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ORIGINAL ARTICLE

Effect of Compliance with Exercise Program Given in Addition to Trigger Point Injection on Number of Trigger Points and Pain Level in Patients with Myofascial Pain Syndrome

ABSTRACT

Objective

The aim of this study was to compare the effects of adherence to an exercise program in addition to trigger point injection (TPI) on pain level and number of trigger points (TrP).

Methods

TPI was performed on active TrP on the backs of 40 patients with myofascial pain syndromes (MPS). Afterwards, exercise program was recommended to the patients. The pain-VAS and number of TrP in the patients who were called for control at 1st and 3rd months were re-evaluated. Patients with exercise compliance of 50% or more for 3 months were considered to be compliant with exercise, while below 50% were included in the exercise non-compliant group.

Results

Pain-VAS decreased in non-compliant and compliant exercise groups at 1st and 3rd months compared to baseline (p<0,001, p<0,001, p=0.006, p<0,001). At 3rd month, a decrease in pain-VAS compared to 1st month was observed only in the compliant group. The decrease compared to baseline at 1st and 3rd months was greater in the compliant group (p<0,001, p=0,003). No statistically significant difference was found in the number of TrP in the non-compliant group (p=0.047). In the compliant group, the number of TrP was significantly lower at 3rd month compared to baseline and 1st month (p<0,001, p<0,001). No significant difference was observed between the groups in terms of change in the number of TrP (p=0,253, p=0,718, p=0,003).

Conclusion

The importance of compliance with the exercise should be emphasized to patients with MPS.

Keywords: Trigger point injection, myofascial pain syndrome, exercise

Introduction

Myofascial pain syndrome (MPS) is one of the main causes of musculoskeletal pain and is mainly caused by trigger points. Trigger points are hyperirritable areas in the muscles and/or fascia that are localized in palpable taut bands. Trigger points cause mainly sensory, motor, and autonomic symptoms. Diagnosis of MPS is typically made by physical examination, and generally accepted diagnostic criteria include the presence of trigger points, pain on palpation, a referred pain pattern, and a local twitch response. Active trigger points cause constant pain, while latent trigger points are tender only to palpation. However, the clinical presentation may overlap with fibromyalgia syndrome, radiculopathy, and painful conditions of tendon or joint origin. However, regional pain distribution, referred pain with palpation of the trigger point, jerk sign, muscle twitch response, weakness without muscle atrophy, and decreased range of motion of the joint, and autonomic findings such as sweating, lacrimation, flushing and paresthesia are helpful in diagnosis. It is frequently seen between the ages of 27 and 50. The difference between the genders has not yet been determined. Studies have showed that MPS is responsible for 85% of back pain and 54.6% of head and neck pain. Despite being encountered so frequently, the pathophysiology

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of MPS is not yet clear. It is thought that excessive or incorrect use of muscles causes excessive acetylcholine release at the neuromuscular junction. Risk factors include trauma, poor ergonomic conditions, abnormal posture, and overuse. Additionally, temporomandibular joint dysfunction, insomnia, a history of cancer, and some psychological problems are also thought to be risk factors for MPS. As with the pathophysiology, there is no definitive consensus on treatment. Various methods such as exercise, posture correction, medical treatments such as tricyclic antidepressants or myorelaxants, physical therapy agents, trigger point injections, and elimination of the underlying causes are used. The most used methods are trigger point injections and passive stretching exercises after spraying a cooling spray on the relevant muscle (1). Among the applied treatment methods, exercise has a special place because it has a protective effect as well as a therapeutic effect. In the long term, treatments that do not have a protective effect cause patients to be dependent on repeated treatments and cause additional problems secondary to this (2). A better understanding of the effectiveness of the methods used, both in the short term and in the medium and long term, can make significant contributions to treatment management.

Comparing the effects of adherence to an exercise program in addition to trigger point injection with prilocaine on pain level and trigger point number at 1st and 3rd months was aimed.

Materials and Methods

The study was conducted by retrospectively and unblinded reviewing the files of 40 patients who were followed up with a diagnosis of MPS in our hospital's physical medicine and rehabilitation clinic between March 2024 and January 2025. The principles of the Declaration of Helsinki were followed in the study. Approval for the study was obtained from the ethics committee.

