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Research Paper:

Effects of Dry Needling of the Upper Trapezius Active Trigger Points on Pain and Pain Pressure Threshold in Women With Chronic Non-Specific Neck Pain

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Conflict of interest

The authors declared no conflict of interest.

ABSTRACT

Background and Objectives: The purpose of the present study was to examine the effectiveness of dry needling as local treatment of upper trapezius trigger points related to chronic neck pain on pain and pain pressure threshold in women with chronic nonspecific neck pain.

Methods: Thirty females with an active myofascial trigger point of the upper trapezius muscle were randomly divided into two groups: dry needling with passive stretch (n=15) and passive stretch alone (n=15). They received 5 sessions of the intervention for three weeks. The outcomes were pain intensity and pain pressure threshold. Every outcome was recorded at baseline and 2 days after the fifth session.

Results: Significant improvement in pain and pain pressure threshold was observed in both groups (P=0.0001) after the treatment. The results of the independent t-test showed a significant difference in measurements between the dry needling and passive stretch groups (P<0.05).

Conclusion: Dry needling with passive stretch can be more effective on pain and pain pressure threshold than passive stretching alone in short term in women with nonspecific neck pain.

Keywords: Dry needling, Myofascial pain syndrome, Myofascial trigger point, Neck pain

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Function & Disability Journal

What is "already known" in this topic:

MTrPs are the prevalent source of pain in patients with nonspecific neck pain. DN is one of the invasive methods. no study has shown the effectiveness of DN in pain and PPT of active UT muscle TrPs.

What this article adds:

After 5 sessions, dry needling with passive stretch was more effective on pain and pain pressure threshold than passive stretching alone in short term in women with non-specific neck pain.

Introduction

Neck pain is the second common medical problem after back pain [1], which has the fourth grade among disabling diseases. Its incidence is estimated at 30% to 70% of the general population [2, 3]. Acute or chronic neck pain is the frequent cause of disability and job absenteeism [4]. Every year, a large amount of health budget is devoted to treat such pains [5]. Nonspecific neck pain is diagnosed as neck pain (with or without radiation to upper limbs) with the lack of an underlying path basis [6-8]. Recent studies have indicated that Myofascial Trigger Points (MTrPs) are the prevalent source of pain in patients suffering from nonspecific neck pain [9]. Its prevalence is 65% in women and 35% in men [10]. MTrPs are defined as hyperirritable spots in a palpable taut band of skeletal muscle fibers. They provoke referral pain in a specific pattern during palpation, compression, stretch, or contraction [11, 12]. MTrPs are clinically classified as active and latent [13]. MTrPs may develop in any muscle in the body due to injury, muscle overload, repetitive microtrauma [13], and poor posture [14]. They are more prevalent in upper quarter postural muscles [6], especially upper trapezius muscle because of its important role in stability and movement of neck and shoulder [6]. MTrPs may lead to neck pain, muscle weakness and dysfunction, and decreased range of motion [1]. They have been treated with several therapeutic methods, including ischemic compression techniques [15], strengthening, stretching [16], analgesic modalities [17], and Dry Needling (DN) [18]. Although dry needling is cheap, easy to learn, and with low risks associated, it is an invasive technique used for the treatment of MTrPs. During the last decade, pieces of evidence have shown that MTrPs dry needling improves pain and Pain Pressure Threshold (PPT) in the cervical region in the short term [19]. This improvement is due to mechanical [20], neurophysiological [21], chemical, and microcirculation [22] mechanisms. Nowadays, dry needling is suggested as a standard treatment for MTrPs [19]. The purpose of this study was to investigate the effects of dry needling on pain intensity and PPT in women with MTrPs in the upper trapezius muscle using a two-day follow-up.

Materials and Methods

Study design

A randomized, single-blinded, clinical trial was performed between January and July 2020, at the School of Rehabilitation Sciences of Iran University of Medical Sciences. This study was approved by the Ethics Committee of Iran University of Medical Sciences, Tehran, Iran (Protocol Number: IR. IUMS.REC1398.848). The study was registered at the Iranian Registry of Clinical Trials (IRCT20191208045652N1).

