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CLINICAL SUBSTANTIATION OF PATIENTS TREATMENT WITH CAST METAL-PLASTIC FIXED DENTURES

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Abstract. *The article presents the clinical substantiation of patients' treatment with cast metal-plastic fixed dentures and use adhesive mechanical and chemical retention systems for fixing a polymeric aesthetic facing covering for one-piece cast fixed dentures. The attention of dentists to modern facing polymer materials is due to their ease of use, lower costs for the organization of the workplace and simplified and quick polishing of the coating in comparison with ceramic masses. However, there is a basic condition - to ensure a reliable connection of facing polymer materials of dentures with metal framework, that is, creating a reliable connection between the elements of the facing material and the dental metal alloy.*

Keywords: *facing polymer, fixed dentures, retention item, coating varnish «Synma-M+V», polymer «Synma-M+V».*

Since the beginning of polymers using for aesthetic facing fixed dentures, the main problem was creation secure fastening of facing material to metal framework surface. For many years, scientists have solved many issues such as improvement of synthetic materials, equipment, mechanical retention to metal framework, chips facing restoration in the mouth and so on. Contemporary acrylic polymers have high physical, mechanical and technological properties, allowing to reduce the rate of complications in orthopedic treatment with combined fixed dentures [5, 6, 7]. But it remains the basic condition - the creation of facing material secure fastening to metal frameworks surface, this adhesive bonding may be reproduced with mechanical, physical or chemical principle, but usually it is combination of these types of bonds [1, 2, 3, 4].

The most common is the use of metal pearls (beads) with a diameter of 0.2-0.6 mm (wax set of retentional pearls), which evenly cover the corresponding surfaces of the wax model of the frame. Also, in dental practices we can use next techniques: applying a retentive hemisphere element, performing retention points by distributing retentional material (a mixture of two metallic powders of different fractions and with different melting points), etc. The proposed methods for using electroplasma preparation and chemical etching of the metal framework, but these methods require the availability of special equipment and is economically expensive [1, 3, 6].

The purpose of our study is the clinical substantiation of patients' treatment with cast metal-plastic fixed dentures with a new adhesive system for fixing the aesthetic facing layer in cast non-removable dental prosthesis designs.

Materials and methods of research. In order to achieve this goal, we proposed to the clinical trial a new method for manufacturing metal-plastic dentures by applying a mechanical retention to the cast framework and using the new coating varnish "Synma M + V" together with aesthetic facing polymer "Synma M + V" developed at the orthopedic dentistry department of HNMU in cooperation with JSC "Stoma" (Kharkiv) [8, 9, 10].

Clinical trials were performed on 76 patients with small limited defects of dentition and replaced defects of hard dental tissues (46 female and 30 male people at the age of 19 - 58 years). Patients were divided into two groups, depending on the technology of applying retention points on the cast framework and facing materials.

The patients of the control group (36 patients) were performed orthopedic treatment with 40 combined cast non-removable dentures (28 bridges and 12 single crowns) with facing polymer of foreign manufacture, as well as with coating varnish, and for production of retention points using traditional methods with metal pearls.

Patients of the main group (40 people) underwent orthopedic treatment with 48 combined non-removable dentures, of which 36 bridges and 12 single crowns with facing polymer "Synma M + V", and a new coating varnish "Synma M + V" and using the proposed mechanical retention system.

Immediately after our orthopedic treatment, the color of the coating was observed to match the color of the natural teeth of the patients, as well as the integrity of the polymer coating of the non-removable denture. The further control was carried out after 6, 12 months and 2 years.

The proposed method is as follows.

On cast metal framework (which made according to the classical method), with a diamond baked disc (thickness 0.4 mm) were marked notches at the angle $\approx 20^\circ$ - 30° to the axis of the crowns to a depth of 0.2 mm. Notches were placed at a distance of 0.3-0.4 mm from each other. On the occlusal surface of the supporting crowns and an intermediate part, caused numerous notches perpendicular to the axis of crown. Thus creating the adhesive system with auxiliary unloading platforms area [9].

