

Immune correction of the dental status of patients with type ii diabetes mellitus using removable orthopedic prostheses.

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Abstract:

The dental status of patients with diabetes mellitus and the ways of its correction are an important section in the complex of therapeutic and preventive measures for this pathology. In orthopedic patients, the condition of the oral cavity is affected not only by the presence of the main general somatic disease-diabetes mellitus, but also by all types of removable prostheses used. **The aim of the study** was to improve the effectiveness of therapeutic and preventive manipulations aimed at correcting the dental status of patients with type 2 diabetes mellitus during dental prosthetics with removable types of structures, using immunomodulatory therapy and phytotherapy. In this article, we will conduct a study on the impact of previously virtually unexplored effects of immunomodulators and herbal medicines on the transformation of the functional state of periodontal tissues in patients using removable types of prostheses and having a history of type 2 diabetes mellitus. **Materials and methods.** The clinical study was conducted on the basis of the orthopedic department of United Dental Polyclinic of the Starooskolsky city district. The object of the study was patients with a history of type 2 diabetes mellitus lasting from 7 to 10 years. The study involved 64 people. The first group consisted of 32 people, including 23 women and 9 men. This group was a control group and was treated with traditional drugs. The second group also included 32 people, 24 women and 8 men, respectively. In this group, experimental treatment with immunomodulatory therapy and herbal medicine was carried out. As an immunomodulator, the drug "Imudon" was used, and as a phytotherapy-the drug "Bolus Huato". Clinical, laboratory, and radiological diagnostic methods were used to evaluate the results. These methods included the collection of anamnesis, complaints, oral examination, gingivostomy, periodontal index, hygiene and bleeding index, papillary-alveolar-marginal (PMA) index, as well as cytobacteriological and statistical methods. The study of the prosthetic bed was performed before prosthetics, three months after prosthetics, 20 days after experimental treatment, and 6 months later. **The results of the use of the drugs "Imudon" and "Bolus Huato"** in the process of orthopedic treatment of patients with type 2 diabetes mellitus give a certain positive dynamics on the quality of rehabilitation. Thanks to this experimental technique, the patients of the main group not only normalized the conditions and microflora of the oral cavity, but as a result, there was a complete adaptation to removable orthopedic structures with a subsequent increase in the use of dental prostheses.

Keywords: orthopedic dentistry, immune correction, removable dentures, type 2 diabetes, rehabilitation

Introduction

One of the clinically severe and ubiquitous systemic diseases that affects the conditions of the dentoalveolar system is insulin-dependent diabetes mellitus.

The pathological processes that occur as a result of this disease destroy the tissues and organs of the oral cavity (Bayakhmetova & A.A, 2017). Blood vessel damage, hyperglycemia, oligoptialism, immunodeficiency and other abnormalities provide the basis for the occurrence of many diseases in the oral cavity, which leads to an increase in the number of people with diabetes who seek dental care. According to our data, about 68% of patients of the Starooskolsky city district who have a history of type 2 diabetes need orthopedic dental care (Kozicina, Gel'shtejn,

Obuhov Je, & Chibisova, 2015; S.I, K.B, E.V, & M.A, 2016).

Removable dentures as a type of orthopedic structures have the greatest impact on the tissues and organs of the oral cavity of a healthy person. Microangiopathy of the tissues of the prosthetic bed, hyposalivation and a decrease in the local immunity of the oral cavity when using prostheses create conditions for the formation of dental deposits, and as a result, there is a mutation of the oral microflora (Daurova, I.B, & A.Yu, 2015; Vaytsner, G.S, & E.S, 2011). For patients suffering from type 2 diabetes, this factor is complicated by the presence of general somatic diseases. As a result, the condition of the oral cavity is affected not only by the presence of diabetes, but also by the removable prosthesis itself (Kozicina et al., 2015; S.I et al., 2016).

