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EVALUATION OF PHYSICO-MECHANICAL PROPERTIES INCLUDING PARAMETERS OF DEFORMATION USING C-SILICON IMPRESSION MATERIALS TO TENSION AND COMPRESSION

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In orthopedic dentistry, an important place of doctor and dental technician work takes an informative and precise (precision) impression of the prosthetic area. One of the main requirements for high-precision impression is a clear reflection of the cult of supporting teeth [1, 2].

A precision impression can show the the most exact correspondence of denture to the prosthetic area's tissue [3, 4], while we can see the probability of occurrence of complications as secondary caries, recementation, inflammation of marginal gums, which considerably increases the period of using dentures [5, 6] .

Recently, in clinical dentistry, there are many new types of silicone impression materials which are used in the manufacture of removable and unremovable structures of dentures, but their physical and mechanical properties are slightly different.

The purpose of our **investigation**s was to compare the physical and mechanical properties of foreign and domestic dental materials to tension and compression for a reasoned selection of C-silicone impression materials in the manufacture of removable and unremovable denture structures.

Materials and methods. We have been researching samples of the following silicone impression materials: «Consiflex-0» and «Consiflex-1» constructed by company «Latus» (Kharkiv); «SwissTEC» by «Coltene Whaledent» (Sweden); «Speedex» by «Coleten Whaledent» (Sweden); «Zetaplus» by «Zhermack» (Italy); «Lasticomp» of the company «Kettenbach dental» (Germany).

These investigations allowed us to determine the yield limit, the conditional yield strength, the strength limit and the relative residual deformation to the destruction of the silicone material to tension and compression.

To determine the deformation of the samples to tension, we made them in the form of two-legged blades with a calculated length of 13 mm, a thickness of 3 mm, a width of 5 mm, using the standard form. The form was filled with material and the samples were kept until the material was solidified, and in order to determine the strain on compression, they were made in the form of columns 10 mm in diameter, 7 mm in diameter, using the standard form. The forms were filled with impression material and the samples were kept until completely cured. During the production of samples, the recommendations of the manufacturer were followed.

The investigations were carried out using the deformation unit MRK-1. The sample was fastened and placed in the installation, by which it was subjected to a static stretching at a strain rate of 0.25 mm/min until the material was destroyed. The curve in the coordinates "tension strength - absolute deformation" was recorded with the help of a recorder KSP-4. In the tension diagram, it was recognized the yield limit (σ_{el}), the conditional yield strength (σ_{02}), the strength limit (σ_{sl}) and the relative residual deformation (σ) by the standard method.

Result of investigations. While making our research, it was found that the indicators obtained in different materials are different from each other.

The largest index of yield limit was recorded in the impression material

«Consiflex-0», which was 1,585±0,900 MPa, while the smallest - 0,381±0,040 MPa - in the silicone impression material «Lasticomp». Based on the data obtained, in the domestic C-silicone «Consiflex-1», the yield limit is 0.657±0.050 MPa, whereas in «Consiflex-0» this figure is more than 2 times greater than 1,585±0.900 MPa.

When determining the the conditional yield strength the highest index of material like 1.187±0.020 MPa was determined in samples of «Speedex». The samples of the silicone impression material «Lasticomp» were the lowest and were 0.435±0.04 MPa. About domestic impression materials «Consiflex-1» and «Consiflex-0», the conditional yield strength was approximately the same and amounted to 0.748±0.050 and 0.831±0.090 MPa, respectively.

On silicone impression materials «SwissTEC» and «Speedex» the strength limit was the same and numbered 1,439±0,010 та 1,468±0,070 MPa. The strength limit of domestic samples «Consiflex-1» by the results of 0,879±0,050 MPa та «Consiflex-0» 1,142± 0,120 MPa had differences, which was 0,263 MPa.

The largest relative residual deformation to destruction was observed in domestic silicone impression material « Consiflex-1» near 12,692±1,580% and «Consiflex-0» at 10,962±2,240%, while the lowest relative residual deformation rates were at «Speedex» 6,827±1.352% and «Lasticomp» were 7.596± 1.851%.

Conclusions: In complex of researches, we have found that the indicators obtained in different materials differ from each other. It should be noted that the impression material «SwissTEC» has the same values of the yield limit, the conditional yield strength and the strength limit of the elasticity and is equal to 10,001±0,296 MPa, while other materials have different characteristics, which allows a differentiated and reasonable choice of C-silicone reflective material for obtaining a precision impression of the mucous tissue of the prosthetic area for qualitative orthopedic treatment.

Among other researched C-silicone impression materials, the «Lasticomp» material has the smallest indicator of yield limit and is 5,343±0,054 MPa, while «Zetaplus» has an index of 8,823±0,089 MPa. In the domestic impression materials «Consiflex-1» and «Consiflex-0», the difference in the values of the yield limit is 0.583 MPa.,

which will further influence the choice of type of taking impression, depending on the clinical situation and the state of hard and soft tissues.

The C-silicone impression material «Lasticomp» has the lowest index of conditional yield strength, which is 5,546±0.071 MPa. This indicator is almost the same with the index of the yield limit of the same material, which is 5.334±0.054 MPa.

The conditional yield strength of domestic imprint materials varies considerably and is close to those of yield limit, which in the future will have an impact on the qualitative reflection of the tissues of the prosthetic area and on the improvement the quality of the clinical stages of the manufacture by removable and unremovable orthopedic dentures.

The difference between indicators of strength limit of C-silicone impression materials «Zetaplus», «Speedex», «Lasticomp», «Consiflex-1» and «Consiflex-0» is 2,847 MPa. The maximum indicator has «Speedex» - 9,923±0,133 MPa, but the minimum due to «Consiflex -1» - 7,076±0,581 MPa.

Thus, according to the results of physical-mechanical studies on the compression of samples of silicone impression materials of foreign and domestic production, we can conclude that the impression materials «Consiflex-1» and «Consiflex-0», manufactured by the company «Latus» (Kharkiv) of most indicators are slightly different from foreign analogues and can be used in the clinic of orthopedic dentistry.

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