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THE EVALUATION OF HEADS OF TEMPOROMANDIBULAR JOINT (TMJ) POSITION IN PATIENTS WITH MALOCCLUSION

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Abstract

This article is concerned with the evaluation of temporomandibular joint position, symmetrical heads position, timely diagnostics of dentofacial abnormalities. The aim of the investigation is to study position and evaluate symmetry of condyles of temporomandibular joint of dentofacial abnormalities based on Angle's classification of malocclusion (the first class includes normal jaw relations; the second one contains distal position of mandible, the third class includes medial position of mandible).

Materials and methods. *70 patients were involved in the investigations that have dentofacial abnormalities. cone beam computed tomography was also used. Based on Angle's classification, all patients were divided in three groups: 1st group included 34 patients (the first class), 2nd group included 30 patients (the second class), 3rd group included 6 patients (the third class), 34 male patients and 36 female patients were involved in the investigation aged from 8 to 29 years old. The reveal of heads of temporomandibular joint position was done by* H *Gelb in medial sagittal plane of joint.*

Results. *Based on results of our investigation, it has been established that patients having bite abnormalities and correct position of temporomandibular joint heads on either side of position 4/7, only 8 patients are involved in this group (11.43 %). Based on Angle's classification (the 1st class) symmetrical position of heads of that joint in 4/7 was indicated 17.65 %, the second class includes 6.67 %, the third one contains no one case was established. Despite bite abnormality, number of patients with correct position of condyles in segment 4/7 from 20 % to 5 % is decreased. Besides pathology is caused by increase of asymmetrical correlations of condyles of the joint in the segments with 6.67 % to 50 % (based on Gelb).*

Conclusions. *Despite class of bite pathology symmetrical position of heads in position 4/7 is occurred only in 11.43 % cases, and it indicates the correlation between dentofacial abnormalities and temporomandibular joint pathology, correspondingly complex approach to treatment of orthodontic patients is simply correct. Number of patients with optimal position of heads of the joint in segment 4/7 with 17.65 % based on 1st Angle's classification, to 6.67 % based on 2nd Angle's classification, absence of patients of the 3rd class is decreased. Age dynamics of rotational displacement of the centre of condyles is pointed, and it can affect negatively joint function.*

Keywords: *Malocclusion, dentofacial abnormality, temporomandibular joint, cone beam CT.*

Introduction

The problem of medical rehabilitation of patients with bite abnormalities (malocclusion) has attracted the attention of dentists for several decades, because this problem is explained by the constant increase in its prevalence in children, adolescents and adults [*Kuroedova VD et al., 2017c*].

Dental abnormalities create aesthetic disorders and are accompanied by functional disorders of the maxillofacial organs, play a role in the pathogenesis of the temporomandibular joint (TMJ) disease.

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According to literature data, from 27% to 76% of patients who addressed to dentist, they complain of discomfort, gnashing, crunching when talking and eating, crepitus, pain in the area of TMJ [*Kuroedova V et al., 2017a*]. A number of scientists the occurrence of sleep apnea (obstructive sleep apnea) is associated with the position of the lower jaw and tongue [*Jefferson Y, 2009*].

Michael L Gelb indicates that the position of the TMJ and occlusive factors affect the airway passage. According to this philosophy of "Airway Centric TMJ Philosophy," therapeutic measures should be aimed at normalizing breathing: firstly the respiratory tract, then the joint and muscles, and finally the occlusion [*Huang Y, Guilleminault C, 2009*].

Orthodontists – advocators of the FACE philosophy, consider the normal functioning and position of the TMJ as one of the most important goals of orthodontic treatment, along with facial aesthetics, dental aesthetics, healthy periodontal tissues and airways [*Fricton J et al.,1995*].

Diseases of the TMJ are a common pathology of the maxillofacial area, which in terms of frequency takes the third place after caries and periodontal disease. According to the results of studies by many authors, from 36% to 75% of the population have various dysfunctions of the TMJ [*Gelb M, 2014*]. The inconsistency of data on the prevalence of clinical manifestations of TMJ dysfunction is due to a number of reasons: the lack of diagnostic algorithms and standard clinical and supplementary examination methods, accepted concepts for treating patients with TMJ dysfunction syndrome.

