# MODERN ASPECTS OF CHOICE OF MATERIAL FOR ORTHOPEDIC TREATMENT OF PATIENTS IN NEED OF DENTAL PROSTHETICS

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***https://doi.org/10.5281/zenodo.14633193***

***Abstract****. The most common structural material in removable prosthetics is acrylic plastic. However, it has a number of disadvantages:*

*1) residual monomer, which increases to 8% when the polymerization mode is violated, which causes local and general allergic reactions;*

*2) microporosity of acrylic plastic bases;*

*3) low strength of acrylic plastics. As an alternative to removable dentures made of acrylic plastics, new technologies for the manufacture of removable orthopedic structures from thermoplastic materials have appeared on the dental market. Their chemical structure is devoid of the main negative properties inherent in acrylic plastics, and their strength indicators are many times better.*

*Thermoplastic materials used in dentistry are of 5 types:*

*1. polyoxymethylene*

*2. nylon*

*3. ethylene-vinyl acetate*

*4. acrylic*

*5. monomer-free*

*Thus, the range of thermoplastic base masses, as an alternative method of prosthetics for people with intolerance to acrylic plastics, is quite large, which allows choosing the type of base material depending on the specific clinical situation.*

***Key words:*** *allergic history, removable dentures, acrylic plastics, thermoplastic materials.*

# СОВРЕМЕННЫЕ АСПЕКТЫ ВЫБОРА МАТЕРИАЛА ДЛЯ ОРТОПЕДИЧЕСКОГО ЛЕЧЕНИЯ ПАЦИЕНТОВ, НУЖДАЮЩИХСЯ В ЗУБНОМ ПРОТЕЗИРОВАНИИ

***Аннотация.*** *Наиболее распространенным конструкционным материалом в съемном протезировании является акриловая пластмасса. Однако она имеет ряд недостатков:*

*1) остаточный мономер, который при нарушении режима полимеризации увеличивается до 8%, что вызывает местные и общие аллергические реакции;*

*2) микропористость базисов акриловых пластмасс;*

*3) низкая прочность акриловых пластмасс. В качестве альтернативы съемным зубным протезам из акриловых пластмасс на стоматологическом рынке появились новые технологии изготовления съемных ортопедических конструкций из термопластичных материалов. Их химическая структура лишена основных отрицательных свойств, присущих акриловым пластмассам, а прочностные показатели во много раз лучше.*

*Термопластичные материалы, используемые в стоматологии, бывают 5 видов:*

*1. полиоксиметилен*

*2. нейлон*

*3. этиленвинилацетат*

*4. акриловые*

*5. безмономерные*

*Таким образом, ассортимент термопластичных базисных масс, как альтернативного метода протезирования для людей с непереносимостью акриловых пластмасс, достаточно велик, что позволяет выбирать вид базисного материала в зависимости от конкретной клинической ситуации.*

***Ключевые слова:*** *аллергический анамнез, съемные зубные протезы, акриловые пластмассы, термопластичные материалы.*

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Orthopedic treatment of patients with complete or partial absence of teeth using removable dentures occupies a leading place in the clinic of orthopedic dentistry. However, it is extremely difficult in the presence of diseases of the oral mucosa due to intolerance to the materials used to make the bases of removable dentures. One of the reasons for this phenomenon in recent years is the increase in the number of patients with intolerance to drugs or with a history of allergic diseases. Due to insufficient information, lack of clear recommendations and practical skills, dentists avoid patients with a burdened allergy history. This is due to the danger of the negative impact of structural materials on the mucous membrane of the prosthetic field and on the patient's body as a whole. Therefore, the choice of structural material is made based not only on its physical and chemical characteristics, but also on the biological impact on the surrounding tissues of the oral cavity. The most common construction material in orthopedic dentistry is acrylic plastic.

