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ORIGINAL ARTICLE

Comparison of injection methods in myofascial pain syndrome: a randomized controlled trial

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Abstract In this study; we aimed to compare the efficacy of local anesthetic injection and dry needling methods on pain, cervical range of motion (ROM), and depression in myofascial pain syndrome patients (MPS). This study was designed as a prospective randomized controlled study. Eighty patients (female 52/male 28) admitted to a physical medicine and rehabilitation outpatient clinic diagnosed as MPS were included in the study. Patients were randomly assigned into two groups. Group 1 (n=40) received local anesthetic injection (2 ml lidocaine of 1%) and group 2 (n=40) received dry injecting on trigger points. Both patient groups were given stretching exercises aimed at the trapezius muscle to be applied at home. Patients were evaluated according to pain, cervical ROM, and depression. Pain was assessed using Visual Analog Scale (VAS) and active cervical ROM was measured using goniometry. Beck Depression Inventory (BDI) was used to assess the level of depression. There were no statistically significant differences in the pre-treatment evaluation parameters of the patients. There were statistically significant improvements in VAS, cervical ROM, and BDI scores after 4 and 12 weeks in both groups compared to pre-treatment results ($p<0.05$). No significant differences were observed between the groups ($p>0.05$). Our study indicated that exercise associated with local anesthetic and dry needling injections were effective in decrease of pain level in MPS as well as increase of cervical ROM and decrease of depressive mood levels of individuals.

Keywords Dry needling · Local anesthetic · Local injection · Myofascial pain syndrome

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Introduction

Myofascial pain syndrome (MPS) is a soft tissue rheumatism characterized by associated trigger point in one or more muscles, taut bands, characteristic referred pain, development of sensory changes, and local twitch response. The patients generally suffer from pain, weakness, limited mobility, stiffness, autonomic dysfunctions, or they display a clinical manifestation associated with these [1, 2].

The treatment is focused on decreasing the pain, ensuring sufficient muscle strength and appropriate posture, eliminating the factors that cause the case. The primary goal is to inactivate the trigger points and loosen the taut bands. There are various treatment modalities including patient education, nonsteroidal anti-inflammatory drugs (NSAIDs), physical therapy, stretch and spray technique, acupuncture, local injections, and exercise [1, 3, 4].

Trigger point injection is one of the most effective methods in treatment of MPS. It is found to be effective in decreasing pain and muscular spasm, increasing the range of motion (ROM) and local blood circulation, and cause fibrotic scar formation on trigger points. Local anesthetic, saline, steroid, botulinum toxin, and dry needling techniques

are used as local injections [1, 3, 5]. Local anesthetic injection and dry needling techniques are the most common applications. Different results have been obtained in studies carried out on both methods [6, 7].

In this study; we aimed to compare the efficacy of local anesthetic injection and dry needling methods on pain, cervical ROM, and depression in MPS patients.

Patients and method

This study was designed as a prospective randomized controlled study. Eighty patients (female 52/male 28) admitted to a physical rehabilitation and medicine outpatient clinic diagnosed as MPS were included in the study. The patients' inclusion criteria in the study were; presence of at least one active trigger point located in the upper trapezius muscle, age between 19 and 58 years, and symptom durations for 1 month. The diagnosis of MPS was based on the criteria defined by Travell and Simons (five major and minimum of one minor criteria are required for clinical diagnosis) [8]. Major criteria are regional pain complaint, palpable taut band in reachable muscles, pain reflected from trigger point to a certain area and sensory change, extreme sensitivity in a point along the taut band, decrease of measurable range of motion and minor criteria are clinical pain complaint with pressurized palpation of trigger point and/or occurrence of sensory change, local twitch response of the sensitive point in the taut band with palpation, and decrease of pain with injection of trigger point or stretching of muscle.

The patients with fibromyalgia, systemic disease, cervical disk lesion, trigger point injection, and physical treatment program within the recent 6 months, pregnant, having undergone neck and shoulder surgery, drug allergy history, and abnormal laboratory results were excluded from the study.

After physical examination, full blood count, erythrocyte sedimentation rate, C-reactive protein, and biochemical markers were evaluated.

