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Comparison of the treatment effects of extracorporeal shock wave therapy and trigger point injection in myofascial pain syndrome

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Abstract

Myofascial pain syndrome (MPS) is a common chronic musculoskeletal disease and the lifetime prevalence is about 85%. Comparison of the effects of ESWT (extracorporeal shock wave therapy) and trigger point injection (TPI) treatments on sleep quality in myofascial pain syndrome has rarely been studied. The aim of this study was to compare the effects of TPI + Dry Needling (DN) and ESWT treatments on pain, neck disability level, and sleep quality in patients with myofascial pain syndrome. 63 patients diagnosed with myofascial pain syndrome were included in the study. The patients were divided into two groups. ESWT was given to 32 patients and TPI to 31 patients. These two treatment regimens were compared in terms of pain (VAS), sleep quality (PSQI), and neck disability (NDI). In terms of mean VAS, NDI, and PSQI values, there was no statistically significant difference between the groups in the mean of pre-treatment, post-treatment day 0 and post-treatment 1 month. A similar and significant improvement was observed in both groups in terms of the evaluated parameters and based on our results, we can recommend both treatment options to MPS patients.

Keywords: myofascial pain syndrome, ESWT, trigger point injection, trapezius, dry needling

1. Introduction

Myofascial pain syndrome (MPS) is a common chronic musculoskeletal disease and the lifetime prevalence is about 85%. MPS is characterized by the presence of palpable taut bands and trigger points in skeletal muscle (1). It is characterized by perceived local and referred pain due to the presence of trigger points. Apart from pain, patients present with muscle spasm, tenderness, regional twitching, sensory changes, and sometimes autonomic dysfunctions (2).

MPS negatively affects functionality and participation in activities of daily living. Myofascial trigger points often affect postural muscles, including trapezius, and can cause associated muscle pain, motor dysfunction, and autonomic reactions (3).

Many treatment options are available for inactivation of trigger points and relaxation of taut bands. Treatment methods include modification of relevant factors, medications, stretching exercises, massage therapy, manual therapy, acupuncture, injections, mesotherapy, transcutaneous electrical nerve stimulation (TENS), ultrasound (US), laser therapy, and biofeedback (4-6). In addition, nonsteroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, tricyclic antidepressants (TCAs), and 5-hydroxytryptamine and norepinephrine reuptake inhibitors (SNRIs) are the main pharmacological treatment options (7, 8).

One of the most commonly used treatment methods in MPS is trigger point injection (TPI). TPI blocks the release of neurotransmitters from peripheral nerve endings, prevents the passage of painful stimuli reaching the dorsal horn of the spinal cord, activates the endogenous opioid system, and increases blood circulation with local vasodilation effect. TPI can be done as local anesthetic, steroid, botulinum toxin injections or dry needling (DN) to the trigger point (9). Extracorporeal shock waves (ESWT) are pressure waves that can be focused on any part of the body and used for therapeutic purposes after they are produced outside the body. The analgesic effects of ESWT have been demonstrated by many clinical studies. However, the mechanism of formation of this effect is not known exactly. Mechanisms such as neuronal membrane damage, nociceptor blockade, central control of sensory inputs, and reduction of neuropeptides can be mentioned (10). ESWT is thought to have pain-reducing effect on ischemic muscle tissue by stimulating angiogenesis and increasing blood flow (11).

The trapezius muscle is one of the muscles in which myofascial trigger point formation is most common. In patients

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suffering from MPS, neck movements may be restricted due to trigger points in the trapezius muscle. However, it has been previously shown that sleep quality is impaired in patients with neck pain due to MPS. Deterioration of sleep quality negatively affects activities of daily living and the emotional state of the patient (12).

2. Materials and Methods

2.1. Study design, setting, and population

63 patients aged between 18-65 years who were diagnosed with MPS according to the diagnostic criteria of Travell and Simons, who applied to the Physical Medicine and Rehabilitation Outpatient Clinic, were included in the study. All patients had active trigger points in the upper and middle zones of the trapezius muscle. Detailed anamnesis of the patients was taken, general physical examinations, musculoskeletal and neurological examinations were performed. The patients were divided into two groups. A total of 3 sessions of radial ESWT were applied to the trigger point of the patients in Group I, at a frequency of 2 bar 10 Hz, every 3 days. Group II was injected with 1 ml of 2% prilocaine every 3 days using an insulin injector, and then dry needling was applied to the same point 8-10 times with inward and outward needle movements. Injection treatment was applied to Group II for a total of 3 sessions.

Having a serious psychiatric disease and receiving medical treatment for it, having cervical disc herniation or severe cervical osteoarthritis, radiculopathy, presence of kyphosis or scoliosis, neurological disease, inflammatory rheumatological disease, presence of cardiovascular problems, pregnancy, malignancy, infection, using anticoagulants, having received injections or physical therapy for MPS in the last 3 months, symptom duration less than 3 months, having uncontrolled endocrine diseases (thyroid or parathyroid disorders, diabetes mellitus) were accepted as exclusion criteria from the study.

