ORIGINAL ARTICLE

Effects of manual therapy on cervicogenic headaches: a therapeutic approach

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ABSTRACT

The cervical spine is considered a possible source of headaches, however there are still some controversies regarding the pathophysiology, clinical presentation, and treatment. **Objective:** To propose a physical therapy treatment protocol with multimodal approach for cervicogenic headache and evaluate the effects of manual therapy on such patients. **Method:** This was an uncontrolled experimental study in which 9 patients from the UNIFESO Physical Therapy Clinic (Teresópolis, RJ) diagnosed with cervicogenic headache underwent 10 physiotherapy interventions with manual therapy techniques. The experimental protocol included joint techniques, fascial release, and muscle recruitment. The Neck Disability Index (NDI) and a visual analogic scale (VAS) were used as measurement tools and the pain pattern was recorded. **Results:** Of the nine selected patients, all were female and had an average age of 43.3 years (± 15.5). Significant differences were observed between the average intensity of pain (VAS) before treatment (8.0 ± 1.3) and after (2.2 ± 0.9, $p < 0.01$). The NDI also showed improvement after intervention 63.9% ($p < 0.01$). Regarding crises frequency, a decrease of 70% was observed after the intervention ($p < 0.01$) and a reduction was also shown in the duration of such crises before (4 hours ± 1.5) and after treatment (1 hour ± 0.5; $p < 0.01$). **Conclusion:** A multimodal approach by manual therapy techniques was beneficial in the reduction of the patients' symptoms and it provided a decrease in cervical disability.

Keywords: Headache Disorders, Combined Modality Therapy, Musculoskeletal Manipulations, Physical Therapy Modalities

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INTRODUCTION

The cervical spine is considered a possible source of headaches, however, there are still some controversies regarding its physio-pathogenesis, clinical presentation, and treatment.[1] Epidemiological studies estimate that approximately 95% of the population suffers or will suffer some cephalea episode during their lifetimes. In this context, the cervicogenic cephalea has a prevalence that varies from 0.4% to 15% among all different types of cephalea, with a predominance among the female gender.[2,3]

Caused by functional and/or organic conditions situated in the cervical region, the cervicogenic cephalea can be characterized by clinical signs and symptoms, such as: pain episodes with weight, tightness, burning, sometimes throbbing or sharp paroxysms in the occipital region and radiating to the temporal, frontal, ocular, or retro-auricular regions. It can be accompanied by craniofacial neurovegetative phenomena such as watery eyes, ocular erythema, palpebral edema, rhinorrhea, and dizziness.[4]

It is estimated that in 5% to 10% of the cases, cervicogenic cephalea is confused with the common migraine. Therefore, in order to have a correct diagnosis, the criteria already defined in the literature must be used, such as: pain usually unilateral, episodic, and with variable intensity; the origin is situated in the posterior part of the neck and may radiate to the entire head; there is resistance or limitation to the passive movement of the neck; tonus alterations in the musculature of the cervical region.[4] The cephaleas that are recurrent and unilateral, that is, that do not alternate sides, are usually described as stemming from morphofunctional alterations situated in the cervical region.[5]

Similar to migraine headaches, cervicogenic cephaleas can have complaints of nausea, vomiting, irritability, and photophobia. For the differential diagnosis, specific characteristics are evaluated, such as trigger zones, whether the crises are intensified by cervical movement or by postures maintained for long periods of time.[4,5]

Many therapeutic interventions can be used for this pathological condition and, among them, physiotherapy stands out as a constant approach to the control of symptoms. Although manipulative therapy is the treatment of choice by most physical therapists, clinical trials describing its effectiveness are scarce in the literature. The involvement of different regions and tissues related to this group of dysfunctions must stimulate the physical therapist's multimodal approach with manual techniques for the articular and myofascial components, local as much as adjacent.

OBJECTIVE

The objectives of this study were: to propose a physical therapy treatment protocol with a multimodal approach and to evaluate the effects of manual therapy on these patients.

METHOD

Delineation of the Study

This was an uncontrolled experimental study. The inclusion criteria were: patients of both genders, older than 18 years old, with symptoms of cervicogenic cephalea. The exclusion criteria included having had surgical procedures for the vertebral column; fractures of the spine; neoplastic processes; dysfunctions in the temporomandibular joint, and patients with any type of pulmonary alteration previously diagnosed.