More researchers consider that occurrence of abnormalities of the TMJ disease results as the impact of a combination of a number of adverse factors that can reinforce each other [*Badel T et al., 2012*]. The most significant of them: dysfunction of the masticatory muscles, the presence the hypersthenia, spasm, the occurrence of trigger points in the muscles [*Trezubov VN et al., 2005*]. According to some authors, up to 73% of patients with symptoms and signs of functional disorders of the TMJ have the same etiological factors as the main disorders of occlusion, which are associated with the presence of premature contact and a decrease in interalveolar height [*Luther F, 2007*].

One of the important points of stability of orthodontic treatment are therapeutic measures aimed at creating a central position of the heads of the mandible and stable occlusion, that is, there is an inextricable link between occlusion and the position of the TMJ heads. There are many publications proving that orthodontic treatment can reduce the symptoms of TMJ dysfunction [*Michelotti A, Iodice G, 2010; Coelho T, Caracas H, 2015*].

One of the most significant problems in modern dentistry is the timely diagnosis of TMJ pathology, which is associated with certain difficulties: the complexity of the anatomical structure of the joint, the multifactorial nature of the occurrence of TMJ dysfunctions. Therefore, for the diagnosis of diseases of the TMJ, along with clinical and laboratory research methods (survey, examination, palpation, auscultation, anthropometric methods), different X-ray and instrumental methods are used [*Petersson A, 2010; Currie R, 2011; Kai Y et al., 2011; Kuroedova V et al., 2017b*].

At present, diagnostic uses have increased significantly due to the use of modern instrumental and technical methods, such as magnetic resonance imaging (MRI), cone-beam computed tomography (CBCT), arthrography, which allow obtaining images in different planes, as well as visualizing not only bone, but also soft tissue structures of the joint, which makes it possible to develop new approaches in the treatment [*Reiter S, 2007; Kuroedova V et al., 2018a*]. The most informative method of X-ray study of the TMJ is CT, which gives basic information about bone structures and the ability to measure the size of the joint gap [*Scherbakov A et al., 2013; Shepitko V, 2014; Kuroedova V et al., 2018b*]. This information determines the topicality of the chosen topic and the necessity for this study.

The aim of the investigation is to study position and evaluate symmetry of condyles of TMJ of dentofacial abnormalities based on Angle's classification of malocclusion (the first class includes normal jaw relations; the second one contains distal position of mandible, the third class includes medial position of mandible).

MATERIALS AND METHODS

The study was carried out on dental cone beam computed tomography (CBCT) data of 70 patients who applied to the Department of Postgraduate Education of Orthodontists of UMSA.

By gender, the distribution of patients was uniform: 34 men and 36 women, aged from 8 to 29. CT examinations of the jaw bones were performed on a VATECH PAX-ZENITH 3D dental computer tomograph, with 1 mm scanning step, 15 sec. scanning time and the total radiation load of 50 μSv. The study of the position of the articular heads was performed in the Ez3D2009 program. According to Angle's classification, all patients were divided into three groups: Group 1 – the 1st class by Angle, 34 patients (18 men, 16 women), Group 2 – the IInd class, 30 patients (12 men and 18 women), Group 3 – the IIIrd class, 6 patients (4 men and 2 women).

Depending on the period of bite development, all patients were divided into two groups: Group A – with mixed occlusion, 30 patients aged 8–12 (18 men and 12 women), and Group B – 40 patients with permanent occlusion aged 13–29 (18 men and 22 women).

A written parental agreement was obtained for the examination of patients from the 1st group. Determination of the position of the TMJ heads was carried out by H. Gelb method in the midsagittal plane of the joint [*Gelb H, Arnold G, 1959*]. The first one is a horizontal line with respect to the upper part of the articular fossa. The second horizontal line is drawn with respect to the lower part of the fossa in the region of the slope of the articular tubercle parallel to the first horizontal line. The third horizontal line is formed by dividing the distance between the first and second horizontal lines parallel to them – the middle parallel line (Fig. 1).