Clinicians

Two experienced physiotherapists participated in the study. The clinical group met for a minimum of four hours of training/practice sessions before main sessions to train about MTrPs localization and treatment, as well as getting familiar with the measurement tools and verbal instructions for data collection. Assessment and treatment were performed by separate clinicians. The assessor remained blind about the group allocation.

Study population

Participants were women with chronic non-specific neck pain enrolled by public written notifications in the Rehabilitation School of Iran University of Medical Sciences. They were included if they aged between 18 and 35 years, had a history of neck pain more than 3 and less than 6 based on Visual Analogue Scale (VAS) during the last 3 months, and had the presence of active MTrPs in their upper trapezius muscle according to the diagnostic

criteria described by Simons et al. in Table 1 [13]. Exclusion criteria were the history of traumatic injuries or surgery in the cervical region or upper limb, any treatment or injection of trigger points during the last 3 months, using anti-coagulant or immunosuppressive drugs, acute psychopathy, radiculopathy signs, rheumatic disorders, fibromyalgia syndrome, coagulopathy, pregnancy, and fear of the needle.

Participants taking part in the study underwent a prescreening by the blind assessor. The purpose and procedure of the study were fully explained to the eligible participants and they signed consent forms before participating in the study. In the baseline assessment, demographic information was collected, including age, height, and weight (Table 2).

Randomization

Participants were randomized using the computer blocking program performed by an independent person to the intervention group that received dry needling with upper trapezius passive stretch (n=15) and the control group that received only a passive stretch (n=15). A power analysis, based on the pilot study information, determined that a sample size of 15 participants per group provided a minimum of 90% power to detect an effect magnitude of 1.4 Standard Deviations (SD) at an alpha of 0.05.

Assessment

In this study, the outcomes measured were pain intensity and PP. Each outcome was recorded at baseline and 2 days after the fifth session. The procedures were repeated three times with a time interval of 10 seconds. The mean of these three repetitions was recorded as the main data. It should be noted that for familiarizing the participants with the tests, each test was done 3 times before the main data collection. The assessor remained blind about group allocation.

Myofascial trigger point

Participants lied in the prone position with hands under the forehead. The possible location of MTrPs was found through pinch pincer palpation of the muscle in a longitudinal direction between the C7 spinous process and acromion. Investigations to identify the exact location of trigger points were performed based on diagnostic criteria proposed by Simons et al. [13]. As all of the assessment and treatment steps were performed on the most painful MTrPs, its precise location was marked on the skin using a water-resistant marker and the participants were asked not to wash the point roughly throughout the study for ease of follow-up identification.

Pain intensity

Pain intensity was determined by a Visual Analog Scale (VAS). The participants were placed in the prone position with their hands under the forehead and the neck in a neutral position without any rotation. Using an algometer (JTECK USA), the constant vertical pressure of 25 N/cm^2 was applied to the identified trigger point for 3 seconds. Participants were then asked to indicate the pain caused by this pressure on a 100-mm-line VAS. The line length was 100 mm, with zero indicating no pain and 100 indicating the worst pain experienced by the participants.

Pain pressure threshold

The PPT was measured using an algometer (JTECK USA). The participants were positioned prone with their hands under the forehead and the neck in a neutral position without any rotation. The Algometer disc with 1 cm^2 contact area was placed vertically on the identified trigger point. The constant pressure of 1 N/cm^2 per second was applied to the trigger point and the participant was asked to indicate pain onset by saying yes.

Intervention

Both interventions lasted 3 weeks and were performed twice a week leaving 3 days between sessions, comprising five sessions. All participants were requested not to take any other therapeutic measure, including self-care management, analgesic drugs, or home physical therapy during the follow-up period for pain control.

