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Research Article

Comparison of Dry Needling and Physical Therapy in Patients with Trapezius Myofascial Pain Syndrome

Shima Hesari[1], Behrouz Attarbashi-Moghadam[*2], Azadeh Shadmehr[2]

1- MSc Student, Department of Physical Therapy, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran
2- Associate Professor, Department of Physical Therapy, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran

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Corresponding Author:
Behrouz Attarbashi-Moghadam
Emial: attarbashi@tums.ac.ir
Tel: +989121883095
Fax: +982177534133

ABSTRACT

Introduction: Myofascial trigger points (MTrPs) are one of the main characteristics of musculoskeletal disorders. The main purpose of this study was to compare the long-term effects of dry needling (DN) and physical therapy modalities (PT) on the MTrPs of upper trapezius muscle.

Material and Methods: A total of 34 subjects with upper trapezius MTrP participated in this study. Subjects were randomly assigned into two groups of DN (N = 17) and PT (N = 17). DN group was treated two sessions per week, and PT group was treated three sessions per week. Pain intensity, pressure pain threshold (PPT), cervical range of motion (CROM), and function of upper limbs were assessed every session.

Results: Significant decrease of pain (P = 0.002), increase of CROM (P = 0.002), PPT (P = 0.003), and functional improvement of upper limbs (P = 0.001) after treatment occurred in both groups. DN group revealed more improvement than the PT group (P = 0.001).

Conclusion: Although both of PT and DN are effective treatments for MTrP, the DN seems to be more effective.

Keywords: Dry needling; Physical therapy; Trigger point; Trapezius muscle

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Introduction

Myofascial pain syndrome (MPS) is a common source of pain and is usually associated with myofascial trigger points (MTrPs), which are defined as highly localized, hyperirritable spots in a palpable taut band of skeletal muscle fibers (1). Epidemiological studies have shown that MTrPs were the primary source of pain in 30-85% of patients presenting in the pain clinics because of pain (2). Up to 14% of patients are at risk of their neck pain becoming chronic which makes a substantial burden for both health of patients and health system (3, 4). The upper trapezius muscle is more capable to invasion MTrP in patients with mechanical neck pain (5). Various methods are used to deactivate MTrPs, including ultrasound, pressure release, cold spray, electrotherapy, stretch, injection of local anesthetics, and dry needling (DN) (no substance injected) (1, 6). Inappropriate treatment of MTrPs causes dysfunction of muscle firing, efficiency of motion, reciprocal inhibition, and co-contraction, and finally, produces over pressure on the muscles and joints (7). Despite the long sessions of electrotherapy modalities, use of this method is more common in the treatment of MTrPs (8). MTrP DN, also referred to as intramuscular stimulation, is an invasive method, in which an acupuncture needle is inserted into the skin and muscle (1). Physical therapists around the world practice DN as part of their clinical practice and use the technique in combination with other physical therapy (PT) interventions. In many researches, the positive immediate effects of DN have been reported (9). This method is often done between 1 and 4 times per week. Many reviews have been conducted about physiotherapy or DN effects on MPS. However, there is rarely any study evaluating and comparing the long-term effects of PT modalities and DN on upper trapezius muscle MTrPs. In this study, we aim to compare DN with PT modalities in the patients' treatment and recovery during the same period.

Materials and methods

Following Tehran University Research Ethics Committee approval, participants were recruited from patients with musculoskeletal pain referred for physiotherapy by one orthopedist of an inner city. Each patient read the information sheet and signed up consent form before enrollment in the study. Inclusion criteria were: Aged 20-45 years, exist of MTrP in the upper trapezius muscle on the basis of clinical finding of Travel and Simons (10), pain of at least 30 mm on a visual analog scale (VAS) in the initial evaluation (11). Exclusion criteria were: Pregnancy in test time, damaged skin, infection or inflammation in the MTrPs area and bleeding of the time of test, use of sedative drugs before or during therapy, history of traumatic neck (whiplash injury), specific neck pain, neck surgery, drug abuse, corticosteroid drugs (such as aspirin or warfarin), kyphosis or scoliosis disorders, fibromyalgia, treatment of MTrPs in the past month, epilepsy (6, 11, 12).

