▪ Headache Medicine 2022, 13(3):201-207 ▪ p-ISSN 2178-7468, e-ISSN 2763-6178

Headache Medicine

▪ DOI: 10.48208/HeadacheMed.2022.21

Original

Manual therapy, stretching, and strength exercise on patients with tension-type headache – Multiple case study

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Edited by:
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Abstract

Introduction

Tension-type headache (TTH) has been considered the most common primary headache in adults, characterized by the presence of bilateral pain, presenting in the form of pressure or tightness (non-pulsating), with intensity ranging from mild to moderate.

Objectives

To analyze the medium-term effects of manual therapy techniques, stretching and muscle strengthening exercises on functionality, pain and disability in patients with TTH.

Methods

The following variables were evaluated: pain through the Visual Analog Scale (VAS); the strength of the cervical musculature through dynamometry; the disability by the Neck Disability Index (NDI); and the impact of headache on activities of daily living (ADL) through the application of the Headache Impact Test (HIT-6) before and after the intervention. Six physiotherapy sessions were performed, once a week, for six weeks.

Results

There was a reduction in the post-intervention pain pattern (4.2 ± 2.3 vs. 0.2 ± 0.5; p=0.019). In terms of disability, there was a difference between the pre- and post-intervention periods (11.4 ± 1.5 vs. 6.6 ± 2.3; p=0.022). In addition, after the intervention, there was a reduction in HIT-6 levels when compared to the pre-intervention period (51.0 ± 7.5 vs. 59.6 ± 3.9; p=0.038).

Conclusion

The physical therapy intervention protocol proved to be effective in reducing the pattern of pain, disability, and headache impact on ADL of patients with TTH.

Keywords:
Tension-type headache
Headache
Physiotherapy
Activities of Daily Living
Physical Therapy Modalities
Musculoskeletal Manipulations

Received: May 12, 2022
Accepted: September 19, 2022

Introduction

Tension-type headache (TTH) has been considered the most common primary headache, with a prevalence of 46% in adults.[1] This type of headache is characterized by the presence of bilateral pain, presenting as pressure or tightness (non-pulsating), with intensity varying from mild to moderate. However, it is not aggravated by physical activity, nor is it associated with the presence of nausea and vomiting.[2]

Several pharmacological and non-pharmacological therapeutic modalities have been used for the treatment of both the acute phase and the exacerbations of TTH. However, the most used non-pharmacological treatment is physical therapy, which can be subdivided into several modalities, such as electrical stimulation, exercises, massage, joint mobilization, trigger point release, spinal manipulation, among others.[3]

A recent systematic review with meta-analysis aimed to analyze the effectiveness of physical therapy on pain parameters and quality of life in patients with TTH. After performing a network analysis, the authors were able to conclude that the combination of passive mobilization techniques, exercises, and transcutaneous neuromuscular electrical stimulation was the most effective physiotherapeutic intervention for reducing the frequency and intensity of pain in these patients in the short term.[4]

To evaluate the effectiveness of manual therapy modalities on pain intensity and frequency, as well as the pain impact on individuals with TTH, Kamonseki and cols.[5] conducted a systematic review with meta-analysis that included 1,131 patients. The authors concluded that manual therapy may have positive effects on pain intensity and frequency, but further studies are needed. In addition, they pointed out that interventions on soft tissue and dry needling may be used to reduce the frequency and intensity of pain in patients with TTH. However, high-speed and low-amplitude spinal manipulations were not effective in reducing the frequency and intensity of pain, and manual therapy was not effective on the impact of pain in patients with TTH.[5]

Along this line of reasoning, Pourahmadi et al.6 decided to systematically evaluate the effects of dry needling on headache intensity and related disability in patients with TTH, migraine and headache of cervicogenic origin. Eleven randomized clinical trials were included, but only 9 met the criteria to enter the meta-analysis. Most studies showed low quality of evidence, demonstrating that dry needling is not superior to any other intervention in improving short-term pain intensity in patients with TTH. However, dry needling produces similar effects to other interventions for short-term pain relief, but seems to have some benefit on the level of disability when compared to the other interventions.[6]

Currently there are no specific national guidelines for the non-drug treatment of TTH and most studies emphasize the effects of modalities in the short term and on an isolated basis. In this sense, our hypothesis is that the application of a medium-term protocol, based on the association of non-pharmacological modalities, could be an important ally in the rehabilitation of patients suffering from tension headaches. Therefore, the aim of this study was to analyze the medium-term effects of manual therapy techniques, stretching and muscle strengthening exercises on the functionality, pain and disability in students and teachers linked to the Life Sciences area (VC) of the Vale do Taquari University - UNIVATES, with symptoms of TTH.