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The rigid base of the removable prosthesis spreads the chewing load on the vessels of the prosthetic bed that have been rebuilt due to hyperglycemia, which in turn leads to microangiopathies and creates conditions for the occurrence of prosthetic stomatitis and dysbiosis of the oral cavity (Yu.N, A.A, S.N, & Yu.S, 2019). Exacerbation of the signs of periodontitis and overstrain of the supporting teeth provoke inflamed periodontal tissues, which carry an additional load in the presence of a removable prosthesis. As a result of the inhibition of healing processes in this disease, mechanical microtraumas of the mucous membrane that occur under the influence of a dental prosthesis develop into severe, long-term non-healing damage to the soft tissues of the mouth (A.Yu et al., 2016; Bazarnyi et al., 2017). Pathological changes in the periodontal tissues are the most common sign of the severity of diabetes in the oral cavity. According to our data, the detection of diabetes mellitus in patients with periodontal tissue damage occurs in 62% of cases (A.I, A.S, & Yu.V, 2015; Kirst et al., 2015).

Due to all factors, rehabilitation and dental prosthetics of patients suffering from insulin-dependent diabetes mellitus becomes more complicated.

The search for the most effective and productive methods for regulating violations of the microflora in the oral cavity is currently urgent and urgent (D.F, M, H.G, S.A, & K.N, 2017; S.I et al., 2016). Currently, due to the increasing allergization of the population, as well as the widespread spread of antibiotic-resistant strains of microorganisms, the leading role is given to non-drug methods of therapy for periodontal pathologies, in particular, immunomodulatory therapy and phytotherapy. However, after analyzing the literature sources, we came to the conclusion that the data on the transformation of the functional state of periodontal tissues under the influence of immunomodulators and phytopreparations are practically not studied (Bartold & Van Dyke, 2019; Ji, Choi, & Choi, 2015).

As an immunomodulatory therapy, the immunomodulator Imudon (Solvay Pharma, France), a polyvalent complex of antigens created from the lysate of bacteria — mainly representatives of the normal microflora of the human oral cavity, including cariogenic *Lactobacillus* spp. and *Streptococcus* spp., has found wide application in dentistry (Aleshkin & Afanasev, 2015; S.I et al., 2016). The drug acts on the mucous membrane, thereby stimulating phagocytic activity, the production of immunocompetent cells, the amount of secretory IgA, and at the same time increasing the content of lysozyme in saliva, which gives the drug a strong bactericidal property (Bayakhmetova & A.A, 2017; S.V, S.N, M, & I.S, 2020).

Herbal medicine has found a positive response in dentistry. A wide range of alternative medicine products allows you to choose the most effective and effective means. The drug "Bolus Huato" ("Guangzhou Pharmaceutical Company Baiyunshan Jixing", China) is an effective means of traditional medicine in China. It includes: *Sophora japonica*, Chinese angelica, Ginseng, Sichuan lovage, Chinese dereza, camphor cinnamon, Japanese *Ophiopogon*, *Evodia officinalis*, large-leaved gentian, Daurian angelica, Honey, Activated charcoal. The drug does not contain chemical substances, preservatives and dyes, which is important in the treatment of periodontal tissue pathologies. Due to the biologically active substances contained in the plant components, the drug has a combined effect, while reducing the time of blood clotting, reducing the overall peripheral vascular resistance, it is analgesic, tonic, restorative, immunostimulating and adaptogenic effects (Barros, Williams, Offenbacher, & Morelli, 2016; S.A et al., 2019).

We did not find any information about the studies on the use of the drugs "Bolus Huato" and "Imudon" and the analysis of their effect in a comparative aspect in patients with insulin-dependent diabetes mellitus, which determines the relevance of this scientific work.

The aim of the study was to improve the effectiveness of therapeutic and preventive manipulations aimed at correcting the dental status of patients with type 2 diabetes mellitus during dental prosthetics with removable types of structures, using immunomodulatory therapy and phytotherapy.

Materials and Methods

The clinical study was conducted on the basis of the orthopedic department of United Dental Polyclinic of the Starooskolsky city district. The object of the study was patients with a history of type 2 diabetes mellitus lasting from 7 to 10 years. The age of the subjects ranged from 45 to 60 years.

The study involved patients with compensated and subcompensated forms of diabetes mellitus, without the presence of concomitant somatic and infectious diseases. Using the questionnaire method, the type, duration and degree of compensation of the disease were specified.

