ORIGINAL ARTICLE

Clinical study on head and jaw position of patients with muscle temporomandibular disorder

Estudo clínico da posição da cabeça e mandíbula em pacientes com disfunção temporomandibular muscular

Daisilene Baena Castillo[1], Flaviane Keiko Azato[1], Tulio Kalife Coelho[1], Paulo Zarate Pereira[1], Marcela Galdina Silva[2]

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ABSTRACT

BACKGROUND AND OBJECTIVES: Temporomandibular disorder is a collective term encompassing a wide range of clinical orofacial joint and muscle problems. The stomatognatic system is part of the postural system, so changes in one system may interfere with the other. This study aimed at observing whether there is change in jaw and head position before and after temporomandibular disorder treatment.

METHODS: Participated in the study 16 volunteers, aged above 18 years, of both genders, who looked for assistance in the dentistry course clinic of a Public University, with diagnosis of temporomandibular disorder according to Diagnostic Criteria for Temporomandibular Disorder Research. Volunteers were submitted to X-rays (teleradiography with analysis of cephalometric points); posture in physiologic centric relation was evaluated by computerized photogrammetry and pain intensity was evaluated by the visual analog scale from zero to 10. Patients were evaluated before and after 8 weeks of treatment.

RESULTS: Pain has decreased from 6.43±2.84 to 2.17±2.39, before and after treatment, respectively ($p<0.05$). Vertical head alignment, in initial angle, has changed from 21.84^0±17.49^0 to 11.38^0±14.61^0 ($p<0.05$). Jaw position has changed from A-NB (angle indicating mandible-jaw relationship in the anterior posterior direction): 4.95±2.52 millimeters to A-NB: 4.64±2.52 mm ($p<0.05$).

CONCLUSION: Muscle temporomandibular disorder changes vertical head alignment and interferes with jaw position.

Keywords: Cephalometry, Photogrammetry, Posture, Temporomandibular joint.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A disfunção temporomandibular é um termo coletivo que abrange um largo espectro de problemas clínicos da articulação e dos músculos na área orofacial. O sistema estomatognático integra o sistema postural, assim sendo, alterações que ocorrem em um sistema podem interferir no funcionamento do outro. O objetivo deste estudo foi verificar se há alteração da posição da mandíbula e da cabeça antes e após o tratamento da disfunção temporomandibular.

MÉTODOS: Foram selecionados 16 voluntários, com idade acima de 18 anos, de ambos os gêneros, que buscaram tratamento na clínica do curso de odontologia de Instituição Pública de Ensino Superior, com diagnóstico de disfunção temporomandibular de acordo com os Critérios de Diagnóstico para Pesquisa das Desordens Temporomandibulares. Realizaram-se tomadas radiográficas (telerradiografia com análise de pontos cefalométricos); a avaliação postural, em relação cêntrica fisiológica, foi verificada por meio da fotogrametria computadorizada e a intensidade da dor foi avaliada pela escala analógica visual com pontuação de zero a 10. Os pacientes foram avaliados antes e após 8 semanas de tratamento.

RESULTADOS: A percepção à dor diminuiu de 6,43±2,84 para 2,17±2,39, antes e após tratamento, respectivamente ($p<0,05$). O alinhamento vertical da cabeça, no ângulo inicial, mudou de $21,84^0$±$17,49^0$ para $11,38^0$±$14,61^0$ ($p<0,05$). A posição da mandíbula mudou de A-NB (ângulo que indica a relação maxila-mandíbula no sentido anteroposterior): 4,95±2,52 milímetros para A-NB: 4,64±2,52 mm ($p<0,05$).

CONCLUSÃO: A disfunção temporomandibular muscular promove alteração do alinhamento vertical da cabeça e interfere na posição da mandíbula.

Descritores: Articulação temporomandibular, Cefalometria, Fotogrametria, Postura.

INTRODUCTION

Temporomandibular disorder (TMD) is a collective term involving a large spectrum of clinical orofacial joint and muscles problems. These disorders are primarily characterized by pain, joint noises and irregular or limited mandible function[1].

Orofacial pain is multifactorial since factors triggering such disorders may be physical, psychological, traumatic, pathologic or functional, such as parafunctions, bruxism and

1. Universidade Federal de Mato Grosso do Sul, Faculdade de Odontologia, Campo Grande MS, Brasil.
2. Centro Universitário Anhanguera de Campo Grande, Graduanda do Curso de Fisioterapia, Campo Grande, MS, Brasil.

