Temporomandibular disorder and dysfunctional breathing

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Abstract
This article studied the relationship among respiratory, masticatory and cervical muscles and the factors that contribute for TMD. It consists in a review of studies approaching dysfunctional breathing and TMD, enclosing mouth breathing syndrome, anxiety, respiratory mechanics changes, diaphragmatic muscular dystonia and overuse of accessory inspiratory muscles. It also stresses the importance of breathing evaluation and the multiprofessional intervention in the TMD patients.

Key Words:
temporomandibular disorder, temporomandibular joint, breathing, respiratory muscles.

Introduction

The ventilatory function involves more than thoracic and abdominal movements and this should be understood as an integrated system, with muscular actions significantly affected in no-physiologic conditions. Hruska[1] studied the influence of breathing pattern in the rest mandibular position and the alignment craniocervical, demonstrating that alterations of body posture, upper thoracic breathing pattern and mouth breathing constitute causal factors for the overuse of the accessory inspiratory musculature, that generates hyperactivity and, consequently, alteration of head position, and mandibular traction.

The causes for the overuse of this musculature can be related to body posture, upper thoracic breathing pattern, mouth breathing and neuro-psychological stress.

In the present article, we will discuss each one of these topics and their relationship with Temporomandibular disorder (TMD), besides the relationship among the cervical, masticatory and respiratory muscles.

Cervical, Masticatory and Respiratory Muscles

The stomatognatic system muscles are part of the cervical muscular chain, being an integrant part of the postural system. The tongue and the jaw are integrated into the anterior muscular chain and the maxila is tied up to the posterior muscular chain. The hyoid bone is the pivot among the anterior and posterior muscular chains[2].

TMD occurs due to an unbalance between the extensor and flexor muscles of the head and the masticatory, supra and infrahyoid muscles (Fig.1).

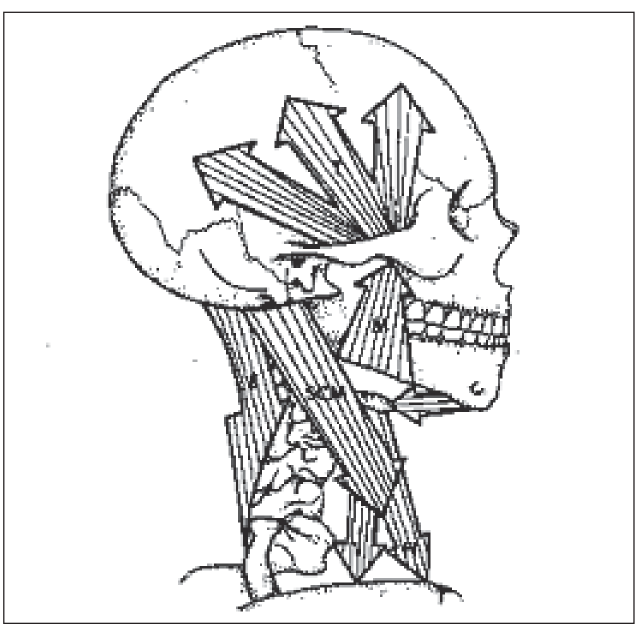

Fig. 1: *Muscular balance of head and neck. M, masseter muscle; E, neck extensors muscle; SCM, sternocleidomastoideus muscle; T, temporal muscle; IH, infrahyoid muscles. (From Friedman and Weisberg[3])*

The accessory inspiratory muscles, as integrants of the anterior cervical chain, are also linked with the stomatognatic system. The hyperactivity of the sternocleidomastoideus (SCM) muscle determines a posterior cranial rotation with mentum anteriorization, tension in the muscles supra and infra-hyoid, lowering of the tongue and posterior rotation of the jaw.