The first vertical line starts from the highest point of the fossa and goes perpendicular to the first horizontal line. The second vertical line starts from the intersection point of the middle horizontal line with the front surface of the articular fossa downwards parallel to the first vertical line. As a result of all line's intersection we get 8 segments – the Gelb 4/7 grid.

The grid segments are numbered: 1st segment is in the anterosuperior part of the fossa, 2nd segment is in the posterosuperior part of the fossa, 3rd, 4th and 5th segments are located in the middle of the grid, where the 3rd one is in the anterior part, the 5th one is in the posterior one. Segments 6, 7 and 8 are located in the lower part of the grid: 6 – in the anteroinferior, 8 – in the posteroinferior section. According to the Gelb 4/7 grid, there are 4 main positions of the TMJ head: 2/5 position – posterior-superior position, 1/5 – superior position, 1/4 – anterior-superior position and 4/7 – inferior-forward position, which is considered to be the optimal position for a healthy TMJ. The software package "Microsoft Office 2010" was used to process the research results.

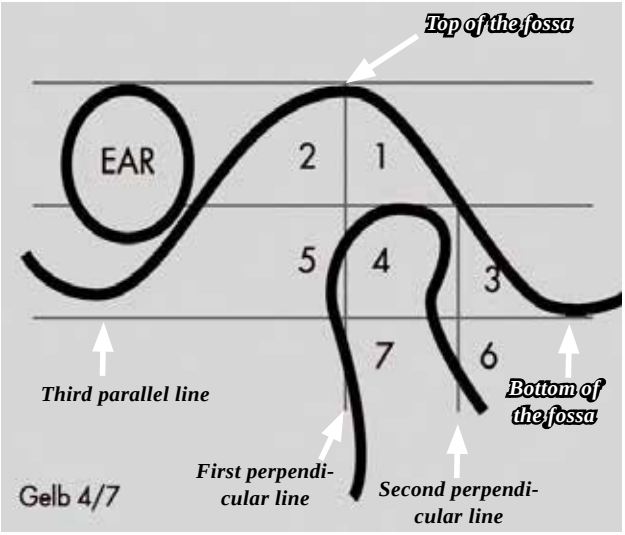

FIGURE 1. *The position of the TMJ head according to* [*Gelb H, Arnold G, 1959*].

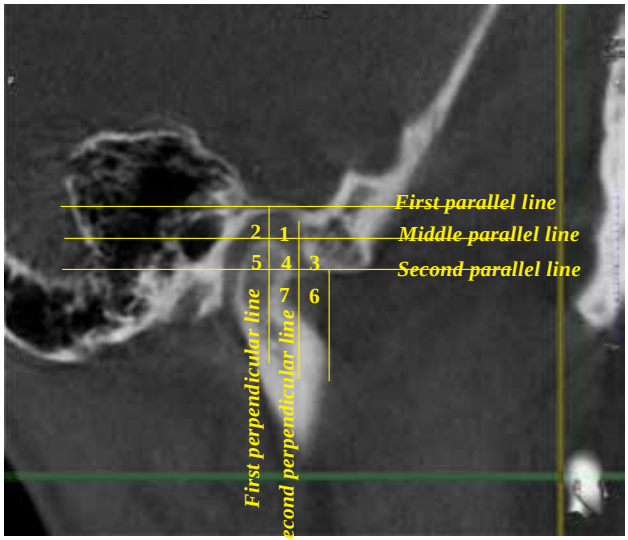

FIGURE 2. *Studying the position of the articular head on the right of patient M. on CT.*

Results and discussion

According to the results of our research, it was established that, regardless of the malocclusion, there are only 8 patients (11.43%) who have the right position of the TMJ on the left and right in 4/7 position (Fig. 2).

In patients of Group 1 (Class I malocclusion by Angle's classification), correct, i.e. the symmetric, position of the TMJ on the left and right in 4/7 position was found only in 6 patients (17.65%). Unilateral position of the articular head was found in 4 cases, and they all are on the right only (Table 1).