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Correspondence to:
Av. Costa e Silva, s/n - Bairro Universitário
Faculdade de Odontologia
79070-900 Campo Grande, MS, Brasil.
E-mail: flavianeazato@bol.com.br

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clenching (act of maintaining unnecessary occluded teeth). Change in head posture is also pointed as a possible causal factor[2,3]. Forward head posture has been suggested as a factor interrelated with TMD[4,5], however it is not clear whether it is cause or effect.

Myofascial TMD pain is classified as a regional painful condition characterized by firm and hypersensitive muscle tissue bands, known as trigger points[6]. Although this disorder has not been totally understood, some factors, such as continuous deep painful stimulation source, increased emotional stress levels, sleep disorders, parafunctional habits, abnormal posture and muscle tension may be related to myofascial pain.

By means of lateral face radiographies and A-NB angle analysis (angle indicating mandible-jaw relationship in the anterior posterior direction), it was observed that the position of the mandible in relation to the jaw may be altered by increased muscle activity[7].

Mandible is stabilized in the skull especially by muscles which also command opening, closing and laterality movements. When positioning it to posterior, it is possible that with contracture there is change in biomechanical balance favoring the development of myofascial trigger point. Still, depending on time, intensity and frequency, there is change in intra-articular structures with decreased intra-articular space, which may lead to disc displacement[8].

This study aimed at evaluating whether muscle TMD may promote forward head posture and take the mandible to a more posterior position.

METHODS

Sample was made up of 16 volunteers with major complaint of masticatory muscles pain.

Muscle pain was diagnosed during functional tests in patients with at least 20 teeth and was classified as muscle TMD by Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)[9]. Exclusion criteria were individuals with systemic diseases which could be mistaken for TMD (arthritis, fibromyalgia, sclerosis, inflammatory myopathy), those using or having used anti-inflammatory, anticonvulsant, antidepressant and psycothropic analgesic drugs in the six month previous to the study, those with history of facial or cervical trauma and those with Angle's occlusal relation Class III.

Evaluation of signs and symptoms

Clinical evaluation was performed according to RDC criteria[9], by a single researcher. In addition to palpation recommended by RDC for general evaluation of patients and their pain perception[10,11], measurements were taken with the visual analog scale (VAS)[12], when patients were asked to mark in a zero to 10 scale the point corresponding to pain intensity at that moment.

Posture analysis

After signs and symptoms evaluation and classification of patients in the muscle TMD group, posture was evaluated by photogrametry. Images were recorded by a 10 megapixels Nikon® digital camera, on a tripod, three meters away from volunteers in a previously assembled studio for this purpose. Evaluations were always carried out by the same evaluators. Ear tragus and acromion received polystyrene markers with 15mm diameter, for photographic recording, to evaluate vertical head angle (VHA) (Figure 1). After being transferred to a computer, images were analyzed by the posture evaluation software – SAPO®.

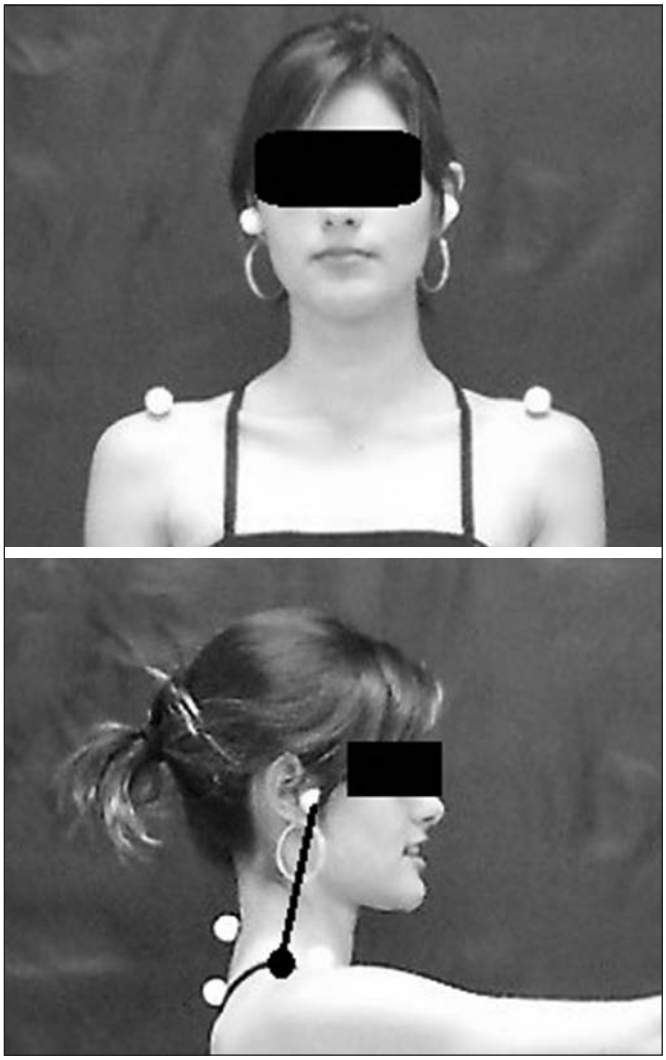

Figure 1. Records with markers using Styrofoam balls (polystyrene)

Cephalometric analysis

Profile teleradiography was performed after posture evaluation, aiming at having gauged radiographic images. Teleradiography was performed with patients duly positioned, that is with the mandible parallel to ground and stabilized tongue, to obtain centric occlusal relationship with the anterior splint and another without splint.