Population of the Study

For a convenience sample, 85 patients were evaluated who presented complaints of cephalea, regardless of gender and age, referred from the physical therapy outpatient clinic for orthopedic trauma at the UNIFESO school-clinic - in Teresópolis, Rio de Janeiro state. Of those patients, only nine met the inclusion criteria and all the criteria to confirm the diagnosis of cervicogenic cephalea already described by Sjaastad.[6,7] The selection and allocation flow diagram of the patients for the proposed intervention is shown in Figure 1.

Ethical considerations

All the patients included in the study signed the free and informed consent form, after receiving detailed information about the study. The criteria of this study followed the ethical precepts established by resolution Nº 466/12 of the National Health Council and was approved by UNIFESO's CEP under the number 411-09.

Measuring instruments

For the evaluation and quantification of the results, the disability scale Neck Disability Index (NDI) was used, which is already validated in the Brazilian population and which proposes to quantify the disability index of the cervical region.[8,9] It is a scale that validates the pain intensity and the ability to perform daily life activities from the perspective of the patient. The categorization of the dysfunction degree of the patients is made according to the percentage of disability measured by the instrument on a scale from 0-100%. In addition, the visual analog scale for pain (VAS) was used; it records the pain intensity of the patient in a growing scale from zero to ten, in which zero is the minimum level of pain and ten, the maximum. The pain pattern of those individuals was also recorded by means of identifying the frequency of crises (in the space of a week) and their duration (in hours).

Procedures

Each patient included in this study was submitted to ten therapeutic interventions, with a weekly frequency of two to three sessions, according to the availability of the patient, that lasted approximately 40 minutes each. All the patients were evaluated by a physical therapist with clinical experience and trained in manual therapy and were subsequently treated by another physical therapist, also trained in the area. At the end of the treatment, a reevaluation was made by the same physical therapist who did the first evaluation.

The proposed protocol included the techniques described as follows:

- Manual Cervical Traction Technique, as described by Kisner & Colby.[10] This procedure was done three times, maintaining each traction for 30 seconds.
- Positional Release Therapy (PRT) at the sensitive points of the sub-occipital, levator scapulae, and sternocleidomastoid (SCM) muscles. It deals with the inhibition of sensitive points that present local pain (tender points) using pressure on these points and the passive maintenance of the muscle in question in a position of relaxation for 90 seconds.[11] The positioning for relaxation of such muscles was done as proposed by D`Ambrogio & Roth.[12]
- Articular mobilization in C2 and from T1 to T4. Rhythmical and passive oscillations in the posteroanterior direction were done, at a rate of one oscillation per second for 60 seconds. The positioning of the hands of the physical therapist and of the patient

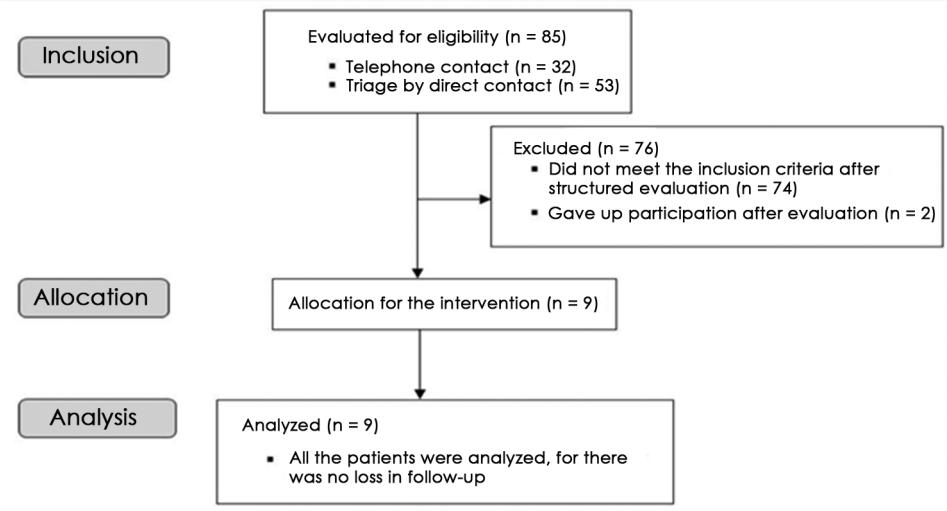

Figure 1. CONSORT flow diagram of the allocation of patients for the intervention

was done according to what is postulated by Maitland.[13] The pressure was applied to the limit of the arthrokinematics available between the articular surfaces in question and respecting the pain threshold of the patient.