The indication for the manufacture of removable orthopedic structures was a partial or complete loss of teeth of the upper and lower jaws. Before the start of dental prosthetics, a complete rehabilitation of the oral cavity was performed, including professional hygiene, therapeutic and surgical treatment.

Removable dentures were made on the basis of the dental laboratory of our clinic with the use of materials from one manufacturer. For the study,

79% of partial dentures and 21% of complete dentures were made in the first group, and 82% of partial dentures and 18% of complete dentures were made in the second group.

The study involved 64 people.

The first group consisted of 32 people, including 23 women and 9 men. This group was a control group and was treated with traditional drugs.

The second group also included 32 people, 24 women and 8 men, respectively. In this group, experimental treatment with immunomodulatory therapy and herbal medicine was carried out. As an immunomodulator, the drug "Imudon" ("Solvay Pharma", France) was used, and as a phytotherapy –the drug "Bolus Huato" ("Guangzhou Pharmaceutical Company Baiyunshan Jixing", China). The study was conducted three months after prosthetics. The drug Imudon was prescribed to patients as a preventive course for 20 days, 6 tablets a day with a two-hour interval. The drug Huato boluses was used for laser phoresis, where 1 part of the boluses and 2 parts of vaseline were taken. This mixture with a volume of 1 gram was evenly applied to the oral mucosa, and then, with the help of a dental laser device "Mustang", low-frequency laser irradiation was applied to the surface of the gums. This procedure was performed for 20 days with a one-day interval.

Clinical, laboratory, and radiological diagnostic methods were used to evaluate the results. These methods included the collection of anamnesis, complaints, oral examination, gingivostomy, periodontal index, hygiene and bleeding index, papillary-alveolar-marginal (PMA) index, as well as cytobacteriological and statistical methods.

The study of the prosthetic bed was performed before prosthetics, three months after prosthetics, 20 days after experimental treatment, and 6 months later.

Results and Discussion

The examination of patients after rehabilitation before prosthetics showed a satisfactory level of

the state of the prosthetic bed and oral hygiene. At the time of the initial orthopedic appointment, the patients had no complaints about any pathological processes in the oral cavity.

The following measurements were carried out after three months of wearing removable structures. Patients began to complain of bad breath, bleeding gums, itching and swelling. During the examination and analysis of the indicators, it was revealed that after three months the situation in the oral cavity deteriorated significantly: high indicators of the level of bleeding gums and the hygiene index were determined, the periodontal index and the PMA index revealed the middle phase of inflammation, gingivostomy showed the presence of an increase in inflammatory processes in the periodontal tissues.

Before the study, the patients of both groups were re-interviewed about the need to follow the rules of hygiene and care for prostheses and the oral cavity. Recommendations were given for the further use of prostheses.

Then a clinical trial was performed for 20 days. In the control group, therapy was carried out by traditional methods, in the main group, immunomodulatory therapy and herbal medicine were used.

At the end of the study, the necessary data were collected. As a result, we found that after the treatment, the situation in both groups improved significantly. However, the indicators of the main group were significantly higher than in the control group.

After 6 months from the beginning of prosthetics and after the treatment, the delayed data revealed that the use of immunomodulatory therapy and phytotherapy in the main group led to remission of inflammatory processes and to further full adaptation to removable prostheses, but in the control group, the indicators of the tests revealed the initial stage of the inflammatory process, which delayed the adaptation process for a long time. Comparative data of the studied indicators are given in Table 1.

Table 1: Dynamics of indicators of these patients with type 2 diabetes mellitus in the course of the study.

