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THE INFLUENCE OF ADHESIVE CREAMS ON THE PERIOD OF ADAPTATION TO REMOVABLE DENTURES

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ВЛИЯНИЕ АДГЕЗИВНЫХ КРЕМОВ НА ПЕРИОД АДАПТАЦИИ К СЪЕМНЫМ ЗУБНЫМ ПРОТЕЗАМ

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Adentia, whether partial or complete, is a common condition in the population, especially among older individuals. Although removable orthodontic devices are an effective solution for adentia, dentures can cause irritation in the oral cavity. The nature and duration of symptoms experienced by patients using dentures for the first time depend on various factors, such as the condition of their teeth and gums, jaw bone density, prosthesis design, psychological factors, and previous dental work. Studies have shown that special adhesive agents can improve the fit of removable dentures, leading to faster adaptation and better stability, even in challenging oral conditions. Using adhesives not only helps with new prostheses but also enhances comfort with existing ones, reduces movement while eating, and prevents food from getting trapped under the denture. This ultimately improves the patient's psychological well-being, reduces the foreign body sensation, and enhances quality of life. Proper maintenance and use of removable dentures can prevent jaw bone atrophy and degenerative changes in the oral tissues.

Literature review revealed the numerous variables that impact the successful treatment of total or partial tooth loss in patients. The incorporation of bonding agents unquestionably enhances the adjustment process to removable orthodontic devices by enhancing stability, a critical factor in the early stages of prosthesis use. However, it is essential to consider other various factors that influence the complexity and duration of adaptation, such as the characteristics of the dental structure, oral mucosa condition, jaw bone atrophy level, prosthesis selection and design, patient's psychological state, presence of macroglossia, previous prosthetic work, or its absence.

Keywords. Adentia, removable dentures, adjustment, bonding agents.

Задача обзора литературы заключается в оценке ключевых факторов, влияющих на эффективность адгезии съемных протезов, определении роли современных адгезивных средств в процессе адаптации пациентов к съемным ортопедическим конструкциям.

Частичное или полное отсутствие зубов относится к распространённым заболеваниям, особенно часто диагностируремым у пациентов старших возрастных групп. Использование съемных ортопедических конструкций является оптимальным решением проблемы адентии, однако протезы являются комбинированными раздражителями зубочелюстной системы. Характер и длительность жалоб пациентов, начинающих использовать съемные протезы, зависят от многих факторов. Исследователи рекомендуют практикующим врачам учитывать тип окклюзии, особенности костной структуры челюсти, слизистой оболочки рта, размеры языка пациента, проведение иммедиат-протезирования после удаления зубов и другие аспекты. Авторы приведенных в обзоре исследований изучали влияние клеевых композиций на надежность фиксации и уровень комфорта пациента при использовании протеза. Адгезивные средства в виде крема или порошка помогают надежно зафиксировать протез в полости рта даже при наличии «сложной» анатомии протезного ложа. Доказано, что пациенты, использующие данные средства, быстрее привыкают к наличию инородного тела в полости рта и имеют меньший уровень тревожности. Обследованные, уже использующие съемные протезы в течение длительного времени и привыкшие к ним, также сообщают о положительном влиянии адгезивных композиций: снижается балансирование конструкции при жевательной нагрузке, при более плотном прилегании протеза пища перестает травмировать слизистую оболочку полости рта. Таким образом, улучшается психологическое состояние пациента, протез все меньше воспринимается как инородное тело, повышается качество жизни протезируемого. При правильном использовании и тщательном уходе за съемными зубными протезами приостанавливается атрофия костной ткани челюсти и предотвращаются дистрофические изменения подлежащих тканей.

Анализ литературы позволил выявить, что эффективность лечения пациентов с частичным или полным отсутствием зубов зависит от множества различных факторов. Использование адгезивных средств значительно улучшает процесс адаптации к съемным ортопедическим конструкциям за счет повышения уровня фиксации, особенно на начальном этапе использования протезов. Однако необходимо учитывать и другие аспекты, влияющие на сложность и продолжительность адаптации: структуру зубочелюстного аппарата, состояние слизистой оболочки полости рта, уровень атрофии

челюстной кости, выбор и характеристики протеза, психологическое состояние пациента, наличие макроглоссии, а также проведенное предварительное протезирование или его отсутствие.
Ключевые слова. Адентия, съемные протезы, процесс адаптации, адгезивные средства.