Dry needling

The intervention involved dry needling of the most painful MTrPs found in the upper trapezius, using a 0.3×50 mm acupuncture needle with a guided tube (Dong Bang, Korea). After wearing the gloves on both hands, the physiotherapist cleaned the target area with alcohol before treatment.The dry needling was performed in the prone position as described by Simons et al. [13]. The needle was inserted into the active MTrPs with the vertical direction according to Hong's fast-in and fast-out technique [23]. The dry needling technique was applied until the Local Twitch Responses (LTRs) ended. The LTR indicated the effectiveness of the technique due to its immediate desirable effects [24]. Then, the needle was withdrawn, hemostatic compression was applied, and the passive stretch was performed on the same muscle (Figure 1).

Figure 1. Dry needling of upper trapezius muscle

Passive stretch

To stretch the upper trapezius muscle, the participant seated on a chair with their hands on their thighs. The therapist stood behind the participant. Neck contralateral side bending and ipsilateral rotation were applied until tension without any pain elicitation can be sensed at the end of the Range of Motion (ROM) by the therapist. The participant was asked to take a deep breath. The therapist increased the stretch slowly during exhalation. The newly gained ROM was held for 45 seconds. This procedure was repeated three times with 30-second rest intervals between stretches [25] (Figure 2).

Results

Figure 3 shows the flow of the participants throughout the study. The Kolmogorov-Smirnov test was used to evaluate the normality of distribution for the variables before and after treatment. Normal distribution was observed for variables in both groups (Table 2). Paired t-test was used to determine any significant changes in the tested variables 2 days after the last session in the intervention and control groups separately. The results

Figure 2. Stretch of the upper trapezius muscle

of paired t-test showed significant changes for VAS and PPT (P=0.0001) in both groups (Table 3). An independent t-test was used to compare score changes between the two groups. The changes for VAS and PPT were statistically significant (P<0.05) (Table 3).

Discussion

This study was done to examine the effect of upper trapezius active trigger points dry needling on pain and PPT in women with chronic non-specific neck pain. The results showed that the amount of pain intensity decreased and PPT increased significantly after five sessions of dry needling with passive stretch in the intervention group.

The effect of dry needling on the active trigger points of the upper trapezius muscle

In the present study, significant improvement was indicated in pain intensity and PPT after five sessions of dry needling with passive stretch.

Table 1. Diagnostic criteria of myofascial trigger points

Diagnostic Criteria
Presence of a taut band in skeletal muscle
Presence of a nodule in taut band
Presence of at least one hypersensitive tender spot in the taut band in response to 25N/cm2 pressure
Patient's recognition of current pain complaint by pressure on the tender nodule (familiar pain)

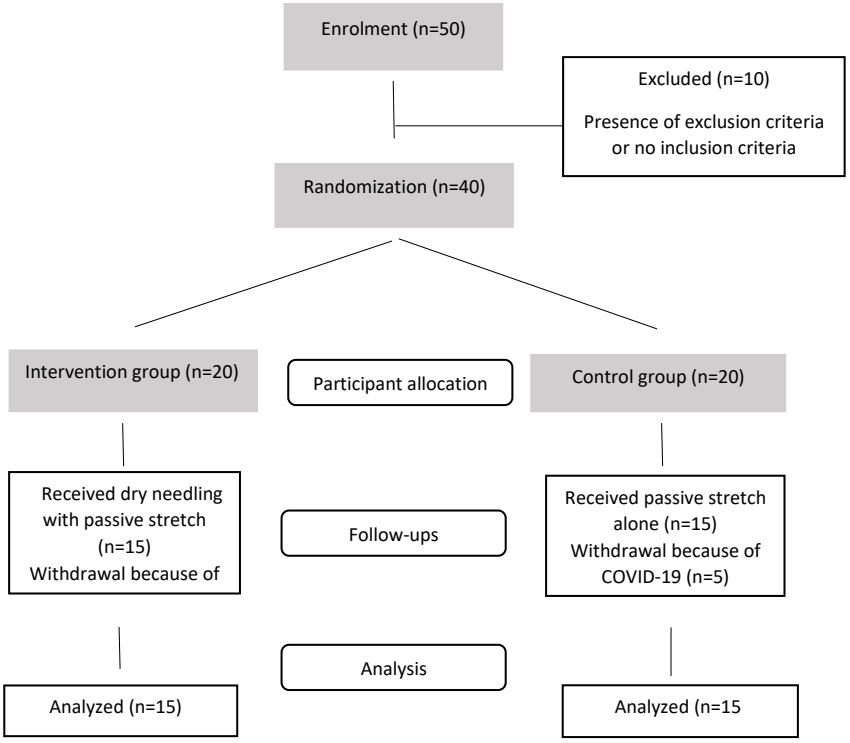

Figure. 3. Flowchart of the general study design and number of participants during the study