The most common is the symmetric position of the articular heads in 1/4 position – 10 patients (29.41%), the asymmetric position was found in 8 cases on the left and in 2 on the right in combination with another position on the opposite side of Gelb's grid. Four patients (11.76%) have the symmetric position of heads in 2/5 segment. The asymmetric position of at least 1 joint is established in 8 cases. In 1/5 position any person doesn't have symmetrical position of the heads, the asymmetric unilateral position was found in 6 cases.

Symmetric position of the articular heads was found in 20 patients (58.82%) in total. In patients of Group 2 the symmetric position of the TMJ heads in 4/7 position was found in 2 people (6.67%), with any asymmetric cases. For patients with Class II malocclusion by Angle's classification this position is the least characteristic. The most common is the symmetric position of the articular heads in 1/4 position – 12 patients (40.0%), the asymmetric position with other positions is established in 6 cases, on the left only. The symmetric position of the articular heads in 1/5 position is found in 8 patients (26.67%), the asymmetric one is in 4 cases, on the right only. In 2/5 segment the symmetric position of the TMJ heads was observed in 2 cases (6.67%), the asymmetric one is in 2 cases on the right.

In patients of group 3 the most characteristic position of the articular head was found in 1/5 segment – 4 patients with the symmetric position (13.33%) and 2 patients with the asymmetric position of the heads in 1/5 segment on the right in combination with 2/5 on the left. The position of the TMJ heads in 4/7 and 1/4 segment in Class III malocclusion has not been established. In mixed occlusion, the correct symmetric position of the TMJ head in 4/7 position is observed in 6 patients (20%). The characteristic feature is also the symmetry of the position of the TMJ head in other segments: 2/5, 1/5, 1/4, which was established in 22 patients (73.33%). Table 2 presents data depending on the occlusion development.

Table 1

The position of the articular heads of the temporomandibular joint (TMJ) according to the Gelb 4/7 grid

Malocclusion class by Angle's classification		The positions of the TMJ heads							
		4/7		2/5		1/5		1/4	
		R	L	R	L	R	L	R	L
Class I (n=34)	uni.	0	4	4	4	2	4	8	2
	sym.	6		4		0		10	
Class II (n=30)	uni	0	0	0	2	0	4	6	0
	sym	2		2		8		12	
Class III (n=6)	uni	0	0	2	0	0	2	0	0
	sym	0		0		4		0	

Notes: uni - unilateral, sym - symmetric, L - Left, R - Raight

Table 2

The position of the temporomandibular jointheads in the mixed and permanent occlusion

		Positions			
Occlusion development		4/7	2/5	1/5	1/4
Mixed (n=30)	unilateral		2		
	symmetric	6	2	4	16
Permanent (n=40)	unilateral		20		
	symmetric	2	4	8	6

In the permanent occlusion, the symmetric position of the TMJ head in 4/7 position was found in only 2 patients (5%), the symmetry in other segments was found in 18 patients (45%) and the number of patients with asymmetric position of the articular heads increased to 50%.

Thus, the age dynamics of the aggravation of the wrong position of the TMJ head is clearly seen. Regardless of the malocclusion, the number of patients with the correct position of the articular heads in 4/7 segment decreases from 20% to 5%. In addition, the severity of the pathology is exacerbated by an increase in the asymmetric combinations of the TMJ heads position in the segments according to Gelb's grid from 6.67% to 50%.

CONCLUSION

Despite the class of occlusion pathology, the symmetrical position of the TMJ heads in the 4/7 position is found only in 11.43% of cases, which indicates the close relationship between dentofacial abnormalities and TMJ pathology, respectively, an integrated approach in the treatment of orthodontic patients is considered only correct.