Methods

A case report of a quantitative exploratory-descriptive interventional study, in which individuals aged 18 years old or more, with symptomatic TTH according to the International Classification of Headaches, who were available to attend the proposed sessions, were included. Those with temporomandibular joint dysfunctions, osteoporosis, spinal fractures, or who had undergone any type of spinal surgery one year prior to the study were excluded.

Initially, a screening questionnaire created through Google Forms was sent to students and professors of the courses that comprise the Life Sciences Center of the Vale do Taquari University - UNIVATES. After feedback from the possible participants (n = 92), we carried out a detailed analysis of the answers, resulting in 80 participants who had headaches. Of these, 30 met the inclusion criteria, and only 6 returned the Informed Consent Form (ICF). These were evaluated and seen at the Clínica Escola de Fisioterapia (CEF), and one participant did not complete the intervention protocol, totaling a sample of five people with TTH (Figure 1).

TTH diagnosis was made based on the criteria of the International Classification of Headache in its third edition (ICHD-3 beta), validated for the Portuguese language in 2014: bilateral location, pressure and squeezing pain,

mild-to-moderate intensity [(≤7.0 on a visual analog scale (VAS)] and no increase in pain during physical activity.[7]

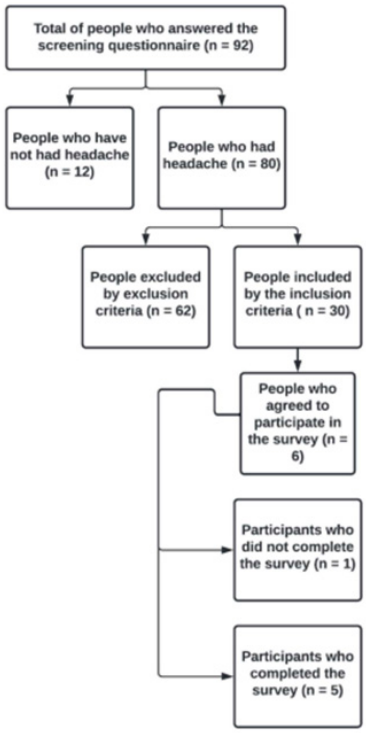

Figure 1. Flowchart of screening.

To evaluate the level of muscle strength of the flexors, extensors and rotators of the cervical region, The Lafayette Hand-Held Dynamometer was used, with its proven reliability and validity.[8] From this evaluation, it was possible to obtain the baseline data to be used as a comparison after the application of the exercise protocol.

The degree of pain of the participants was evaluated through the Visual Analog Scale of Pain (VAS), which is an instrument that makes it possible to verify the intensity of pain and follow the effectiveness of the treatment. The score ranges from zero to ten, where zero is the absence of pain and ten is the maximum pain bearable by the patient.[9]

To verify the disability related to the neck region, we used the Neck Disability Index - NDI, instrument with ten items associated with pain, activities of daily living and concentration. The classification is according to the score: mild disability from 5 to 14 points; moderate disability from 15 to 24 points; severe disability from 25 to 35 points and complete disability over 36 points. Each of the 10 NDI questions is given a score from 0 to 5 and the sum of these questions can total a maximum of 50 points.[10]

And finally, we applied the Headache Impact Test-6 - HIT-6, which evaluates the impact of headache through six questions, such as: the severity of the pain, the individual's ability at work, in his or her studies, at home, in social situations, and in relation to cognitive and mood changes. The sum of the points is done as follows: never (6 points each), rarely (8 points each), sometimes (10 points each), often (11 points each), and always (13 points each), and the total score is obtained through the sum of the six questions. The final classification is according to the score: little or no impact less than 49 points, moderate impact between 50 and 55 points, severe impact between 56 and 59 points, and severe impact greater than or equal to 60 points.[11,12] The screening, application of the questionnaires, and all the evaluation tests were applied by the same evaluator.