Consistent with the present study, several studies have demonstrated the effects of dry needling on the active trigger points of the upper trapezius muscle. Cerezo-T´ellez et al. in 2016 showed that dry needling with passive stretch of multifidus, levator scapula, upper trapezius, and splenius cervicis muscles leads to a greater reduction in pain intensity than passive stretch alone [19]. The results of a study by Gallego-Sendarrubias et

Table 2. Summary of the characteristics of participants (independent t-test results)

Variables	Mean±SD		P
	Intervention (n=15)	Control (n=15)	
Age (years)	25.86±4.17	26.0±5.09	0.938
Weight (kg)	59.9±6.58	58.4±6.67	0.532
Height (cm)	164±5.25	163.9±4.86	0.971

Table 3. Intra- and Inter-group comparisons of the outcomes before and after the treatment (paired and independent t-tests results)

Variables	Group	Mean±SD		Mean Diff.	95% CI Difference		P	P		Effect Size
		Before Intervention	After Intervention		Lower Band	Upper Band		Before Intervention	After Intervention	
Pain intensity (cm)	DN+ST	5.92±0.57	2.63±1.51	3.29	2.46	4.13	0.0001*	0.544	0.006*	1.58
	ST	6.2±1.31	4.29±1.53	1.87	1.4	2.34	0.0001*			1.31
PPT (N/cm^2)	DN+ST	18.01±3.83	30.94±6.17	-12.93	-16.57	-9.3	0.0001*	0.125	0.0001*	2.58
	ST	15.99±3.12	22.45±3.93	-6.46	-8.5	-4.42	0.0001*			1.83

DN: Dry Needling; ST: Stretch; VAS: Visual Analogue Scale; PPT: Pain Pressure Threshold; *Significant intra-group comparison (P<0.05).

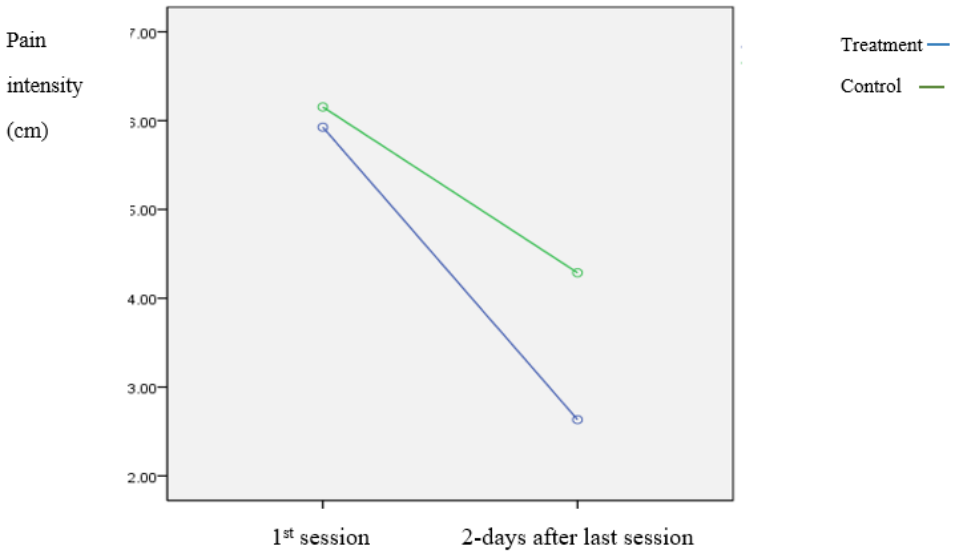

Figure 4. Comparison of Mean VAS between the groups (before and 2 days after the last treatment session)

