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Temporomandibular joint dysfunction

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Abstract

Background: The dysfunction of the temporomandibular joint (TMJ) becomes a significant and serious problem for modern society. TMJ disorder is the pathology of the stomatognathic system that is encountered more and more often every year, because the etiology is different and the pathogenesis is not well investigated. This disease is the result of the action of many factors that are constantly related to each other and over time can intensify and aggravate each other. A large number of studies have been done, articles and scientific papers have been published on the subject to establish the degree of prevalence and severity of this disease. Every year there are more and more patients with this pathology, which would mean that an effective solution in solving this problem has not yet been found and the topic remains relevant to this day. Insufficient knowledge of the mechanisms of this disease is one of the main reasons for the ineffectiveness of the treatment methods used. The objective of the work was to identify the clinical relevance of temporomandibular joint diseases.

Conclusions: TMJ dysfunction is a topic that does not lose its relevance, because it is still a problem to identify the causes of pathologies of the TMJ and their treatment. TMJ pathology can be caused by various factors, the identification of this problem should be approached with all seriousness, taking into account all diagnostic methods and a high-quality anamnesis taken from the patient.

Key words: temporomandibular joint dysfunction, pain, Costen's syndrome.

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Introduction

Dysfunctional temporomandibular joint (TMJ) pain (Costen's syndrome) was first described in 1934 by otolaryngologist James Costen and it is a complex of symptoms characterized by dull pain in the TMJ, headache, pain in the cervical spine, occiput and behind the auricle, which increases towards the end of the day, clicks in the TMJ during eating, hearing loss, tinnitus, heartburn in the throat and nose [1-3].

According to the source of 2019, pain in the face associated with the pathology of TMJ, occurs in 19-26% of the adult population [4]. In 2015, students of ninth – twelfth grades were examined, of which 33.3% suffered from TMJ dysfunction and 52.5% of them had TMJ pain. Without dolore symptoms – 31.03%; in orthodontic treatment – 17.24%; bruxism – 43.1% [5]. This study showed that this disease has a tendency to rejuvenate and therefore does not lose its relevance.

According to the 2004 source, the disease affected about 5-12% of the adult population and is the most common musculoskeletal disorder [6]. Analyzing different articles written in different years, it can be concluded that the problem of TMJ dysfunction is not solved and therefore continues to be current.

TMJ dysfunction is also a multifaceted and interdisciplinary problem that must be solved by doctors from various fields: dentist, neurologist, psychotherapist and others [7-9]. Maxillofacial surgeons restore the correct ratio of TMJ elements, the work of orthodontists is aimed at restoring adequate occlusal ratios, neurologists mainly use medical methods to combat tinnitus, and otorhinolaryngology doctors often identify and treat dysfunction of the Eustachian tube, which is associated with tinnitus and vertigo [10].

Numerous factors can contribute to TMJ dysfunction. Factors that increase the risk of TMJ dysfunction are called predisposing factors. Factors that cause the onset of TMJ are called initiation factors, and factors that interfere with healing or stop the progression of TMJ dysfunction are called perpetuating factors. In some cases, a single factor can perform one or all of these roles. These factors are: occlusal condition, trauma, emotional stress, severe pain intake and parafunctional activities [11].

Based on the main complaints of patients inherent in the syndrome of TMJ dysfunction the following can be highlighted:

- Accusations directly related to TMJ: pain, sound phenomena (clicks, squeaks, and crackles), limitation

of mouth opening, and blockage of the joint, deviation of the lower jaw to the side when opening the mouth.

- Accusations of occlusal disorders: abrasion of enamel, deformation and disruption of occlusion, dissatisfaction with the results of prosthetic and orthodontic treatment.
- Accusations related to pain: in the maxillofacial region, in the masticatory and facial muscles, tension in the facial muscles, frequent headaches, pain when yawning, wide opening of the mouth or mastication.
- Accusations of disorders of the psycho-emotional state: depression, irritability, vertigo, general weakness, general discomfort, decreased performance [12].

The most common clinical manifestations in TMJ dysfunction is the following triad of symptoms: sound phenomena in the joint, functional disorders and pain syndrome [13].

After analyzing a large number of bibliographic sources, four main causes of TMJ dysfunction can be highlighted:

1. Dysfunction of TMJ as a result of orthodontic treatment;
2. Dysfunction of TMJ as a result of partial or total edentation;
3. Dysfunction of TMJ as a result of pathological abrasion of teeth (occlusal pathologies);
4. Dysfunction of TMJ as a result of psycho-emotional stress.

Dysfunction of TMJ as a result of orthodontic treatment

Orthodontic treatment should begin with an examination of the temporomandibular joint, muscles, which are responsible for the movement of the lower jaw, since even in minor abnormalities of localization of a tooth or groups of teeth, the patient may have complaints and, accordingly, symptoms of TMJ dysfunction, which the doctor-orthodontist must take into account in the process of work. In 2012, a scientific research was carried out, which shows that at the stage of examination and preparation of patients for orthodontic treatment, symptoms of musculoskeletal dysfunction of TMJ were revealed, which in the first group of patients intensified in the treatment process, while in another group the symptoms barely appeared [14]. During orthodontic treatment premature contacts on the surface of the teeth may occur, and they are possible to develop disorders in the TMJ. In this case, a possible distal displacement of the articular condyles with dislocation of the anteromedial disc may occur. These changes in the mandibular kinematics and TMJ function lead to damage to the bilaminar zone, which is located behind the articular disc and carries out TMJ trophic. In this case, the formation of synovial fluid and nutrition of the cartilaginous structures of the joint will be disturbed. If the bilaminar zone is already intertwined, pain in the joint appears [9].