INTRODUCTION

Despite significant advances in dentistry and a fairly high level of prevention of dental diseases, the prevalence of complete and partial absence of teeth is slightly decreasing and in different regions of the world is diagnosed in more than 25 % of those examined among elderly and senile patients. One of the obstacles to the use of removable dentures is the possible traumatic impact, therefore, today an important task of orthopedic dentistry is their adaptation.

USE OF DENTAL PROSTHETICS AND STUDY OF PROBLEMS RELATED TO PERIOD OF PATIENTS' ADAPTATION TO PROSTHESES

Tooth extraction can lead to problems with chewing, speech, the appearance of teeth and face, and contribute to the development of various pathologies, such as jaw deformations and abrasion of hard dental tissues. The main goal of dental prosthetics is to restore the function of the dentoalveolar system. Elderly patients prefer removable prostheses, often refusing prosthetics on implants due to their high cost [1].

It is important to understand that the process of adaptation to removable orthopedic structures is quite long and, according to V.Yu. Kurlyandsky, is from 10 to 33 days and depends on various factors. He identified several phases of adaptation to the denture, starting from irritation and ending with complete adaptation of the nervous system.

Such a factor as macroglossia has a negative impact on the process of adaptation to removable prostheses. It was found that according to Kennedy's classification, there is a certain connection between the development of macroglossia and the class of adentia. The study showed that macroglossia most often occurred in patients with bilateral terminal defects of the dental arch, which corresponds to class 1, while it was least often observed with included defects in the anterior part of the dental arch, which corresponds to class 4 [3].

Researchers have found that partial absence of teeth is the most common, followed by complete absence and much less common is congenital adentia. Research by P.J. Dhanrajani (2003) showed that primary adentia is observed in 5.5–6.5 % of the population, while the absence of six or more teeth is detected in 0.3 % of the population. Other scientists note that congenital adentia occurs in approximately 2 % of cases. Although this pathology is rare, patients from this group also require prosthetics [4].

The study by A.N. Ramakrishnan, O. Röhrle and C. Ludtka analyzed age groups of patients with missing teeth. The first group included 66 patients aged 60 years and older, the second group included 68 patients aged 40 to 60 years, and the third group included 36 patients aged 25 to 40 years. Each group contained an equal num-

ber of men and women. According to the initial analysis, 38.5 % of patients had already undergone prosthetics. Most of them were aged 60 years and older. In a subsequent analysis, it was found that 66 % of patients used removable partial dentures, predominantly in the 40–60 age group. Fewer patients (9.1 %) in the 25–40 age group used removable prostheses. The highest number of installed removable partial dentures were in patients with secondary edentulous class 1 (48.8 %) and 2 (34.8 %) according to Kennedy, while the lowest number (2.3 %) was in patients with edentulous class 4. It was also found that the adaptation period to removable prostheses was the longest – up to 30–33 days in patients with partial absence of teeth of class 1 (absence of chewing units on both sides of the dental arch) and class 2 (unilateral terminal defect of the dental arch) aged 60 years and older. Most patients who underwent the examination complained of discomfort caused by the direct impact of the orthopedic structure on the tissues of the prosthetic bed. They noted rubbing, pressure on certain areas of the oral mucosa, pain in the masticatory muscles. These complaints indicated the need for adjustments to the denture. Some patients made other complaints. The application of the prosthesis in the oral cavity provoked gagging in 11.2 % of patients, 5.8 % experienced hypersalivation, 10.7 % had a foreign taste in the mouth, 25.8 % had pronunciation problems, and 49.9 % experienced psychological discomfort from wearing the dentures. It is noteworthy that patients aged 25 to 40 years adapted to removable structures more easily compared to the older contingent. At the same time, patients of this age group, despite recommendations, did not remove the prostheses from the mouth at night (62.5 ± 11.6 %) [5].