- Recruitment of the deep cervical flexor muscles. A manual sphygmomanometer (Glicomed brand, Premium model) was placed under the central cervical region of the patient lying in the supine position and inflated at 20 mmHg. After that, the patient was oriented to flex the high cervical region until the sphygmomanometer indicators showed a maximum oscillation of 10 mmHg and higher. This exercise was done in three series of ten repetitions with isometry of ten seconds, with 30 seconds of interval between the series. The reproducibility and clinical applicability of this procedure have already been described by Jull et al.[14]

Statistical Analysis

The results are presented as average ± standard deviation and shown by graphs and tables. The statistical analysis was made with the SPSS 17.0 program, by which the descriptive variables of the population were calculated and compared to the averages of the results before and after the intervention. Due to the non-parametric distribution of the data, evidenced by the Shapiro-Wilk test, the Wilcoxon test was done for the comparisons between the averages. The correlations between the variables observed were calculated by the Spearman coefficient. The significance index assumed was $p < 0.05$.

RESULTS

The nine patients who received interventions concluded the entire treatment and there were no unexpected events during the program. All the patients were females with an average age of 43.3 years (± 15.5). These were individuals diagnosed on average for 4.7 years (± 2.3) and all of them presented cervical pain at the moment of evaluation, with presentation of outbreak and remission for 7.2 years (± 3.4). The treatment program proposed took approximately 4.7 weeks to be concluded, since one patient took 3.5 weeks to conclude, another took four weeks, and the remaining patients took five weeks to conclude.

The differences between the averages of the results before and after treatment proved to be statistically significant for the main variables measured. When analyzing the pain pattern, a difference between the intensity averages of pain (VAS) was observed before the treatment (8.0 ± 1.3) and after the treatment (2.2 ± 0.9; $p = 0.007$). The total values of this variable can be seen in Figure 2.

Their cervical disability also showed improvement after the intervention. The results of the averages found in the population for the NDI before the proposed intervention (19.7 ± 5.1) and after (7.1 ± 3.8) were also significant ($p = 0.008$). In this way, although the averages for the degree of disability before and after the intervention have remained in the light category, there was a significant reduction from 19.7% to 7.1% among the patients who participated in the study in question. The information can be seen in Figure 3.

In relation to the frequency of the weekly crises, the average before the treatment was approximately 4 (± 1) and after the intervention, it was only 1 (± 1); $p < 0.01$. In the same way, there was also a reduction in the duration in hours before (4 hours ± 1.5) and after (1 hour ± 0.5); $p < 0.01$) the proposed intervention.

The values for the average variations of the main variables measured are shown in Table 1. No statistically significant correlations were found between the intrinsic variables of each individual (age and gender) and those inherent to the symptom presentation (VAS, cervical disability, frequency, and the duration of the crises) (Table 1).

DISCUSSION

The findings of the present study point out the improvement in the pain of these patients as well as their neck disability index after the therapeutic intervention. Although the average neck disability degree even before the intervention was low, there was still a significant reduction of these values. These findings corroborate literature data, which in general show low to moderate disability for this parameter and also report good results with manual therapy techniques.[15,16]

Physiotherapeutic interventions in the diverse neuromusculoskeletal dysfunctions tend to follow multimodal approaches, with the utilization of diverse techniques in different regions and tissues. Reports of systematic reviews about multimodal interventions with combinations of manual techniques and exercises for the cervical region have shown good effectiveness.[17,18]

The symptomatic presentation of cervicogenic cephalea is directly related to alterations in mobility, postural deficits, and/or muscle weakness in the cervical region, which in turn demand articular manipulations/mobilizations and manipulation techniques for soft tissues, as well as postural re-education exercises.[15,18]

