

EFFECTS OF MANUAL THERAPY AND EXERCISES APPLIED TO THE CERVICAL SPINE IN HEAD POSTURE AND SYMPTOMS OF SUBJECTS WITH TEMPOROMANDIBULAR DYSFUNCTION (TMD)

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SUMMARY

Due to the biomechanical influence that cervical posture exerts on temporomandibular joint as well as to the connection between the innervation of these regions, the objective of this study was to investigate the effect of manual therapy, focused on the neck, in the cervical posture, mouth opening, and pain among temporomandibular disorders patients. Using computerized photogrammetry, measurements of mouth opening and a pain scale, we observed that the posture did not change but there was an improvement in both pain and mouth opening.

INTRODUCTION

Studies show that postural changes of the head and neck caused by muscle tension can influence the positioning of the jaw. If the head is forwarded there is a combination of flexion of the upper thoracic and lower cervical spine and hyperextension of the upper cervical spine. This posture increases passive tension of the infrahyoid muscles, creating an inferior and posterior traction on the hyoid. This tension is transferred to the jaw through the suprahyoid muscles, pulling the jaw in the posterior and inferior direction - a condition usually associated with pain [1]. This altered position of the jaw causes condylar displacement, compressing the retrodiskal tissues and provoking protective muscle spasm, especially in the lateral pterygoid muscle [2]. In addition, there is a neuroanatomical relationship between the head and neck that can be explained by the convergence of nociceptive neurons that receive trigeminal and cervical sensory inputs [3]. The topographic arrangement of trigeminal caudal nucleus allows information exchange between nociceptive trigeminal and spinal nerves. Thus, the stimulus of structures innervated by the trigeminal nerve causes painful sensation on the neck and vice versa [4].

Therefore, the objective of this study was to investigate the effect of a program of manual therapy and exercises focused on the rehabilitation of cervical function in pain, mouth opening and in the position of the head in subjects with temporomandibular disorder (TMD).

METHODS

A clinical trial A-B with an intervention protocol based on joint mobilization techniques on the neck and exercises for stabilization, according to the protocol proposed by La Touche [3] was conducted. Twelve women were recruited in a non-probabilistic way, with mean age of 22.08 ± 2.23 years.

They were diagnosed for myofascial TMD, either pure (n=2) or mixed - combining myogenic with arthrogenic (n=7) or discogenic (n=3). The RDC/TMD (Research Diagnostic Criteria for Temporomandibular Disorders [5]) was applied for the diagnosis. The subjects were evaluated before starting the treatment, which was applied during 5 weeks (twice a week). The maximum interval between the last session and the second evaluation was 5 days. Manual therapy was based on upper cervical flexion mobilization (applied for 10 minutes), C5 central posterior-anterior mobilization (applied during 9 minutes), and craniocervical flexor stabilization exercise (10 times holding 10 seconds the flexing position graded through feedback from a pressure biofeedback device - Stabilizer; Chattanooga Group Inc., Chattanooga, TN, USA). The pain was evaluated through the scale from the RDC/TMD - a line scored from 0 to 10, where 0 represents no pain and 10 the worst pain experienced by the subject. The maximum mouth opening (pain free) was measured using a caliper. The head posture assessed through computerized photogrammetry, with emphasis on the craniocervical segment. The photographic records were obtained from a digital camera (Sony Cyber-shot DSC-H55, 14.1 MP), positioned 3.5 m from the subject, allowing the recording of the face and upper trunk in the sagittal plane (right and left views). The subject was kept standing, looking forward in a relaxed posture. Spherical markers were placed on the following anatomical landmarks: spinous process of C7, tragus of the left and right ears [6]. The photographs were analyzed using Corel Draw software - the craniocervical angle (CVA), that is the angle between the horizontal line passing through C7 and a line extending from the tragus of the ear to C7 (Figure 1) was obtained. The literature [7] reports high reliability of this procedure (ICC = 0.88).

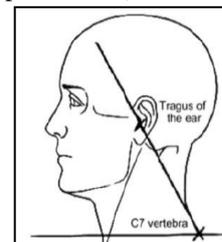


Figure 1. References for measuring craniocervical angle [6].

The normality of the distribution was evaluated using the Shapiro Wilk test. Parametric data with normal distribution was compared using the t-Student test for paired samples, whereas the Wilcoxon test was applied to compare non-parametric data. The alpha level was set at 5%.

RESULTS AND DISCUSSION

Table 1 shows descriptive (mean and standard deviation values) and statistical results.

Table 1. Mean and standard deviation (SD) values for the variables assessed. Statistical results are also presented.

Variables	Pre-test mean (SD)	Post-test mean (SD)	p-value
Pain scale (0-10)	2.3 (1.61)	1.38 (0.99)	0.017
Mouth opening (mm)	30.69 (8.80)	35.92 (8.82)	0.008
Right CVA (degree)	15.63 (2.05)	15.73 (2.25)	0.196
Left CVA (degree)	18.01 (3.19)	16.64 (2.19)	0.131

CVA = craniovertebral angle.