However, it can cause allergic reactions, manifested in the form of inflammation of the oral mucosa. The main etiological factor in the development of allergy to acrylate is considered to be the residual monomer contained in the plastic in the amount of 0.2%, which increases to 8% when the polymerization mode is violated. Plastics used in dentistry for orthopedic treatment are high-polymer organic compounds. They do not have a protein nature and therefore cannot cause allergies by themselves.

The monomer, methacrylic acid ester, is a low-molecular compound, i.e. it is a potential hapten, and when combined with body tissue proteins, it turns into an antigen. Its direct toxic effect on the cells of the oral mucosa, including mast cells and basophils, leads to non-specific release of histamine, which is capable of modulating the allergic response to the effects of causative allergens, thereby causing allergic contact dermatitis. It has been established that the monomer reduces the titer of lysozyme in saliva. The residual monomer washed out of the dentures, even in small quantities, affects the functional state of neutrophils in the oral cavity and suppresses their activity. According to some authors, the monomer is a protoplasmic poison, extremely active when in contact with tissues and capable of producing an irritating and toxic effect on the entire body.

A significant disadvantage of acrylic plastic dentures is the microporosity of the bases, which inevitably occurs for technological reasons, due to shrinkage occurring during polymerization. The third disadvantage is the low strength of acrylic plastics to variable loads during chewing. Nevertheless, acrylic plastics in many clinics are still often the only material for the manufacture of removable denture bases, as they are inexpensive, have a simple manufacturing technology, and do not require expensive equipment. Recently, new technologies for the manufacture of removable orthopedic structures from thermoplastic materials (thermoplastics) have appeared on the domestic dental market, which have been used in world dentistry for over 20 years. The general characteristic of thermoplastics is defined by the formulation "material that is plastic when heated", i.e. the materials are packed in a heated state without the use of monomers.

Thermoplastics are devoid of the main negative properties of acrylic plastics in their chemical structure, and their strength indicators are many times better. When processing thermoplastics into products, a highly toxic monomer is not used. Thermoplastics, after heating at a temperature of 160 to 200 °C, acquire a viscous flow state and are introduced into a pre-closed form through a casting channel under pressure up to 50 atm. Thus, thermoplastics have a number of advantages: - unpleasant sensations in the oral cavity that patients experience during treatment with orthopedic structures made of different alloys can be eliminated by using thermoplastic dentures - to improve the aesthetic properties of removable dentures, instead of metal clasps that can lead to cracks and fractures of the base of removable dentures, thermoplastic clasps are used to match the color of the supporting teeth - thermoplastic dentures do not have a toxic or allergic effect, so they are indicated for patients with an allergic status, diseases of the immune, nervous, endocrine systems, gastrointestinal tract - dentures, made using thermoplastics, have sufficient elasticity, precise fit, good fixation and are aesthetic - the dentures do not contain micropores and practically do not cause imbalance of the microflora in the oral cavity - in terms of mechanical strength to variable loads in the oral cavity, they are many times stronger than dentures made of acrylic plastics - due to their physical and chemical characteristics, thermoplastics expand the

doctor's capabilities in treating patients with partial absence of teeth, bruxism, diseases of the temporomandibular joint, can be used in the manufacture of occlusal splints, sports mouthguards, immediate dentures and in the complex treatment of periodontal diseases. The materials used in dentistry do not contain chemical additives, which often cause reactions in people prone to allergic diseases. At room temperature, these polymers are practically non-toxic. They are resistant to the action of highly aggressive model environments, due to which they are widely used in medicine.