The inclusion criteria for the study were determined as volunteering to participate in the study, accepting trigger point injection, volunteering to do regular exercise, being diagnosed with MPS according to Travell-Simon's diagnostic criteria, having at least 1 active trigger point, and having pain in the neck and/or back region due to the trigger point, continuing complaints despite 2 weeks of medical treatment (analgesic and myorelaxant), not doing regular exercise in the last 6 months, not having any orthopedic, cardiac, respiratory, neuromuscular or psychiatric disease that would prevent exercise, not being allergic to prilocaine or 0.9% NaCl solution, and being at least literate. Travell-Simon's diagnostic criteria includes all 5 major criteria which are presence of localized spontaneous pain, altered sensations in the expected referred area, palpation of taut band within the muscle, localized tenderness at the point, reduction in range of movement when measurable and at least 1 of 3 minor criteria including local twitch response, reproduction of pain and altered sensations that develop by applying pressure to the trigger point and pain relief with trigger point treatment (1). Exclusion criteria were determined as leaving the study voluntarily, developing a new symptom or finding that would prevent exercise during the evaluation or treatment process, having cervical radiculopathy, having a diagnosis of fibromyalgia syndrome, pregnancy, known bleeding disorders, use of anticoagulants, anemia, known methemoglobinemia, having a history of trigger point injection in the last 6 months, being under the age of 18, and having a skin disease/lesion in the area where the injection would be applied. Considering the inclusion and exclusion criteria, the patients followed up with MPS were questioned about their neck and back pain-VAS scores after the first examination, and the number of trigger points in the painful areas was determined based on physical examination methods performed by a single physician and recorded by marking on the muscle diagram in the follow-up file. Procedure for the detection of trigger points the painful muscle was extended to approximately two-thirds of its own length, the skin and subcutaneous tissue were slid at right angles to the muscle fiber with the fingertips, and the reflected pain was determined by applying pressure to the detected tender point. Trigger point injections were performed using 0.5% procaine (obtained by diluting 2% procaine with 0.9% NaCl) on active trigger points on the backs of participants who gave informed consent. Afterwards, isometric strengthening and posture exercises for the cervical region flexors, extensors, lateral flexors, pectoral muscles, and posterior part of the deltoid muscle, as well as stretching exercises for the cervical flexors, extensors, lateral flexors, rotators, and pectoral muscles were recommended to the patients to be applied at home. All exercises were done in 1 set of 10 repetitions per day. Patients were asked to mark their exercise compliance on the exercise follow-up forms. The pain-VAS values and trigger point numbers in the painful areas of the patients who were called for control at 1st and 3rd months were re-evaluated and recorded. Patients with exercise compliance of 50% or more for 3 months were considered to be compliant with exercise, while patients with compliance below 50% were included in the exercise non-compliant group. Patients' exercise compliance was monitored with an exercise diary.

Statistical Analysis: IBM SPSS Statistics ver. 25 (IBM Corporation, Armonk, NY, US) software was used to analyze the data. Whether the data of continuous numerical variables showed a distribution close to normal was examined with the Shapiro-Wilk test, and whether the assumption of homogeneity of variances was met was examined with the Levene test. Descriptive statistics were expressed as mean ± standard deviation and median (25th percentile-75th percentile) for continuous numerical variables, while categorical variables were shown as number of cases and percentage (%). The significance of the differences between the groups in terms of continuous numerical variables for which the parametric test statistics assumptions were met was examined using Student's t-test, and the significance of the differences between the groups in terms of continuous numerical variables for which the parametric test statistics assumptions were not met was

examined using the Mann-Whitney U test. Continuity Corrected χ2, Fisher Freeman Halton, or Fisher's Exact Probability Test was used in the analysis of categorical data. The Friedman test was used to investigate whether there was a statistically significant change in pain-VAS levels and trigger point numbers according to the follow-up times in the groups that did and did not follow the exercise program. If the Friedman test statistics were found to be significant, the follow-up times that caused the difference were determined using the Dunn-Bonferroni multiple comparison test. Results were deemed statistically significant at $p < 0.05$ unless a Bonferroni adjustment was required to control the family-wise error rate. For the within-group trajectory analyses in Table 2, each outcome (VAS or TNS) was examined separately in two independent groups; therefore the nominal alpha was divided by two ($\alpha = 0.025$), and any post-hoc Dunn contrasts were interpreted against the same threshold. For the between-group change-score comparisons in Table 3, three pre-specified contrasts (Δ□–0, Δ□–0, Δ□–□) formed the relevant test family, so the alpha level was divided by three ($\alpha = 0.0167$). All *p*-values reported in Tables 2 and 3 already reflect these adjustments.

