Physiotherapeutic treatment for temporomandibular disorders (TMD)

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Abstracty
To a correct approach for TMD patient the physiotherapist must perform a diagnostic and anamnesis evaluation to make an effective therapeutic intervention. Literature presents some schemes, anamnesis indexes and standardized and validated questionnaires to evaluate TMD. Another important aspect is the biomechanical evaluation of the cervical spine alterations in TMD patients, due to the evidences of symptoms and biomechanical associations between cervical and masticatory systems. Manual therapy, therapeutical resources (like as ultra-sound, TENS) and postural re-education must be applied in a physical therapy treatment for TMD patients, but an appropriate intervention should be related not only to symptoms relief, but look for TMD´s etiology. In view of such considerations one of the most important approachs for TMD physical therapy treatment must be the modification of craniocervical biomechanics and its effects to posture as an etiologic or perpetuating TMD factor.

Key Words:
TMD, physiotherapeutic treatment, evaluation, therapeutic resources, craniocervical posture

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Definition of Temporomandibular Disorders (TMD)

Temporomandibular Disorders (TMD) is a collective term embracing all the problems relating to Temporomandibular joint (TMJ) and related musculoskeletal masticatory structures[1]. It refers to a cluster of disorders characterized by pain in the preauricular region, pain in TMJ, or the masticatory muscles, limitation or deviations in mandibular range of motion and noises in the TMJ during mandibular function[2].

Occlusal disharmony and interferences, emotional stress and hiperatictivity of the masticatory and neck muscles[3] could be considered as etiologic factors involving TMD. Joint overloads and flexion-extension (whiplash) injuries and repetitive loading of clenching and bruxism[1] also have a role in the development of TMD. Moreover, postural factors[4-6] could be consider as an etiologic factor, since studies regarding to patterns of mandibular, head and neck movements have been demonstrating biomechanical associations between temporomandibular and cervical spine systems[7].

Evaluation of TMD

Physical Therapy approach to the management of TMD must be necessarily based on a global and detailed evaluation since the successful management of the disease is directly related to the establishment of an accurate diagnosis and the knowledge of its etiology, consequently, a rational treatment plan can be formulated. Unfortunately, in the management of TMD there is still many obscure aspects to be clarified[8]. In this way, promissing therapeutic interventions in TMD must be directly related to a complete and elaborated anamnesis, to a rational and correct application of available therapeutic resources, as well as effectiveness intervention during the course of the disease.

A great number of schemes, questionnaires and indexes could be found in the literature to diagnostic and evaluation of TMD. Bevilaqua-Grossi et al.[9] have developed an evaluation form designed from TMD patients clinical data, gathering directly on the clinical practice relevant data to formulate a complete and accurate evaluation scheme for TMD patient. However, anamnesis indexes are more appropriate diagnostic tools to be administered in epidemiologic studies involving general population and it could provide important informations to select studied samples, as well as to classify and characterize TMD. Clinical and anamnesis Helkimo's indexes[10] have been usually applied in studies[11- 12] nowadays, despite of critiques to its design. Fonseca[13] attempted to the development of a brazilian anamesis index, and have obtained a strong correlation between his index and that proposed by Helkimo[10]. Craniomandibular index (CMI)[14] after critiques by Dworkin and LeResche[8] was redesigned and renamed Temporomandibular Index (TMI). TMI was reorganized and distributed into Functional, Muscular and Joint items, excluding cervical spine muscles evaluation since cervical muscle palpations may not be informative for the assessment of TMD severity.

The Research Diagnostic Criteria for TMD (RDC/TMD) was developed to address the concerns through classification of TMD subtypes within subjects. This Criteria developed by Dworkin and LeResche[8] provides clinical researchers with a standardized system that can be evaluated for its use in examining, diagnosing, and classifying the most common subtypes of TMD, considering that different studies have been using different instruments of evaluation and couldn't provide an interchangeable knowledge. Nevertheless, it hasn't been used in brazilian population studies yet, since it's a self-administer instrument and considering culture differences must be previously validated in portuguese language.