Dysfunction of TMJ as a result of partial or total edentation

TMJ dysfunction is detected in more than half (62.5%) of people with dentition defects [3]. Due to partial or total tooth loss, vertical occlusion size height and vertical resting size height change. Long change of these parameters leads to the development of irreversible consequences in the TMJ. Tooth loss leads to statistically significant changes in the parameters that characterize the mandibular fossa, articular tubercle and articular condyle of the mandible. Changes in the articular surfaces related to occlusion lead to severe dysfunction of the TMJ and stretching of its capsule [3]. Some authors mention that the most common cause of TMJ dysfunction is the partial absence of teeth or their destruction, which leads to a decrease in the vertical occlusion size [3].

As pointed out by N. A. Rabukhina et al., in the absence of teeth, the articular condyle of the mandible is displaced posteriorly, while there is a moment of compression in the joint to the retroarticular space, where the anatomical formations located in it are compressed [3]. In this regard, it can be assumed that the appearance of Costen's syndrome will be observed, because the anatomical formations and the bilaminar area, which are located posteriorly, are compressed and the patient feels some pain.

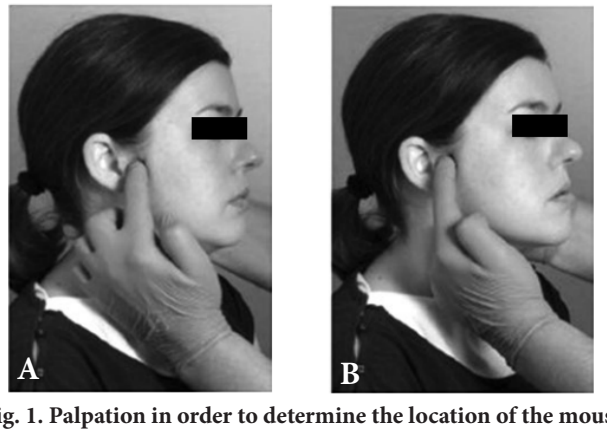

Fig. 1. Palpation in order to determine the location of the mouse process of the lower jaw. A – with a comfortable closing of the mouth, B – with protrusion of the lower jaw [9]

Fig. 2. Palpation of the masticatory muscle in order to determine the form of TMJ dysfunction. A – place of origin of muscle, B – body of muscle, C – muscle attachment area [9]

Dysfunction of TMJ as a result of pathological abrasion of the teeth (occlusal pathology)

For many years, the main cause of TMJ dysfunction was considered to be occlusal disorders, which lead to tension and hypertrophy of the masticatory muscles and TMJ pathology. However, in recent years this relationship has been called into question.

Fig. 3. Palpation of the temporal muscle in order to determine the form of TMJ dysfunction. A – anterior portion of muscle, B – middle portion of muscle, C – posterior portion of muscle [9] Dysfunction of TMJ as a result of pathological abrasion of teeth (occlusal pathology)

If occlusal factors are related to TMJ, then the medical dentist is the only professional who can provide adequate therapy. On the other hand, if occlusal factors are not related to TMJ, the medical dentist should refrain from treating TMJ with occlusal changes [4, 11].

There are many etiological factors of the occurrence of TMJ pathology, the main and most common of which is pathological occlusion [15]. The founder of this theory, the occlusal theory of temporomandibular disorders, is considered Costen J. [9]. In 1934, James Costen made the first systematic description of this group of diseases, indicating occlusal disorder as the main cause [16]. Occlusal pathology can involve several factors that can cause TMJ dysfunction, namely, the presence of premature contacts as a result of dental restorations and the presence of pathological abrasion of the teeth. Both factors will lead to the development of TMJ pathology. In the presence of occlusal pathologies, the patient will feel a constant tension of a certain muscle group, as a result of which the lower jaw will begin to move along the wrong path – pathological. If the pathogenic factor is not eliminated in time, the muscles will be in constant hypertonicity, which will soon lead to a spasm of the mimic and masticatory muscles [17]. These factors will contribute to a change in muscle tone and, as a consequence, the development of the pathological trajectory of the lower jaw will lead to changes in the joint itself, namely, deformation of the articular disc and a change in its position when opening and closing the mouth – the pathological position of the articular disc [9]. In correcting pathological occlusion, it is necessary to take into account the condition of the masticatory muscles; otherwise the treatment will not be effective. In such patients, during treatment to eliminate TMJ dysfunction resulting from occlusion disorders, physical therapy (myogymnastics) is prescribed [8].