Cephalometric tracings aimed at evaluating mandible position changes with regard to jaw, before and after muscle TMD treatment. For such, we decided to check the distance between point A and line NB, for being bone structures with lower risk of changes, during treatment (Figure 2).

Figure 2. Illustration of measurement from point A to line NB

Digitized images were viewed in a 1366 x 768 pixels monitor, with real size gauging, in millimeters. Measurement was the distance between two ruler points of each teleradiography. For better interpreting anatomic points, lateral teleradiography real size was increased in up to three times.

Treatment

Realizada a avaliação postural, foi feita a análise do RDC no fluxograma e, foram selecionados os pacientes com DTM muscular.
After posture evaluation RDC was analyzed in the flowchart and muscle TMD patients were selected.

Proposed treatment was limited to reversible measures[13] with efficacy proven by improved TMD signs and symptoms. Protocol consisted of: 1) behavioral guidance to avoid hard food, not chewing gum, be aware of posture at sleep; 2) thermotherapy on the affected muscle with wet warm compress, three times a day, for 20 minutes; 3) local massage after compress with diclofenac diethylammonium, in circular and rake movements; 4) occlusal splint to be used at night.
After therapy explanation[14], volunteers have periodically returned for follow-up. In the eighth visit, patients were submitted to new posture and radiographic evaluation.

Statistical analysis

Student's *t* test was used for statistical analysis considering significant 5%, both for pain improvement and forward head posture evaluation, where VHA (vertical head angle) was reported in degrees (º), and the distance between line NB and point A was given in mm.
This study was approved by the Research Ethics Committee, UFMS (Opinion 161957).

RESULTS

After eight weeks of cognitive-behavioral therapy associated to anterior occlusal splint, pain intensity evaluated by VAS went from 6.43±2.84 to 2.17±2.39 (p<0.001) (Figure 3).

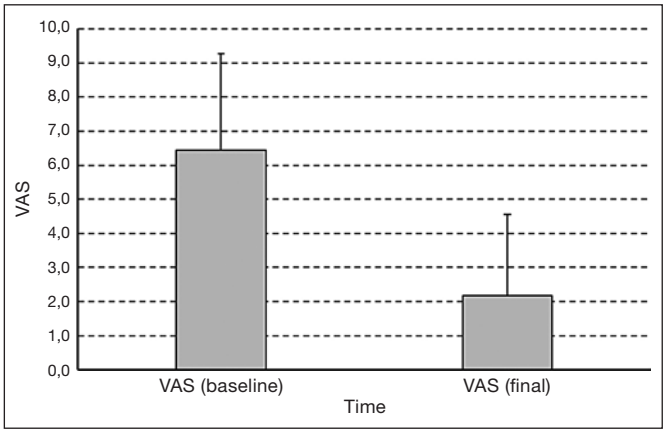

Figure 3. Visual analog scale at treatment beginning and completion
VAS = visual analog scale.

Possible change in forward head posture was evaluated by vertical alignment (forward posture) before and after therapy. Results with regard to baseline and final VHA, respectively, were 21.84º±17.49 and 11.38º±14.61 (p<0.05) (Figure 4).

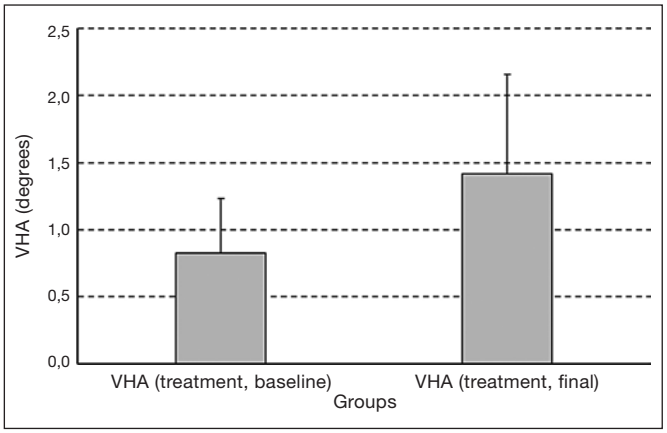

Figure 4. Measurement, in degrees, of forward head posture before and after temporomandibular disorder treatment
VHA = vertical head alignment

This result shows that there are significant differences between vertical head alignment in the treatment group before and after therapeutic intervention.
To check mandible position, the distance between cephalo-

metric point A and line resulting from the union of points N and B was calculated, before and after treatment. We decided to get also the image with occlusal splint since occlusal relationship could interfere with mandible positioning (Table 1).

