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RESEARCH ARTICLE

A Multidisciplinary Approach To The Treatment Of Temporomandibular Joint Myofascial Pain Syndrome Brief Review With Case Report

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ABSTRACT

Myofascial pain syndrome (MPS) or masseter myalgia (M-TMD) is a common type of chronic pain in the orofacial region in temporomandibular disorders (TMDs), which is a complex and multifactorial set of conditions often associated with limitation of TMJ movements, which affects the quality of life of patients with temporomandibular disorders. The aim of this article is to explore the possibilities of rehabilitation of patients with TMDs using a TMJ stabilizing splint and osteopathic manual therapy, aimed at eliminating M-TMD and limiting mandibular movement.

INTRODUCTION

Patients often visit a dentist, otolaryngologist, neurologist, osteopath with painin the orofacial region and the most common type of pain in this area is masticatory muscle pain, pain in the TMJ and related structures. Masticatory muscle pain i.e. myalgia or myofascial pain of the masticatory muscles is characterized by regional pain in the masticatory muscles, difficulty chewing and limitation of TMJmovement [23].

Myofascial pain often starts suddenly, lasts for a long time, and can be worse during the day and at night. Pain characteristic: aching, deep, but can also be acute, varying in severity. Movement of the lower jaw limited, slow, prolonged chewing.[2]. According to OPPERA TMDs are detected annually in 4% of study participants, and there was an increase in TMJ pain with age: 2.5% among 18-25 year olds, 3.7% among 25-34 year olds, and 4.5% among 35-44 year olds [24].

Myofascial pain in masticatory muscle disorders is a relatively common condition worldwide, accounting for 3% to 15% of the general population[24]. A meta-analysis of 21 studies including a total of 3463 patients with temporomandibular disorders found an overall prevalence of myalgia in

masticatory muscles of 45.3%[25]. Similar to other pain conditions, myofascial pain is 4 times more common in women compared to men and is frequently is combined with other chronic pain of neurologic, psychological and gastrointestinal origin [26, 27].

Myogenic pain is more often associated with previous trauma to the musclefrom overstrain (e.g.: when biting food), psycho-emotional excitement and is accompanied by parafunction - night and day bruxism. Such parafunction can persist for many years in the masticatory apparatus and over time manifests with chronicpain symptoms in the orofacial region [24, 6].

There are two main models that explain pain symptomatology and TMJ dysfunction: the "pain adaptation model" and the "vicious cycle model".

"Pain adaptation model", is that pain leads to a decrease in the activity of agonistmuscles and an increase in the activity of antagonist muscles [10]. The overactive inferior lateral pterygoid muscle is believed to be the leading muscle in the formation of masticatory muscle myalgia [8].

According to the "vicious circle model", hyperactivity in masticatory muscles leads to an excessive amount of acetylcholine (Ach) and subsequent release of Ca2+ from the sarcoplasmic reticulum, initiating a continuous cycle of localized muscle contraction. Localized hypertonicity begins to block blood flow to the muscle and leads to ischemia and hypoxia. Local ischemia and hypoxia causes the release of chemicals that provoke inflammation and pain, such as, bradykinin, prostaglandins, serotonin, and a number of inflammatory cytokines, interleukins [9]. At the sametime, there is a significant drop in Ph, which inhibits the action of acetylcholinesterase and calcium ATPase, leading to further tone disturbance and local metabolic disturbance in masticatory muscles [11].

This model takes into account both somatic and autonomic innervation in the TMJ region. Postganglionic fibers of the facial nerves provide innervation of the craniofacial region, with neurons of these fibers located directly in the ganglia of the cervical section of the paravertebral sympathetic chain. Postganglionary fibers of trigeminal nerve are responsible for parasympathetic innervation, the neurons ofwhich are located in the autonomic ganglia of the face, in the region of the pterygopalatine fossaand in the geniculate ganglion of the facial nerve. The autonomic ganglia of the cranio-facialregion have a connection with the parasympathetic nuclei of the brain stem, belongingto the cranial nerves - oculomotor, facial, glossopharyngeal nerves. Thus sympathetic, parasympathetic and somatic fibers in combination form facial nerves of mixed type with multiple anastomoses. For this reason, irritation of nerve endings in the craniofacial region may be the cause of TMDs and there are also a variety of autonomic manifestations associated with the occurrence of trigger zones in themasticatory muscles and, as a consequence, irritation of the wing ganglion [16, 17]. These manifestations are accompanied by pain symptoms of an attack-like, sharp character in the TMJ, maxilla and nose, often accompanied by pain irradiation to the inner corner of the eye, as well as vasomotor and secretory reactions: lacrimation, hypersalivation, abundant nasal secretion. Pain and autonomic reactions gradually spread to half of the face, take over the head, neck, and in some cases extend to the hands and forearms [18].

