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ANTI-INFLAMMATORY AND ANTIDISBIOTIC EFFECT OF ORAL BIOTRIT-DENTA FYTOGEL AT ORTHODONTIC OPERATIONS IN PATIENTS WITH DENTOALVEOLAR ANOMALIES

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Abstract

Background. To determine the condition of the oral cavity in persons with dentoalveolar anomaly after orthodontic operations and the effect on it of oral applications of the Biotrit-Denta phytogel.

Methods. A total of 20 patients with dental-maxillary anomalies and 13 healthy individuals were examined. In unstimulated saliva (oral fluid), the activity of elastase, catalase, lysozyme, urease and the content of malondialdehyde (MDA) were determined. The antioxidant-prooxidant index API was calculated using the ratio of catalase activity and MDA content, and the degree of dysbiosis was calculated using the ratio of relative activities of urease and lysozyme. All 20 patients underwent orthodontic surgery, of this number 10 patients received oral applications of the Biotrit-Denta phytogel for 30 days, the other 10 patients made up the comparison group. After 2 months, the above indicators were determined in all patients in saliva.

Results. An increase in the activity of elastase, urease, the content of MDA and the degree of dysbiosis with a decrease in the activity of catalase and the API index was found in patients with dental-maxillary anomalies. Applications of the phytogel reduced the activity of elastase, urease, MDA content and the degree of dysbiosis, however, they increased the activity of catalase, the API index and showed a tendency to increase the activity of lysozyme. In the comparison group, there were no significant changes in the indicators.

Conclusion. Dentoalveolar anomalies in patients in the oral cavity cause the development of dysbiosis and inflammation, a decrease in antioxidant and immune defense. Oral applications of phytogel "Biotrit-Denta" have antidisbiotic and anti-inflammatory effects.

Key words: dentoalveolar anomalies, orthodontics, oral gel, inflammation, dysbiosis.

INTRODUCTION

In accordance with the data of numerous studies, dentoalveolar anomalies occur in almost 65-75% of people, with more than half of all cases occurring in the abnormal position of the teeth [1]. The elimination of Dentoalveolar anomalies is the most urgent problem not only for orthodontics, but also for all dentistry, since the presence of such anomalies determines, to a large extent, the development of dental pathology, which is fraught with serious consequences for the whole organism [2-4].

Persons with dentoalveolar anomalies that are subject to orthodontic treatment, there are significant impairments in the functional status of the dentoalveolar anomalies system and the oral cavity [5, 6], which can be aggravated by ongoing orthodontic operations [4, 7].

Violations of the auct of chewing, salivation, the development of oral dysbacteriosis, against which inflammatory-dystrophic processes easily develop in the tissues of the oral cavity, are characteristic of persons with tooth-maxillary anomalies, against the background of which inflammatory-dystrophic processes in oral tissues easily develop [8-10].

To eliminate oral dysbacteriosis, a significant amount of antidisbiotic agents containing pro-and prebiotics, immunostimulants, antiseptics has been proposed [11].

Recently, oral mucosal-adhesive gels, containing biologically active substances and possessing anti-disbiotic and anti-inflammatory action, have gained popularity in dentistry [4, 12].

We have proposed the gel form of the previously developed polyfunctional anti-biological agent Biotrit-Denta, containing the herbal preparation Biotrit C, a complex of bioflavonoids, prebiotics, vitamins and microelements from wheat seedlings [12].

Biotrit has immunomodulatory, anti-disbiotic, antioxidant and anti-inflammatory properties [13] and has found its application in dentistry as part of the “Biotrit C”, “Biotrit-Denta” preparations, “Biodent-3”, “Biodent-4” elixirs, as well as the composition of the mucosa-adhesive gel "Biotrit" [14].

The composition of "Biotrita-Denta", in addition to Biotrit, includes osteostimulants, vitamin C and antiseptic [11]. Regulatory documentation has been drawn up for the recipe of phytogel “Biotrit-Dent” and the permission of the Ministry of Health of Ukraine has been obtained for its use as a prophylactic agent [15].

In the experiment on white rats with diabetes mellitus type 1, in which orthodontic springs were fixed in the mouth, we showed the anti-inflammatory, anti-disbiotic and mineralizing effect of oral applications of the Biotrit-Denta phytogel [16].

