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On Muscular Factor Question in the Correction of Transversal Incisor Occlusion

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Abstract

The aim of our study was to evaluate the role of the muscle factor and the effectiveness of manual treatment of masticatory muscle dysfunction in patients with transversal incisor occlusion (TIO).

***Methods and Results*:** We examined and treated 35 patients aged 18-25 years with clinical signs of TIO in the clinic of orthopedic dentistry. Diagnostic methods for TIO included an interview, face and oral cavity examination, and clinical functional tests. Occlusion was assessed using anthropometric measurements and examination of plaster jaw models in an articulator for additional diagnostics of the dental factor; a radiological method (jaw orthopantomography with the inclusion of articular joints) was also used for the articular factor diagnostics and examination of masticatory muscles and neck muscles. The treatment methods included manual treatment of masticatory muscle dysfunction: "myofascial trigger point release technique," "stretching-push," and "post-isometric relaxation." All patients' complaints were mainly confined to improper occlusion of the front teeth, namely, a misalignment of the centerline between the upper and lower anterior teeth. Moreover, 71.4% of patients noted intermittent clicking in one or both articular joints of the temporomandibular joint, 42.8% of patients reported pain in the region of one temporomandibular joint, 28.6% of patients noted noise in the ear of the same joint, as well as discomfort while chewing. On external examination, all patients had a slight asymmetry of the lips and cheeks on the habitual chewing side. The apex of the chin was positioned slightly to the side relative to the facial midline. All patients had a disturbed movement trajectory of the lower jaw. During mouth opening, the lower jaw trajectory changed relative to the facial midline: at first, it was straight, for a very short period, and then it deviated sideways, after which it returned to the center. There was a misalignment of the central line of the lower dentition relative to the midline of the face in the anterior region. The radiological picture showed signs of articular joint dysfunction: difference in the size of the articular gaps on the right and left sides. After a single session of manual treatment of masticatory muscles, all patients noted that the improper occlusion of the front teeth was corrected, pain and clicking sensations in the TMJ disappeared in 42.8% of patients, and pain disappeared in the area of one joint, along with noise in the ears and chewing discomfort. Headache in the parietal and temporal areas disappeared. The trajectory of lower jaw movements during mouth opening normalized in all patients after the performed manual treatment.

Conclusion: We can conclude that when diagnosing and treating occlusal disorders, it is necessary to pay attention not only to the position of the teeth and the TMJ elements, but also to the muscular factor – the condition of the masticatory muscles. Special attention should be paid to the condition of the lateral wing muscles.(**International Journal of Biomedicine. 2022;12(1):147-150.**)

Key Words : transversal incisor occlusion • masticatory muscles • manual treatment

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Abbreviations

LWM, lateral wing muscle; **TIO,** transversal incisor occlusion; **TMJ,** temporomandibular joint.

Introduction

In orthopedic dentistry, we often observe a situation in which adult patients with occlusal anomalies and relatively correct dentition complain of an aesthetic defect at the examination.[1,2] This defect consists of misaligning the central line between the antagonist incisors.[2] Moreover, these patients had previously noted that the cosmetic center of their upper and lower teeth coincided.

According to L.S. Persin's classification (1990) of dental row occlusion anomalies, the misalignment of the interincisal line is a sign of a transversal occlusion anomaly in the anterior part of the dental arch; it is the so-called transversal incisor occlusion (TIO) - a disorder of the anterior teeth occlusion in a transversal direction with preserved contact between them.[3]

TIO is an occlusion anomaly complex of the structure of morphofunctional changes in the dentition and occurs in different age periods.[4] This anomaly is manifested by a mismatch of the interincisal line of the upper and lower jaws, accompanied by a violation of the coordinated activity of the masticatory muscles, a decrease in the tone of the masticatory muscles, and, as a result, severe violations of the chewing function.[4-6] Despite much research, there is still a lot of uncertainty on this issue.

The aim of our study was to evaluate the role of the muscle factor and the effectiveness of manual treatment of masticatory muscle dysfunction in patients with TIO.

Materials and Methods

We examined and treated 35 patients aged 18-25 years with clinical signs of TIO in the clinic of orthopedic dentistry during 2010-2021. All patients gave their written informed consent. Diagnostic methods for TIO included an interview, face and oral cavity examination, and clinical functional tests. Occlusion is characterized mainly by three factors: dental, articular, and muscular.[7] We used anthropometric measurements and examination of plaster jaw models in an articulator for additional diagnostics of the dental factor. We also used a radiological method (jaw orthopantomography with the inclusion of articular joints) for the articular factor diagnostics and examination of masticatory muscles and neck muscles, according to the method described by A. Puzin.[8]

The treatment methods included manual treatment of masticatory muscle dysfunction: "myofascial trigger point release technique," "stretching-push," and "post-isometric relaxation." [9,10]

Statistical analysis was performed using the Statistica 10.0 software package (Stat-Soft Inc., USA). The frequencies of categorical variables were compared using Pearson's chi-squared test or Fisher's exact test, when appropriate. A value of $P<0.05$ was considered significant.