Additionally, post-hoc power analyses were undertaken to clarify whether the non-significant findings reflected true absence of effect or inadequate sample size. We calculated that, with a Bonferroni-adjusted significance level of α = 0.0167 and a target power of 80 %, only 11 participants per arm were required to detect the 0–3-month change in pain intensity (VAS), and 19 per arm for the 1–3-month comparison. Because the present study included 20 participants in each group, the effective power for all VAS analyses ranged between 81.8 % and 95.2 %, supporting the robustness of the pain-related results. In contrast, the same procedure indicated that ≈ 213 participants per arm would be necessary to detect the observed between-group difference in trigger-point number with 80 % power, meaning that our current sample (n = 40) provided only ~19.8 % power for this endpoint.

Results

Forty patients were included in the study. No significant difference was observed between the groups in terms of demographic data (p>0.05) (Table 1).

At baseline, pain-VAS and trigger point counts were statistically similar between the groups that complied with the exercise program and those that did not (p=0.529, p=0.265) (Table 2).

In both exercise-compliant and non-compliant groups , pain-VAS levels were lower at 1st and 3rd months compared to baseline (p<0.001, p<0.001 vs p=0.006, p<0.001, respectively). Only in the exercise-compliant group, pain-VAS levels at 3rd month were significantly lower compared to 1st month (p=0.006), (Figure 1), (Table 2).

Table 1. Demographic characteristics of the subjects according to the groups that comply with and do not comply with the exercise program

	Not comply (n=20)	Comply (n=20)	p-value
Age (year) *	45.1±11.3	51.7±14.0	0.113[a]
Gender			n/a
Male	1 (5.0%)	1 (5.0%)	
Female	19 (95.0%)	19 (95.0%)	
Education			0.310[b]
Primary School	6 (30.0%)	10 (50.0%)	
High School	11 (55.0%)	9 (45.0%)	
University	3 (15.0%)	1 (5.0%)	
Marital Status			n/a
Single	2 (10.0%)	2 (10.0%)	
Married	18 (90.0%)	18 (90.0%)	
Working Status			0.661[c]
Unemployed	16 (80.0%)	18 (90.0%)	
Working	4 (20.0%)	2 (10.0%)	
Place of Residence			n/a
District or Village	17 (85.0%)	17 (85.0%)	
Town Center	3 (15.0%)	3 (15.0%)	
Co-Morbidities			0.205[d]
No	13 (65.0%)	8 (40.0%)	
Yes	7 (35.0%)	12 (60.0%)	

Data are shown as mean ± standard deviation. [a] Student's t test, [b] Fisher Freeman Halton test, [c] Fisher's exact probability test, [d] χ2 test with continuity correction. n/a: No evaluation was made.

Table 2. Pain levels and trigger point numbers of the subjects in the groups that followed and did not follow the exercise program according to the follow-up times.

	Baseline	1st month	3rd month	p-value a
Pain-VAS				
Not compliant with exercise program	9.0 (7.0 – 10.0)A,B	6.0 (4.2 – 7.0)A	6.0 (4.2 – 7.0)B	<0.001
Compliant with exercise program	8.0 (6.5 – 10.0)A,B	5.0 (3.0 – 6.0)A,C	2.0 (1.0 – 3.0)B,C	<0.001
Number of trigger points				
Not compliant with exercise program	7.0 (5.2 – 10.0)	5.0 (4.0 – 8.7)	5.0 (4.0 – 8.7)	0.047
Compliant with exercise program	6.0 (5.0 – 8.0)B	6.0 (5.0 – 9.2)C	3.0 (2.2 – 5.0)B,C	<0.001

Data are shown as median (25th percentile – 75th percentile). a Friedman test, results were considered statistically significant for p<0.025 according to Bonferroni correction. A The difference between baseline and 1st month is statistically significant (p<0.01), B The difference between baseline and 3rd month is statistically significant (p<0.001), C The difference between 1st month and 3rd month is statistically significant (p<0.01).

Table 3. Comparisons between groups that followed and did not follow the exercise program in terms of changes in pain levels and trigger point numbers according to follow-up times.

	Not compliant (n=20)	Compliant (n=20)	p-value a
Pain-VAS			
1st month – baseline	-2.0 (-3.7 – -2.0)	-3.5 (-4.7 – -2.2)	0.091
3rd month – baseline	-3.0 (-4.0 – -0.2)	-5.0 (-7.0 – -4.2)	<0.001
3rd month – 1st month	0.0 (-2.0 – 1.7)	-2.0 (-3.0 – -2.0)	0.003
Number of Trigger Points			
1st month – baseline	-1.0 (-3.0 – 1.5)	0.0 (-1.7 – 1.0)	0.253
3rd month – baseline	-2.0 (-4.7 – 0.0)	-2.0 (-3.7 – -1.0)	0.718
3rd month – 1st month	-0.5 (-2.7 – 1.7)	-2.0 (-3.0 – -1.2)	0.026

Data are shown as median (25th percentile – 75th percentile). a Mann Whitney U test, Bonferroni correction, results were considered statistically significant for p<0.0167.