Associations between Temporomandibular Dysfunction and Craniocervical alterations

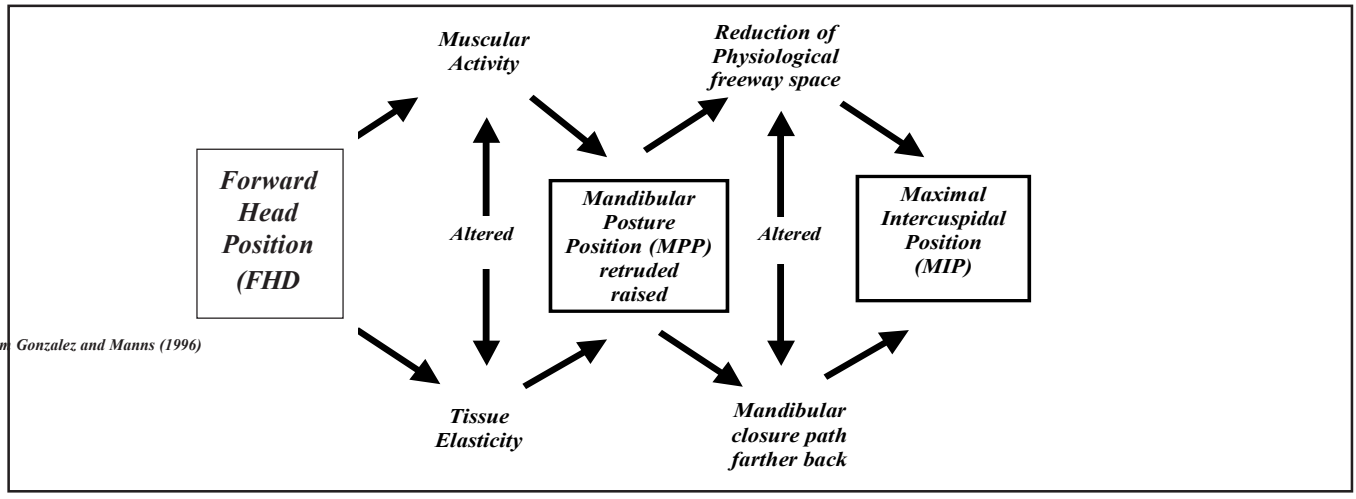
Cervical spine and related structures must be an integrate part of the physical therapy approach to TMD patient, taking into account that many studies have been demonstrating associations between cervical spine and masticatory systems signs and symptoms of alterations[4,7,15-16]. Craniomandibular system is an integral component of the upper quarter, which is basically composed of the head, neck and shoulder girdle. In this way TMJ, muscles, ligaments, fascial connections, as well as neural and circulatory innervations are all intimately related. Any dysfunction, occlusal disorder, postural abnormality or trauma of the upper quarter could likely lead to a problem at adjacent or related components. For that reason an evaluation of cervical spine must be carried out to TMD patients[17].

According to Gonzalez and Manns[5] the Forward Head Position (FHD) is characterized by an extension of the head together with the upper cervical spine (C_1 to C_3), accompanied by a flexion of the lower cervical spine (C_4 to C_7), whereby the cervical curvature is increased, a condition called hyperlordosis. However, it's commonly observed in TMD patients a hiperextension of the upper cervical and a straightening of the lower cervical[5].

The muscular activity resulting from craniocervical extension of the head produces an elevation and retrusion force that acts on the mandible, which results in decrease of the physiological free-way space of TMJ. On the other hand, the tissue elasticity, mainly represented by visco-elastic properties of the muscular and tendinous connective tissues, can also influence the mandibular postural position, when they're stretched as a result of FHD. Tension of the masticatory and suprahyoid muscles increases, which leads to a mandibular elevation and retrusion. Due to the decrease in free-way space of TMJ, movement represented by the path of mandibular closure now occurs farther backwards

than usual which makes the initial occlusal contacts locate farther back than the maximal intercuspidal position (MIP)[5] (Figure 1).

Solow and Tallgren[18] have proposed a method to evaluate craniocervical posture by the analyses of OPT angle (Odontoid Process Tangent) defined by a posterior line tangent to odontoid process through the second cervical vertebra in relation to true horizontal line, and the CVT angle (Cervical Vertebrae Tangent) represented by posterior tangent to the odontoid process through fourth cervical vertebra (Figure 2). The Forward Head Position could be assessed by the use of photography technique. Craniovertebral angle (CVA), between the true horizontal and a line drawn from de midpoint of the tragus of the ear to the skin overlying the tip of the spinous process of the seventh cervical vertebrae (Figure 3), can be obtained by sagittal photograph of the head and neck region. Johnson[19] compared the head posture obtained by cephalometric radiographs with photograph technique and demonstrated no strong correlation between the angles obtained by both methods. However, CVA is a estimative of complete cervical spine posture, since consider the position of the seventh cervical vertebra, while cephalometric angle (CVT and OPT) is only determined by the position of the second or the forth cervical vertebra. The weak correlation between techniques just confirm methodological differences and it suggests that craniocervical posture evaluation using cephalometric radiographs could provide an incomplete information about



Extracted from Gonzalez and Manns (1996)

Fig. 1. *Masticatory system functional alterations caused by Forward Head Position (FHD)*.