Results and Discussion

Patients' complaints were mainly confined to improper occlusion of the front teeth, namely, a misalignment of the centerline between the upper and lower anterior teeth. Moreover, 71.4% of patients noted intermittent clicking in one or both articular joints of the TMJ, 42.8% of patients reported pain in the region of one TMJ joint, 28.6% of patients noted noise in the ear of the same joint, as well as discomfort while chewing. Characteristically, the clicks were mainly on the side opposite habitual chewing. It was also found that 57.14% of patients had a headache in the parietal region on the same side, and 28.57% of patients had slight pain in the temple area on the opposite side. Moreover, patients did not attribute these symptoms to malocclusion of the front teeth. According to the patients, 85.6% had an asymmetrical or late eruption of the first molars on the lower jaw. Also, 42.8% of patients had undergone therapeutic dental treatment for uncomplicated and complicated caries over several months (up to one year) (Table 1). On external examination, all patients had a slight asymmetry of the lips and cheeks on the habitual chewing side. The apex of the chin was positioned slightly to the side relative to the facial midline. All patients had a disturbed movement trajectory of the lower jaw. During mouth opening, the lower jaw trajectory changed relative to the facial midline: at first, it was straight, for a very short period, and then it deviated sideways, after which it returned to the center. The degree of mouth opening did not exceed 2cm in 42.8% of patients.

Table 1.

Results of patient's examination before and after manual therapy

Symptoms	Before manual therapy (n)	After manual therapy* (n)
Improper occlusion of the front teeth	35	0
Clicks in TMJ	25	15
Pain in the area of one joint	15	0
Noise in the ear	10	0
Chewing discomfort	10	0
Headache in the parietal area	20	0
Temporal headache	10	1
Unsymmetrical and late molars eruption	30	0
Fillings, caries	15	0
Soft tissues asymmetry	35	5
Offset of the top of the chin to the facial midline	35	5
Lower jaw trajectory (first sideways and then towards the center)	35	0
Degree of mouth opening less than 2 cm	15	0
Differences in the size of the right and left articular gaps	35	6
Misalignment of the central line of the lower dentition to the midline of the face	35	5
Lack of third molar rudiments	30	0

** - statistically significant differences.*

Examination of dental articulation in the central occlusion position showed the following: The tooth ratio slightly differed from neutral in the lateral sections; a fissure-cusp contact was noted, however, on the side of habitual chewing, the cheek cusps of lower teeth overlapped the cheek cusps of upper teeth with a slight distal shift, approximately to one-fourth of the cusp width; and on the opposite side, the cheek cusps of upper teeth overlapped the cheek cusps of lower teeth somewhat mesially, approximately to the same cusp width.

There was a misalignment of the central line of the lower dentition relative to the midline of the face in the anterior region (Table 1). The anatomical shape of the anterior teeth was not altered, and the sizes on the right and left did not differ significantly. A detailed examination of the state of the occlusal surface of the teeth revealed fillings on the opposite side of the habitual chewing in 42.8% of patients (Table 1).

The radiological picture showed the absence of bone pathology of the TMJ in all patients, but there were signs of articular joint dysfunction: difference in the size of the articular gaps on the right and left sides. There was a lack of third molar rudiments in 30 patients. One 19-year-old patient had a rudiment of the lower third molar removed to prevent asymmetry of the dentition after the expected eruption, which was revealed after the orthopantomogram examination.

After a single session of manual treatment of masticatory muscles, all patients noted that the improper occlusion of the front teeth was corrected (P<0.0001; F-test), pain and clicking sensations in the TMJ disappeared in 42.8% of patients (χ^2=4.73, P=0.030), and pain disappeared in the area of one joint (P<0.0001; F-test), along with noise in the ears (P<0.0001 (F-test)) and chewing discomfort (P<0.0001; F-test). Headache in the parietal (P=0.003; F-test) and temporal (P=0.009; F-test) areas disappeared. The trajectory of lower jaw movements during mouth opening normalized in all patients after the performed manual treatment (P<0.0001; F-test). The degree of mouth opening increased up to 3cm and more (P=0.04; F-test).

In 14.29% of cases, we noted correction of the soft tissues asymmetry and the offset of the top of the chin to the facial midline, a reduction in the differences between the size of the right and the left articular gaps, and the misalignment of the central line of the lower dentition to the facial midline. (χ^2=49.06, P<0.0001) (Table 1).