Patients were randomly assigned into two groups. Randomization were allocated by numbered envelopes method. Group 1 (n=40) received local anesthetic injection (2 ml lidocaine of 1%) and group 2 (n=40) received dry injecting on trigger points.

Injections on trigger point were applied according to the technique described by Travell and Simons [3, 9]. The trigger point area on the trapezius muscle while the patient was laying in facedown position was fully determined and the skin was cleaned with an appropriate antiseptic solution. A 22-gauge 1.25 inch needle was used for injection. Trigger point was ensured to be immobilized between thumb and index finger. Then, the needle was inserted perpendicularly through the skin and moved forward until the trigger point was reached. The trigger point was identified by getting local twitch response or contraction of the band with pain. The same point was inserted a few times with fan-shaped syringe movements after some local anesthetic was injected after negative aspiration and local anesthetic was injected. The same process was applied with an empty syringe to patients in the dry needling treatment group. At most, two trigger points were injected in each patient. All injections were made by the same doctor. Additionally, all patients were received home-based exercise program including isometric-isotonic neck exercises and back extensor stretching exercises everyday for 12 weeks.

No analgesic drugs or NSAIDs were allowed during the treatment process.

Clinical outcomes

Patients were evaluated according to pain, cervical ROM, and depression.

Pain in the trigger point region was assessed using a 10 cm Visual Analog Scale (VAS), where 0 indicated no pain, and 10 worst pain.

Active cervical ROM was measured using goniometry (cervical flexion, extension, right and left lateral flexion, and rotation) when the patient was in sitting position.

Beck Depression Inventory (BDI) was used to assess the level of depression. The BDI is a well-established and validated instrument consisting 21 items with a range of 0–63, where higher scores are related with major depression. Turkish validity and reliability study of the scale has been made. The cutoff value of BDI is 17, and the scores over this indicate major depression [10, 11].

The assessment parameters were measured before treatment, at the end of 4 weeks and 12 weeks after the injections. Before treatment, all participants were informed of the trial and gave written informed consent.

Statistical assessment

The means and standard deviations were given as descriptive statistics. All data for normality was tested by using the Kolmogorov–Smirnov test. For determining the difference before and after treatment for all groups, non-parametric Friedman test was used. In order to compare the differences between the groups, Mann–Whitney U test was used. For power calculations, we assumed a confidence level (α) of 0.05 and a power level of 0.95. The power analyses were completed using the Minitab 13.1 program. A level of significance of $p<0.05$ (two-tailed) was accepted for this study. All analyses were performed using the SPSS for Windows 15.0 software program.

Results

Forty patients comprised group 1 (26 females and 14 males, with a mean age of 37.20±10.10 years, disease duration 30.63±37.25 month) and 40 patients comprised group 2 (26 females and 14 males, with a mean age of 38.08± 9.81 years, disease duration 34.27±40.95 month) with MPS were included in the study.

All patients completed the study. No side effects were observed during the injections. There were no statistically significant differences in the pre-treatment evaluation parameters of the patients. The results of full blood count, erythrocyte sedimentation rate, and biochemical markers were within normal ranges for both groups.

VAS scores showed a statistically significant decrease 4 weeks after injection therapy in groups 1 and 2 ($p<0.001$, 95 % confidence interval (CI): 2.01–4.08). Also, this improvement remained after 12 weeks in both groups ($p<0.001$, 95 % CI: 0.92–1.29). However, no significant difference was observed between the groups in the 4 weeks ($p=0.053$) and the 12 weeks ($p=0.215$; Table 1).

There was a statistically significant improvement in cervical ROM after 4 weeks and 12 weeks in both groups compared to pre-treatment results ($p<0.05$). No significant differences were observed between the groups ($p>0.05$; Table 1).

In groups 1 and 2, BDI scores were significantly decreased after 4 weeks ($p<0.001$, 95 % CI: 10.12–11.42), and after 12 weeks this improvement was still significant in both groups ($p<0.001$, 95 % CI: 9.48–10.54). No significant difference was found between the groups in the 4 weeks ($p=0.716$) and the 12 weeks ($p=0.903$; Table 1).

The results of power analysis in all assessment parameters ranged between 6% and 55%.