All patients' age, weight, height, and body mass index were noted. The patients were evaluated with questionnaires 3 times, before the treatment, at the 0th day after the treatment, and at the 1st month after the treatment. Pain severity of the patients was evaluated with Visual Analog Scale (VAS), neck disability level was evaluated with neck disability index (NDI), and sleep quality was evaluated with Pittsburgh sleep quality index (PSQI) (13-15). Thus, the efficacy of these 2 treatment methods was compared in terms of pain, neck disability, and sleep quality.

The present study was approved by the clinical study ethics committee of Hatay Mustafa Kemal University (approval no. 14, dated June 03, 2021). Written informed consent was obtained from all participants.

2.2. Statistical analysis

SPSS (Statistical Package for Social Sciences) 22.0 program was used to evaluate the data obtained as a result of the study. Conformity of continuous variables with normal distribution was checked by the Shapiro Wilk test. All data were given as mean ± standard deviation, frequency and percentage. Statistical difference between ESWT and TPI+DN treatment groups in terms of categorical variables was determined by Pearson Chi-Square Test. The statistical difference between ESWT and TPI+DN treatment groups in terms of continuous variables was determined by Independent Sample T-Test. The differences between the ESWT and TPI+DN treatment groups in the changes of VAS, NDI, and PSQ parameters before treatment, at day 0 after treatment and at 1 month after treatment were determined by Repeated Measures Analysis of Variance. The statistical significance limit was accepted as $p<0.05$.

3. Results

There was no statistically significant difference between the groups in terms of age, gender, and mean BMI of the patients included in the study ($p>0.05$) (Table 1).

Table 1. Comparison of demographic characteristics (Age, BMI, and Gender) of ESWT and injection groups

Variables		ESWT (n= 32)	TPI+DN (n= 31)	p
Age (year) (Mean ± SD)		33.25±9.78	35.19±8.53	0.404*
BMI (kg/m²) (Mean± SD)		23.67±1.78	24.10±1.38	0.280*
Gender (n/%)	Male	27 (84.4)	25 (80.6)	0.398**
	Female	5 (15.6)	6 (19.4)	

n: Number of patients; SD: Standard deviation; BMI: Body Mass Index; ESWT: Extracorporeal Shock Wave Therapy; TPI: Trigger point injection; DN: Dry needling; *Independent Sample T-Test; ** Pearson Chi-square Test

In terms of mean VAS, NDI, and PSQI values, there was no statistically significant difference between the groups in the mean of pre-treatment, post-treatment day 0, and post-treatment 1 month ($p>0.05$). In the comparison within the group, a statistically significant difference was found in terms of VAS, NDI, and PSQI averages between the 0th day before and after the treatment and between the 1st month before and after the treatment in both groups ($p<0.001$). There was no statistically significant difference between the mean VAS, NDI, and PSQI at day 0 after treatment and at month 1 after treatment ($p>0.05$) (Table 2).

A vasovagal reaction developed in the first session of the treatment in one patient in the injection group. No side effects were observed in the ESWT group.

Table 2. Comparison of VAS, NDI, and PSQI values of both groups before treatment, at day 0 after treatment, and at 1 month after treatment

		GROUP (Mean ± SD)		p*
		ESWT (n= 32)	TPI+DN (n= 31)	
VAS	Before treatment	6.97±1.36	7.23±1.8	0.443
	Post-treatment (day 0)	3.47±1.37	3.58±1.09	0.721
	Post-treatment (1st month)	3.22±1.84	3.10±1.42	0.770
	p**	**<0.001[a]**	**<0.001[b]**	
NDI	Before treatment	25.78±8.76	26.61±7.71	0.691
	Post-treatment (day 0)	15.09±7.09	15.87±5.53	0.630
	Post-treatment (1st month)	14.59±8.37	14.71±6.77	0.952
	p**	**<0.001[a]**	**<0.001[b]**	
PSQ	Before treatment	9.22±3.60	10.13±3.35	0.303
	Post-treatment (day 0)	5.97±2.74	5.94±2.80	0.962
	Post-treatment (1st month)	5.59±2.99	5.35±2.93	0.750
	p**	**<0.001[a]**	**<0.001[b]**	

n: Number of patients; SD: Standard deviation; VAS: Visual Analog Scale; NDI: Neck disability index; PSQI: Pittsburgh sleep quality index; ESWT: Extracorporeal Shock Wave Therapy; TPI: Trigger point injection; DN: Dry needling; * Independent Sample T-Test; ** Repeated Measures Analysis of Variance

a: There is a difference between the 0th day before and after the treatment, there is a difference between the 1st month before and after the treatment

b: There is a difference between the 0th day before and after the treatment, there is a difference between the 1st month before and after the treatment

4. Discussion

MPS is one of the most common musculoskeletal disorders. Although there are a wide variety of treatment options, there is no clear consensus on which treatment to use, when and how. The basis of treatment in MPS consists of breaking the vicious circle in pain by eliminating the trigger point. Our aim in this study is to compare the effects of TPI + DN and ESWT treatments on pain, neck disability level, and sleep quality in patients with MPS. In some studies, both local anesthetic and DN were found to be effective in MPS, but the local anesthetic injection was recommended for trigger point inactivation since the discomfort that may occur during injection was significantly less in the local anesthetic group (16). Lewit preferred DN to local anesthetics (17) and systematic reviews concluded that the efficacy of LA and DN was equal (16).