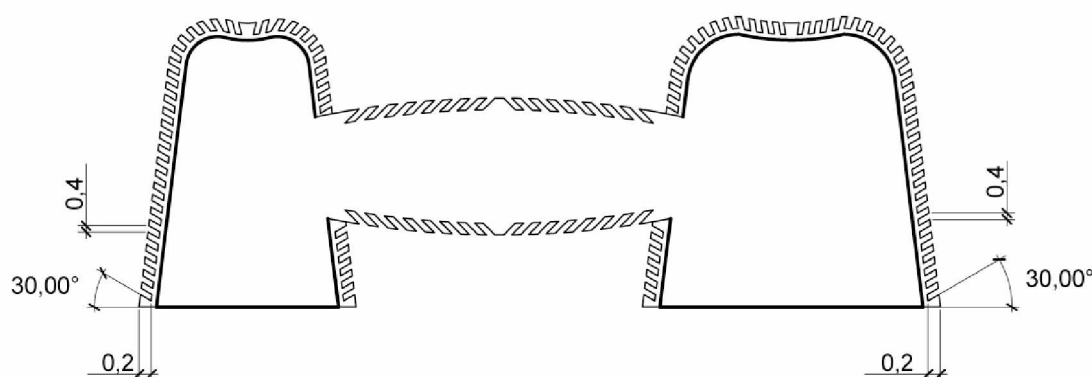


Fig. 1. Diagram of cast metal framework with mechanical retentive system

Results and discussion. According to the obtained results, a new coating varnish for fixed dentures at physical and mechanical properties have fully coincided with requirements for these dental materials, the varnish creates a homogeneous non-translucent metal film, and most importantly is an indicator of strength of adhesive bonding between varnish film to metal surface is equal to 7.2 ± 0.1 MPa, whereas the lower limit of standardized index equal to 3.5 MPa.

The study of temperature parameters of curing influence at the strength properties of adhesive layer tested to the necessity of temperature level is equal to 170°C , which provides in the bond system: coating varnish - polymer.

The study tested samples with the mechanical method of connection between metal and polymer was created according to the standard technique using pearl, and our proposed method of adhesive mechanical system for assessing the strength of bonding in the system "metal - coating varnish - polymer",

The amount of adhesion samples made by our method to 22.81 ± 0.29 MPa, which is significantly greater ($P < 0.001$) than 15.40 ± 0.05 MPa in the samples produced using standard methods.

Table 1. Types and number of manufactured fixed dentures

Research groups	The number of manufactured fixed dentures		Types of manufactured fixed dentures			
			bridges		Single crowns	
		%		%		%
1 the control group	40	45,4	28	31,8	12	13,6
2 the main group	48	54,5	36	40,9	12	13,6
Total	88	100	64	72,7	24	27,2

According to Table 1, patients were made 88 non-removable cast prosthesis designs with aesthetic facing polymer. In the control group, 40 dental designs were made, which is 45.4 % of the total number of prostheses, with the proportion of bridges being 36 (31.8 %), and 12 (13.6 %) were made of single crowns, the second (main) The group underwent orthopedic treatment with 48 metal-plastic dentures manufactured by our method, 36 (40.9 %) bridges and 12 (13.6 %) single crowns were manufactured.

Table 2. The types and number of complications in the study groups at time control observation

Research groups	The number of manufactured fixed dentures	Time control	Discoloration of facing polymer		Violation of the integrity of the aesthetic facing			
					Splitting of facing		Cracing of fscing	
				%		%		%
1 the control group	40	6 month	2	5	4	10	-	-
		1 year	3	7,5	3	7,5	2	5
		2 years	6	15	4	10	4	10
		total	11	27,5	11	27,5	6	15
2 the main group	48	6 month	-	-	2	4,1	-	-
		1 year	-	-	-	-	-	-
		2 years	2	4,1	-	-	-	-
		total	2	4,1	2	4,1	-	-
Total	88	6 month	2	2,3	6	6,8	-	-
		1 year	3	3,4	3	3,4	2	2,3
		2 years	8	9,0	4	4,5	4	4,5
		total	13	14,77	13	14,77	6	6,8

According to Table 2, after 6 months of using prostheses complications were found in 8 cases, which is 9.0 % of the total number of prostheses. Of these, 2 (2.3 %) using the Synma-M + V plastic and 6 (6.8 %) foreign. With the use of foreign plastic, a change in color was observed in 2 (5 %) cases, in another 4 (10 %) cases there was a cleavage of the facings from the cast framework.

When using the "Synma-M + V" plastic liner in 2 (4.1 %) cases, the cleavage of the facing polymer was observed, which was associated with an abnormality of the patients' occlusion. Therefore, we consider it necessary in such cases, mandatory preliminary orthodontic preparation for orthopedic treatment.

After 12 months of using non-removable dentures in the control group, a discoloration was observed in 3 (7.5 %) cases, facing cleavage from the cast framework, also in 3 (7.5 %) cases.

From the main group, where the treatment was carried out according to our method, no complications were observed after 12 months.

At the next follow-up, 2 years after orthopedic treatment, the following shortcomings were identified.

In the control group, a change in the color of the aesthetic facing polymer was observed even in 6 (15 %) cases, 4 (10 %) - clipping and in 4 (10 %) cases cracks were found on the polymer coating.

When examining the patients of the main group, 2 (4.1 %) cases of color change in the aesthetic facing polymer in the cervical region were found after 2 years of use of metal-plastic dentures. The destruction of the aesthetic facing and the presence of any defects in its integrity have not been detected.

Conclusions.

1. The using in prosthodontics practice new coating varnish "Synma M+V", which eliminates the metal transmission through the layer of facing polymer and due to the high strength of adhesive bonding to metal surface improves the quality and warranty time of construction using.

2. At adhesive strength of system "metal – coating varnish – polymer" is simultaneously affected by several different factors: the method of preparation metal framework, the adhesive properties of coating varnish and physical, mechanical properties facing material. Consequently, the creation and comprehensive clinical trial of materials for fixed dentures is the key to quality treatment.

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