Discussion

MPS is the most common muscle disease characterized by existence of hyperirritable areas localized by taut bands in muscles or fascias and called trigger point, and by the referred pain caused by these areas [1, 4].

Source of symptoms and findings in myofascial pain syndrome is the trigger points within taut band. Trigger point formation mechanism is not fully known. Overload of muscles, damage, and stress are accepted as the most important factors. Sensitization of peripheral muscle nociceptors and disorder of pain-control system were claimed. Decreased ATP and glycogen concentration, increased release of substance P, acetylcholine, bradykinin, serotonin, prostaglandin, and associated increased tissue sensitivity may stimulate locally afferent sensory nerves and cause pain in trigger points [3, 12–14]. The basic treatment principle is aimed at breaking the "spasm-pain-spasm" cycle in the muscles and eliminating the trigger point. Local anesthetic, saline, steroid, botulinum toxin, and dry needling techniques are used in local injections [3, 14]. The mechanism of trigger point inactivation after injection is unknown. However, Simons and Travell have suggested that mechanical damage of muscle fibers and nerve terminations leads to an increase of extracellular potassium, depolarization of nerve fibers, inhibition of central feedback mechanisms, local dilution of nerve-sensitizing substances, increasing vasodilatation, and formation of necrosis in trigger point area depending on the injected matter [15].

In our study, we aimed to investigate the differences between efficacies of local injection of lidocaine and dry needling on pain, cervical ROM, and depression in MPS patients.

Kraus et al. have found both 2% prilocaine and dry needling injection methods effective in MPS. This efficacy has been correlated with successful injection technique, well-localization of trigger points, and proper injection of primary trigger point. However, since the disturbance forming during injection is significantly less in the local anesthetic group, they have suggested local anesthetic injection to be used in trigger point inactivation [16]. Hong's trial compared the effectiveness of lidocaine and dry needling to trigger points in the trapezius muscle of patients with MPS. They reported that both techniques were effective, but dry needling had increased efficacy by causing pain after injection [17]. Some of the studies suggested that dry needling injection can be preferred to local anesthetics. It has lower side effects and its therapeutic effect has been correlated to mechanical damaging of trigger points by needling over the most painful point [18, 19]. Also, various trials concluded that both local anesthetics and dry needling methods are effective in MPS treatment. This was due to neurogenic mechanisms with local mechanical damage and central interruption. Taut bands loosen, local twitch response disappears, and pain is taken under control with these two mechanisms [4, 6, 7, 17]; similar to those we obtained significant improvement in pain relief in both local anesthetic injection and dry needling treatment groups. In our study, after dry needle injection, patients did not complain about additional pain, and dry needling was obtained to be as effective as local anesthetics in the inactivation of trigger points. The efficacy of injections to the trigger points was related to reflex mechanisms rather than pharmacologic effects of the solutions. Local mechanic disruption leads to relaxation of taut bands which is a major factor in pain control. Studies showed that both of the injection methods (dry needling or local anesthetics injection) result with local mechanic disruption.

Recently, botulinum toxin injections have been applied in MPS treatment. Cheshire et al. compared effectiveness of botulinum toxin type A, it was found to be more effective

Table 1 Comparison of the assessment parameters (VAS, BDI, and cervical ROM) in both groups after at fourth week of the therapy and 12th week follow-up period