After the evaluation period, the participants were submitted to 6 physiotherapy sessions, once a week, lasting 45 minutes, all performed by the same researcher. The routine of appointments included: 1) checking blood pressure, heart rate, and oxygen saturation; 2) pompage in the upper trapezius and sternocleidomastoid (ECOM) muscles; 3) upper neck traction technique, referring to the Mulligan Concept; 4) manual cervical traction; 5) isometric cervical flexion and extension exercises; 6) passive stretching of the scalene and levator scapulae muscles. The definition of the modalities included in the protocol was based on results already presented in the scientific literature.

The pompages were performed for 60 seconds with three repetitions each, as follows: a) for the pompage of the upper trapezius muscle, the participant remained in dorsal decubitus (DD) and the researcher at the top of the headboard with one hand on the side of the trapezius muscle and the other at the base of the skull. The two hands were held apart; b) for the sternocleidomastoid muscle pompage, the participant remained in DD with the head rotated and the researcher on top of the headboard, with one hand gripping the base of the sternocleidomastoid muscle and the other hand resting on the sternum. A downward tensioning was performed with the hand resting on the sternum, accompanying the expiration.[13]

The upper neck traction technique was done with the participant in DD and the researcher with her forearm positioned under the participant's cervical region and the opposite hand on the participant's chin, applying pressure with the fingers while flexing the forearm on the occipital bone. The technique was held for 10 seconds and repeated 10 times.[14]

The manual cervical traction was performed with the participant in DD and the researcher positioned at the top of the headboard, holding the occipital of the participant with the fingertips of both hands, and performing a traction force in the cranial direction for a period of 20 seconds, repeating the maneuver for five times.[15]

The isometric exercises were performed for 30 seconds with three repetitions each: a) for the flexion isometric exercise, the participant placed the palms on the forehead and performed a counter resistance; b) for the extension isometric exercise, the participant placed the palms on the occipital bone and performed a counter resistance.[15]

The stretching lasted 30 seconds, with two repetitions each: a) to stretch the muscles, the participant remained in sitting position with axial extension, followed by lateral flexion of the neck to the opposite side and rotation to the same side of the contracted muscles. The researcher remained behind the participant, stabilizing the head and the upper thorax; b) for the scapular lifter stretching, the participant remained in sitting position with the head tilted to the opposite side, the arm was abducted, and the hand placed behind the head. The researcher remained in orthostasis behind the participant, assisting in stabilizing the head and scapula.[15] After the protocol was applied, the participants were re-evaluated using the same tests as before.

The study was approved by the Research Ethics Committee - COEP/Univates under opinion number 4,486,288, according to the guidelines of Resolution No. 466, December 12, 2012, of the National Health Council. The ethical precepts of research involving human beings were respected and all participants signed the ICF.

The data were presented from descriptive statistics using coefficient of variation, mean and standard deviation (SD). The normality of the data was tested using the Shapiro-Wilk test and comparisons were made using the paired t-test. The software used for data analysis and graphs was GraphPad Prism version 7.0 for Windows (San Diego, California, USA). Values of $p \leq 0.05$ were considered statistically significant.

Results

The group studied was 33.6 ± 7.54 (SD) years old, and 80% were female. It was observed that most participants had finished college education (80%). As for marital status, most participants are single (60%), with the same percentage of divorced (20%) and married (20%) respondents. It was observed that no participant is an alcoholic (100%) or smoker (100%) (Table 1).

Table 1. Sample characteristics

Variables	Mean ± SD/ n (%)
Age (years)	36,6 ± 7,5
Sex	
Masculine	1 (20%)
Feminine	4 (80%)
Civil Status	
Married	1 (20%)
Divorced	1 (20%)
Single	3 (60%)
Education level	
Incomplete university education	1 (20%)
Complete university education	4 (80%)
Smoker	
Yes	0 (0 %)
No	5 (100%)
Alcoholic	
Yes	0 (0%)
No	5 (100%)

SD = standard deviation.