It is considered, that TMJ and dental occlusion from a functional point of view are related not only to each other, but also to the musculoskeletal system. In this context it has been observed that if a patient with occlusion pathology begins orthodontic or prosthetic treatment without correcting the condition of the cervical spine, then the success of dental treatment is questioned. A scientific research, conducted in 2018, can show us that the complex rehabilitation tactics, which include muscle relaxation procedures, drug treatment, splint therapy, myogymnastic exercises for masticatory muscles according to an individual plan and correction of body posture, proved to be 12.49 and 2.18% more effective than traditional methods of treatment [18]. Occlusal pathologies include not only the presence of supracontacts, but also pathological abrasions, which can also be called bruxism [19, 20]. To best understand bruxism that occurs at night, the clinician should first have an appreciation of the sleep process. Sleep is investigated by monitoring the brain wave activity (electroencephalogram) of an individual during sleep. This monitoring is called a polysomnogram. Elements of bruxism seem to be associated with an etiology and identification of functional disorders in the masticatory system, during the transition from a deeper sleep to a lighter one [11]. Most often, the front group of teeth is prone to bruxism. This may not bother the patient for a long time; he will not notice a decrease in the function of the stomatognathic (dental) system [19, 20]. The only thing that will worry him will be the presence of an aesthetic defect. At the same time, the height of the vertical occlusion size decreases, the position of the lower jaw relative to the upper one may change, which entails the appearance of problems in the temporomandibular joint. The appearance of attrition of the hard tissues of the tooth, the narrowing of the clinical crown of the tooth, the lowering of the lower third of the face – all this will indicate bruxism [19].

Dysfunction of TMJ as a result of psycho-emotional stress

The emotional state of the patient is largely dependent on the psychological stress incurred. Stress is described by Selye as the "nonspecific response of the body to any request made on it" [11]. The etiopathogenetic basis of this factor, which is the cause of TMJ disorders, is based on the neuromuscular theory, proposed by B. Jankelson (1953). The main link of this theory is the statement that "TMJ only allows movement to be performed, and the very movement and, accordingly, the function is performed by the muscles" [21].

A common systemic phenomenon that can influence masticatory function is an increase in the level of emotional stress borne by the patient. The emotional centers of the

brain influence muscle function. The hypothalamus, the reticular system, and especially the limbic system are primarily responsible for the emotional state of the individual. These centers influence muscle activity in many ways, some of which are gamma – efferent pathways. Stress can affect the body by activating the hypothalamus, which in turn prepares the body to respond (the autonomic nervous system). By the hypothalamus, through the complex neural pathways, increases the activity of gamma efferents, which cause contraction of muscle fibers. This sensitizes the muscle shaft so that any slight stretching of the muscle will cause a reflex contraction. The overall effect is to increase the tonicity of the muscle. The therapist must understand and appreciate emotional stress, as it plays an important role in the development of TMJ dysfunction [11].

The masticatory muscles participate in raising the mandible (masticatory, temporal, masseter and medial pterygoid muscles) and lowering the lower jaw (milohyoid, geniohyoid, digastric venter anterior, lateral pterygoid muscle). These muscles are at rest when the mandible is in a state of physiological rest and contract when closing the mouth (i.e. raising the lower jaw) and closing the teeth in occlusion. In a stressful situation, the teeth will more often be placed in the position of centric occlusion, which means that the masticatory muscles will be in constant tension (there will be a constant contraction of muscle fibers). Such discoordination of the activity of the masticatory muscles will lead to disturbances in intraarticular relationships [21, 22]. Prolonged hypertonicity of the masticatory muscles, which can be examined using magnetic resonance imaging (MRI), can lead to structural changes in the muscles, i.e., TMJ dysfunction. MRI imaging allows obtaining multiplanar images, visualization of masticatory muscles throughout, evaluation of their symmetry and morphostructure [23].

Conclusions

Analyzing a large number of different sources and scientific articles, it is possible to make the conclusion, that TMJ dysfunction can be caused by different reasons.

1. The dentist must consciously examine patients with TMJ disorders, drawing special attention to the collection of anamnesis. To make an accurate diagnosis of the disease, additional instrumental methods of TMJ examination should also be used.

2. As reported, TMJ dysfunction has different etiologies, and for etiotropic treatment, the doctor must establish a causal relationship between the symptoms of TMJ dysfunction and the causes that caused it.

3. Treatment of TMJ dysfunction, as well as its study and examination, must be carried out by specialists from different fields of medicine. Surgical treatment does not give the desired effect and often entails various destructive and functional disorders in the postoperative period. The treatment of patients with TMJ dysfunction will be complex: therapeutic and preventive measures aimed at normalizing occlusal relations, restoring the functional state of the masticatory muscles, normalizing the psycho-emotional state of patients. Also it is recommended to exclude solid foods, limit the opening of the mouth, which increase strain and tension or cause a feeling of fatigue, stiffness and spasm in the TMJ region.

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Authors' contributions
DR collected data, wrote the first version of the manuscript; OC conceptualized the idea, completed the final text; DU revised critically the manuscript. All the authors approved the final version of the manuscript.

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Ethics approval and consent to participate
There is no need to approve this review.

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The authors have no conflict of interests to declare.