Variable (independent) VAS	Group 1 (n=40)	Group 2 (n=40)	P value
Baseline	5.82±1.25	5.55±1.33	
Posttreatment fourth week	2.27±0.98	3.82±0.47	0.053
Posttreatment 12th week	0.97±0.83	1.25±0.83	0.215
P value	<0.001	<0.001	
BDI			
Baseline	14.52±16.92	12.12±3.57	
Posttreatment fourth week	10.67±2.58	10.87±3.25	0.716
Posttreatment 12th week	9.92±2.17	10.10±2.58	0.903
P value	<0.001	<0.001	
Flexion			
Baseline	53.87±5.93	53.00±4.64	
Posttreatment fourth week	55.60±6.22	56.12±5.71	0.466
Posttreatment 12th week	58.12±6.95	58.75±5.74	0.430
P value	<0.001	<0.001	
Extension			
Baseline	58.00±6.28	56.87±6.85	
Posttreatment fourth week	59.00±6.22	58.25±6.93	0.639
Posttreatment 12th week	60.12±6.45	59.62±6.34	0.750
P value	<0.001	<0.001	
Right lateral flexion			
Baseline	41.25±2.19	42.37±2.52	
Posttreatment fourth week	41.25±2.46	42.25±2.76	0.116
Posttreatment 12th week	42.75±3.19	43.12±3.33	0.618
P value	<0.001	0.008	
Left lateral flexion			
Baseline	41.12±2.50	42.62±2.52	
Posttreatment fourth week	42.12±2.50	43.20±2.39	0.058
Posttreatment 12th week	42.50±2.53	43.25±2.41	0.178
P value	<0.001	0.050	
Right rotation			
Baseline	74.75±3.19	74.50±3.72	
Posttreatment fourth week	76.00±3.24	75.87±3.90	0.987
Posttreatment 12th week	77.87±3.17	78.87±3.90	0.631
P value	<0.001	<0.001	
Left rotation			
Baseline	74.37±3.78	74.92±4.38	
Posttreatment fourth week	76.75±3.31	76.00±3.78	0.442
Posttreatment 12th week	78.87±3.29	78.75±3.88	0.746
P value	<0.001	<0.001	

Group 1 lidocaine injection+exercise group, *Group 2* dry needling+exercise group, *VAS* visual analog scale, *BDI* Beck Depression Inventory

than saline injections to trigger points [20]. In contrast, some other studies could not indicate statistically significant difference between placebo and botulinum toxin type A injections [21]. Wreje et al. injected sterile water and saline to the trigger points, although a decrease in pain level was found they couldn't find any significant difference in pain relief after 14 days between two groups [22]. Studies showed that the efficacy of injections were independent of the injected substance, as wet injection didn't have therapeutic superiority over dry needling. The evidences based on clinical studies were failed to support or reject the injections or its superiority over placebo [7].

Cervical ROM restriction mostly occur due to muscle spasm in MPS. Studies showed improvement in ROM values, both dry needling and local anesthetic, immediately after injections [17, 23]. In our study, a significant increase was obtained in every direction in the first and third months in cervical ROM in both groups. The increase in servical

ROM may be due to the reduce in patients' servical muscle spasms or exercises program applied to the patients.

It is well-known that patients suffering from chronic pain have more psychologic disturbances than normal population. In chronic diseases, depression is closely related with intensity and duration of pain. It is accepted that depression and pain often accompany each other, however, there is still arguments on which of them begins first [24–26]. In MPS, the ratio of depression and high anxiety were 29% and 89.3%, respectively, by using BDI and Taylor Manifest Anxiety Scale. In addition, depression showed improvement by the treatment of MPS [25]. In another study, which dry needling and lidocaine injection methods were compared, depressive mood levels of patients were measured with Geriatric Depression Scale (short form); a significant decrease was observed in depression levels in both groups in a monitoring of 28 days. These trials showed that depression and pain have close relationship, and as pain decreases, depression decreases as well [23]. When we look at pre-treatment BDI values in our study, a statistically significant decrease in BDI values was found at the end of first and third months after therapy. Improvement in BDI scores, without any anti depression medication, brings to mind that chronic pain increases depressive complaints in MPS patients and is related to psychogenic changes originating from musculoskeletal system.

This study has several limitations. First, there was no third group as a placebo group or an exercise group. Secondly, sample sizes were small. Also, the power analysis of the study was low due to the small sample size. In order to increase the power of the test, the sample size should be expanded. Power analysis and sample-size calculation in trials should be always considered at the beginning of the research study, which was a third limitation of our study.

Our study indicated that exercise associated with local anesthetic and dry needling injections were effective in decrease of pain level in MPS as well as increase of cervical ROM and decrease of depressive mood levels of individuals. Therefore, pain relief should be the main goal of MPS treatment. Also, the methods coping with depressive symptoms should be taken into consideration. Both methods were effective, however, we support that dry needling and exercise method will be more appropriate from financial aspects as well, since it is both easy and doesn't require any drugs.

Disclosures None.