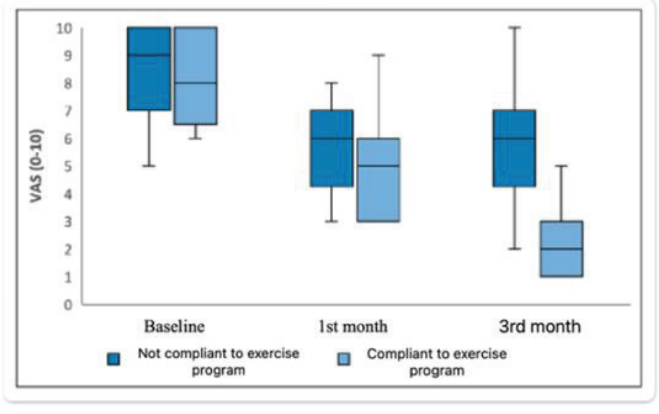

Figure 1. Box-plot graph of VAS levels of subjects in groups that did and did not comply with the exercise program according to follow-up times.

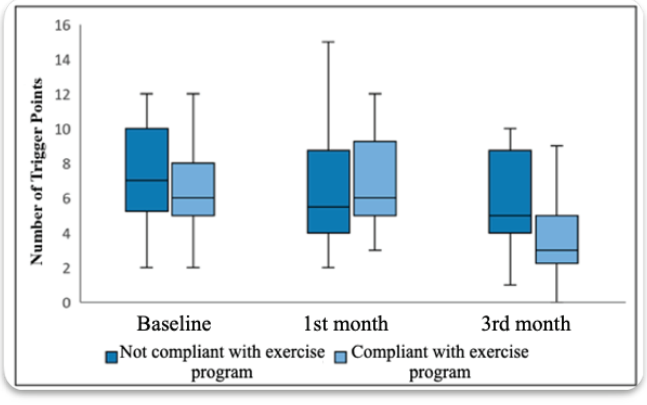

Figure 2. Box-plot graph of trigger point numbers in groups that did and did not comply with the exercise program according to follow-up times.

No significant difference was found in the number of trigger points between the follow-up times in the group that did not comply with the exercise procedure (p=0.047) (Table 2). In the group that complied with the exercise, the number of trigger points at the 3rd month was significantly lower than at the beginning and at the 1st month (p<0.001, p<0.001) (Figure 2).

There was no significant difference between the groups in terms of changes in pain-VAS levels at 1st month compared to baseline (p=0.091). Pain-VAS levels decreased more in the group complying with the exercise program at 3rd month compared

to baseline and 3rd month compared to 1st month (p<0.001, p=0.003). No significant difference was observed between the groups in terms of changes in trigger point numbers at 1st month compared to baseline, 3rd month compared to baseline, or 3rd month compared to 1st month (p=0.253, p=0.718, p=0.026) (Table 3).

Discussion

MPS accounts for the majority of complaints of pain. Better identification of effective and long-term protective treatments is critical for treatment management.

In our study, pain-VAS levels decreased in both groups at 1st month and 3rd month compared to baseline. However, the decrease in pain-VAS levels at 3rd month compared to 1st month was observed only in the exercise-compliant group. Among the groups, the decrease at 3rd month compared to baseline and 1st month was statistically greater in the exercise-compliant group than in the non-compliant group. Lugo et al. compared the effectiveness of a standard physical therapy program consisting of manual therapy, stretching and strengthening exercises, and warming treatments, 3 days a week, 4 weeks, combined with trigger point injections using 0.5% lidocaine on pain-VAS levels at 1st and 3rd months with the patient groups that received only trigger point injections and only physical therapy programs. Similar to our findings, no difference was observed between the groups at 1st month, but differently, no decrease was observed at 3rd month (3). In a 12-week randomized controlled study conducted by Majidi et al., the pain-VAS levels at 1st and 3rd months were compared after stretching and strengthening exercises applied to patients diagnosed with head-forward posture and MPS. Similar to our data, there was a significant improvement in the pain-VAS level within the exercise group at the 1st month compared to the beginning, at the 3rd month compared to the beginning, and at the 3rd month compared to the 1st month (4). In a systematic review, conducted by Mata Diz et al. showed that exercise has a small to moderate positive effect on pain intensity in MPS patients in the short term, and stretching and strengthening exercises in particular are more effective (5). These results suggest that the effect of stretching and strengthening exercises in the treatment of MPS begins in 1st month and this increase continues over time.