The relationship among the masticatory and cervical muscles has being studied, by means of electromyography. Boyd et al.[4] verified an increase of the masseter muscle activity and reduction of the temporal (anterior portion) muscle activity during flexion of the head and, the opposite during the extension. Zuniga et al.[5] demonstrated, that the sternocleidomastoid (SCM) and trapezius muscles became more actives with the occlusion in retrusive contact. The SCM muscle became inactive during the deep nasal inspiration in individuals with diaphragmatic breathing pattern and active during nasal and oral inspiration in individuals with thoracic breathing pattern[6]. The increased electric activity of the SCM muscle is considered the main decisive factor for head forward posturing, temporomandibular disorder and craniofacial pain.

The diaphragm, the most important inspiratory muscle, has its function dependent on its morphology, that is, dome-shaped, which position influences the thorax mechanics and the posture in the lumbar and cervical areas. Its cylindrical aspect, that opposes to the lower rib cage, constitutes the apposition zone. Accessory respiratory muscle overuse is also influenced by the diaphragm position and changes in the zone of apposition. When the zone apposition decreases due to reduction of the intra-abdominal pressure, there is an alteration of the anterior cervical muscles and fascia alignment as a result of the forward, outside and upward displacement of the anterior rib cage. This situation contributes to the development of the forward head posturing and posterior cranial rotation[1].

Dysfunctional Breathing Pattern

The respiratory dysfunctional mechanics, with excessive use of the breathing musculature accessory contributes to craniofacial pain. The decisive factors of this condition can be:

a)Tension/anxiety

The stress increases the neuro-muscular tonus and it tends to increase the shortening and the stiffness of the breathing muscles.

The thorax blocked in inspiratory position is a body attitude of nervous individuals, with emotional and organic instability[7-8]. This situation reduces the thorax and the diaphragm mobility.

In the oriental culture, the human being, due to breathing control, the individual has higher domain of the body, emotions and vital energy. In the western culture, breathing is responsible for the psyco-physical balance. The mouth and superficial breathing, as an anxiety symptom, is a controllable phenomenon in the psychomotor instability moments[9]. Emotional alterations can cause rapid breathing and reduction in the amplitude of diaphragmatic movement. The muscular tensions accumulated progressively block the diaphragmatic action, according to Campignion[8], because this is one of the first muscles affected by emotions, as melancholy, fear, anguish cholera. Only happiness can liberate it.

b) Upper thoracic breathing pattern (breathing effort increased)

The upper thoracic breathing pattern occurs due to an increased inspiratory effort, with higher activity of the SCM muscle, which produces a posterior cranial rotation. This change in head posturing intensifies the inspiratory effort, settling down a vicious cycle of dysfunctional breathing. Several authors have investigated the breathing pattern in the evaluation of TMD. It happens mainly due to the intense action of accessory inspiratory muscles. When the SCM muscle acts in inspiration, it stops exercising its primary function of flexor of the head, causing protrusion of this and decrease of the neck movements. There is also more energy waste with reduction of mechanical work, when exercising a secondary function[10].

The accessories inspiratory muscles are spinal, thoracic, neck and scapular. The spinal muscles (scalene, intercostal, superior and medium trapezius, minor pectoral, mayor pectoral) are anti-gravity tonic muscles. A length loss in these muscles modifies the position of the nape, shoulders and dorsal column and, in the same way, the incorrect posturing of cervical column, scapular waist and spine favors their stiffness and this promotes an inspiratory deficit[11].

The inspiratory pattern produces thoracic deformities, with elevation of the lower ribs due to diaphragm shortening. This pattern can be caused by biomechanical factors, as mouth breathing. Besides, the thoracic deformities cause breathing anxiety with use of the accessory breathing muscles, as described by Farah and Tanaka[12]. These authors reported a decreases thoracic expansibility in individuals with myofunctional oral changes, that can be related to the posterior chain, sternocleidomastoideus and scalene muscle shortening, including the breathing and the antero-medial of the hip muscles chains, due to cervico-thoracic-abdomino-pelvic fascia muscles commitment (Fig.2).