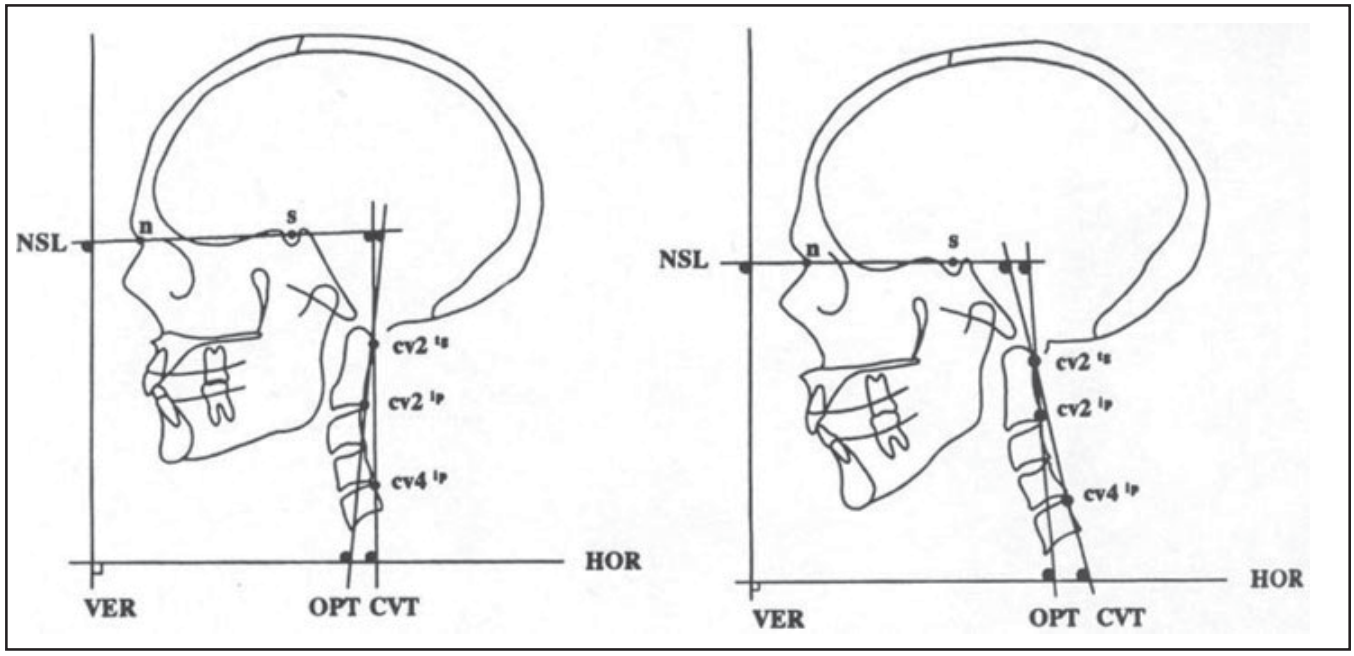


Fig.2. *Reference cephalometric points and lines according to Solow and Tallgren (1976) showing OPT and CVT angles differences between two subjects: one subject with normal craniocervical posture (A) and another with Forward Head Position (B).*

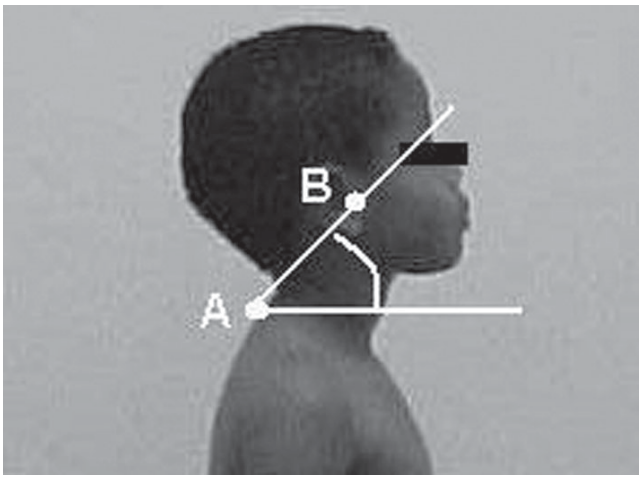


Fig. 3. *Measurement of Craniovertebral angle (CVA), between the true horizontal and a line drawn from the skin overlying the tip of the spinous processes of the seventh cervical vertebrae (A) and the mid-point of the tragus of the ear (B) in natural head position.*

craniocervical posture, mainly when it consider only the position of the upper cervical spine.

