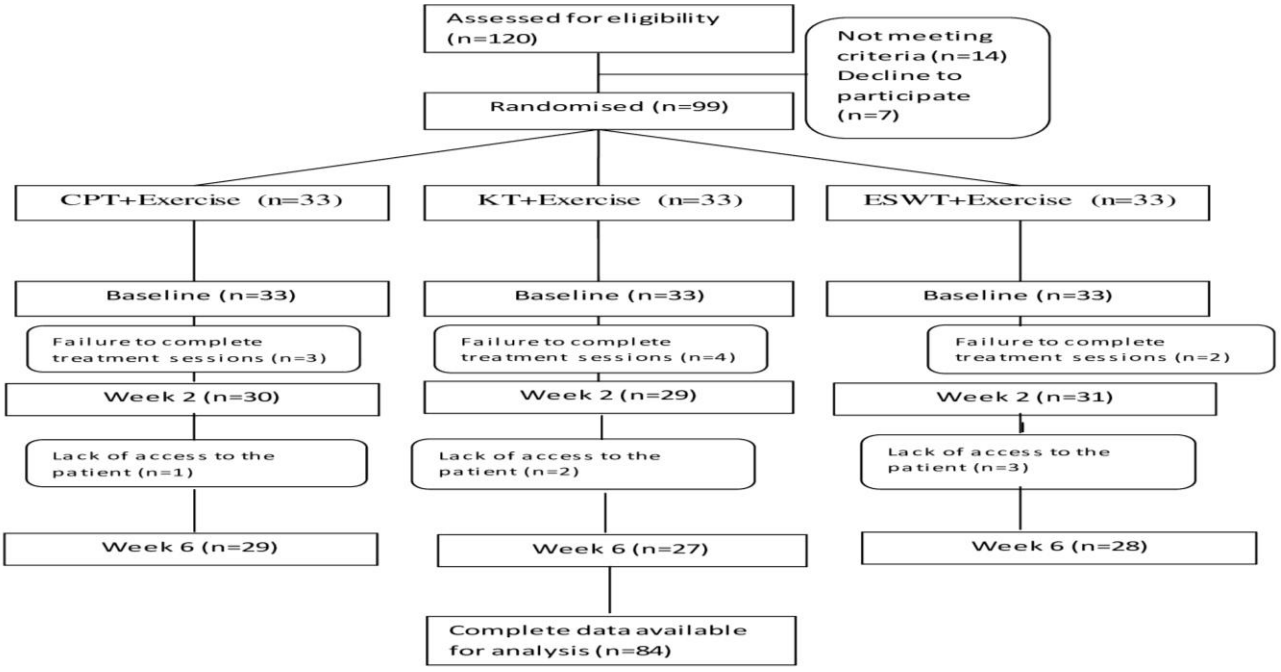

Fig.1. Flow of Study Participants

program was found to be superior when compared to Interferential Therapy Flow (ITF) + home exercise program and Hotpack + home exercise program (control group) (16). Kavadar et al. randomized 59 UTMPS patients to treatment groups (therapeutic US and placebo US) and they observed that outcome measures improved significantly more in the therapeutic US group (26).

Although the effectiveness of KT in the treatment of UTMPS is controversial (11,27–29); Akpinar et al., in their more recent study, observed that both KT techniques (space correction and muscle inhibition) significantly improved pain intensity and functional status when compared with the control group in the treatment of UTMPS (30).

In a recent study comparing ESWT with KT in the treatment of UTMPS, both treatment modalities were found to be effective in the treatment of UTMPS. However, VAS, pain threshold, and NDI scores improved significantly more in the ESWT group than in the KT group (31). Another trial showed that therapeutic ESWT was found to reduce pain scores in UTMPS patients more than Sham ESWT. However, there was no significant difference between these two groups in terms of pressure threshold values (32).

The results of these previous studies revealed that all three treatment modalities (CPT, KT, ESWT) were effective in the treatment of UTMPS, which is consistent with the results of our study. However, in the treatment of any disease, choosing the most effective one among the available treatments is essential for the most effective use of labor and time for both the physician and the patient. To our knowledge, no clinical study comparing these three treatment modalities in the same study has been found in the literature.

Considering that the small differences between the groups in the evaluation just after the treatment (week 2) were not statistically significant, the inter-group differences 1 month after the treatment (week 6) were remarkable. Although all

three treatments were found to be effective at week 6, superior recovery results were obtained in the ESWT group compared to the other two treatment groups.