al. in 2020 showed a significant change in pain intensity in dry needle therapy and manual therapy in patients with chronic mechanical neck pain [26]. In this regard, Abbaszadeh et al. in 2017 showed that one session of upper trapezius active trigger points dry needling significantly improved pain intensity compared with before treatment [21]. Kietrys et al. in 2013 also in a systematic review study showed that dry needling can significantly reduce pain intensity compared with the placebo or Sham effect, both immediately and after 4 weeks [27]. Mechanisms proposed to reduce the severity of pain include mechanical, neurophysiological, and chemical effects. From a mechanical point of view, insertion of a dry needle into the trigger points leads to local twitch response, separation of actin fibers from myosin, and return of the sarcomere to its resting length. Following mechanical stimulation, type II fibers that are sensitive to changes in fiber length are activated and block pain messages are sent from trigger points by closing the pain gate [28]. From a neurophysiological point of view, dry needle stimulation of A delta receptors leads to the activation of encephalin, production of inhibitory neurons, and activation of the serotonergic and noradrenergic inhibitory system in the posterior horn of the spinal cord and reduces pain following treatment [28]. Studies have shown that the level of chemicals, such as bradykinin, Calcitonin Gene-

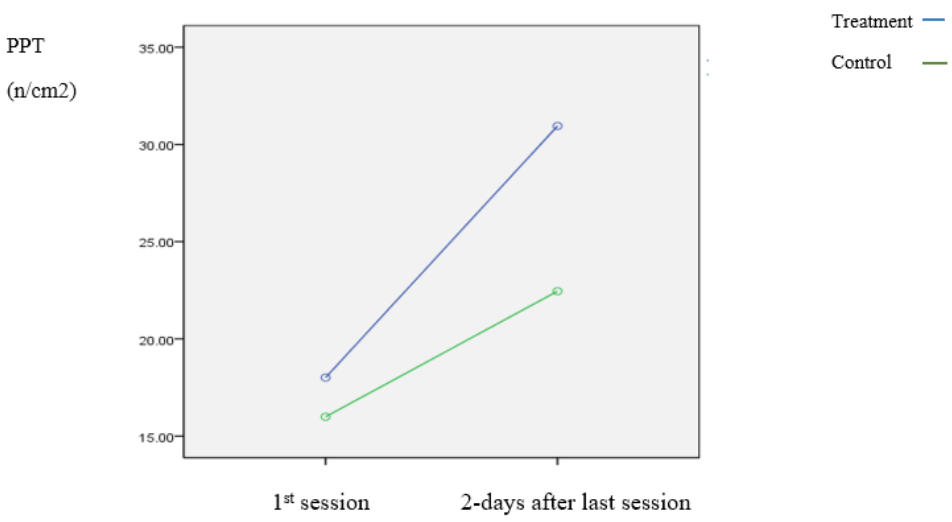

Figure 5. Comparison of Mean PPT between the groups (before and 2 days after the last treatment session)

Related Peptide (CGRP), and substance P is increased at the trigger points' site. Dry needling and its subsequent local twitch response can return the level of these substances to normal and affect microcirculation [20].

In a heterogeneous study in 2018, Martin et al. stated that the pain intensity was aggravated 48 hours after the needling session [29]. The probable reason for the difference between the two studies was due to the different methods of pain intensity assessment.

Researchers believe that performing dry needling following the activation of the descending inhibitory system and reducing the level of chemicals, such as bradykinin and histamine at the trigger points' site leads to an increase in the PPT [30]. Consistent with the present study, Gerber et al. in 2015 showed that the PPT improved significantly after one dry needling session [31]. These studies and the present study represent the effectiveness of dry needling in patients with MTrPs.

In a corresponding study in 2016, Martin-Pintado et al. reported that 48 hours after a dry needling session in patients with latent trigger points of the upper trapezius muscle, the PPT was lower than before treatment [32]. The discrepancy between the present study and the Martín-Pintad study was probably due to differences in the nature of the trigger point and the number of treatment sessions in the two studies.