Cone beam computed tomography is an informative method in the study of malocclusions and TMJ pathology. With the severity of bite pathology, the number of patients with the optimal position of the TMJ head in the H. Gelb's net, that is, in the 4/7 segment, from 17.65% in the first class in Angle to 6.67% in the second class and absence of patients in the third class decreases. The wide variation in the different positions of the articular heads in the studied patient groups indicates the asymmetry of the position of the articular heads, the age dynamics of the rotational displacement of the center of the articular heads is clearly visible, which can have a negative effect in the incongruous work of the joint.

With age, all large deviations in the structure and relationships of the structural elements of the joint are detected. According to the results of research, orthognathic bite at any age is only 5-7%, and according to our research, symmetry of the position of the TMJ heads occurs about in 11%, then the question should be revised the norm in orthodontics and the transition to the concept of an individual patient's norm is long overdue.

Prospects for further investigations

The paper considers only some of the additional research methods of malocclusion and TMJ. Developments in this direction can be continued.

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THE STUDY OF THE ELECTROCHEMICAL POTENTIALS OF METAL STRUCTURES IN THE ORAL CAVITY IN DISEASES OF THE ORAL MUCOSA.

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Abstract

The aim of the study was to research the electrochemical potentials in the oral cavity in various oral mucosa diseases.

On the Department of Therapeutic Dentistry in I.M. Sechenov First Moscow State Medical university was examined 342 patients, aged from 36 to 78 years old with suspected development of galvanic syndrome in oral cavity. Women accounted for 61% (207 people), men - 39% (135 people). 138 patients were referred to us with a diagnosis of glossalgia and burning mouth syndrome, 54 patients with limited hyperkeratosis of the oral mucosa, 45 patients with a diagnosis of verrucous leukoplakia, 63 patients with a diagnosis of lichen planus (erosive and ulcerative form) and 42 patients with erythema migrans. All patients aimed at studying the electrochemical potential had various prosthetic metal constructions in oral cavity: crowns, bugel denture, implants, inlays, metal pins. As a measuring device, when determining the electrochemical potentials of the oral cavity, a millivoltmeter with high input resistance (more than 20 mega ohm), sensitivity above 200 mV, protection from external interference and autonomous power supply was used.

As a result of the study, it was established that the determination of the electrochemical potentials of metal structures located in the oral cavity allows confirming or refuting the presence of galvanic syndrome in various oral mucosa diseases. In patients diagnosed with glossalgia, burning mouth syndrom and erythema migrans, a high difference in the electrochemical potentials of various metal structures was observed in only 50% of the patients examined. In erosive and ulcerative lichen planus, verrucous leukoplakia and limited mucosal hypekeratosis, the number of patients who had confirmed galvanic syndrome, was above 70%.

Keywords: *dentistry, galvanic syndrome, oral mucosa diseases, lichen planus, leukoplakia, hyperkeratosis.*

Introduction.

Galvanic syndrome is a complex of symptoms due to the presence of galvanic current in the oral cavity. The widespread use of various metals and their alloys in dentistry has led to the emergence of new problems and diseases, which include the development of galvanic syndrome. This syndrome is manifested by the following symptoms: metallic taste in the mouth, sense of acid, perversion of taste, and a burning sensation of the tongue [*Gozhaya L, 2000; Lebedev K et al., 2010; Makarenko N, Arakelyan M, 2017*]. Irritability, headaches, weakness, and dry mouth can occur. As a result of chronic irritation with electric current, the resistance of tissues decreases, the microbial landscape of the oral cavity changes, glossalgia, burning mouth syndrome and oral mucosa diseases develop, accompanied by erosion or hyperkeratosis [*Lebedev K.A.et al.,2012; Lebedev K, Ponyakina I, 2014*].

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The cause of galvanic current is the presence of dissimilar metals in the oral cavity (crowns, implants, inserts, pins) it can occur in the vast majority of patients. It is known for electrochemistry in which every metal immersed in an electrolyte solution acquires a certain potential peculiar only to it. If there are alloys of metals with different electrochemical potentials in the oral cavity, then galvanic currents begin to flow between these metals. The role of electrolyte in this case is performed by saliva [*Ponyakina I et al., 2009*].