One of the few studies that proposed a method to evaluate all cervical spine posture was performed by Visscher et al.[20]. The authors proposed a new reference line to measure the antero-position of the head: the Cervical Posture Line (CPL). This line is determined by the position of the upper six cervical vertebras, but the seventh cervical vertebra wasn't included in the analysis, ever since the authors mentioned that it was often not completely visible because of overlap on the shoulder girdle (Figure 4).

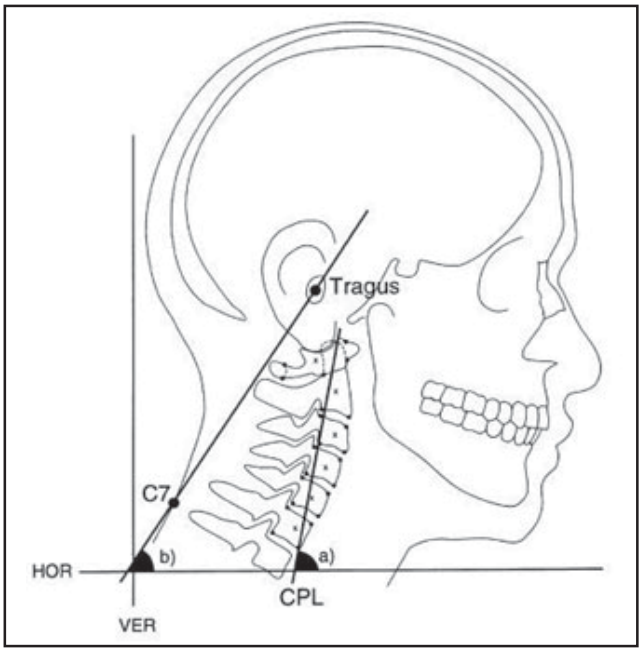


Fig. 4. *Schematic diagram of the Cervical Position Line (CPL), proposed by Visscher et al. (2002), its reference points (·) and the angle with the horizontal plane (a); and a schematic diagram of the line between the tragus of the ear and the tip of the seventh cervical spinous process (C7) and its angle with the horizontal (b). x = mathematical centre of a vertebra. (Extracted from Visscher et al. 2002)*

Quantitative methods have been applied in many studies to evaluate postural alterations in TMD patients. Huggare and Raustia[21] reported that after masticatory treatment TMD patients displayed an extended head posture, smaller size of the uppermost cervical vertebrae and a flattened cranial base as compared with age- and sex-matched healthy controls, showing that postural mandibular changes could lead to cervical spine alterations, even when its region wasn't the treatment focus. Lee et al.[6] analyzed the head posture of TMD patients compared with age- and gender-matched controls and verified a smaller CVA angle in TMD patients than in control subjects, suggesting that TMD patients have a more forward head position than non TMD patients.

Subjective evaluations have been used to evaluate associations between cervical spine and masticatory system. In a previous research Visscher et al.[4] reported that signs and symptoms of cervical spine alterations was significantly greater in both myogenous and/or arthrogenous TMD patient in relation to healthy controls. Pedroni et al.[16] used Fonseca[13] anamnesis index to evaluate TMD in university students and verified that more than 60% exhibited cervical spine straightened and forward shoulder position. Fink et al.[7] and Stiesch-Scholz et al.[15] also reported associations between internal TMJ derangement and cervical spine alterations. Despite of the evidence of correlations between cervical spine and TMD signs and symptoms there is a small number of studies that have established a correlation between these signs and symptoms and craniocervical posture alterations using quantitative methods in TMD patients. Thus, further studies using quantitative techniques to evaluate craniocervical posture are necessary to support the evidences of relationship between both systems.

Physiotherapeutic Treatment for Temporomandibular Dysfunction

Feine and Lund[22], in a literature review, reported that the majority of studies that compared patient groups submitted or not to physical therapy treatment, supported with basically methodological criteria (15 out of 16), active treatment groups was almost always better than no-treatment controls. Such findings demonstrated that patients do better when they're getting some form of physical therapy than when they are getting no treatment and mentioned that a great number of studies about the efficacy of TMD treatment modalities used validated measures of pain intensity as the primary outcome variable, but few evaluated quality of life. The authors conclude that future efficacy trials should be designed to determine whether management strategies that reliably affect ratings of symptoms also make a difference to quality of life and whether improvements out-last the period of therapy.