The effect of passive stretch on the active trigger points of UT muscle

In the present study, pain and PPT improved significantly after five sessions of passive stretch. The pain reduction following passive stretch can be due to increased blood flow and muscle metabolism [33]. Consistent with the present study, Jaeger et.al concluded that trigger point sensitivity decreases following passive stretch, and this decrease in sensitivity leads to a decrease in pain intensity [34].

Passive stretching also reduces the sensitivity of muscle spindle receptors and increases the PPT [25]. Consistent with the present study, Hong et al. showed that passive stretch with anesthetic spray leads to a significant increase in PPT in people with active trigger points compared with the use of heat [35].

This study showed that dry needling and passive stretching are effective treatments to increase the PPT in women with chronic nonspecific neck pain.

Comparing the effect of dry needling with passive stretch and passive stretch alone on UT MTrPs

In the inter-group comparison, based on the independent t-test results, in the present study, a significant difference was found between groups in pain intensity and PPT (Figure 4 & 5).

Conclusion

Due to the significant reduction in pain intensity and a significant increase in PPT in the dry needling and passive stretch groups compared with the control group, it is recommended to treat the clinical symptoms of women with chronic nonspecific neck pain with dry needling and passive stretching.

Limitations

In this study, there were missing data at follow-up and case allocation limitation, and these data were excluded from the analysis because of the COVID 19 pandemic. Further research is needed to examine the results of dry needling in long term. Due to the short follow-up period, the results of the study should be used with caution in other patients.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Iran University of Medical Sciences, Tehran (Protocol Number: IR. IUMS.REC1398.848). The study was registered at the Iranian Registry of Clinical Trials (IRCT20191208045652N1).

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The paper was extracted from the MSc. thesis of the first author at the Department of Physiotherapy, Faculty of Rehabilitation Science, Iran University of Medical Science, Tehran.

Authors' contributions

Conceptualization, supervision: Marzieh Yassin; Methodology: Reza Salehi, Marzieh Yassin, Fereshteh Navaee; Investigation, writing – review & editing: All authors. Writing – original draft: Fereshteh Navaee; Funding acquisition, resources: Marzieh Yassin.

Conflict of interest

The authors declared no conflict of interest.

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مقاله پژوهشی

بررسی اثر سوزن خشک نقاط ماشه‌ای فعال عضله تراپزیوس فوقانی بردرد و آستانه فشاری درد در زنان مبتلا به گردن درد مزمن غیر اختصاصی

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چکیده

مقدمه هدف از مطالعه حاضر، بررسی اثر سوزن خشک نقاط ماشه‌ای عضله تراپز فوقانی بر درد و آستانه فشاری درد در زنان مبتلا به گردن‌درد مزمن غیراختصاصی بود.

مواد و روش‌ها سی زن با نقطه ماشه‌ای فعال عضله تراپز فوقانی به طور تصادفی به دو گروه سوزن خشک همراه با کشش غیرفعال (۱۵ نفر) و کشش غیرفعال به تنهایی (۱۵ نفر) تقسیم شدند. شرکت‌کنندگان پنج جلسه مداخله به مدت سه هفته دریافت کردند. متغیرهای مورد بررسی، شدت درد و آستانه فشاری درد بود. متغیرها در ابتدا و دو روز پس از جلسه پنجم ثبت شدند.

یافته‌ها در دو گروه بعد از درمان بهبود قابل توجهی در میزان درد و آستانه فشاری درد مشاهده شد (P=۰/۰۰۰۱). نتیجه آزمون تی مستقل تفاوت معنی‌داری در گروه سوزن خشک همراه با کشش غیرفعال نشان داد (P<۰/۰۵).

نتیجه‌گیری سوزن خشک همراه با کشش غیرفعال در کاهش درد و افزایش آستانه فشاری درد مؤثرتر از کشش غیرفعال به تنهایی در زنان مبتلا به گردن‌درد مزمن غیراختصاصی در کوتاه‌مدت است.

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