Raeissadat et al. compared lidocaine injection, dry needling, and ozone therapy methods in patients with MPS and found that all three treatment methods were effective in short-term follow-up (1 month), but the groups treated with ozone and LA were slightly better in pain reduction and functional recovery compared to the group treated with dry needling (18). In a systematic review comparing TPI with local anesthetics applied to the head, neck, and shoulder areas with placebo and dry needling treatments, local anesthetics showed a significant reduction in pain compared to dry needling. However, it was stated that there was no difference between the treatment methods in terms of improvement in depression and joint range of motion, and it was also emphasized that well-organized studies involving more participants were needed to determine the superiority of the treatments over each other (19).

In one of the groups, we formed in our study, we applied the combination of TPI + DN to increase the effectiveness of the treatment and to reduce the discomfort that may occur after the injection. We applied ESWT treatment in the other group for comparison.

ESWT has also become one of the evidence-based treatment methods for MPS in recent years. The decrease in the mean VAS score after ESWT treatment has also been shown by many studies (20, 21). TPI may not always be a suitable treatment option for dispersedly located multiple taut bands. In these cases, ESWT may be a more appropriate treatment modality due to its advantages such as non-invasiveness, wider area of effect and no post-injection pain. Furia et al. in 34 patients and Hsu et al. in 36 participants examined the effects of ESWT on pain and functional improvement and found significant changes in VAS (22, 23).

Jung-Ho Lee et al. compared ESWT and TPI treatments in MPS patients and found similar efficacy (24). In another study, Jeon et al. divided the patients into ESWT and TENS + TPI groups, and the researchers found that pain decreased in both groups (25). Hong et al. compared the efficacy of ESWT and TPI in the treatment of myofascial pain syndrome in the quadratus lumborum (QL) muscle. Both treatment options showed statistically significant improvements in pain and disability scores, but they found that ESWT was more effective than TPI in terms of pain reduction. In terms of disability, they did not detect a statistically significant difference between the groups. In many studies in the literature conducted with the trapezius muscle in MPS patients, similar results were found when the efficacy of ESWT and TPI treatments were compared. The reason for the different results in the study of Hong et al. may be related to the fact that the upper trapezius muscle is more superficial, while the QL muscle is more deeply located (26). Jung-Ho Lee et al. compared the effects of proprioceptive neuromuscular facilitation (PNF), ESWT, and TPI treatment modalities on pain reduction and functional recovery in patients with myofascial pain syndrome. They found that PNF treatment was more effective than the other two methods in improving neck functions and activities of daily living, and increasing the range of motion of the shoulder joint. ESWT was found to be effective in reducing pain and functioning. TPI treatment was effective in reducing pain but

had limited effects in increasing functional activities (27).

In a study by Muñoz-Muñoz et al., it was stated that sleep quality is related to pain severity and these parameters are disability factors that affect each other (28). In addition, there are many studies in the literature showing that there is a relationship between sleep quality and pain intensity in both MPS and other chronic musculoskeletal diseases. In their research, Çağlar et al. showed that connective tissue massage provided a decrease in pain intensity and an increase in sleep and quality of life in MPS patients (29, 30).

As a result of our research, we determined that both treatment modalities were effective in reducing the severity of pain and neck disability, and also increased the sleep quality of the patients. Both treatment regimens were effective, but they were not statistically superior to each other.

Limitations of our study include: 1- Relatively small number of patients. 2- Relatively short follow-up period. 3- The possibility that individual modes of administration of treatment modalities will have variable effects.

In this study, we showed that TPI + DN and ESWT treatment modalities had similar efficacy in reducing pain, improving neck disability, and improving sleep quality in patients with MPS. At the end of this randomized controlled study, a significant improvement was observed in both groups in terms of the evaluated parameters and based on our results, we can recommend both treatment options to MPS patients. In order to determine which treatment is superior, we should say that multicenter studies with more participants and longer follow-up periods are needed.

Conflict of interest

Authors declare that there is no conflict of interest.

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Authors' contributions

Concept: A.U., M.G., Design: A.U., M.G., Data Collection or Processing: A.U., Analysis or Interpretation: M.G., Literature Search: M.G., A.U., Writing: M.G., A.U.

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