One of the main complaints revealed during the patient survey is the pronunciation disorder. This problem seriously affects the quality of life and causes psychological discomfort, especially in people whose professional duties include communication. It was found that this complaint persists the longest – up to one month – in respondents over 60 years old. At the same time, in patients aged 25 to 40, the speech defect disappears in 7–10 days. Observations show that the vast majority of respondents with complete loss of teeth get used to removable structures much longer than patients with partial loss of teeth. This is due to the fact that patients with partial adentia redistribute the chewing load on their own teeth, which leads to uneven pressure on the prosthetic bed [6].

The research data obtained by S.Ye. Zholudev showed that after the installation of the denture in the oral cavity, the nature and intensity of complaints in patients changes over time. On the first day of using the prosthesis, 96 % of patients complained of a feeling of inadequacy of the denture size and discomfort, but after a day this complaint decreased to 52 %, and by the fifth day the number of complainants decreased to 32 %. After a month of using the prostheses, only 8 % of patients continued to have complaints. This is a completely natural process, when after installing the denture, the patient feels it as a foreign body in the mouth, but then begins to adapt

to it, and the complaints practically disappear. On the day of installing the dentures, 37 % of patients complained about the violation of fixation and mobility of the denture on the upper jaw, and 62 % – on the lower jaw. After 24 hours, unsatisfactory fixation on the upper jaw was noted by 18 % of patients and by 36 % on the lower jaw. Five days after the prosthesis was installed, problems with fixation were noted by 8 % of patients on the upper jaw and 21 % on the lower jaw. After 5–30 days, only 2 % of patients complained of poor fixation of the denture on the upper jaw and 11 % on the lower jaw [7].

The works of V.N. Trezub, A.S. Shcherbak, L.M. Mishnev and other researchers revealed a relationship between the time elapsed since the installation of the denture and patients' complaints about problems with pronunciation. 58 % of patients experienced a deterioration in pronunciation on the first day after the installation of complete removable prostheses, but after 24 hours this figure dropped to 48 %. After 1–5 days, only 38 % of patients complained of pronunciation problems, and after 5–30 days, only 12 %. It was also found that 88 % of patients had difficulty chewing food on the first day after the installation of dentures, but after 24 hours this figure dropped to 78 %. These data highlight the importance of patient comfort when using dentures and the individual nature of the process of getting used to them [8; 9].

V.A. Klemin, B.S. Kozlov and V.E. Zhdanov worked with two categories of patients: in the first category, patients immediately after tooth extraction received dentures, in the second category, patients did not undergo immediate prosthetics. Analysis of the comparative correlation in the first category of patients who received immediate prosthetics and the second category of patients who did not undergo this procedure revealed a very strong positive relationship. Evidence has been obtained that immediate prostheses prevent jaw bone tissue atrophy and promote the formation of normal bone structure. Immediate prosthetics is an indispensable stage before permanent prosthetics [10].

Researchers S.Ye. Barinov, E.Kh. Romodanovsky and others studied in detail the clinical symptoms and pathological changes in tissues in denture stomatitis in patients using removable dentures. According to their research, one of the main signs of denture stomatitis is the appearance of spots of various shapes and sizes. There is a variety in their location, size and shape. Scientists have identified the main factors leading to pathomorphological changes in the denture bed: improper fit of prostheses, uneven distribution of chewing load, presence of pores and irregularities on the surface of dentures, as well as poor care of them. The study also showed that with denture stomatitis, pathological changes affect all structures of the denture bed – from the epithelium to the bone [11].

Research by A.V. Sevbitov, N.Ye. Mitin and A.S. Brago indicate that pathological processes occur in the epithelium of the prosthetic bed in cases where patients do not seek retrofitting a removable prosthesis after manufacture or use "old" dentures without relining for more than 2–3 years. The data obtained confirm that the entire epithelial layer of the prosthetic bed is consistently in-

volved in the inflammatory process. The outcome of this pathological process is atrophy and thinning of the stratum corneum of the epithelium, a decrease in the regenerative capacity of tissues. In parallel with infiltration, degenerative changes are detected in the vessels of the tissues of the prosthetic bed in the form of their thickening and sclerosis [12].