There is a sustained depolarization due to an increase in acetylcholine production and release at the neuromuscular junction, resulting in muscle ischemia by increasing calcium uptake and release in the etiopathogenesis of myofascial pain syndrome (32,33). ESWT may have positively affected these mechanisms related to calcium and blood flow in the etiopathogenesis of UTMPS than the other treatment methods in our study, as it both positively changes the pain signals caused by calcium release and increases tissue perfusion (34).

Although ESWT is mostly a safe treatment method, it could have some adverse consequences such as dysesthesia, swelling, ecchymosis and/or petechiae, bruising, and a throbbing sensation (35).

Limitations: This study had some limitations as far as we could detect. Because we included only female patients between the age of 18-45, our conclusions are not applicable to women of different ages and men of all age groups. Assessment was not blind as the interventions were administered by a single clinician. Since only patients with pain duration of less than 1 month (acute) were included in the study, the efficacy of these treatmenst in patients with subacute and chronic UTMPS can be evaluated in other studies. We only assessed the immediate and short-term effects of the treatments we applied, so we could not have the knowledge of medium and long-term effects. Lastly, clinical researches with larger numbers of patients are needed to confirm our findings.

According to the results of our study, all three treatment methods (CPT, KT, ESWT) were found to be effective in the treatment of UTMPS. However, since ESWT had the most positive effect on outcome measures in the evaluation 1 month after the treatment (week 6), it can be preferred over the other two methods (CPT and KT) in the treatment of UTMPS.

Conflict of Interest: The author declared no conflicts of interest with respect to authorship and/or publication of the article.

Financial Disclosure: The author received no financial support for the research and/or publication of this article.

Author Contributions: Concept - V.Ş.; Design - V.Ş.; Supervision - V.Ş.; Materials - V.Ş.; Data Collection and/or Processing - V.Ş.; Analysis and Interpretation - V.Ş.; Literature Review - V.Ş.; Writing Manuscript - V.Ş.; Critical Reviews - V.Ş.

References

1. Simons DG, Travell J, Simons LS. Myofascial pain and disfunction. The trigger point manual. Volume 1 1999; 11-94.
2. Fleckenstein J, Zaps D, Rüger LJ, Lehmeyer L, Freiberg F, Lang PM, et al. Discrepancy between prevalence and perceived effectiveness of treatment methods in myofascial pain syndrome: results of a cross-sectional, nationwide survey. BMC Musculoskelet Disord 2010; 11: 1-9.
3. Hubbard JE. Myofascial trigger points. What physicians should know about these neurological imitators. Minn Med 2010; 93: 42-45.
4. Astin JA. Why patients use alternative medicine: results of a national study. jama 1998; 279: 1548-1553.
5. Moraska AF, Stenerson L, Butryn N, Krutsch JP, Schmiege SJ, Mann JD. Myofascial trigger point-focused head and neck massage for recurrent tension-type headache: a randomized, placebo-controlled clinical trial. Clin J Pain 2015; 31: 159.
6. Smith HS. Current therapy in pain. Elsevier Health Sciences; 2009.
7. Cameron MH. Physical agents in rehabilitation: from research to practice. Elsevier Health Sciences; 2012.
8. Melzack R, Wall PD. Pain Mechanisms: A New Theory: A gate control system modulates sensory input from the skin before it evokes pain perception and response. Science (80-) 1965; 150: 971-979.
9. Fu T-C, Wong AMK, Pei Y-C, Wu KP, Chou S-W, Lin Y-C. Effect of Kinesio taping on muscle strength in athletes—a pilot study. J Sci Med Sport 2008; 11: 198-201.
10. Martínez-Gramage J, Merino-Ramirez MA, Amer-Cuenca JJ, Lisón JF. Effect of Kinesio Taping on gastrocnemius activity and ankle range of movement during gait in healthy adults: a randomized controlled trial. Phys Ther Sport 2016; 18: 56-61.
11. Montalvo AM, Cara E Le, Myer GD. Effect of kinesiology taping on pain in individuals with musculoskeletal injuries: systematic review and meta-analysis. Phys Sportsmed 2014; 42: 48-57.
12. Perez M, Weiner R, Gilley JC. Extracorporeal shock wave therapy for plantar fasciitis. Clin Podiatr Med Surg 2003; 20: 323-334.