The purpose of this study was to determine the state of oral tissues in patients with dental-maxillary anomalies that are subject to orthodontic treatment and the influence on this condition of oral applications of the Biotrit-Denta phytogel.

MATERIAL AND RESEARCH METHODS

In the work, mucozo-adhesive phytogel "Biotrit-Denta" produced by the NPA "Odessa Biotechnology" was used in accordance with TU U 20.4-13903778-032: 2012 and the formulation of the RC U 20.4-13903778-032 / 15: 2018. Gel applied to the gum daily in the evening after dinner at a dose of 0.5 ml per dose for 30 days. A total of 20 patients with dental-maxillary anomalies were examined, who underwent orthodontic operations (placement of braces, movement of teeth, partial extraction of teeth).

Of this number, 10 patients, starting from the first day (before the operation), received gel applications (main group), and 10 patients made up the comparison group (did not receive Biotrit-Dent). Oral fluid (unstimulated saliva) was collected from all 20 patients by spitting into test tubes [17]. Collection of saliva was carried out twice: on the first day (before surgery) and 2 months later.

The level of inflammation markers [18] was determined in saliva: the activity of the proteolytic enzyme elastase [19] and the content of malonic dialdehyde (MDA) [20], the

indicator of microbial contamination — urease activity [21], an indicator of the state of nonspecific immunity — lysozyme activity [22], activity antioxidant enzyme catalase [23].

The degree of dysbiosis according to A. P. Levitsky [24] was calculated by the ratio of the relative activity of urease and lysozyme, and the antioxidant-prooxidant index API was calculated by the ratio of catalase activity and MDA content [18].

The research results were subjected to standard statistical processing [25].

RESULTS AND DISCUSSION

Table 1 presents the results of the distribution of patients according to the nature of the manifestations of the dental-maxillary anomalies, which generally correspond to generally accepted indicators [1].

Table 1. The distribution of patients according to the diagnosis

№№	Diagnosis	Men	Women	Total
1	Teeth crowding	5	3	8
2	Dental bite	1	3	4
3	Medial bite	2	2	4
4	Open bite	1	1	2
5	Prognathia	1	1	2
	Total	10	10	20

Table 2 presents the results of determining the level of inflammation marker, from which it is evident that in all patients with dental-maxillary anomalies in the saliva the activity of elastase increases 2,2 times, and the content of MDA 3,1 times, indicating the presence of inflammatory events in oral cavity in all patients with dental-maxillary anomalies. In patients undergoing orthodontic manipulation, the condition of the oral cavity after 2 months, almost did not change, as evidenced by the results of determining the level of elastase and MDA. Patients who underwent orthodontic surgery and who received oral gel applications normalized elastase activity and decreased MDA content by 41 %.

The findings suggest that the pathological condition of the oral cavity is mainly due to the presence of a tooth-gingival anomaly, and the orthodontic operation itself after 2 months did not significantly affect the level of biochemical markers of inflammation.

Table 2. The effect of oral applications of phytoegel "Biotrit-Denta" on the level of inflammatory markers in the saliva of patients receiving orthodontic treatment ($M \pm m$)

№№	Groups	n	Elastase , mk-cat/l	MDA, mmol/l
1	Healthy	13	0,157±0,044	0,212±0,027
2	Patients before treatment	20	0,348±0,051	0,650±0,099
			p<0,05	p<0,01
3	Patients after treatment (comparison group)	10	0,359±0,028	0,638±0,135
			p<0,01; p ₁ >0,5	p<0,01; p ₁ >0,5
4	Patients after treatment with gel "Biotrit-Denta"	10	0,166±0,045	0,374±0,077
			p>0,5; p ₁ <0,05	p<0,05; p ₁ <0,05
			p ₂ <0,01	p ₂ >0,05

Notes: p – in comparison with gr. № 1; p₁ – in comparison with gr. № 2; p₂ – in comparison with gr. № 3.

The results of this study confirmed previously obtained in the experiment data on the anti-inflammatory effect of the gel "Biotrit-Denta" [16].

Table 3 presents the results of the determination of catalase activity and the API index in saliva. From these data it is clear that in patients with dental-maxillary anomalies, catalase activity is significantly reduced (1,8 times) and the API index is greatly reduced (5,4 times). Orthodontic treatment had little effect on the level of these indicators, whereas gel applications significantly increased the activity of catalase and the API index, although they did not return them to the level of the norm.