The researchers conducted a deep analysis of pathomorphological processes in all tissues of the prosthetic bed. They found that the pathological process affects nerve fibers, leading to their destruction under the influence of compression. At the initial stages of inflammation of the periosteum of the prosthetic bed, an increase in the number of osteoblasts is observed, then the periosteum degrades, being replaced by fibrous tissue. With a long course of the pathological process, pinpoint and diffuse hemorrhages appear in the periosteum. It is noted that the main cause of pathomorphological disorders in the tissues of the prosthetic bed is circulatory disorders due to compression. The authors emphasize the fact that patients adapt to the prosthesis, but any removable structure is subject to mandatory replacement after 2–3 years of use [13; 14].

In the studies of V.I. Kulazhenko it was noted that the lack of vertical compliance of the mucous membrane of the denture is the result of excessive and prolonged compression, which is observed with prolonged use of prostheses. M.I. Sadykov joins the opinion of other researchers regarding the need for immediate prosthetics and notes the absolute importance of the correct placement and grinding of artificial teeth to ensure successful adaptation to orthopedic structures [15].

Correction of prosthesis after the initial application in the oral cavity is a necessary stage. The patient is explained that discomfort during the first period of wearing the denture is normal, but it is necessary to perform mandatory relining of the base within 1–3 days. Monitoring of adaptation to the denture continues on average for 30–33 days, which corresponds to the onset of the inhibition stage in the cerebral cortex.

To determine the effectiveness of the orthopedic treatment, the following indicators can be identified: the patient's self-assessment of the function of the prosthesis and the stability of the dentures, their compliance with aesthetic standards, clarity of pronunciation of sounds and the ability to comfortably consume a variety of food [16].

ANALYSIS OF THE RELIABILITY OF FIXATION OF DENTAL PROSTHESIS USING VARIOUS MATERIALS

The importance of reliable fixation of the prosthesis to prevent injury to the tissues of the oral cavity is emphasized by researchers M.I. Sadykov, A.M. Nesterov, S.V. Vinnik, A.R. Ertesyan and others. They note that existing methods for improving the fixation of removable dentures are constantly being improved using various techniques for obtaining impressions, volumetric modeling, elastic materials, surgical preparation and implants. These methods facilitate more effective adaptation to removable dentures. Together with the main adaptation methods, adhesive preparations can provide psychological comfort for pa-

tients. Adhesive agents have been used for a long time, including tragacanth powder to accelerate adaptation to complete removable dentures during initial use. The first means for fixing dentures were plant extracts such as Gum karaya resin and Astragalus Verus extract. Adhesive compositions are not a new phenomenon in dentistry and have been invented in the union of the chemical industry and practical medicine since 1913. Currently, the dental materials market offers adhesive compositions in the form of fixing pads, powders and gels [17].

T. Kurogi, H. Murata and E. Yamaguchi found that the use of cream denture adhesives significantly increased their retention ($p < 0.01$) and occlusal strength ($p < 0.05$). However, no significant differences were found between the initial strength and the post-intervention strength in the groups using powder denture adhesive and the control group. However, no significant differences were found between the baseline and post-intervention strengths between the denture powder adhesive and control groups. Within-group comparisons showed that cream denture adhesives improved both the retentive and occlusal strengths. Statistically significant results ($p < 0.05$) showed that the use of powder denture adhesives resulted in improved occlusal strength ($p < 0.01$) [18].

According to the data obtained during the study by A. Slaugter and R.V. Katz, the use of adhesives for prosthesis can significantly improve the level of comfort and quality of life in people using complete dentures [19].

The use of adhesive compositions in patients with xerostomia is quite effective; in particular, it has been determined that when using some types of adhesives for fixation, the holding force of prosthesis increases over time, reaching a maximum 10 minutes after application, but they are easily washed off, while other types of compositions show high holding force and good durability immediately after application [20].