The relationship of myofascial pain and TMDs with stress, anxiety, and depression is supported by the OPPERA studies; one prospective cohort study enrolled 3263 participants without symptoms of TMDs, administered a battery of psychological distress tests, and followed up for an average of 2.8 years. In a multivariate analysis, global psychological and somatic symptoms were risk factors for temporomandibular disorders and showed that measures of psychological functioning can predict the first symptoms of TMDs [31]. The clinical picture of M-TMD is characterized by functionally altered muscle fibers (some bundles are spasmodic, while others are exhausted and weakened), functional muscle heterogeneity and trigger points (TPs) atthe site of painful muscle tension.

Restriction of jaw movement occurs, which is expressed in reflex functional restriction of the masticatory muscle segment [8].

It is believed that the main causes of M-TMD are: trauma (physical impact, impact, stretching) [8], parafunctions (incorrect tongue position, bad habits - clenching teeth, putting a fist under the lower jaw). The state of stress (acute or chronic) also occurs with protective tension of certain groups, cranial, masticatory muscles, neck muscles [12, 8]. During times of increased emotional tension and anxiety, these muscles are actively overstressed and are involved in the formation of M-TMD unilateral, long-lasting, debilitating, low-intensity orofacial pain [28,13] Constant or recurrent hearing impairment, tinnitus, dull pain inside or outside the ear, eye pain, dizziness, hypersensitivity of cranial muscles [7].

M-TMD is frequently encountered in dental clinical practice and is attributed to the occurrence of muscle imbalance of the masseter muscles (masseter, temporalis, lateral and medial pterygoid muscles) and compensatory imbalance of humanposture [29]. These cases of masticatory muscle myalgia represent a clinical challenge due to the difficulty in diagnosis and understanding the origin and pathways of TMDs [30].

Despite the fact that the etiopathogenetic aspects of TMDs have been identified during the study of TMDs, to date, this problem requires further study and new approaches in the rehabilitation of TMJ disorders, with the use in treatment and rehabilitation programs of symptomatic therapy aimed at eliminating myofascial pain in TMDs (myorelaxants, stabilizing splint therapy, myogymnastics) and additional manual and osteopathic therapy to eliminate myofascial pain in TMDs.

Clinical Case Study

This case is part of a clinical study. In December 2021, patient M., 26 years old, cameto “M+Clinik” Medical Center with complaints of restricted mouth opening and chronic pain in the temporomandibular joint area. When opening her mouth, the patient noted pain in the left side of her face. She reported that the pain started about 3 months ago and she managed the pain by taking ibuprofen alone. However, the pain and restriction of mouth opening persisted. On clinical examination, the patient reported ascore of 40 on a visual analog pain scale (VAS) of 40 mm, where 0 mm means "no pain" and 100 mm means "as much pain as possible". When opening her mouth, the patient had left facial pain, parafunction - bruxism during sleep/wakefulness, restriction of mouth opening - 25mm (normal - 35-55mm distance between incisors), especially in the mornings. The patient had a history of birth trauma - torticollis, maxillary sinusotomy at the age of 22. Extended imaging (MRI of TMJ) was prescribed to exclude articular disc disease. MRI diagnostics conclusion: no signs of fibrous ankylosis of TMJ were revealed. Bite evaluation and muscle palpation were performed according to RDC/TMD (axis 1) [23]. The patient had premature contacts onthe anterior teeth and occlusal contacts on the lateral teeth movements on the right side. Pain was reported in the left masseter muscle and temporal muscle on the right, sternoclidomastoid muscle on the right on palpation, pain on chewing, especially with harder foods. The patient also reported being under stressdue to difficulties at work. The RDC/TMD (axis2) questionnaire was used to confirm the diagnosis of TMDs[23]. Electromyography revealed marked asymmetry of the masticatory muscles: temporal on the right, masseter on the left.(Figures 1, 2). The patient was diagnosed with muscle disorders with myofascial pain and restriction of mouth opening, with pain associated with the masticatory muscles.