Analyzing the levels of pain by VAS, we observed a reduction after the interventions (4.2 ± 2.3 vs. 0.2 ± 0.5; p = 0.01). In terms of disability, there was also a reduction in the NDI indexes after the interventions (11.4 ± 1.5 vs. 6.6 ± 2.3; p=0.02). In this same sense, participants showed less influence of pain on functional activities after the interventions (59.6 ± 3.9 vs. 51 ± 7.5; p=0.03). There was no influence of the interventions on muscle strength of the cervical flexors, cervical extensors, right and left rotators, and right and left lateral flexors (Table 2).

Table 2. Muscle Strength, Pain, and Disability

Variables	Pre-intervention	Post-intervention	P (*Paired t-test*)
Cervical flexors	3.66 ± 1.39	4.10 ± 3.82	0.72
Cervical extensors	4.24 ± 1.72	3.52 ± 1.38	0.11
Rotators D	3.24 ± 1.34	2.76 ± 1.39	0.07
Rotators E	3.54 ± 2.28	3.28 ± 2.05	0.30
Lateral flexor D	3.72 ± 1.70	3.4 ± 1.85	0.81
Lateral flexor E	3.9 ± 1.87	3.46 ± 1.77	0.31
VAS	4.2 ± 2.28	0.2 ± 0.45	0.01*
NDI	11.4 ± 1.54	6.6 ± 2.30	0.02*
HIT-6	59.6 ± 3.91	51.0 ± 7.45	0.03*

Values presented as mean ± SD. VAS: Visual Analog Pain Scale; NDI: Neck Disability Index; HIT-6: Headache Impact Test - 6; SD: Standard Deviation; D: Right; E: Left; *Statistically significant values ($p < 0.05$).

Figure 2 presents the results of HIT-6, NDI, and VAS pre- and post-intervention. In Figure 2A it was observed that the

pre-intervention mean was 59.6 and reduced to 51.0 in the post-intervention period, in Figure 2B the pre-intervention mean was 11.4 and reduced to 6.6 post-intervention, and in Figure 2C the pre-intervention mean was 4.2 and in the post-intervention period it reached 0.2.

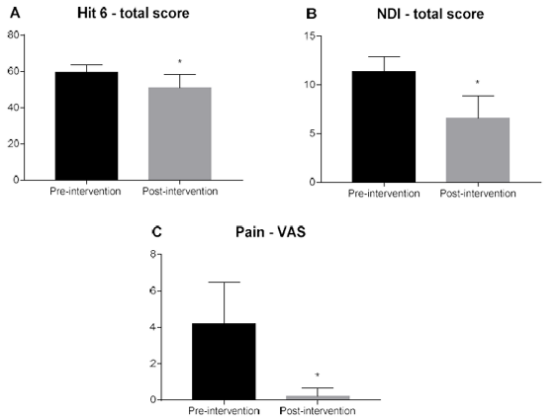

Figure 2. Values showed as mean ± SD. Comparison of results on HIT-6, NDI and EVA, pre and post-intervation. *p>0.05.

Discussion

In the present study, participants with TTH showed improvement in the pain pattern, Neck Related Disability Index, and Headache Impact Test after intervention with the physical therapy protocol based on manual therapy techniques, stretching, and muscle strengthening exercises.

The higher prevalence of TTH in women coincides with the study carried out by Matta e cols REF, which included 50 patients with episodic TTH, with the objective of studying the clinical aspects, family history and the impact of pain on work activities, showing that females were 80% more vulnerable than males. In addition, the authors observed that 50% of the participants had mild pain (1 to 4 points in the VAS), 34% moderate pain (5 to 7 points in the VAS) and 16% severe pain (8 to 10 points in the VAS).16 In the present study, similar results were obtained in relation to pain intensity, even when evaluated in two different moments, one pre-intervention and the other post-intervention.