Fig. presents the results of determination in the saliva of the activity of urease and lysozyme. It is seen that in patients with dental-maxillary anomalies, urease activity increases 3-fold, indicating the growth of microbial contamination of the oral cavity. Orthodontic surgery reduces the activity of urease by 1,3 times (p>0,05), and operations against the background of gel applications reduce the activity of urease by 2,1 times (p<0,05).

The activity of lysozyme in the saliva of patients with dental-maxillary anomalies is reduced by 2 times, indicating the weakening of non-specific immunity. Orthodontic surgery had little effect on reduced levels of lysozyme. They did not significantly affect the level of lysozyme and gel applications (an increase of 1,27 times, p>0,3). These data indicate that the dentoalveolar

anomalies significantly reduce the level of nonspecific immunity in the oral cavity, which requires the use of more effective immunostimulating agents.

Table 3. Influence of oral applications of Biotrit-Dent phytogel on catalase activity and antioxidant-prooxidant index API in the saliva of patients receiving orthodontic treatment (M ± m)

№№	Groups	n	Catalase, mkat/l	API
1	Healthy	13	0,228±0,021	10,75±0,64
2	Patients before treatment	20	0,129±0,019 p<0,01	1,98±0,27 p<0,001
3	Patients after treatment (comparison group)	10	0,125±0,024 p<0,01; p ₁ >0,5	1,96±0,31 p<0,001; p ₁ >0,7
4	Patients after treatment with gel "Biotrit-Denta"	10	0,168±0,006 p<0,05; p ₁ <0,05 p ₂ <0,05	4,49±0,33 p<0,01; p ₁ <0,05 p ₂ <0,05

Notes: see tab. 2.

The degree of dysbiosis in the oral cavity, calculated from the indices of urease and lysozyme activity, is shown in the figure, from which it follows that in patients with dental-maxillary anomalies, the degree of dysbiosis increases almost 6 times, slightly decreases after orthodontic surgery (by 15 %, p> 0,2) and very significantly in patients who received oral applications of the gel "Biotrit-Denta" (61 %, p<0,01).

CONCLUSIONS

1. Dento-maxillary anomalies cause the development in the oral cavity of the inflammatory process by reducing the level of protective systems: antioxidant and immune.
2. Orthodontic surgery has little effect on the condition of the oral cavity.
3. Oral applications of the mucous-adhesive gel "Biotrit-Denta" have an anti-inflammatory and anti-disbiotic effect in the oral cavity.

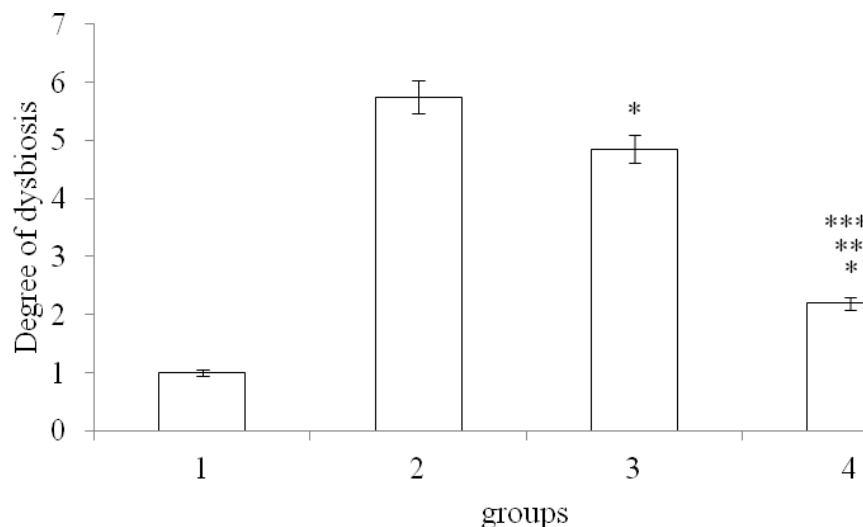


Fig. The effect of oral applications of phytogel "Biotrit-Denta" on the degree of dysbiosis in the saliva of patients receiving orthodontic treatment

(1 - healthy, 2 - patients before treatment, 3 - comparison group, 4 - main group)

* – $p < 0,05$ compared with gr. 1, ** – $p < 0,05$ compared with gr. 2, *** – $p < 0,05$ compared with gr. 3

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