Based on the research conducted by Ye.A. Buyanov, V.I. Shemonaev, O.G. Strusovskaya, R.I. Zodorov and A.N. Parkhomenko, it was revealed that some of the most popular fixing creams in Russia are Corega, Lacalut, President, Protefix. The study included patients aged 38 to 91 years. The questionnaire assessed such parameters as the degree of atrophy of the alveolar processes of edentulous jaws in accordance with the classification of I.M. Oksman (1978), the type of dentures used (partial or complete), the duration of use of the structures, as well as the reliability of their fixation, the presence of pain when applying the prosthesis and during chewing, the state of oral hygiene before and after using the adhesive, and adaptation periods. After application of Corega cream, corresponding assessments were made. According to patients' feedback, fixation of the prosthesis improved by 19 ± 2.4 %, becoming good by 47 ± 1.0 % and excellent by 34 ± 2.6 %. Patients who had their dentures repeated or relined noticed faster and easier adaptation to the structures in 1–3 days, while patients who had their prostheses made for the first time needed 4–8 days. 96 ± 0.7 % of patients did not experience pain after application of the cream, and in 4 ± 0.7 % it was significantly reduced. 27 ± ± 3.1 % said that it became easier for them to

clean the denture from food residues. Patients assessed the moisture content of the oral mucosa as satisfactory, and the perception of food taste did not change. The authors emphasize the importance of including the formation of a positive communicative position in rehabilitation programs for the elderly [21].

J. Mendes, J.M. Mendes, P. Barreiros, C. Aroso and A.S. Silva noted the important influence of adhesive compositions, which contribute to strengthening of adhesion. The use of adhesives provides significant advantages: when eating, the prosthesis is maximally stable in the oral cavity, chewing pressure when eating is distributed more evenly, food particles do not get under the denture and do not irritate the mucous membrane, and the bone structure of the jaw is also indirectly preserved. Studies have also shown that the pressure on the oral mucosa using denture adhesive decreased to 0.15 MPa, while for the model without adhesive it was 0.25 MPa. Thus, it can be concluded that the use of adhesives helps relieve the soft tissues of the denture bed and ensures its decompression [22; 23]. In addition, various adhesives have been developed that contain antifungal and antibacterial components, which significantly expands the range of their application [24].

When analyzing modern adhesives for removable dentures, a detailed comparison of several known drugs reveals significant differences in their chemical composition, adhesive properties and clinical effectiveness. These differences emphasize the need for careful selection of the preparation taking into account the individual needs of the patient.

For example, Corega Ultra Cream, which uses a zinc-free formula containing polyvinyl acetate and polyvinyl alcohol, demonstrates high retention properties, especially in conditions characterized by high salivary flow. This formulation not only improves mucosal adhesion, but also reduces the potential toxicity of zinc that was associated with previous generations of zinc-containing adhesives. Clinical trials have shown that Corega Ultra provides a 12-hour bonding, outperforming formulations such as Fixodent Original, which remain effective for approximately 8–10 hours.

In contrast, Poligrip Super Denture Adhesive, which is also zinc-free, uses a combination of carboxymethylcellulose and sodium alginate. These biopolymers offer a distinct advantage to patients with xerostomia, where moisture retention and mucosal adhesion are compromised. Poligrip Super, although providing a slightly shorter moisture retention time than Corega Ultra (10–12 h), offers increased comfort due to its softer gel-like consistency, which reduces mucosal irritation [25].

Secure Denture Adhesive is another product that contains aluminum / magnesium silicates in a hydrophobic base. The use of this composition provides long-term adhesion even in low humidity conditions, which makes it especially effective for patients with extensive alveolar ridge resorption. Secure Denture Adhesive maintains its retention properties for more than 12 hours, which significantly reduces the need for reapplication, which is a common requirement for other adhesives such as Ef-

fergrip, which maintains adhesion for only 6–8 hours in similar conditions.

A more recent innovation in denture adhesives is Super Poligrip Extra Care, a formulation that incorporates multifunctional acrylate copolymers and silicone-based compounds. This adhesive has improved viscoelastic properties, providing excellent distribution of occlusal forces and reducing the risk of denture-induced ulcers. Comparative studies have shown that Super Poligrip Extra Care is superior to traditional adhesives such as Orafix Denture Adhesive Cream, especially in patients with fragile mucosa or thin gums [26; 27].

Fixodent Plus Scope incorporates flavor additives along with adhesive properties using a unique blend of cellulose gum and polymer resins. Although the primary function of Fixodent Plus Scope is to stabilize the denture, the inclusion of flavors such as thymol and eucalyptol significantly improves patient compliance, especially in cases, where prolonged denture wear results in halitosis. Despite its advantages, Fixodent Plus Scope has a slightly shorter fixation time (8–10 h) compared to other formulations [28].