Morelli & Rebelatto[17] examined the evolution of 6 patients diagnosed with TTH, submitted to a physiotherapeutic treatment protocol, consisting of ten sessions of manual cervical traction, stretching, vertebral mobilization, and massage. After the application of these techniques, the patients presented pain intensity reduction, according to the VAS to values close to zero. Except for one patient, all remained pain-free at the end of the treatment. We believe that the results of this study corroborate with our work, due to the similarity between the interventions, as well as in the time of application of the protocol.[17]

In order to investigate the effects of two manual therapy techniques targeting the cervical spine on pain levels, disability and the pressure pain threshold (LPP) of patients with TTH, a recent randomized clinical trial showed that upper cervical spine manipulation associated with exercise were effective in reducing headache frequency, severity and duration, improving headache disability and increasing LPP post-treatment and at the third month of follow-up.[18] Even though the participants of the present study presented a mild level of functionality and disability related to the disease in the initial phase, after the application of the protocol, there was a reduction in these values, as well as a reduction in pain levels, which is in line with the results of the aforementioned study.

Taking into consideration the results available in the literature, a systematic review was able to bring out the main non-pharmacological therapeutic modalities used in the treatment of patients with TTH. In this study the authors suggest that the use of passive techniques (dry needling, soft tissue mobilization, neural mobilization, manual therapy, joint manipulations, and relaxation) associated with exercises and transcutaneous neuromuscular electrical stimulation are more effective in reducing the intensity and frequency of short-term pain in this population.[4] Our study showed similar results to all those selected for this review, which ratifies the importance of a multifactorial approach to the treatment of patients with TTH.

Although the focus of the present study was not to assess/measure the presence of pain in the cervical region, this symptom was reported by 80% of the participants in the screening questionnaire. Silva and colsREF proposed to verify the effectiveness of the manual traction and pompage techniques of the trapezius, sternocleidomastoid, scalenes, and semi spinal muscles of the head in the rehabilitation of cervicalgia. The instruments used for the evaluation were the numerical pain scale and the NDI. The case study was composed of fifteen sessions, held twice a week and 50 minutes long. In the initial evaluation the patient presented pain grade 5 in the numeric pain scale and 11 points in the NDI. However, in the final evaluation the patient reported zero pain according to the numeric pain scale and 2 points in the NDI.[19]

Chung & Jeong[20] using the Neck Related Disability Index compared the effects of isometric neck exercise (control group) and craniocervical flexion exercise (experimental

group) in people with chronic nonspecific neck pain. The study had a sample size of 41 participants, divided into two groups, an experimental (n = 22) and a control (n = 19). After 8 weeks of intervention, both groups showed improvement in NDI, pain, and strength of the cervical flexor muscles.[20] In the present study there was also an improvement in pain and NDI scores.

Ojini and cols[21] found that only 4.6% of students with TTH who participated in their study sought medical attention, while the vast majority (68.2%) self-medicated with simple analgesics. Facing these findings and relating them to the risks of self-medication, we can see the need for the insertion of non-pharmacological treatments, such as physiotherapy.[21] In the present study, using manual therapy techniques, stretching and muscle strengthening exercises, there was a significant improvement in pain.

Even with the initial perspective of recruiting a larger sample number and taking all the methodological precautions, the study presents some limitations: the reduced sample number; the short period of application of the protocol; and the frequency of application of only once a week, make it impossible to generalize the results. These were also the probable reasons why we did not reach a better performance regarding muscle strength.

Conclusion

The association of manual therapy techniques, stretching and muscle strengthening exercises can be allies in the treatment of TTH. Because it is a non-drug treatment that is easy to apply, it offers the health system lower drug costs and promotes an increase in well-being, precisely because it reduces pain and increases functionality in people with TTH. It is essential that more scientific studies, with larger samples and longer follow-up periods, be carried out to more conclusively verify the long-term effects that this protocol can provide.

Author's contributions: LC, analysis and interpretation of data and review; NGL, study description, topic definition and data collection; MTQG, review and production.

Conflict of interesting
The authors declare no conflict of interest.

Financing
There was no participation of funding sources for this study.

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