Original Article

The Effectiveness of Sternocleidomastoid Muscle Dry Needling in Patients with Cervicogenic Headache

Abstract

Background: Cervicogenic headache (CGH) is a secondary headache with a cervical source that radiates pain to the head or face. Accordingly, one reason of CGH is myofascial trigger points. The purpose of this study was to investigate the effect of one session dry needling (DN) of myofascial trigger points of the sternocleidomastoid (SCM) muscle in patients with CGH. **Materials and Methods:** In this before-and-after clinical trial, 16 females aged 18–60 years with a clinical diagnosis of CGH were enrolled. All of the patients received one session DN into the myofascial trigger points of the SCM muscle. Headache index (HI), headache duration, headache frequency, and headache disability index (HDI) were assessed at 2 weeks before and 2 weeks after the intervention. This study was registered in Clinical Trials as IRCT20181109041599N1. **Results:** One session DN into myofascial trigger points of the SCM muscle showed a significant improvement in HI ($P < 0.001$). Duration and frequency of headache as well as HDI significantly reduced after intervention ($P < 0.001$). **Conclusion:** One session DN into myofascial trigger points of the SCM muscle was effective on improvement of HI, headache duration, headache frequency, and HDI in patients with CGH.

Keywords: *Cervicogenic headache, dry needling, myofascial trigger points, pain, sternocleidomastoid*

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Introduction

Cervicogenic headache (CGH) is a secondary headache with a cervical source.[1,2] According to the International Headache Society (IHS) definition, pain from cervical radiates to the head or face.[1] This type of headache is characterized by unilateral pain of head with cervical movement, external pressure over the upper cervical, and/or sustained awkward head positions.[1,2] In most of the cases, the pain triggers from the posterior of the neck or head, which radiates to the frontotemporal or zygomatic regions.[3] Unilateral radicular pain at shoulder or arm and/or numbness at the same involved side might also be reported as the CGH.[3] The prevalence rate of CGH was estimated to be from 0.4% to 2.5% in the adult population[4] and appears to affect women more than men.[5,6] Physiological base of pain in CGH headache is the convergence of upper cervical spinal nerves (C1, C2, and C3) afferents and trigeminal afferents in the trigeminocervical nucleus caudalis.[7]

Previously, the association between CGH and structures, which was innervated by C1–C3, was considered.[8] Another cause of CGH is myofascial trigger points (MTrPs).[9,10] MTrPs can be usually defined as a hyperirritable spot within a taut band of a skeletal muscle that elicits a referred pain upon examination.[10] From a clinical viewpoint, MTrPs can be classified as active or latent. MTrPs were considered as active when the referred pain elicited by their palpation reproduced the pain symptoms, for example, reproducing the headache pattern.[10] Studies have reported the existence of MTrPs in patients with tension-type headache,[11] migraine,[12] and cluster headache.[13] Furthermore, data related to MTrPs in CGH are increasing.

According to a previous study, MTrPs in the muscles, which are innervated by C1 to C3 (suboccipital, semispinalis capitis, splenius cervices, trapezius, and sternocleidomastoid [SCM]), can cause referral pain in different parts of the head.[14] Based on the limited studies performed in this field, the presence of MTrPs in the SCM muscle may lead to a headache pattern in patients with CGH.[15-18] Individuals with headache resulting from the SCM MTrPs usually do not complain

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of pain along with the muscle and often report pain in the supraorbital and temporal regions of their head,[10] so that this muscle should be also considered in the evaluation and treatment of patients with CGH. The treatment of active MTrPs in this muscle was effective for the management of the concerned patients.[15] Recent studies concluded the effectiveness of manual therapy of MTrPs in SCM to treat people with CGH.[17,18]