Table 1. Mean ± standard deviation of mandible displacement in mm, of patients with temporomandibular disorder, with and without anterior occlusal splint at radiography time (n=27)

Occlusal splint	Yes	No
Before treatment	5.94±2.63[a]	4.95±2.52[a]
After treatment	5.48±2.50[b]	4.64±2.52[b]

Different letters in lines, intervariables (before and after treatment), indicate significant difference (p<0.05). Kolgomorov-Smirnov sample distribution test. Student't *t* test.

DISCUSSION

Most skull weight rests on anterior cervical spine region and on temporomandibular joints (TMJ), so, orthostatic position of the skull-cervical spine relationship is maintained by a complex muscle mechanism involving head, neck and shoulder muscles[3,16,17]. It is to be expected that masticatory muscles hyperactivity, in addition to generating pain and mouth opening limitation, promotes changes both in head and mandible position.

In our study, conservative therapies, that is, healthy behavioral habits, warm and wet compress, massages and anterior occlusal splint have significantly improved pain. The efficiency of self-management therapies, counseling, massage with diclofenac, use of occlusal splints associated to heat and compresses is found in the literature[14,18-20]. Manual therapy associated to self-care exercises at home has excellent short-term results[21,22].

A study[23] evaluating the result of treatment applied to patients with masticatory muscles pain has observed that cognitive-behavioral therapy is effective, however, when associated to total or anterior occlusal splint, pain relief is faster, in addition to being a conservative and low cost treatment[20]. Hard occlusal splints inhibit mandible neuromuscular activity[24], decreasing, during sleep, the number of muscle contracture events.

Our results have shown a significant change with regard to anterior head tilting. Vertical angle, at beginning of treatment was 21.84±17.49º; at treatment completion it was 11.38±14.61º. So, one may state that TMD actively participates in forward head posture. Other authors have also confirmed that the more severe is the TMD, the more pronounced is forward head posture[25,26].

When evaluating the postural tonic system[27], it is observed that mandible and tongue are connected to anterior head and neck muscle chain, and the hyoid bone plays an important role in the inter-relation of such structures; jaw, for being fixed in the skull, is related to posterior chains. So, masticatory muscles hyperactivity may lead to mandible changes since this is the only mobile bone of the skull, maintained in position by occlusal teeth relationship.

With results obtained before and after treatment, with significant pain improvement and increased tolerance to pressure, one may infer that there has been mandible position change. A previous study[28] has observed correlation between sagital mandible position and body posture at thoracic and cervical regions.

Pain may increase muscle tone resulting in forward head posture and mandible retraction. A study[29] has reported that in people with forward head posture, the condyle goes to a more posterior position with regard to natural head position. In our study, we tried to observe how much this movement represented in the anterior skull portion (distance between point A and line of points NB), and has observed difference in mandible position before and after treatment, respectively, of 4.95±2.52 mm and 4.64±2.52 mm. It is interesting to evaluate occlusal relationship, the observe whether there is need for occlusal adjustment (removing premature and deflective contacts), aiming at providing mandible orthopedic balance.

In light of these data, one may infer that a possible muscle tension due to TMD may change the whole rehabilitation planning, be it orthodontic or prosthetic, in adult patients. A planned rehabilitation with the mandible displaced from the ideal position may promote constant tension in cranial-cervical posture and may cause a postural problem with painful discomfort along the years if there is not a natural body reconditioning.

Our results are in line with other studies[3,30] which state that patient's posture should be balanced, that is, in the natural position when obtaining mandible-jaw relationship. This is a fact which should not be neglected when planning a rehabilitation program, due to inter-relations existing between cranial-cervical posture and the development and function of dental-facial structures.

Face to this close relationship between posture system and masticatory system, it was observed that multidisciplinary assistance, especially between dentists and physiotherapists, is first line indication for the success both of TMD treatment and of rehabilitator, because when starting such procedure, it is indicated that patients have their muscle tonicity balanced, so that records are real and treatment is effective and efficient.

CONCLUSION

TMD treatment promotes vertical head alignment change and interferes with mandible position, normalizing it.

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