The physiotherapeutic intervention proposed in this study was based on techniques previously described. The multimodal treatments

Figure 2. Values of all the patients for the Visual Analog Scale for pain before and after the proposed intervention ($p < 0.01$)

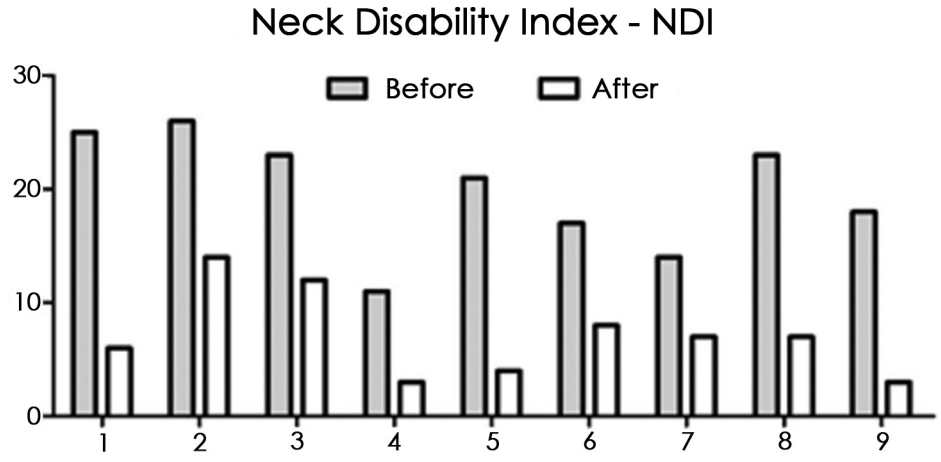

Figure 3. Values of the neck disability index before and after the proposed intervention ($p < 0.01$)

Table 1. Variables measured before and after the proposed intervention, with respective variations

Variable	Before Intervention#	After Intervention#	Improvement (%) Δ
VAS	8 ± 1.3	2.2 ± 0.9*	72.50
NDI	19.7 ± 5.1	7.1 ± 3.8*	63.9
Freq. of Crises	4 ± 1	1.2 ± 1*	10.0
Duration of Crisis¶	4 ± 1.5	1 ± 0.5*	75

VAS: Visual Analog Scale for pain; NDI: Neck Disability Index; Freq. of Crises: Frequency of crises per week; ¶ Results expressed in hours; # Results shown by averages and standard deviation; * Statistically significant values ($p < 0.01$)

specific to the cervical region, with or without cephalea, have also been encouraged in the literature. Miller et al. report in their systematic review that, although there are few studies in this area, the combined manual therapy techniques are superior to isolated conservative treatments regarding the patient's pain relief and disability.[16]

The articular approach through mobilization techniques makes it possible to reestablish the proper arthrokinematics and also provides neuromodulating effects for the relief of pain.[19] The positive results with the application of such techniques in the regions described by the present study suggests a relationship between hypomobility and consequent involvement of these articulations in the cervicogenic cephalea.[20,21]

The effects expected with the soft tissue techniques are muscle relaxation and also a neuromodulation of pain through the stimulation of fascial mechanoreceptors.[19] The trigger point technique already has had its effectiveness confirmed in many regions and pathological conditions,[21,22] as well as in the region of the sternocleidomastoid to relieve the symptoms of cervicogenic cephalea and to improve the cervical function.[14,23]

It is also noteworthy that pain control via manual therapy techniques happens through neurophysiological stimuli and not simply due to mechanical reasons such as increases in the range of movement.[15,19] The articular and myofascial techniques seem to be more connected to the mechanoreceptor stimuli, suppressing the pain through the gate control mechanism, with a presynaptic inhibition in the dorsal root ganglia and also through the release of endogenous opioids. Both techniques seem to also produce an effect in the autonomous nervous system, since the mechanoreceptors have been found in visceral ligaments, dura-mater, and in the fascia.[15,19,23]