No statistically significant difference was detected in the number of trigger points between the follow-up times in the group that did not comply with the exercise program in our study (p=0.047). In the group that complied with the exercise program, the number of trigger points in the 3rd month was significantly lower compared to the beginning and the 1st month. No significant difference was observed between the groups in terms of the change in the number of trigger points in the 1st and 3rd months compared to the beginning or in the 3rd month compared to the 1st month. In the study conducted by Cho et al., patients with active trigger points in the suboccipital muscles, head forward posture, and tension-type headache were divided into 3 groups and suboccipital muscle inhibition was applied to one group, and posture exercises were applied to the other group in addition to suboccipital muscle inhibition, while the 3rd group was evaluated as the control group. While a decrease in the number of trigger points was observed in the group that performed posture exercises together with suboccipital muscle inhibition, it was observed that the improvement in the number of active trigger points was greater in the group that performed posture exercises in addition to suboccipital muscle inhibition (6). Ahmed et al., in their review, showed that aerobic exercise for at least 4 weeks had a positive effect on the number of trigger points and pain-VAS levels in MPS patients compared to the non-exercising group (7). These results suggest that various types of exercise may reduce the number of trigger points.

Also, our post-hoc power analyses strongly suggest that the lack of statistical significance for trigger point numbers is most likely a type-II error rather than evidence of no clinical effect. The study is sufficiently powered for pain outcomes but under-powered for structural changes assessed by trigger point numbers. The retrospective design limited our ability to perform an a priori sample-size calculation; we therefore analysed all eligible charts to maximise the available cohort. In addition, as in other retrospective studies, there may be inherent limitations of retrospective studies, such as reliance on existing documents or the potential for missing data. Nevertheless, future research should employ prospective, multi-centre designs and larger samples—potentially exceeding 400 participants overall—or alternative repeated-measures approaches to provide definitive evidence regarding trigger-point resolution.

Conclusion

In order to provide long-term pain control, compliance with a home exercise program based on stretching and strengthening may be more effective than trigger point injection alone. In patients who receive trigger point injections with a diagnosis of MPS in the outpatient clinic, an exercise program should be added to the treatment plan, and patients should be informed about the importance of compliance with the exercise program.

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Declarations

Ethics Committee Approval: This study was designed as a single-center, retrospective, descriptive observational analysis. Ethical approval was obtained from the Clinical Research

Ethics Committee of Etlik City Hospital (Approval No: AEŞH-BADEK-2025-0223).

The study was conducted in accordance with the principles of the Declaration of Helsinki

References

1. Urits I, Charipova K, Gress K, Schaaf AL, Gupta S, Kiernan HC, et al. Treatment and management of myofascial pain syndrome. Best Pract Res Clin Anaesthesiol. 2020;34:427-48.
2. Borg-Stein J, Simons DG. Focused review: Myofascial Pain. Arch Phys Med Rehabil. 2002;83:40-7.
3. Lugo HL,Garcia HI, Rogers HL, Plata JA. Treatment of myofascial pain syndrome with lidocaine injection and physical therapy, alone or in combination: a single-blind, randomized, controlled clinical trial. BMC Musculoskeletal Disorders (2016) 17:101 DOI: 10.1186/s12891-016-0949-3
4. Majidi L, Kargar Z, Alaei B, Nikoo MR. Comparison of The Effectiveness of Exercise Therapy and Electroacupuncture in Patients Forward Head Abnormalities and Myofascial Pain Syndrome: A Randomized Clinical Trial. Med J Islam Repub Iran. 2023;37:34
5. Mata Diz JB, Miranda de Souza JRL, Leopoldino AAO, Oliveira VC. Exercise, especially combined stretching and strengthening exercise, reduces myofascial pain: a systematic review. Journal of Physiotherapy. 2017;63:17-22.
6. Cho SH. The effect of suboccipital muscle inhibition and posture correction exercises on chronic tension-type headaches. J Back Musculoskelet Rehabil. 2021;34:989-96.
7. Ahmed S, Khattab S, Haddad C, Babineau J, Furlan A, Kumbhare D. Effect of aerobic exercise in the treatment of myofascial pain: a systematic review. J Exerc Rehabil. 2018;14:902-910.