The SCM and scalene hypertonia " flattens " the cervical column and it pulls the mastoid processes forward, provoking the forward head with short nape, when the thorax is immobile. If the nape is immobile, The SCM and scalene contraction cause an elevation of the thorax[11].

The inspiratory chain retraction elevates the thorax. It hinders the thorax to relax through out and it limits the amplitude of the diaphragm movements.

There is also a direct relationship among facial musculature and clavicular breathing, because this breathing pattern provokes cervical contractions that dissipate to face, causing hypertonia of chewing muscles, muscle pain and alterations in temporomandibular joint function[13].

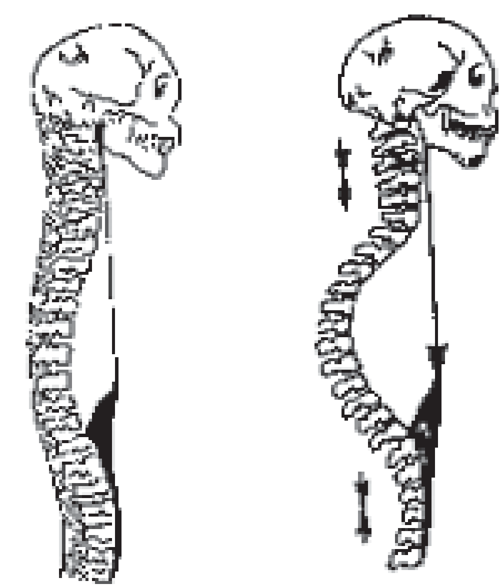

Fig. 2: *Diaphragm tendon shortening with diaphragmatic hyperlordosis, short nape and forward head (Souchard[11])*

c) Mouth Breathing Syndrome

The head extension, characteristic of mouth breathers, involves the jaw lowering and the tongue descent to the mouth floor, what is an ethyological factor of dental malloclusion due to superior maxillary compression.

Oral breathing is associated with anterior movement of the tongue and forward movement of the hyoid bone. The position of hyoid bone affects facial characteristics by means of neuromuscular compensations[14].

The nasopharynx changes causes posturing modifications in the tongue rest position in order to open the airway and to allow a normal breathing function. This, therefore, provokes dysfuntion in the associated actions as the mandibular position, swallowing and articulation proficiency. The hyoid bone controls tongue function, as its normal position is related to the cervical column, infra-hyoid muscles and scapular waist and their relationship with the airway permeability. The tongue interposition has as deformant effetct the overjet, frequently found in mouth breather children due to the decrease in the nasopharyngeal space[15].

Solow et al.[16] observed that the obstruction or narrowing of pharyngeal airway space were associated with larger cranium-cervical and cranium-vertical angle, which confirmed the strong relationship between the position of the head and the airway adaptation. The effects of the forward cephalic position for a long period are: alterations of proprioceptive pulses (with space disorientation, dizzyness, nauseas and vertigo) due to sternocleidomastoideus hyperactivity and shortening, which commits nervous structures, cephalic pain, occlusal alteration, more posterior dental contact, more compression of TMJ due to mandibular replacement, with consequent cranium-facial pain. It is concluded that TMD, as well as cephalic pain, dizzyness, vertigos, nistagmo and the swalowing difficulty, can have extrinsic origin in the system stomatognatic.

Sartor[17] described a sequence of biological events that starts with the nasal obstruction and produces cranium-cervical and mandibular physiological posture adaptations for easier breathing.

Ribeiro et al.[18] verified that mouth breathing children present higher electromyographic activity in the sternocleidomastoideus and trapezius muscles during nasal inspiration than nasal breathing children. The authors concluded that this hyperactivity is attributed to the highest resistance of the airway, which results in larger effort of the accessory muscles breathing.