High prevalence of galvanic syndrome in oral cavity in modern dentistry requires effective prevention, diagnosis and treatment, which demonstrates the relevance of current study. It is practically impossible to register the galvanic current, which occurs when there are metals with different electrochemical potentials in the oral cavity, due to its volume distribution in soft tissues. In this regard, the measurement of the strength of the current in the oral cavity does not represent a great diagnostic value due to the presence of leakage currents, which leads to serious measurement errors.

The presence of galvanic currents in the oral cavity can only be determined indirectly by measuring the electrochemical potentials of various metal structures and inclusions in the oral cavity [*Gorina E, 2016; Volkov A et al., 2016; Makeeva I et al., 2017*]. In this case, the greater the difference in the electrochemical potentials of various metal structures and inclusions, the higher the electromotive force and the likelihood of galvanic currents. According to the literature, the probability of galvanic currents appears when the difference in electrochemical potentials between different metal structures is at least 60 *mV* [*Lebedev K, Ponyakina I, 2014*].

It should be noted that prosthetics often create conditions conducive to galvanic currents in the oral cavity.For example, when in the mouth of permanent metal dentures with support on teeth with metal inserts and/or dental implants, since these metal structures are represented by several types of metals or alloys. After the appearance of metal structures and inclusions in the oral cavity with the difference of electrochemical potentials exceeding the threshold values, signs of galvanic syndrome development can begin to appear from 1-3 weeks to 2-3 months and more after the appearance of "galvanic pair" in the mouth. Long-term irritation of oral mucosa by galvanic current can contribute to the development of mucous membrane diseases, including pre-cancer diseases, such as verrucous form of leukoplacia, erosive-ulcerative and hyperkeratotic form of red flat deprivation, limited hyperkeratosis. There is also evidence in the literature that electrogalvanic microcurrents can lead to the development of malignant neoplasms [*Volkov A.et al.,2016]*. The electrochemical potentials of the oral cavity are investigated in the presence of suspected galvanic syndrome. Without conducting this study it is almost impossible to clarify and correctly make a diagnosis.

Some autors are argued that only if a large difference in potentials of metal structures in the oral cavity is detected in patients and if symptoms characteristic of galvanic syndrome are present can we talk about making the correct diagnosis *[Lebedev K, Ponyakina I,2014]*. There are no absolute contraindications for measuring the electrochemical potentials of the oral cavity.

Aims. The study of electrochemical potentials in the oral cavity in various oral mucosa diseases.

Materials and Methods:

On the Department of Therapeutic Dentistry in IM Sechenov First Moscow State Medical university was examined 342 patients aged from 36 to 78 years old with suspected development of galvanic syndrome in oral cavity. Women accounted for 61% (207 people), men - 39% (135 people). 138 patients were referred to us with a diagnosis of glossalgia and burning mouth syndrome, 54 patients with limited hyperkeratosis of the mucous membrane, 45 patients with a diagnosis of verrucous leukoplakia, 63 patients with a diagnosis of lichen planus (erosive and ulcerative form) and 42 patients with erythema migrans. All patients aimed at studying the electrochemical potential had various prosthetic metal constructions in oral cavity: crowns, bugel denture, implants, inlays, metal pins. As a measuring device, when determining the electrochemical potentials of the oral cavity, a millivoltmeter with high input resistance (more than 20 mega ohm), sensitivity above 200 *mV*, protection from external interference and autonomous power supply was used [*Makeeva I et al.,2017*].

In the study, was used two electrodes passive

and active. A passive electrode is an electrode that is non-polarizable during the study, and its potential must be stable over time. A neutral silver chloride electrode was used as a passive electrode.

The active electrode was an inert metal electrode made of 900 purity of gold. The change in the potential of the active electrode is determined by the level of redox processes in those tissues where the active electrode is placed.