Outcome measures

A pressure algometric (PA) was used to measure pressure pain threshold (PPT) of the involved upper trapezius MTrPs. It consisted of a gauge that was attached to a hard rubber tip of 1 cm in diameter. The dial gauge was calibrated in kg/cm^2 and ranged from 1 to 10 kg/cm^2. The force recorded was the amount of pressure that caused PPT. The range of motion goniometer was used to measure cervical range of motion (CROM) (model Baseline 360°). A VAS was used for subjects to grade their current level of pain. The VAS for pain is a10 cm horizontal line with polar descriptors of “no pain” and “worst pain possible.” Subjects indicated their pain by placing a vertical line through the VAS line at the point that represented their current level of neck pain. Persian version of the Disabilities of Arm, Shoulder, and Hand’s (DASH) questionnaire was filled for functional evaluation of the patients (13).

Procedure

The subjects filled out the pain scale and DASH questionnaire. The most tender MTrP located in the area was marked with a cross using a skin-pencil. For fixation the target of therapy in sessions, we used the clear paper by dimension 10 cm × 10 cm with central hole. Then, for detection the CROM to contralateral, the goniometer was attached to the subject’s head with straps. Subjects in sitting position on the chair asked to laterally flex the neck to opposite side of MTrPs area (degree of lateral flex was recorded). To measure PPT, the rubber tip of the PA was placed over the MTrPs location, and the patient was instructed to indicate when the sensation change from pressure to pain. All the parameters were assessed every session and were recorded before and after the therapy session. After evaluation, patients were randomized equally into two groups (DN and PT) by random table numeric. Interventions were carried out by fixed physiotherapist.

Intervention

DN group

Patients received a course of DN with a frequency of twice per week for 7 periods by fixed physiotherapist. MTrP was implicated in the condition were palpated and marked with a small dot on the skin in the every treatment session. Patients lie in a prone position to relax upper trapezius muscle. The target was sterilized by alcohol solution and then needled in turn as Baldry’s technique. Sterile stainless steel acupuncture needles (30 × 50, model DB9, Korea) with coiled copper, handles, and plastic guide tube were used; the needle was inserted as vertically with the fibers to the depth 5-10 mm for 30 seconds. If the patients had no pain after needling in the previous point, the needle could be inserted to another point in the same area, and then, this process can be repeated 2-3 minutes (14).

PT group

Patients received 10 courses of physiotherapy with a frequency of 3 days/week with a fixed physiotherapist. Each session included:

- Hot pack (20 minutes), (74.5° C) on the target region (15)
- Transcutaneous electrical nerve stimulation (TENS) (model newdyn 6201, Iran), (duration pulse: 100-110 µ, F: 70-80 Hz, 25 minutes), the negative electrode was closed on the MTrP, and positive electrode was closed on the insertion of muscle (15)
- Continuous ultrasound (model US-100, Japan) (1.25-1.5 W/Cm2, 5 minutes) was used on hyperirritable spots of the MTrPs (15).

Results

Kolmogorov–Smirnov showed all the parameters had a normal distribution in this study. Independent samples T-test showed no significant difference weight, age, length, and body mass index between the groups at the beginning of the study (Table 1). General linear model with repeated measures test showed both techniques were significant effects on independent variable, and there was a significant difference between the groups (P = 0.001).

Table 1. Anthropometric characteristics of patients (N = 34)

Anthropometric characteristics	Groups	Mean (SD)	P value
Age (year)	DN	23.5 (1.6)	0.850
	PT	23.6 (1.81)	
Length (cm)	DN	163.8 (6.79)	0.710
	PT	163.7 (4.49)	
Weight (kg)	DN	74.20 (9.57)	0.850
	PT	73.8 (7.17)	
BMI (kg.m^2)	DN	23.82 (2.07)	0.730
	PT	24.15 (3.55)	

DN: Dry needling, PT: Physical therapy modalities, SD: Standard deviation, BMI: Body mass index

Table 2. Amounts of mean changes of the outcomes after treatment in both groups (N = 34)

Parameters	Groups (N)	Mean (SD)	Minimum	Maximum	P value
CROM	DN (17)	3.86 (2.46)	9.8	11.59	0.002
	PT (17)	2.43 (2.8)	1.19	0.75	
DASH	DN (17)	40 (19)	55	6	0.001
	PT (17)	43 (16)	53	20	
VAS	DN (17)	0.96 (0.85)	1.38	3.12	0.002
	PT (17)	0.58 (0.6)	0.5	2.19	
PPT	DN (17)	0.75 (71)	2.38	0.38	0.003
	PT (17)	0.39 (35)	0.87	0.73	

CROM: Cervical range of motion, DASH: Disability of Arm, Shoulder, and Hand, VAS: Visual analog scale, PPT: Pressure pain threshold, SD: Standard deviation, DN: Dry needling, PT: Physical therapy

Hence, significant decrease of pain (P = 0.002), increase of CROM (P = 0.002), PPT (P = 0.003), and functional improvement of upper limbs (P = 0.001) after treatment occurred in the both groups (Table 2).