Dry needling (DN) is considered as one of the most effective methods for treatments of MTrPs.[19] The effectiveness of DN into the MTrPs of the suboccipital and upper trapezius muscles in improvement of headache index (HI), MTrP tenderness, functional rating index, and the range of motions in patients with CGH has previously been reported.[20] Furthermore, a retrospective case series showed the effectiveness of DN into the SCM muscle coupled with a standard manual therapy approach like manipulation, exercise, and soft-tissue technique only on three patients with CGH.[21] Togha *et al*. compared the effect of DN and ischemic compression on the headache symptoms in patients with CGH originating from MTrPs of the SCM muscle. They showed that the application of 4 sessions of DN into the SCM as well as ischemic compression can improve the headache symptoms in these patients.[22]

Since time is an important factor in disease management process, finding a rapid and effective treatment option would be considerable. Therefore, we aimed to investigate the outcomes of one session MTrP DN of the SCM muscle in patients with CGH. It is anticipated that DN of this muscle would improve the HI, headache duration, headache frequency, and headache disability index (HDI) in patients with CGH.

Materials and Methods

Design and participants

In this before-and-after clinical trial, female patients with CGH aged between 18 and 60 years old were enrolled. The study was approved by the Ethics Research Committee of the Isfahan University of Medical Sciences (approval number: IR.MUI.RESEARCH.REC.1397.374) and was registered in Clinical Trials as IRCT20181109041599N1. This study was conducted in the Physical Therapy Department of Isfahan University of Medical Sciences from April 2019 to September 2019.

Patients with CGH eligible criteria were invited to participate in this study. All of the patients were examined by a blind experienced neurologist in terms of the International Classification of Headache-3 criteria determined by the IHS.[1] In addition, patients must have headache frequency of at least one per week over a period >3 months and present active MTrPs in the SCM muscle reproducing their headache and headache symptoms reproduced or provoked by palpation of MTrPs. MTrP diagnosis was conducted in terms of the criteria of Simons *et al*.[10] All patients had used analgesics for headache treatment in the past. They agreed not to use such drugs during the study with the specialist's permission. They also had no drug dependence. Patients were excluded if they exhibited other primary headaches such as migraine and tension-type headache, a history of neck trauma, cervical radiculopathy, previously having surgery on the neck or shoulder area, MTrPs therapy or DN in the neck within the previous 6 months, evidence of cognitive deficits, presence of any needle contraindication, and presence of tumor in the neck or head region. In order to be sure, the inclusion and exclusion criteria were re-evaluated and confirmed by a blind physiotherapist. Then, another blind physiotherapist with more than 10 years of experience in the finding and management of MTrPs, who was an expert in DN, performed this technique.

The objectives of the study as well as the methods were described for the patients, and written informed consent was obtained from those who accepted to participate in the clinical trial. Selected participants received one session DN (needle length and diameter: 30 mm and 0.3 mm, respectively) of the SCM muscle's MTrPs according to the technique that was previously described by Dommerholt *et al*.[19]

A headache questionnaire was completed 2 weeks before and 2 weeks after the intervention by participants. Using the questionnaire information, patient's headache frequency, headache duration, HI, and HDI were determined and compared 2 weeks before and after intervention.

Outcome measures

A series of headache-associated measurements were assessed at 2 weeks before and 2 weeks after the treatment. A headache questionnaire was given to the patients to record their headache intensity using the Visual Analog Scale, headache duration (the sum of the total hours with headache), and headache frequency (the number of days with headache) in 2 weeks. HI was separately calculated for each patient, from the statements in the headache questionnaire, by multiplying the headache intensity and headache frequency.[23] In addition, headache disability was evaluated using the Persian version of headache disability questionnaire in 2 weeks before and 2 weeks after the intervention.[24] The HDI has been reported in the headache literature as a standard criterion to measure disability in patients with headache with good internal consistency (0.89), robust long-term test–retest reliability (0.83), and good construct validity.[25,26] A total score change of at least 29 points is necessary for the effects to be considered as clinically significant.[25]

Statistical analysis

Statistical analysis was conducted using the SPSS ver. 20 software (IBM Corp. SPSS 20, Armonk, NY, USA.

IBM Corp). Normal distributions of collected data were examined by Shapiro–Wilk test ($P > 0.05$). Furthermore, comparisons were made between pre- and post headache frequency and headache duration; and HDI and HI were analyzed using paired *t*-test. The significance level was set at 0.05. Furthermore, effect sizes will be measured using the Eta-square (η2). Statistical significance level is set at $P \leq 0.05$.