13. Schroeder AN, Tenforde AS, Jelsing EJ. Extracorporeal shockwave therapy in the management of sports medicine injuries. Curr Sports Med Rep 2021; 20: 298-305.
14. Wang C, Wang F, Yang KD, Weng L, Hsu C, Huang C, et al. Shock wave therapy induces neovascularization at the tendon–bone junction. A study in rabbits. J Orthop Res 2003; 21: 984-989.
15. Benjaboonyanupap D, Paungmali A, Pirunsan U. Effect of Therapeutic Sequence of Hot Pack and Ultrasound on Physiological Response Over Trigger Point of Upper Trapezius. Asian J Sports Med 2015; 6: e23806.
16. Dissanayaka TD, Pallegama RW, Suraweera HJ, Johnson MI, Kariyawasam AP. Comparison of the effectiveness of transcutaneous electrical nerve stimulation and interferential therapy on the upper trapezius in myofascial pain syndrome: a randomized controlled study. Am J Phys Med Rehabil 2016; 95: 663-672.
17. Alotaibi M, Ayoub A, King T, Uddin S. The effect of Kinesio taping in reducing myofascial pain syndrome on the upper trapezius muscle: A systematic review and meta-analysis. Eur Sci J 2018; 14: 336-350.
18. Ji, H.M.; Kim, H.J.; Han, S.J. Extracorporeal Shock Wave Therapy in Myofascial Pain Syndrome of Upper Trapezius. Ann. Rehabil. Med 2012; (36): 675-680.
19. Gonen Aydln C, Orscelik A, Gok MC, Akman YE. The Efficacy of Extracorporeal Shock Wave Therapy for Chronic Coccydynia. Med Princ Pract 2020; 29: 444-450.
20. van der Worp H, van den Akker-Scheek I, Van Schie H, Zwerver J. ESWT for tendinopathy: technology and clinical implications. Knee Surgery, Sport Traumatol Arthrosc 2013; 21: 1451-1458.
21. Sun J, Gao F, Wang Y, Sun W, Jiang B, Li Z. Extracorporeal shock wave therapy is effective in treating chronic plantar fasciitis: A meta-analysis of RCTs. Medicine (Baltimore) 2017; 96 (15).
22. Storheim K, Gjersing L, Bølstad K, Risberg MA. Extracorporeal shock wave therapy (ESWT) and radial extracorporeal shock wave therapy (rESWT) in chronic musculoskeletal pain. Tidsskr den Nor lægeforening Tidsskr Prakt Med ny række 2010; 130: 2360-2364.
23. Freyd M. The graphic rating scale. J Educ Psychol 1923; 14: 83.
24. Vernon H, Mior S. The Neck Disability Index: a study of reliability and validity. J Manipulative Physiol Ther 1991;
25. Kesiktas N, Ozcan E, Vernon H. Clinimetric properties of the Turkish translation of a modified neck disability index. BMC Musculoskelet Disord 2012; 13: 1-6.
26. Kavadar G, Çağlar N, Özen Ş, Tütün Ş, Demircioğlu D. Efficacy of conventional ultrasound therapy on myofascial pain syndrome: A placebo controlled study. Agri 2015; 27: 190-196.
27. Kalron A, Bar-Sela S. A systematic review of the effectiveness of Kinesio Taping--fact or fashion? Eur J Phys Rehabil Med 2013; 49: 699-709.
28. Morris D, Jones D, Ryan H, Ryan CG. The clinical effects of Kinesio® Tex taping: A systematic review. Physiother Theory Pract 2013; 29: 259-270.
29. Zhang XF, Liu L, Wang B Bin, Liu X, Li P. Evidence for kinesio taping in management of myofascial pain syndrome: a systematic review and meta-analysis. Clin Rehabil 2019; 33: 865–874.
30. Akpinar FM, Sindel D, Ketenci A. Investigation of effectiveness of two different kinesiotaping techniques in myofascial pain syndrome: An open-label randomized clinical trial. Pain Physician 2021; 24: E721-731.
31. Yalçln Ü. Comparison of the effects of extracorporeal shockwave treatment with kinesiological taping treatments added to exercise treatment in myofascial pain syndrome. J Back Musculoskelet Rehabil 2021; 34: 623-630.
32. Ji HM, Kim HJ, Han SJ. Extracorporeal shock wave therapy in myofascial pain syndrome of upper trapezius. Ann Rehabil Med 2012; 36: 675-680.
33. Shah JP, Danoff J V, Desai MJ, Parikh S, Nakamura LY, Phillips TM, et al. Biochemicals associated with pain and inflammation are elevated in sites near to and remote from active myofascial trigger points. Arch Phys Med Rehabil 2008; 89: 16-23.
34. Wang FS, Yang KD, Chen RF, Wang CJ, Sheen-Chen SM. Extracorporeal shock wave promotes growth and differentiation of bone-marrow stromal cells towards osteoprogenitors associated with induction of TGF-beta1. J Bone Joint Surg Br 2002; 84: 457-461.
35. Roerdink RL, Dietvorst M, Van der Zwaard B, Van der Worp H, Zwerver J. Complications of extracorporeal shockwave therapy in plantar fasciitis: Systematic review. Int J Surg 2017; 46: 133-145.