Infections of the superior airways in asthmatic children, according to Chaves et al.[19], determine nasal obstruction with development of mouth breathing. Consequently, it establishes significant cranium-facial alterations. These authors evaluated the incidence of cranium-mandibular dysfunction (CMD) in 20 asthmatic children with mouth breathing, where all children presented CMD, 55% of children with severe dysfunction, 15% moderate and 30% light.

Respiratory Mechanics Evaluation

The symptoms related to changes in cranium-cervical biomechanics and maxillo-mandibular relationship, according to Rocabado[20], include: pain, alterations in dental occlusion, in postural relationship of head-neck, in the muscular and respiratory system and psychological factors. In the breathing aspect, the superior, short and insufficient costal breathing, that causes hyperactivity of sternocleidomastoideus muscle and occasional mouth breathing are referred in the symptomatology of TMD[20].

Voice modification, swallowing difficulty and breathing changes are referred by patients with disturbances in the anterior neck region. Therefore, Rocabado[20] recommends analysis of the hyoid system and airways as a factor of possible cranium-mandibular dysfunction due to posturing changes. He concluded that, after several clinical studies of DTM patients, the cranium-mandibular, cervical, hyoid region biomechanical relationship and airways are an indivisible unit. The two approaches (dentist and physical therapist) must be coordinated in order to normalize the biomechanical relationship of these structures.

Research Diagnostic Criteria (RDC) includes in the evaluation of TMD the question no. 20 (r): do " you breathe well "?[21]. Recent studies on TMD evaluated the ventilattory pattern (mist, thoracic, diaphragmatic) and breathing mode (nasal or mouth)[22-23].

Physiotherapy Intervention

The physiotherapy intervention in Cervico-craniomandibular disorders is an important factor due to the close relationship with tension situations, anxiety and stress. Many patients, in these conditions, develop or manifest pain in the temporomandibular joint, whose main causal factor is the muscular unbalance and/or tension muscular. Besides, the dysfuntional breathing (upper thoracic breathing) can influence cranium-cervical posturing and alignment, breaking out a painful situation. The physiotherapist has been integrated to the multiprofessional team (dentists, speech therapists, psychologists, physicians, etc), contributing to the evaluation and treatment of cervico-craniomandibular disorders with the goal of alleviating the pain, reducing the level of muscular tension, improving the function of stomatognatic system (responsible for speech, mastication), re-educating breathing musculature, controlling ventilation and correcting cervical posture.

The diaphragmatic muscular re-education promotes a physiologic pattern, with less energy expense. It also provides an improvement of lung ventilation and correction of thorax mechanical changes, caused by the incorrect use of the muscular groups involved[10]. The physiotherapeutic methods indicated in the treatment of the syndrome of mouth breather, are described by Marins[24]: RPG, Iso-stretching, Hydrokinesiotherapy, GDS, conventional Kinesiotherapy and Posturology. The author still recommends an integrated work of interdisciplinar team and preventive measures as breast-feeding, observation of vicious habits, stress control, ergonomic orientation and professional ability. It is this associated action that guarantees the therapeutic success.

In the Ribeiro and Soares'[25] study with spirometric evaluation of mouth breathing children, it was demonstrated an improvement of the lung function after physiotherapy treatment. The authors concluded that postural correction and diaphragmatic re-education promoted improvement of ventilatory mechanical and muscular diaphragmatic work, with reduction of breathing effort. Besides, they also reccomended environmental control with measures for reducing the exposition to allergic factors, as the passive tabagism.

Chaves et al.[19] suggests breathing exercises, in the correction of the mouth breathing, that also causes cranium-mandibular dysfunction, in order to improve the quality of the asthmatic children's life.

Campignion[8] affirms that the breathing should not be taughet, but indeed it should liberate the body tensions and to obtain a larger mobility in the thoracic joints. The author mentions Mézieres that said " it is so absurd to teach somebody to breathe as to want to teach to do to circulate the blood in her/his veins ".

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