The study was performed in a dental chair, in the sitting position of the patient. Before the study, the patient was asked to rinse the mouth with distilled water. Between the skin and the passive electrode was placed a gauze wad moistened with physiologic saline. A passive electrode was placed on the skin of the inner side of the arm wrist. The active electrode consistently touched various metal structures and inclusions in the oral cavity. At each test site, the active electrode was fixed for 10–15 seconds (until the instrument readings stabilized). At the same time, using a measuring device, the potential difference in *mV* between the passive electrode placed on the arm wrist and the active electrode, which was placed sequentially on various metal structures and inclusions in the oral cavity, was determined.

Results

Of the 342 patients examined, 228 (66%) had a high difference in electrochemical potentials of various metal structures in the oral cavity, which indicated the possibility of the appearance of galvanic currents in the oral cavity and the development of galvanic syndrome.

Out of 138 patients referred with glossalgia and burning mouth syndrome, in 90 patients burning mouth syndrome or glossalgia was combined with the subjective sensations of “dry mouth”. In 69 patients, which accounted for 50% of this group, a high difference in electrochemical potentials of metal structures was determined - from 60 to 200 *mV* (on average from 80 to 150 *mV*).

In 33 (73%) of 45 patients with a verrucous form of leukoplakia, a high difference in the electrochemical potentials of metal structures was found - from 60 to 250 *mV* (average 100–200 *mV*). All 54 patients with limited hyperkeratosis of the oral mucosa showed a high difference in electrochemical potentials of metal structures from 120 to 250 *mV*.

With the erosive form of lichen planus in 51 patients out of 63, which accounted for 73%, a high difference in the electrochemical potentials of various metal structures was found - from 100 to 120 *mV*. Of the 42 patients diagnosed with erythema migrans in 21, which accounted for 50%, a large difference in the electrochemical potentials of metal structures was determined 100–120 *mV*.

Discussion

Studies on the galvanic syndrome interested dentists and were carried out in a historical aspect for a long time [*Venugopalan R, Lucas L, 1998; Brailo V et al., 2006*]. Materials and alloys are rapidly developing in prosthetic dentistry. However, despite the great interest in this topic, there are currently more questions than answers[*Stawiński K, Wójciak L,1966; Korraah A et al., 2012; Makeeva I et al., 2017*]. A number of authors consider that a gastroenterologist and a mental specialist should treat a patients with glossalgia [*Makeeva I. et al.,2017*].But, in our study, patients with glossalgia in 50% of cases determined the high difference in electrochemical potentials of metal structures, which suggests that this factor cannot be disregarded. At the same time, the data of our study are fully consistent with [*Herrström P, Högstedt B,2017*] and [*Podzimek S, 2013; Mohammed F, Fairozekhan A, 2017*], which concluded that the phenomena of galvanic syndrome in the mouth induce subcellular changes in precancerous cells during leukoplakia in vitro and simulate some morphological features of these cells in vivo. A number of authors note the importance of the microbial factor in galvanic syndrome [*Balasubramaniam R et al.,2009*], and of course, since the end of the 1990s, materials research has been carried out and acceptable combinations of metals have been developed for use as clinical guidelines in prosthetic dentistry [*Koh I et al.,2008*].The fact that the problem of galvanic syndrome exists must be remembered when treating patients with a dental profile [*Stawiński K, Wójciak L,1966*]. And also, to strive to improve the methods of diagnosis and prevention of such conditions, which was the subject of our research.

Conclusion

Thus, as a result of the conducted research, it was established that the determination of the electrochemical potentials of metal structures located in the oral cavity, allows confirming or refuting the presence of galvanic syndrome in various oral mucosa diseases. In patients diagnosed with glossalgia, burning mouth syndrome and erythema migrans, a high difference in the electrochemical potentials of various metal structures was observed in only 50% of the patients examined. In erosive and ulcerative lichen planus, verrucous leukoplakia and limited mucosal hypekeratosis, the number of patients who had confirmed galvanic syndrome, was above 70%.

If there is a large difference in electrochemical potentials between metal structures in the oral cavity, a galvanic current appears and a galvanic syndrome develops. Considering that diseases of the oral mucosa have a multifactorial etiopathogenesis, the data of our study indicate that galvanic syndrome may be one of the factors provoking the development and exacerbation of diseases of the oral mucosa.

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