In toxic experiments, the polymer was found to have no toxic properties. The use of thermoplastics based on polyformaldehyde allows for the production of many types of orthopedic structures. The strength of the prostheses is comparable to that of metal ones. Due to elasticity, a more precise and tight fit to the teeth is ensured, and, accordingly, a more reliable fixation of the prosthesis. Polyoxymethylene can be used to manufacture one-sided removable dentures with a terminal defect of the dentition on a telescopic fixation system; in case of intolerance to the metal base of the clasp denture, and for aesthetic purposes, the frame with clasps can be cast from thermoplastic based on polyoxymethylene in the treatment of periodontal diseases and with included defects of the dentition, splinting of teeth and restoration of the dentition with a removable denture with a base and a multi-link clasp made of thermoplastic is rational; in implantology and with a long post-surgical healing period, polyoxymethylene is used to manufacture temporary orthopedic structures. Thermoplastics made of nylon. Polyamides are heterochain polymers containing macromolecules in the main chain - amide groups. However, migration of toxic caprolactam and hexamethylenediamine from materials is observed.

Polyamides change the organoleptic properties of model media in contact with them; monomers and oligomers are found in extracts. In medicine and dentistry, only non-toxic aliphatic polyamides (Polyamide 12) are used to produce synthetic fibers that are durable, abrasion-resistant, highly flexible and plastic. Currently, materials for the manufacture of nylon dentures are manufactured in the USA (Valplast, Flexite), Israel (Flexy-Nylon), San Marino (T.S.M. Acetal Dental), Singapore (Vertex ThermoSens), Germany (Flexiplast). Nylon is used to manufacture: partial removable dentures with alveolar denture clasps; combined dentures; removable dentures with a base and a splinting multi-link clasp; anti-snoring device. Dentures made of polypropylene.

In its main characteristics, polypropylene is close to nylon, but is inferior to it in some physical and chemical characteristics. However, it is many times stronger than acrylic plastics, has a high accuracy of fit. Polypropylene is a colorless polymer (contains methyl groups) without a characteristic odor and taste, a soft, rubber-like material, softens at high temperatures. Dentures are biologically neutral in relation to body tissues and are stable in the oral cavity. Биологическая нейтральность обусловлена отсутствием мономеров, ингибиторов, катализаторов и других реактивных включений. Currently, polypropylene, USA ("ProFlex Clear Wire" Dental

Resources), Ukraine ("NDlex" New Dental), injection molding thermoplastic brand developed by Professor E.Ya. Vares "Lipol" (Ukraine) is used to manufacture orthopedic structures as a cheap alternative to nylon. Intraoral devices made of ethylene vinyl acetate. Amorphous transparent colorless polymer without smell and taste, its monomer and polymer are non-toxic. It has a high degree of elasticity, has very little water absorption, excellent resistance to acids. Sanitary and chemical studies have revealed migration of small amounts of oxidizable and brominated compounds from the material. Thermoplastics based on ethylene vinyl acetate polymers are produced in Italy (Flexidy), in San Marino (Corlex Orthodontic), etc. With the advent of thermoplastic materials from ethylene vinyl acetate in dentistry, it became possible to manufacture individual positioners, dental protectors for sports, and individual mouthpieces for diving in dental laboratories. Dentures based on monomer-free acrylic plastics. The main characteristics of these materials are the absence of free monomer, sufficiently high strength, and aesthetics, which allows for the production of particularly thin removable dentures. They have a wide range of colors.

Complete and partial plate dentures, as well as saddles for clasp dentures, are made from monomer-free acrylic plastics. Currently, monomer-free materials based on acrylic plastics are produced in the USA (Flexite M.P.), Israel (Acre-Free), San Marino (Thermo Free), Italy (Fusicril), and Germany (Polyan). Thus, the range of modern base masses, as an alternative method of prosthetics, is quite large. However, today the issue of studying the mechanisms of biodegradation and metabolism of polymers during a long stay in the body, as well as the development of "criteria of biocompatibility" of polymers remains relevant. Which in the future will allow 44 patients with intolerance to acrylic plastics and the presence of signs of diseases of the oral mucosa to reduce the content of residual monomer, by using modern base materials, thereby preventing the occurrence of intolerance to acrylic plastics, which significantly increases the effectiveness of orthopedic treatment of patients with aggravated allergological anamnesis.

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