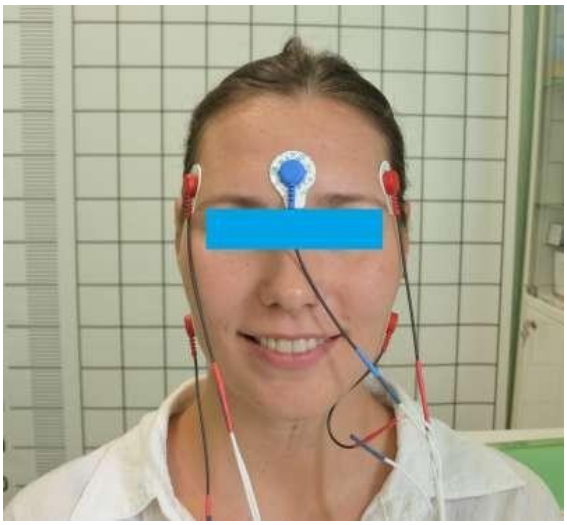

Figure 1. Electromyography of the masseter muscles.

Basic parameters

	Td	Ts	Ms	Md
A (max), μV	2645	22	30	54
A (avg), μV	118	8	11	12
S, mV*ms	1181	84	114	21

Indexes

	Value	Prevailing muscles	Result
Symmetry of the temporal muscles,%	7	Td↑	Pronounced asymmetry
Symmetry of the masticatory muscles,%	92	Md↑	Norm
Torsion index, %	16	TdMs↓	Pronounced asymmetry
Mass inertial center, %	18	T↑	Pronounced asymmetry
IMPACT, μV	149		Norm

Figure 2. Results of electromyography.

Td - Temporalis dextra;

Ts - Temporalis sinister;

Md - Masseter dextra;

Ms - Masseter sinister;

A (max), μV - is the maximum amplitude of the chew, measured in μV;

A (avg), μV - is the average amplitude of the chew, measured in μV;

S, mV*ms - is the average value of the chewing area, measured in mV*ms-Impact,

μV - t h e total potential of all the muscles studied

The patient was prescribed a comprehensive rehabilitation program that includeda number of osteopathic techniques, stabilizing splint therapy, and myogymnastics aimed at relaxing the masseter and neck muscles.

Osteopathic techniques aimed at eliminating M-TMD deserve special attention. The patient was also fitted with a stabilizing splint to separate the occlusion by 1mm, which allows the masticatory muscles to relax and eliminate asymmetric tone. The patient was prescribed myogymnastics. Myogymnastics included a set of 3 exercises: correct tongue position (tongue tip in the area of the maxillary incisor, slight tension for 15 sec.), correct swallowing (back of the tongue in the area of the palate) and correct nasal breathing (deep inhalation and slow nasal exhalation for 10 sec.).

As a result of complex treatment after chiropractic and osteopathic correction, the restriction of mouth opening disappeared already at the first appointment (openingincreased up to 3 fingers of the patient), pain symptomatology according to VASH - 10mm.

One month after the start of complex dental (splint therapy) and osteopathic correction (once), independent daily myogymnastics, the dysfunction of mouth opening restriction was absent, there were no pain symptoms. Deviation in mandibular movement during opening and closing of the mouth remained, chewing difficulties were much less frequent (after prolonged chewing). The symptoms of night and daytime teeth clenching, as noted by the patient, were significantly reduced. Control examination after 3 months of complex TMJ rehabilitation revealed no restriction of mouth opening, no pain symptoms and no difficulty in chewing. Deviation of the lower jaw remained (the patient was recommended to orthodontic therapy) to correct occlusal imbalances and TMJ trajectory.

Among all the techniques used in medical practice to relax the masseter muscle, the osteopathic technique on the lateral pterygoid muscle, described below, has shown the greatest effectiveness.

Technique of m. pterigoideus lateralis correction (left)

Position of the patient: lying on the back with the head turned to the right side.

Position of the clinician: at the side of the patient in a sitting or standing position on the side opposite the temporomandibular joint dysfunction (right side).