Examination of the masticatory muscles showed narrowing of the maxillary space (in 100% of cases; χ^2=46.63, P<0.0001), shortening, and hypertonicity of the LWM on the side opposite to habitual chewing in all 35 patients (Table 2). Extraoral palpation of the upper pole of the LWM head revealed trigger points of the inferior head of the LWM (in 100% of cases; χ^2=46.63, P<0.0001), trigger points of the superior head of the lateral pterygoid muscle (in 100% of cases; χ^2=46.63, P<0.0001). At the same time, 42.8% of patients had unilateral clicks on the same side where the trigger points of the LWM upper head were identified, and 28.57% of patients had bilateral clicks intermittently. Palpation of the temporalis and parietal muscles also revealed slight soreness in 28.57% of patients (Table 2).

Table 2.

Results of examination of masticatory muscles.

Symptoms	Before manual therapy	After manual therapy*
Unilateral narrowing of the maxillary space	35 (100%)	5 (14.29%)
Trigger points of the inferior head of the lateral wing muscle	35 (100%)	6 (17.14%)
Trigger points of the superior head of the lateral pterygoid muscle	35 (100%)	0
Clicks in one joint	15	0
Clicks in both joints	10 (28.57%)	2 (5.71%)
Temporal muscle soreness on one side	10 (28.57%)	0
Soreness of the parietal muscle on the opposite side	10 (28.57%)	0

* - *statistically significant differences.*

After a single session of manual treatment of masticatory muscles, no patients noted trigger points of the superior head of the lateral pterygoid muscle (χ^2=70.96, P<0.0001), clicks in one joint (χ^2=16.63, P<0.0001), and soreness (χ^2=9.45, P=0.002). Unilateral narrowing of the maxillary space was noted in 14.29% cases (χ^2=49.06, P<0.0001), trigger points of the inferior head of the lateral wing muscle in 17.14% cases (χ^2=46.16, P<0.0001), and clicks in both joints in 5.71% cases (χ^2=4.93, P=0.026) were noted.

Anatomically, the fascial fibers of one of the poles of the lateral pterygoid muscle superior head are woven into the TMJ capsule and also give off fibers to the interarticular meniscus.[8,11] Obviously, the synchronous movement of the condyle and meniscus in the temporal bone socket will be impaired if the lateral pterygoid muscle spasms. This explains the clicking sound in the articulation during mandibular excursions. Besides, the branch of the mandibular nerve of the same name innervates the lateral pterygoid muscle, which is the third branch of the trigeminal nerve. The sensory fibers passing next to the motor fibers of the lateral pterygoid nerve are the connective branches of the auricular ganglion that approach this parasympathetic node. With the increased tone of one of the heads of the lateral pterygoid muscle, these nerve branches are compressed, which can lead to the formation of noise in the ear. And therapeutic dental treatment for uncomplicated and complicated caries can lead to the formation of the habit of chewing on one side. Also, the asymmetrical or late eruption of the first molars on the lower jaw can be a reason for forming one-sided chewing habits. In the process of forming the habit of chewing on one side, spasm of the lateral pterygoid muscle occurs on the opposite side, mainly in the area of its lower head.[11-14] In our opinion, a patient with the removed embryo of the lower third molar could also have developed the habit of chewing on one side, since such surgical intervention causes pain and discomfort during chewing for a long time.

Pain and soreness in the muscles, spasms, increased tone, and hypertonicity can be the signs that characterize muscle dysfunction.[10]

The zigzagging of the mandibular trajectory during mouth opening is characterized by lateral wing muscle

dysfunction.[1,2,10,12,15-17] At first, the trajectory is straight; it is the first phase – the articulated movement of the condyle under the action of the muscles lowering the lower jaw. And then, in the middle phase, during the linear progressive movement of the lower jaw along the slope of the articular tubercle of the temporal bone, the lateral wing muscles come into action, extending the lower jaw. And if one side of the muscle spasms, the trajectory of the lower jaw movement will be changed to the opposite side. In the lower phase of the movement, the muscles lowering the lower jaw straighten the trajectory of the lower jaw.

I. Klineberg and S. Eckert [15] refer to the term "occlusion" as the dynamic biological interaction of the components of the masticatory system, which determines the teeth' interposition. The driving force for the interaction of the components of this system is the masticatory muscles. L. Persin`s findings [9] show the mismatch between the central position of the lower jaw and its habitual position. Therefore, the mismatch of the central lines between the upper and lower teeth can be explained by the different tones of the lateral wing muscles on the right and left. Special attention should be paid to the condition of the lateral pterygoid muscles; this is confirmed by the words of J. Travel et al.,[10] who called the lateral pterygoid muscle "the key to understanding and correcting functional disorders in the skull and mandible."

Thus, we can conclude that when diagnosing and treating occlusal disorders, it is necessary to pay attention not only to the position of the teeth and the TMJ elements, but also to the muscular factor – the condition of the masticatory muscles. Special attention should be paid to the condition of the lateral wing muscles.

Competing Interests

The authors declare that they have no competing interests.

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