Physiotherapist has in hands a great number of therapeutic

resources for the treatment and control of the TMD[23]. Transcutaneous Electrical Nerve Stimulation (TENS) has been used widely in literature for the treatment of TMD[24-25]. Kamyszek et al.[26] had evaluated the effect of ULF-TENS (ultra low frequency TENS) in patients with resting masticatory muscle hyperactivity (2,0mv at rest) compared to controls without muscle hyperactivity and had observed that ULF-TENS has an activity-reducing effect on the resting EMG levels of both hyperactive and relaxed muscles of TMD patients.

To evaluate the efficacy of a Low-Level Laser therapy in patients with Temporomandibular Disorders (TMD), Conti[27] in a double-blind study administered the treatment to 10 myogenous and 10 arthrogenous TMD patients. Laser therapy was performed one time per week during 3 consecutive weeks using 830 nm Ga-Al-As Laser device with a energy power of 4 joules (Omnilase, Laserdyne PTY Ltd). The author reported a reduction of pain intensity in myogenous TMD patient and improvement of mandibular range of motion in arthrogenous TMD patients. However, placebo group also showed improvement in mandibular range of motion, suggesting placebo effect related to laser therapy treatment.

Gray et al.[28] reported that the application of ultrasound therapy (0,25W/cm; 2,3 MHz of frequency) in TMD patients, when compared to placebo group, resulted in relief of pain symptoms of 73,3% to treatment group and 19.2% to placebo group.

Eletrical Stimulation could be also used for TMD patient's treatment. In a recent study, Bevilaqua-Grossi et al.[29] used Neuromuscular Electrical Stimulation (NMES) to selective strength of the right masseter muscle in a patient with fracture of mandible left angle, after-immobilization, who has complained of pain on right TMJ and mandibular deviation to the right during mouth opening. After electrical-stimulation the authors observed increase of right masseter muscle activity and the mandibular deviation disappeared.

Manual therapy is one of the most important physical therapy resources for TMD patient's treatment. However, few studies had verified the effect of this therapeutic intervention. Martini et al.[30] have evidenced, using magnetic resonance image (MRI), the effectiveness of a repetitive manipulative technique for the treatment of TMD patients with disk displacement without reduction and mentioned that in 1500 treated cases, documented on videotape, only 5 cases required further surgical intervention.

Another physiotherapeutic possibility is the association between the therapeutic resources and the manual therapy. Burgess et al.[31] compared the effect of the cryotherapy, stretch to passive resistance exercises and non-treatment group in patients with TMD and found that pain measured with the McGill PRI scale was significantly less for the two treatment groups immediately after the first session, and treated patients also had significantly less pain than did the other two groups. Dao et al.[32] found evidence that the short-term effect of mandibular exercises (mastication) depends on the level of pre-treatment pain which was obtained with a checklist and on five-point category scales. According to the authors, pain tended to decrease during exercise (mastication) in those myogenous TMD subjects who had high initial pain levels, and to increase in subjects who had low initial pain. Such results suggested that two subgroups of myofascial pain patients may exist with opposite reactions to exercise and it remains to be seen if these reactions are due to two different pathologies or to the fact that the pre-exercise pain levels were significantly different in the two groups.

Posture training must be employed for TMD treatment, due to the evidences of relationship between TMD and craniocervical posture, as well as symptoms of cervical alterations. Therefore, in physical therapy approach for TMD patients, physiotherapist must consider craniocervical and scapular girdle biomechanical improvement. Nicolakis et al.[33] have administered a protocol based on passive mandibular movements, correction of the body posture and relaxation techniques in twenty TMD patients with previous TMJ disk displacement without reduction. It was observed immediately mouth opening increase and significant decrease of pain complaint after treatment and during follow-up.

Postural recommendations are important, but postural re-education could bring more effective benefits, as demonstrated by Wright et al.[34] who compared the effects of the postural re-education between two groups of TMD patients: one group received posture training and TMD self-management instructions while the control group received TMD self-management instructions only. Significant improvement was demonstrated by the modified symptom severity index, maximum pain-free opening, pressure pain threshold measurements, reduction of patients' perception of TMD and neck symptoms, as well as correlation between TMD symptoms improvement and head and shoulder posture modification. The authors conclude that posture training and TMD self-management instructions are significantly more effective than TMD self management instructions alone for TMD patients who have a primary muscle disorder.

Pain reduction and biomechanical conditions improvement of craniocervical and shoulder girdle posture must be the focus of physical therapy program predestined to TMD patient, due to associations between signs and symptoms of masticatory and craniocervical systems as reported in the literature. However, a physical therapy effective approach must be preceded by an anamnesis and diagnostic complete evaluation of masticatory and cervical spine regions.

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