OlivaFix Gold is a premium adhesive that is distinguished by the fact that it contains extra virgin olive oil and silicone-based polymers. This formula is indicated for use in patients with sensitive oral mucosa or allergies to synthetic compounds. The oil base of OlivaFix Gold improves fixation and patient comfort, providing adhesion for up to 12 hours, comparable to Corega Ultra, but with the additional benefit of reducing irritation of the mucous membrane [29; 30].

Finally, Protefix Active Denture Adhesive, containing sodium carboxymethylcellulose and tragacanth gum, combines sufficient adhesion with comfort in relation to the mucous membrane. Protefix Active is especially effective for patients with deep palatal vaults or complex alveolar ridges, where traditional adhesives cannot provide uniform coverage and retention. This adhesive maintains its effectiveness for 10–12 hours, slightly exceeds Fixodent Original, but is inferior to the Secure Denture Adhesive composition [31; 32].

The variety of adhesive formulations highlights the importance of selecting an adhesive based on a comprehensive assessment of patient-specific factors, including oral anatomy, salivary composition, and mucosal health. Continuous advances in adhesive technologies, characterized by the integration of new polymers and bioactive compounds, promise further advances in denture stabilization and patient comfort [33; 34].

Another example of a modern adhesive is the Pectafix gel, produced by Vladmiva JSC. This product is affordable to most buyers. A study conducted by Zh.B. Zhilbakieva revealed the main characteristics of this product. The polysaccharide pectin is a natural component obtained from apples or citrus fruits. In addition to moderate adhesive properties, pectin is able to absorb toxic substances. The disadvantages of this adhesive include a short fixation time and the absence of bactericidal properties [35; 36].

Also, researchers [37; 38] analyzed and described the features of another well-known glue in Russia – a gel called “Denta-

fix", modified by adding components that enhance its fixation ability and protection against bacteria. This helps improve the fixation of removable dentures and speed up the process of patient adaptation to them.

The Dentafix gel contains such components as apple pectin, polyvinylpyrrolidone, sodium benzoate, food colorings and water with silver ions – all these components are present in silver-containing preparations, which are of great value for medical use. The unique properties of silver are due to its ions, which are capable of preventing the development of diseases caused by fungal, bacterial or viral infections. In addition, silver ions promote tissue healing under excessive functional load.

The researchers obtained the following significant conclusions: differences in the adhesive properties of two means for fixing removable dentures were studied. The first group, including 20 patients, applied the Pectafix gel, and the second group, consisting of 22 people, used the Dentafix adhesive agent. The clinical trial lasted for five days, after which a survey and examination were conducted. It turned out that the time of reliable fixation of the denture: for the Pectafix gel was 3–5 hours, and for the Dentafix gel – 6–7 hours. The use of the Dentafix gel revealed several advantageous factors: the structure was more firmly held on the prosthetic bed, pain during eating was minimized, food particles got between the prosthesis and the mucous membrane much less often, the adaptation period was reduced from 2–3 weeks to 10–12 days. The adhesive composition of the Dentafix gel showed excellent results and can be a good auxiliary means for fixing prostheses. When choosing adhesives, it is important to take into account the individual characteristics of patients [39; 40].

Conclusions

From the literature review it becomes obvious that adaptation to removable prostheses depends on many factors. The use of adhesives can significantly improve the process of adaptation to removable orthopedic structures, especially in the initial period of using dentures. However, it is worth remembering that adhesives are auxiliary means. It is necessary to take into account many factors that affect the process of getting used to orthopedic structures, in particular – the class of adentia, the age of patients, the type of occlusion, the degree of bone loss, the material from which the denture is made, the patient's readiness to overcome difficulties during adaptation, the presence / absence of macroglossia, the presence of a stage of preliminary or immediate prosthetics and others. The use of adhesives should not be prescribed instead of correction or re-manufacturing of the denture.

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A.V. Sevbitov – development of the concept and design of the study.

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A.S. Utyuzh – collection of the material and the analysis of the obtained data.

V.V. Kireev – development of the concept and design of the study.

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