Indicators	Control group				Main group			
	Before prosthetics	In 3 months	In 20 days after therapy	6 months	Before prosthetics	In 3 months	In 20 days after therapy	6 months
Hygiene Index	0.9±0.3	2.0±0.4	0.6±0.2	1.3±0.5	0.9±0.2	1.9±0.5	0.6±0.2	0.6±0.1
Bleeding index	1.2±0.3	2.0±0.4	0	1.3±0.2	0	2.0±0.6	0	0.7±0.1
Periodontal index	2.0±0.8	2.8±0.7	2.1±0.4	2.5±0.4	2.1±0.3	2.9±0.7	1.4±0.3	1.3±0.3
RMA	22.3±4.1	39.6±4.5	8.1±2.4	25.7±6.4	20.3±0.1	39.8±5.1	1.4±0.4	1.3±0.1
Gingivostomy	2.1±0.2	2.5±0.4	1.4±0.3	2.2±0.1	2.2±0.4	2.5±0.4	1.0±0.3	1.6±0.3

of the candida group	5.5±0.2	10.9±0.3	6.4±0.2	7.6±0.4	4.9±0.4	11.3±0.4	2.5±0.3	4.3±0.1
Cocca flora	0.8±0.2	2.1±0.3	0	1.0±0.3	0.8±0.2	2.0±0.1	0	0.4±0.4

Evaluating the data obtained throughout the study, we came to this conclusion:

1) at the end of the treatment, the patients of both groups had indicators of bleeding and hygiene within the normal range; after half a year from the moment of prosthetics, these indicators in the control group revealed an unsatisfactory state of the oral cavity, bleeding pockets were detected during probing, in the main group these indicators remained satisfactory;

2) on the 20th day of therapy in the control group, the paradontal index decreased by 1.4 times, and in the main group-by 2.3 times; after 6 months, when examining the control group, the results revealed an acute stage of inflammation, in patients of the main group, the indicators were stable;

3) the data of the PMA index in both groups demonstrate remission of pathological processes in both groups; after 6 months in the control group, the indicators were equal to the parameters of mild periodontitis, but in the main group, complete remission was observed for this indicator;

4) as a result, the dynamics of the index data is confirmed by microbiological data: due to the use of immunomodulatory therapy in the main group, the oral microflora corresponded to the indicators of a healthy person, while in the control group, remnants of coccoid and candida infections were detected.

The results of the use of the drugs "Imudon" and "Bolus Huato" in the process of orthopedic treatment of patients with type 2 diabetes mellitus give a certain positive dynamics on the quality of rehabilitation. Thanks to this experimental technique, the patients of the main group not only normalized the conditions and microflora of the oral cavity, but also, as a result, there was a complete adaptation to removable orthopedic structures and, as a result, the terms of use of dental prostheses increased.

Conclusion

Thus, in the course of the research work, we identified the following significant conclusions:

1. The condition of the oral cavity of patients suffering from type 2 diabetes mellitus is affected not only by the presence of concomitant pathology, but also by the impact of removable orthopedic structures on the prosthetic bed.

2. In case of non-compliance with the rules of hygiene and care for prostheses, such patients have severe symptoms of periodontal tissue

damage, as well as the microflora of the oral cavity is disturbed, which leads to traumatization of the oral mucosa.

3. Studying the data of the studied groups, the positive dynamics of index indicators was revealed in the experimental group, where patients were treated with the drugs "Imudon" and "Huato Boluses". After a long time, the results of this group remained stable and showed no signs of inflammation, in contrast to the control group with traditional drug therapy.

4. After the study, there was a complete adaptation of the patients of the main group to removable prostheses due to the normalization of the conditions of the prosthetic bed and the creation of a healthy oral microflora with the help of the medicinal properties of the drugs used.

5. According to our forecasts, the period of use of dental prostheses can be extended to 5-7 years, subject to compliance with the rules of hygiene and care for prostheses, as well as compliance with the dynamic therapy of the main endocrine pathology.

References:

- A.I, Z., A.S, S., & Yu.V, C. (2015). Clinical features of oral cavity tissues in patients with diabetes mellitus. Undergoing orthopedic treatment with prostheses made of various structural materials. Modern problems of science and education 16(2), 101-107.
- A.Yu, M., B.V, T., E.T, Z., O.O, N., D.I, P., & A.V, T. (2016). A new look at the problem of prevention and treatment of periodontal diseases. Medicine and pharmacy. . 2(3), 64-69.
- Aleshkin, V. A., & Afanasev, S. S. (2015). Microbiocenoses and health of the person: the monograph/under a general edition of Alyoshkin VA, Afanasyeva SS, Karaulov AV. Moscow: Dynasty.
- Barros, S. P., Williams, R., Offenbacher, S., & Morelli, T. (2016). Gingival crevicular fluid as a source of biomarkers for periodontitis. *Periodontology 2000*, 70(1), 53-64. doi:<https://doi.org/10.1111/prd.12107>
- Bartold, P. M., & Van Dyke, T. E. (2019). An appraisal of the role of specific bacteria in the initial pathogenesis of periodontitis. In (Vol. 46, pp. 6-11): Wiley Online Library.
- Bayakhmetova, A. A., & A.A, E. (2017). Characteristics of the microflora of periodontal pockets, immunological parameters of peripheral blood and oral fluid in patients with periodontitis. Actual scientific research in the modern world. 22(6), 33-37.
- Bazarnyi, V. V., Polushina, L. G., Sementsova, E. A., Svetlakova, E. N., Beresneva, N. S., Mandra, Y. V., & Tsvirinko, S. V. (2017). The interleukins in the pathogenesis of periodontitis. *Vestn. Ural. Med. Akad. Nauki. Journal of Ural Medical Academic Science*, 14(1), 35-39.

- D.F, B., M, M., H.G, M., S.A, L., & K.N, L. (2017). The effect of Smoking on markers of inflammation and bone remodeling slit in gingival fluid and subgingival microbiota after periodontal therapy. *J Periodont ReS*. 52, 713-724. doi:<https://doi.org/10.1111/jre.12438>
- Daurova, F. Y., I.B, R., & A.Yu, T. (2015). Evaluation of the anti-inflammatory effect of plant-based drugs in the treatment of gingivitis in adult patients with crowded teeth. *Russian Dental Journal*, . 6, 17-21
- Ji, S., Choi, Y. S., & Choi, Y. (2015). Bacterial invasion and persistence: critical events in the pathogenesis of periodontitis? *Journal of periodontal research*, 50(5), 570-585. doi:<https://doi.org/10.1111/jre.12248>
- Kirst, M. E., Li, E. C., Alfant, B., Chi, Y.-Y., Walker, C., Magnusson, I., & Wang, G. P. (2015). Dysbiosis and alterations in predicted functions of the subgingival microbiome in chronic periodontitis. *Applied and environmental microbiology*, 81(2), 783-793. doi:<https://doi.org/10.1128/AEM.02712-14>
- Kozicina, S. I., Gel'shtejn, K. B., Obuhov Je, V., & Chibisova, M. A. (2015). Standards in orthopedic dentistry developed in the Department of Dentistry of the MEDI Clinic System (part 1). *Institute of Dentistry*, 4, 36-39.
- S.A, A., G.S, R., M.S, P., V, T. E., E.V, I., & V.N, T. (2019). Microbiological justification of the use of phytopreparations for the treatment of inflammatory periodontal diseases. *Periodontology*, 24(3), 196-202. doi:<https://doi.org/10.33925/1683-3759-2019-24-3-196-202>
- S.I, K., K.B, G., E.V, O., & M.A, C. (2016). The procedure for providing orthopedic care adopted in MED clinics, at the clinical reception and in the dental laboratory when creating non-removable structures (part 2). *Institute of Dentistry*, 2, 26-28.
- S.V, M., S.N, G., M, Y., & I.S, G. (2020). Efficiency of the use of blood ozone therapy in the phenomena of periodontitis in orthopedic patients. *Tula*, 2: 57-61
- Vaytsner, E. Y., G.S, R., & E.S, P. (2011). Comparative characteristics of vital computer capillaroscopy and laser Doppler flowmetry in the study of microcirculation in periodontal tissues. *Proceedings of the VIII International Conference "Systemic Blood Circulation, Microcirculation and Hemorheology"*, Moscow, . 167-168.
- Yu.N, K., A.A, B., S.N, G., & Yu.S, S. (2019). Features of prosthetics for periodontitis, from the practice of a dentist-orthopedist. *Dentistry of the Slavic States: proceedings of the XII-th Scientific and Practical International Conference*, Belgorod., 195 -197.