Results

Fifty patients with CGH were screened for possible eligibility criteria. Sixteen female patients with a mean age of 33.43 ± 11.18 years met all the eligibility criteria and agreed to participate. The flowchart diagram of the study selection process is illustrated in Figure 1.

The demographic characteristics that belonged to the patients are presented in Table 1.

The pre intervention and post intervention scores for headache frequency, headache duration, HI, and HDI in patients are presented in Table 2. After one session DN of the SCM muscle's MTrPs, the mean of headache frequency, headache duration, HI, and HDI significantly decreased ([effect size] partial Eta squared > 0.1, $P < 0.05$).

Discussion

In the present study, the effects of DN of the SCM muscle's MTrPs on headache symptoms in patients with CGH were investigated. Our result showed that applying one session of DN into the SCM muscle can be effective for the management of patients with CGH originating from SCM MTrPs. It can lead to a reduction in the HI, headache frequency, and headache duration.

These results would support the hypothesis that MTrP DN can be an effective approach for the patients with CGH having the referred pain from active MTrPs in the SCM muscle.

The present study examined the effectiveness of one session MTrP DN into SCM in CGH patients, while previous studies investigated the effectiveness of application of DN into the suboccipital and upper trapezius muscles in these patients.[20]

Table 1: Demographic characteristics of participants

Demographic characteristics	Mean±SD
Age (years)	33.43±11.18
Height (cm)	164.87±4.95
Weight (kg)	69.31±13.67
Headache history (month)	56.62±50.24

The results of our study are similar to the previous studies, showing that the management of active MTrPs in the SCM muscle is effective for treatment of the patients having CGH, due to SCM muscle involvement.[17,18,21]

Bodes-Pardo *et al*. investigated the effectiveness of manual therapy (manual pressure to taut band with following passive stretching) on MTrPs of SCM in the patient with CGH for 1 week in a preliminary clinical trial and they reported a significant improvement of headache in the studied population.[17] Furthermore, Jafari *et al*. reported that four sessions of ischemic compression of MTrPs of the SCM muscle in the patient with CGH can result in a significant improvement in frequency and duration of headache as well as headache intensity.[18] Although our results are consistent with Togha *et al*.'s study, showing that the application of 4 sessions DN into the SCM can improve the headache symptoms in CGH individuals,[22] our results demonstrated the same results only by applying 1 session of DN. Given the importance of time in the management of diseases, finding a rapid and effective treatment method would be considerable. Considering the similarity of the results of both studies, it seems that the advantage of the present research was that similar therapeutic results were obtained in only one treatment session instead of 4 sessions. However, it seems that further studies are needed to carefully determine the frequency of sessions required for treatment, as well as follow-up to determine the long-term effectiveness of this technique.

One of the superiorities of our study was its sample size. In the study of Togha *et al*., only 10 people with CGH were treated by DN, while in the present study, the DN technique was performed on 16 people. Therefore, the effects of dry needles in these patients can be discussed with more confidence.

Furthermore, considering the association between severity and frequency of headache with each other, using HI which is the product of the two mentioned variables would be more appropriate variable for evaluation of the headache symptoms.[23] If we evaluate the effectiveness of intervention only based on the headache intensity, the conclusion would not be accurate. It seems that it would be more logical to interpret the results both based on frequency and severity.

In spite of introducing the neurophysiological and mechanical mechanisms of DN, its effect on MTrP management is not exactly identified.[27] The mechanical effects of DN may improve the fiber structure, the

Table 2: Pre intervention and post intervention change scores for headache frequency, headache duration, headache index, and headache disability index

Variable	Pre intervention	Post intervention	*P*	η^2	Observed power
Headache frequency	6.25±2.93	3.62±3.38	0.000	0.62	0.99
Headache duration	26.70±19.83	17.39±23.66	0.002	0.49	0.94
Headache index	34.06±13.27	18.36±13.86	0.000	0.69	1.00
Headache disability index	49.43±18.02	25.43±22.21	0.000	0.58	0.99