Position of the doctor's hands: the fifth finger of the doctor's left hand moves the cheek away from the upper, after which the fifth finger of the right hand is inserted with the pad on the lateral surface of the upper. The fifth finger of the right hand is then brought as far back as possible until it comes into contact with the coronoid process of the lower jaw. The doctor then invites the patient to pull the lower jaw to the left side and guides the finger further behind the upper jaw. The tip of the fifth finger is flexed inward and comes into contact with the outer surface of the left lateral pterygoid muscle.

The cephalic hand grasps the large wings of the sphenoid bone with the first and third fingers (Fig. 3).

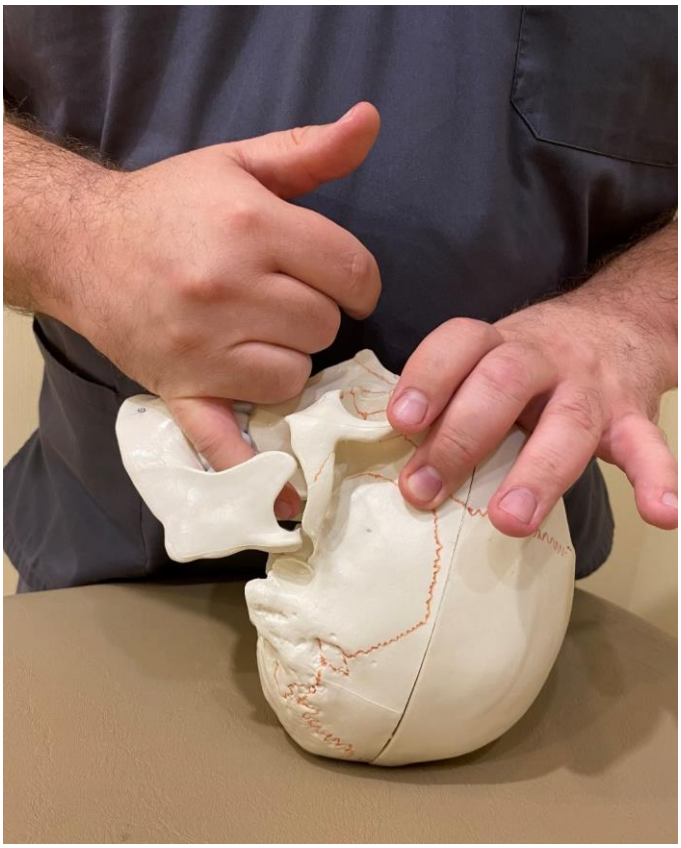

Fig. 3. Technique for correction of the left lateral pterygoid muscle.

Correction:

1. The doctor inserts the fifth finger of the right hand until tissue resistanceis felt and holds the achieved position.

2. When the tissues feel relaxed, the practitioner gently moves the finger inward.

3. The practitioner reaches the lateral pterygoid muscle, applies pressure with thefifth finger for 7 seconds, and then quickly removes the finger from the mouth.

4. At the stage of preparation for correction of the lateral pterygoid muscle, it isnecessary to eliminate somatic dysfunctions of the cranial bones and soft structures(masticatory muscles, ligaments, intra-articular disk) of the TMJ system.

DISCUSSION

The described clinical case is a clear confirmation of the most effective approaches tothe treatment of M-TMD, based on the optimal combination of various diagnostic andtherapeutic techniques at the junctions of different medical disciplines.

When collecting a history, it is important to remember, TMDs are polyetiologicin nature. The main factors suggesting the occurrence of M-TMDs are the state of the muscular system, psycho-emotional state. Differential diagnosis of orofacial pain in TMDs is often difficult. One possible cause

of M-TMDs may be dueto dysfunction of the pterygopalatine ganglion. The ganglion is located behind the posterior wall of the maxillary sinus and anterior to the pterygopalatine sphenoid process andis surrounded by connective tissue fibers with fatty tissue, so fibrotic changes can also significantly reduce mobility and microcirculation of the ganglion. Tension ofthe intercranial aponeurosis in visceral disorders can also cause disorders of the pterygopalatin ganglion [20]. The anatomical relationship between the TMJ and the wing ganglion isdue to the lateral pterygoide muscle attaching to the articular disk of the TMJ and the pterygide process of the sphenoid bone. Thus, visceral-somatic TMJ dysfunction with pain andautonomic symptoms is possible: impaired lacrimation, dryness of nasopharyngeal and oral mucosa, visual disturbances. Also in some cases, pain in the temporal and cervical regions and even the auditory tube are noted [21]. To make the diagnosis, itis important to realize that palpation should elicit the same pain reported by the patient. Intra-articular disc problems, with or without displacement, result in clicking and, if the disc is not repositioned, intermittent locking. Limitation of mouth opening is defined as less than 40 mm (distance between the anterior incisors) [2].