Motor control exercises for the high cervical region allow a better movement pattern for this region, with less biomechanical overload in the atlantoaxial articulations and consequent reduction of tissue irritability in the adjacent soft tissues and also in the major occipital nerve, which is possibly compromised in these dysfunctions.[14,18] The correction of the movement pattern with proprioceptive improvement for proper muscle recruitment also allows for a cortical neuroplasticity that may increase the cerebral activity of the movement recognition areas and decrease the pain interpretation and production areas.[24]

The medication treatments of cervicogenic cephalea still appear inconsistent and the pharmacological strategies for this type of cephalea are still weak and show less efficacy when compared to other types.[15,25] In this way, the multimodal physiotherapeutic treatment, with its diverse manual therapy techniques and exercises, has been more and more indicated due to its high effectiveness, as reported by Chaibi & Russel.[26]

Although the results of the applicability of the proposed techniques are positive, possible limitations can be observed in the present study. The fact that the study was made without the presence of a control group to compare the results should be highlighted. However, it is important to point out that the proposal did not seek to compare the techniques used, but only to demonstrate the effectiveness of combining these methods in the treatment of the cervicogenic cephalea symptoms.[15,17,18,27]

CONCLUSION

The results of the study show that the proposed method of the interaction of manual therapy techniques as a physiotherapeutic intervention was effective in the treatment of cervicogenic cephalea symptoms. The improvement in the pain and in the neck disability index showed that this treatment proposal could be a relevant component in dealing with this pathology.