Discussion

The results showed that both DN and PT are effective in the treatment of MTrPs of upper trapezius muscle. Both techniques significantly decreased pain and increased PPT and CROM and improved the function of upper limbs. This result matches with the other studies on the effectiveness of DN and PT. The majority researches have checked the short-term effect of DN and PT. This research tended to comparison between the effect of DN and PT on the treatment the MTrP of upper trapezius muscle. Furthermore, in this research the effect of DN is significantly more than PT in all of the parameters was measured. PT is more common treatment for the MTrPs. Many researches mentioned the positive effect of PT (16, 17). However, this research had some deficiency such as lack of control group and follow-up after treatment (18). Many studies have been shown that DN is an effective method for treatment of MTrPs (9). Knowles et al. (19) documented the successful DN treatment of the MTrPs that causes decreased pain and increased PPT in the patients with MPS. One of the limitations in our study was a lack of double-blind that causes to produce bias. However, an equal period of treatment of both techniques is more valuable.

The researchers believe that the effect of DN is the result of mechanical and neurophysiological effect. Needling may also provide a localized stretch to the contracted cytoskeletal structures, which would allow the involved sarcomeres to resume their resting length by reducing the degree of overlap between actin and myosin filaments (20). Rotate and pressure to the needle may be beneficial to provide ultra-localized stretch to the contracted structures (20, 21). Mechanical disruption of the DN in MTrPs could rapid the regeneration phase of the MTrPs. There is some evidence suggests that this could trigger specific changes in the endplate cholinesterase and ACh receptors as part of the normal muscle regeneration process. It is not known, repeated needling in the same MTrPs during the regeneration phase can exhaust the regenerative capacity of muscle and impairing the regeneration process (22). For this reason, we tried in this study, contrived suitable interval between in therapy sessions. Baldry suggested that DN was stimulated the A and C afferent fibers for 72 hours after needle insertion. Prolonged stimulation of this fiber may activate enkephalinergic, serotonergic, and noradrenergic inhibitory systems, which would imply that DN could cause opioid-mediated pain suppression (23, 24). The finding that local twitch response can normalize the chemical environment of MTrP such as bradykinin and P-substance and diminish endplate noise associated with MTrP (25). Pain reduction in the treatment of MTrPs can be attributed to several factors.

In general, there are two factors to consider in the treatment of trigger points (23, 25)

1. Mechanism that increases blood flow in the trigger point's area

2. Mechanical effects that causes modification of sarcomere length in the affected area. PT is relatively costly and time consuming and needs to the high cost for both of individual patient and health care. The mechanism of US not known, if the probe of US has put pressure on the MTrPs, it is possible through act as pressure release. Roland et al. in a double-blind study to evaluate the effect of TENS on patients with MPS. The currents that high frequency and high intensity was used, patients showed additional pain relief than the other group that the currents low frequency and intensity was used. Currents of high frequency and high severity increases blood flow and causes getting away pain-causing substances in affected area. In general, in this study, both of PT and DN used as therapy techniques, but the DN can be effective in fewer sessions for deactivation the MTrPs.

Limitations

- All of the measurements were not blind to grouping; it is possible that bias was introduced
- Lack of long-term follow-up study findings
- The long number of therapy's sessions and involvement of patients, their willingness to participate in the scheme was limited.

Implications for study

- To evaluate the effectiveness of DN, add the group as combination of DN with PT
- For a more accurate determination of VAS, uses the cryotherapy for reduce the pain and soreness after DN
- Before and after the treatment, monitoring histological change and blood flow MTrPs region by ultrasonography
- Because of the specific role of the upper trapezius muscle in movements of the shoulder girdle, determination electrical activity muscle of shoulder girdle in different movements of glenohumeral joint in each session of therapy.

Conclusion

Although both of DN and PT techniques are effective in the treatment of MTrPs, the DN technique seems to be more affective so that use of the DN offers as an invasive method after insufficiency non-invasive methods.

Conflict of Interests

Authors have no conflict of interests.

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