References

1. Lavelle ED, Lavelle W, Smith HS (2007) Myofascial trigger points. Med Clin N Am 91:229–239
2. Borg-Stein J, Simons DG (2002) Myofascial pain. Arch Phys Med Rehabil 83(suppl1):40–49
3. Simons DG (1988) Myofascial pain syndrome due to trigger paints. In: Goodgold J (ed) Rehabilitation Medicine. Mosby Co, St Luis, pp 686–723
4. Friction JR (1994) Myofascial pain. Baillieres Clin Rheumatol 8:858–880
5. King JC, Goddard MJ (1994) Pain rehabilitation: chronic pain syndrome and myofascial pain syndrome. Arch Phys Med Rehabil 75:9–14
6. Tough EA, White AR, Cummings TM, Richards SH, Camphell JL (2008) Acupuncture and dry neddling in the management of myofascial trigger point pain: a systematic review and meta-analysis of randomised controlled trials. Eur J Pain 3:1–11
7. Cummings TM, White AR (2001) Neeedling therapies in the management of myofascial trigger point pain: a systematic review. Arch Phys Med Rehabil 82:986–992
8. Simons DG (1990) Muscular pain syndrome. In: Friction JR, Awad EA (eds) Advances in pain research and therapy. New York, Raven Pres, pp 1–41
9. Simons DG, Travell JG, Simons LS (1990) General overview. In: Johnson EP (ed) Myofascial pain and dysfunction: the trigger point manuel. Williams&Wilkins, Baltimore, pp 11–89
10. Beck AT (1961) An inventory for measuring depression. Arch Gen Psychiatry 4:561–571
11. Hisli N (1989) Beck depresyon envanterinin üniversite öğrencileri içi geçerliği, güvenirliği. Psikoloji Dergisi 7:3–13
12. Jensen R (1993) Muscle tenderness and pressure pain thresholds in headache. A population study. Pain 52:193–199
13. David G, Simons MD (2008) New views of myofascial trigger points: etiology and diagnosis. Arch Phys Med Rehabil 89:157–159
14. Thompson JM (2000) The diagnosis and treatment of muscle pain syndromes. In: Braddom RL (ed) Physical medicine and rehabilitation. WB Saunders, Philadelphia, pp 934–956
15. Simons DG, Travell JG (1989) Myofascial pain syndromes. In: Wall PD, Melzack R (eds) Textbook of Pain. Churchill Livingstone, New York, pp 368–385
16. Kraus H, Fischer AA (1991) Diagnosis and treatment of myofascial pain. Mt Sinai J Med 58:235–239
17. Hong CZ (1994) Lidocaine injection versus dry needling to myofascial trigger point: the importance of the local twitch response. Am J Phys Med Rehabil 73:256–263
18. Lewit K (1979) The needle effect in the relief of myofascial pain. Pain 6:83–90
19. Han SC, Harrison P (1997) Myofascial pain syndrome and trigger point management. Reg Anesth 22:89–101
20. Cheshire WP, Abashian SW, Mann D (1994) Botulinum toxin in the treatment of myofascial pain syndrome. Pain 59:65–69
21. Wheeler AH, Goolkaisan P, Gretz SS (1998) A randomized, double-blind, prospective pilot study of botulinum toxin injection for refractory, unilateral, cervicothoracic, paraspinal, myofascial pain syndrome. Spine 23:1662–1666
22. Wreje U, Brorsson B (1995) A multicenter randomized controlled trial of injections of sterile water and saline for chronic myofascial pain syndromes. Pain 61:441–444
23. Hyuk G, Ji-Ho C, Chang-Hae P, Hyun-Jung Y (2007) Acupuncture needling versus lidocaine injection of trigger points in myofascial pain syndrome in elderly patients. Acupunct Med 25(4):130–136
24. Fishbain DA, Cutler R, Rosomoff HL, Rosomoff RS (1996) Chronic pain-associated depression: Antecedent or consequence of chronic pain. A review. Clin J Pain 13:116–137
25. Esenyel M, Caglar N, Aldemir T (2000) Treatment of myofascial pain. Am J Phys Med Rehabil 79:48–52
26. Keefe FJ, Dolan E (1986) Pain behavior and pain coping strategies in low back pain and myofascial pain dysfunction syndrome patients. Pain 24:49–56