The subjects presented a significantly decrease in pain and increase in mouth opening after the intervention. Even though we have not applied the most used tools to pain assessment, the results were positive and the scale was sensitive to detect variation in pain. In general, studies use the Visual Analogue Scale (VAS) [3,8] and the results reported in the literature are consistent with the results of the present study. The mechanism of pain reduction has not been fully elucidated. It has been proposed that the effects occur by the activation of the descending inhibitory path in the trigeminal region [9], stimulated by the cervical spine. It decreases the pain in the trigeminal innervation area.

The increase in mouth opening had an average of 5 mm (17% of the initial range). It might be probably related to the decrease in pain. These data are consistent with the literature considering that studies dedicating to the application of manual therapy on the cervical spine have also reported increased range of mouth opening. Masilla-Ferragut and co-workers [10] used manipulative techniques directed to the upper cervical region in myogenic TMD patients. They reported significant improvement in mouth opening immediately after the intervention. La Touche et al. [3] found significant difference in pain threshold pressure on masseter and temporal muscles between pre-test and post-test, after applying a cervical-based manual therapy protocol. Thus, we might think that the treatment based on manual therapy focusing on the neck can bring benefits to TMD patients since TMD pain during opening is one of their main complaints. Moreover, acting directly on the neck may be advantageous for these patients, since they have an increased sensitivity in the adjacent structures of the temporomandibular joint (TMJ).

No difference was observed in the CVA data. The intervention was not effective to improve cervical posture. Therefore, we believe that the improvement in pain was related to the inhibition of painful stimuli through the trigeminal nucleus than actually to changes in head position. This study is a pilot study. For this reason the sample size was reduced no control or sham group was evaluated. Another limitation is the heterogeneity of the sample regarding the TMD genesis. Moreover, subjects had no

severe functional limitation, which may limit the effect of the proposed therapy.

CONCLUSIONS

Manual therapy applied on the cervical region and stabilization exercises can improve clinical condition of TMD patients by decreasing pain and increasing mouth opening. No change in the head position was observed after the treatment. The relationship between cervical spine and TMJ has to be investigated by high quality studies in order to rise up strong evidences to support the clinical rehabilitation of TMD patients.

REFERENCES

1. Andrade, A. V., Gomes P. F., Teixeira-Salmela L. F. Cervical spine alignment and hyoid bone positioning with temporomandibular disorders. *Journal of Oral Rehabilitation*, **2007**; **34**; 767-772.
2. Neumann, D. A., *Cinesiologia do aparelho musculoesquelético: fundamentos para reabilitação física*. Editora Guanabara; Rio de Janeiro, Brasil, **345-71. 2006**.
3. La Touche R., Fernández-de-Las-Peñas C., Fernández-Carnero J., Escalante K., Ângulo-Díaz-Parreño S., Paris-Aleman A., Cleland J. A. The effects of manual therapy and exercise directed at the cervical spine on pain and pressure pain sensitivity in patients with myofascial temporomandibular disorders. *Journal of Oral Rehabilitation*, **2009**; **36**; 644-652.
4. Bartsch T, Goadsby PJ. Increased responses in trigeminocervical nociceptive neurons to cervical input after stimulation of the dura mater. *Brain*. **2003**;**126**:1801–1813.
5. Dworkin SF, Friction JR, Hollender L, Huggins KH, LeResche L, Lund J, Mohl N, Ohrbach R, Palla SF, Sommers EE, Stohler C, Truelove EL, Von Kroff M and Widmer CG. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. *J. Craniomandib. Disorders Facial Pain Oral Pain*, **1992**, **6**:302-355.
6. Fernández-de-las-Peñas C, Alonso-Blanco C, Cuadrado ML, Gerwin RD, Pareja JA. Myofascial trigger points in the suboccipital muscles and forward head posture in chronic tension type headache. *Headache*. **2006**;**46**:454-460.
7. Raine S, Twomey LT. Head and shoulder posture variations in 160 asymptomatic women and men. *Arch Phys Med Rehabil*. **1997**;**78**:1215-1223.
8. Craane B, Dijkstra P.U, Stappaerts K. De Laat A: Randomized controlled trial on physical therapy for TMJ closed lock. *Journal of Dental Research*. **2012**, **91**(4):364-369.
9. Wright A. Pain-relieving effects of cervical manual therapy. In: Grant R, ed. Physical therapy of the cervical and thoracic spine. New York: Churchill-Livingstone; **2002**:217–238.
10. Mansilla-Ferragut P, Fernandez-de-las Peñas C, Albuquerque-Sendín F, Cleland JÁ, Boscá-Gandía JJ. Immediate effects of atlanto-occipital joint manipulation on a active mouth opening and pressure pain sensitivity in womem with mechanical neck pain. *Journal of manipulative and physiological therapeutics*. **2009**;**2**: 102-105.