Parafunction associated with psycho-emotional state (nocturnal/daily bruxism) can cause functional overload of the dento-mandibular system and compensatory, inhomogeneous spasm of the masticatory muscles and muscles of the cranio- mandibular system, which can lead to M- TMDs [4].

Current principles of diagnosis are based primarily on clinical findings, radiation and functional methods examinations. Mandatory clinical procedures include: external examination of the maxillofacial region; visual examination of TMJ, osteopathic diagnosis of TMJ and masticatory muscles (palpation of masticatory muscles, neck muscles and upper limb girdle), identification of trigger (pain zones) muscle areas.

Among radial diagnostic methods, traditional radiologic studies are widely used: tomography, orthopantomography, teleradiography, and magnetic resonance tomography. Of functional methods, electromyography of masticatory muscles is of great importance [7].

The differential diagnosis of M-TMD is made with infectious, inflammatory and traumatic arthropathies. In addition, it should be differentiated with a number of otherdiseases, such as arthritis of various etiologies, neuralgia of branches of trigeminal, lingual, tympanic nerves, neuralgia o f the wing node, migraine, styloid processsyndrome, temporal arteritis, dysfunction of the cervical vertebrae. Differential diagnosis is helped by a carefully collected anamnesis. Purulent arthritis is characterized by the appearance of soft tissue edema and pain in the area of the affected joint. When palpating the joint, sharp pain appears, there is limited movement of the lower jaw. Rheumatoid arthritis is a systemic disease of connective tissue, with destructive lesions of the joint. The criterion for diagnosing rheumatoid arthritis is: pain in 3 joints or more, swelling, restricted movement, restricted movement in 3 joints or more, positive reaction to rheumatoid factor.

In trigeminal, laryngeal, tympanic, and wing ganglion neuralgia, sharp onsetpain occurs in response to trigger zone irritation [7].

Today, a patient with M-TMD has to make many visits to doctors of various specialties in order to make a correct diagnosis and prescribe effective treatment, and surgical intervention to eliminate TMJ pain symptoms is a last resort [22].

Treating patients with M-TMD only from a dental point of view and ignoring other aspects of M-TMD etiology leads to ineffective treatment of this dysfunction. Thus a multidisciplinary integrated approach to rehabilitation of patients with M- TMD is relevant in medical practice.

Myofascial orofacial pain associated with muscle spasm occurs quite often in clinical practice and does not always lend itself to diffusion diagnosis, which causes certain difficulties in the treatment tactics of such patients. M-TMD is a relatively frequent cause of pain in the orofacial region. Differential diagnosis of prosopalgia is important and the effectiveness of treatment and rehabilitation of such patients depends on it.

CONCLUSIONS

The considered clinical observation is a clear confirmation of the essential roleof interdisciplinary approach in the treatment of TMJ dysfunction and elimination of pain symptoms in the orofacial region associated with TMJ.

Clinical observation, the results of which are presented in this scientific work, testify to the effectiveness of complex rehabilitation techniques using osteopathic correction of TMJ dysfunction in the treatment of myofascial pain if the specified sequence of their implementation is observed. An obligatory aspect that is important from the point of view of ensuring the effectiveness of complex therapy of TMJ dysfunction should be considered preliminary elimination of somatic dysfunctions of the pterygopalatin fossa, dysfunctions of the maxillary and temporal bone, myofascial relaxation of periarticular muscles and muscles of the upper thoracic aperture.

In addition, an important role in the elimination of M-TMG has a complexdental approach to TMJ rehabilitation with the use of splints to stabilize the TMJ and a complex of daily myogymnastics. Further scientific research in the direction of effective TMJ rehabilitation will contribute to the search for effective combinationsof methods of therapy and rehabilitation of this dysfunction and prevention of complications in this group of patients, improving their quality of life.

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