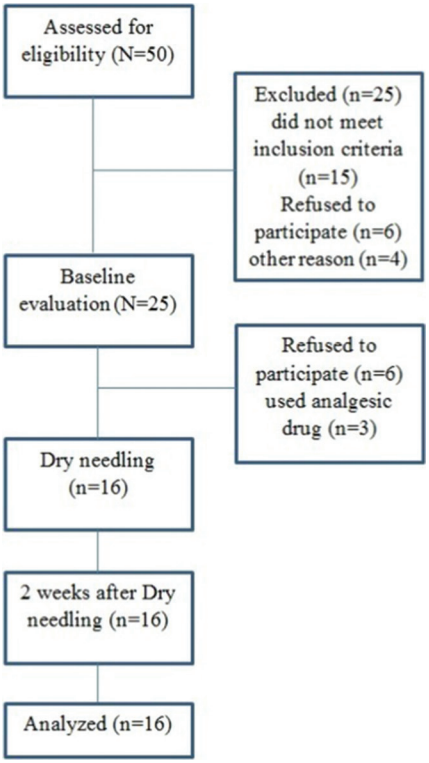

Figure 1: Study process consistent with consort flow diagram

localized tissue stiffness, and the local circulation of the biochemical milieu associated with the MTrPs.[28] The neurophysiological effects of DN include the impacts on both peripheral and central sensitizations.[27] In general, DN affects four main aspects of the pathophysiology of MTrPs through reduced spontaneous electrical activity of the tout band, increased circulation, and decreased central and peripheral sensitization.[27]

It can be concluded that all the above-mentioned effects on MTrP region after DN can cause the management of MTrP and subsequently improve the headache pattern created by MTrP.

It should be noted that DN can be used as an adjunct to other physiotherapy treatment methods. It is suggested that using one DN session in patients with CGH could result in a significant reduction in the symptoms and frequency of the headache so that, by relieving the patient's symptoms, we could provide a more appropriate condition for using other required treatment options for the patients which could not be used in acute phase of the disease and consequently achieve a proper result in the headache management process.

In this study, the effect of DN on disability caused by headache was also investigated. However, no studies have examined all of these variables in patients with CGH up to now. The results of this study showed that one session of DN into the SCM muscle can significantly reduce the mean score of this index. It should be noted that the least acceptable change for clinically significant score is 29.[25] However, this value is relatively high because the reported patients with moderate disability scores before the intervention had a lower chance of making significant changes after the intervention. In this regard, the results of this research are similar to other studies, which have investigated the HDI in people with other types of headaches including tension headaches.[29] By the way, reporting only the significant *P* value for an analysis is not adequate for readers to fully understand the results, but both the substantive significance (effect size) and statistical significance (*P* value) are essential results to be reported.[30] Therefore, in the present study, both statistical significance and effect size were reported.

The current study is considered to be a preliminary study in the field of DN effectiveness for CGH. Accordingly, it had some limitations including small sample size, single gender, lack of control group, and short-term follow-up period. Moreover, it is recommended to perform further studies with application of more sessions of DN and also comparison of different treatment methods.

The patients were selected in terms of the CGH clinical criteria and active MTrP in the SCM muscle. Therefore, the obtained conclusion is only applicable for the mentioned patients, not for the others.

Conclusion

The results of this study stated that one session DN into MTrPs of the SCM muscle as a simple, low-cost, and fast treatment may be an effective and useful method for reducing the pain and disability of patients with CGH showing active MTrPs in the SCM muscle.

Clinical relevance

- Significant decrease in headache frequency, after one session DN into MTrPs of the SCM muscle in patients with CGH
- Significant decrease in headache duration, after one session DN into MTrPs of the SCM muscle in patients with CGH
- Significant improvement in HI, after one session DN into MTrPs of the SCM muscle in patients with CGH
- Significant improvement in HDI, after one session DN into MTrPs of the SCM muscle in patients with CGH.

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Conflicts of interest

There are no conflicts of interest.

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