REFERENCES

1. Vincent MB. Cervicogenic headache: clinical aspects. Clin Exp Rheumatol. 2000;18(2 Suppl 19):S7-10.
2. Silva Júnior AA, Moraes DN, Rezende FB, Pereira GL, Morato EG, Cunninghan MCQS, et al. Frequência dos tipos de cefaleias atendidos no pronto atendimento do Hospital das Clínicas da Universidade Federal de Minas Gerais. Migrâneas Cefaleias. 2008;11(2):67-72.
3. Rachid RM, Pinheiro LTM. A terapia osteopática manipulativa na cefaléia cervicogênica. RBPS. 2009;22(2):128-34.
4. Bono G, Antonaci F, Dario A, Clerici AM, Ghirmai S, Nappi G. Unilateral headaches and their relationship with cervicogenic headache. Clin Exp Rheumatol. 2000;18(2 Suppl 19):S11-5.
5. Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Headache Classification Committee of the International Headache Society. Cephalalgia. 1988;8 Suppl 7:1-96.
6. Sjaastad O, Fredriksen TA, Pfaffenrath V. Cervicogenic headache: diagnostic criteria. Headache. 1990;30(11):725-6. DOI: http://dx.doi.org/10.1111/j.1526-4610.1990.hed3011725.x
7. Sjaastad O, Fredriksen TA, Pfaffenrath V. Cervicogenic headache: diagnostic criteria. The Cervicogenic Headache International Study Group. Headache. 1998;38(6):442-5. DOI: http://dx.doi.org/10.1046/j.1526-4610.1998.3806442.x
8. Cleland JA, Fritz JM, Whitman JM, Palmer JA. The reliability and construct validity of the Neck Disability Index and patient specific functional scale in patients with cervical radiculopathy. Spine (Phila Pa 1976). 2006;31(5):598-602. DOI: http://dx.doi.org/10.1097/01.brs.0000201241.90914.22
9. Cook C, Richardson JK, Braga L, Menezes A, Soler X, Kume P, et al. Cross-cultural adaptation and validation of the Brazilian Portuguese version of the Neck Disability Index and Neck Pain and Disability Scale. Spine (Phila Pa 1976). 2006;31(14):1621-7. DOI: http://dx.doi.org/10.1097/01.brs.0000221989.53069.16
10. Kisner C, Colby LA. Exercícios terapêuticos: fundamentos e técnicas. 4 ed. São Paulo: Manole; 2005.
11. Chaitow L. Técnicas avanzadas para tejido blando-técnicas de liberación posicional. 3 ed. Madrid: Elsevier; 2009.
12. D´ambrogio KJ, Roth GB. Terapia de liberação posicional. São Paulo: Manole; 2001.
13. Maitland GD, Hengeveld E, Banks K, English K. Manipulação vertebral de Maitland. 6 ed. Rio de Janeiro: MEDSI; 2003.
14. Jull GA, O'Leary SP, Falla DL. Clinical assessment of the deep cervical flexor muscles: the craniocervical flexion test. J Manipulative Physiol Ther. 2008;31(7):525-33. DOI: http://dx.doi.org/10.1016/j.jmpt.2008.08.003
15. Knackstedt H, Bansevicius D, Aaseth K, Grande RB, Lundqvist C, Russell MB. Cervicogenic headache in the general population: the Akershus study of chronic headache. Cephalalgia. 2010;30(12):1468-76. DOI: http://dx.doi.org/10.1177/0333102410368442
16. Miller J, Gross A, D'Sylva J, Burnie SJ, Goldsmith CH, Graham N, et al. Manual therapy and exercise for neck pain: a systematic review. Man Ther. 2010;15(4):334-54. DOI: http://dx.doi.org/10.1016/j.math.2010.02.007
17. Gross AR, Hoving JL, Haines TA, Goldsmith CH, Kay T, Aker P, et al. A Cochrane review of manipulation and mobilization for mechanical neck disorders. Spine (Phila Pa 1976). 2004;29(14):1541-8. DOI: http://dx.doi.org/10.1097/01.BRS.0000131218.35875.ED
18. van Duijn J, van Duijn AJ, Nitsch W. Orthopaedic manual physical therapy including thrust manipulation and exercise in the management of a patient with cervicogenic headache: a case report. J Man Manip Ther. 2007;15(1):10-24. DOI: http://dx.doi.org/10.1179/106698107791090114
19. Nogueira LAC. Neurofisiologia da terapia manual. Fisioter Brasil. 2008; 9(6):414:21.
20. Jull G, Amiri M, Bullock-Saxton J, Darnell R, Lander C. Cervical musculoskeletal impairment in frequent intermittent headache. Part 1: Subjects with single headaches. Cephalalgia. 2007;27(7):793-802. DOI: http://dx.doi.org/10.1111/j.1468-2982.2007.01345.x
21. Rudolfsson T, Björklund M, Djupsjöbacka M. Range of motion in the upper and lower cervical spine in people with chronic neck pain. Man Ther. 2012;17(1):53-9. DOI: http://dx.doi.org/10.1016/j.math.2011.08.007
22. Fryer G, Hodgson L. The effect of manual pressure release on myofascial trigger points in the upper trapezius muscle. J Bodyw Mov Ther. 2005;9(4):248-55. DOI: http://dx.doi.org/10.1016/j.jbmt.2005.02.002
23. Bodes-Pardo G, Pecos-Martín D, Gallego-Izquierdo T, Salom-Moreno J, Fernández-de-Las-Peñas C, Ortega-Santiago R. Manual treatment for cervicogenic headache and active trigger point in the sternocleidomastoid muscle: a pilot randomized clinical trial. J Manipulative Physiol Ther. 2013;36(7):403-11. DOI: http://dx.doi.org/10.1016/j.jmpt.2013.05.022
24. Wand BM, Keeves J, Bourgoin C, George PJ, Smith AJ, O'Connell NE, et al. Mislocalization of sensory information in people with chronic low back pain: a preliminary investigation. Clin J Pain. 2013;29(8):737-43. DOI: http://dx.doi.org/10.1097/AJP.0b013e318274b320
25. Lin YC, Lai CH, Chang WH, Tu LW, Lin JC, Chou SW. Immediate effects of ischemic compression on neck function in patients with cervicogenic cephalic syndrome. J Manipulative Physiol Ther. 2012;35(4):301-7. DOI: http://dx.doi.org/10.1016/j.jmpt.2012.04.009
26. Grande RB, Aaseth K, Benth JŠ, Lundqvist C, Russell MB. Reduction in medication-overuse headache after short information. The Akershus study of chronic headache. Eur J Neurol. 2011;18(1):129-37. DOI: http://dx.doi.org/10.1111/j.1468-1331.2010.03094.x
27. Chaibi A, Russell MB. Manual therapies for cervicogenic headache: a systematic review. J Headache Pain. 2012;13(5):351-9. DOI: http://dx.doi.org/10.1007/s10194-012-0436-7