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CLINICAL AND PHYSICAL AND MECHANICAL CHARACTERISTICS OF THE DOMESTIC LIGHT-CURED "FIRUZE-GRAND" INTENDED FOR THE RESTORATION OF ANTERIOR AND POSTERIOR TEETH

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ABSTRACT
This article is devoted to the study of the clinical and physical-mechanical properties of the new domestic composite filling material "Firuze-Grand" of light curing for the restoration of anterior and posterior teeth.

Keywords: anterior and posterior teeth, secondary caries, polymerization, cariogenic microflora, fluorine compounds, anamnesis, dental micromotor

I. INTRODUCTION
We know that various composite filling materials are currently used to treat caries. One of the most important problems arising from the use of these materials is the violation of the marginal adherence of the filling to the tooth tissues. As a result of polymerization shrinkage at the “tooth-filling” border, a micro-gap is formed, which promotes micro-leakage and penetration of microorganisms into the hard tissues of the tooth, as a result, secondary caries develops [5, 7]. For this reason, the problem of secondary caries remains acute and relevant in modern dentistry [1, 2, 3, 4, 6].
In order to reduce the risk of secondary caries, modifications of filling materials with the addition of substances capable of inhibiting the reproduction and growth of cariogenic microflora were proposed. Various composite materials containing fluorine compounds and silver nanoparticles are available. Research by Farrugia C. etal. [170] indicate the need to study bacterial adhesion to the surface of filling materials widely used in dental practice.

II. ANALYSIS
The study involved 120 patients (78 women and 42 men), aged 18 to 60 years old in the dental clinic of Ltd. "Sardor-Denta", and the outpatient clinic of therapeutic dentistry, where the department of "Faculty therapeutic dentistry" of the Tashkent Dental Institute is located. Research methods included clinical and laboratory assessment and examination of PR; study of the state of filled teeth with primary and secondary caries, the state of PR at the stage of primary examination (table No. 1), after filling in the period: 12 months and 24 months (table No. 2). The filling materials used are light-cured composites: nanocomposite - "Filtek Ultimate" (3M ESPE, USA) (2-group A); Latelux (Latus, Ukraine) (2-group B); "Restavrin" (Technodent, Russia) (2-group C) and 1-st A, 1-st B, 1-st C groups - patients who used the filling material Firuze-Grand (Dentals Pharma GmbH) which has been produced since 2019 year in the Zamin free economic zone of the Jizzakh region according to German technologies.
We collected complaints, anamnesis and clinical examination of patients. For each patient under study, medical records were filled out. The map recorded the dental formula deployed over the surfaces, the presence or absence of complaints, the state of the mucous membrane (RM) of the gingival papillae and marginal gums. To identify primary caries, we used the method of vital staining with a fuchsin solution using a caries marker (Voco), and the criterion for diagnosing 2 caries was the assessment of the marginal adaptation of the filling

material to the tooth tissues and X-ray studies. At the stage of the clinical study, the intensity, prevalence and growth of dental caries were studied.

Table # 1. The number of examined patients and filled teeth, distribution by types of filling materials.

			Group A (40 people and 1120 physiological teeth (100%))		**Group B (40 people and 1120 physiological teeth (100%))**		**Group C (40 people and 1120 physiological teeth (100%))**	
			1	2	1	2	1	2
Number of patients (total -120)		120	22/55%	18/45%	26/65%	14/35%	27/67,5%	13/32,5%
		100%	22/18,3%	18/15%	26/21,7%	14/11,7%	27/22,5%	13/10,8%
Gender	Men (42)	42/35%	8/20%	10/25%	12/30%	6/15%	3/7,5%	3/7,5%
			8/19,4%	10/24%	12/28,5%	6/14,3%	3/7,2%	3/7,14%
	Women (78)	78/65%	14/35%	8/20%	14/35%	8/20%	24/60%	10/25%
			14/17,9%	8/10,25%	14/17,9%	8/10,25%	24/30,8%	10/12,8%
Age	18-45 years old (52)	52/43,3%	7/17,5%	6/15%	14/35%	6/15%	12/30%	7/17,5%
			7/13,5%	6/11,5%	14/27%	6/11,5%	12/23%	7/13,5%
	46-60 years old (36)	36/30%	3/7,5%	6/15%	8/20%	5/12,5%	10/25%	4/10%
			3/8,3%	6/16,7%	8/22,2%	5/13,9%	10/27,8%	4/11,1%
	61 years old and elder (32)	32/26,7%	12/30%	6/15%	4/10%	3/7,5%	5/15%	2/5%
			12/37,5%	6/18,75%	4/12,5%	3/9,4%	5/15,6%	2/6,25%
Quantity of. inspection of teeth = 3360/100%	Healthy(2210)	2210/65,8%	501/44,8	328/29,3%	386/34,5%	340/30,3%	345/30,8%	310/27,7%
			501/22,6%	328/14,8%	386/17,4%	340/15,3%	345/15,6%	310/14,0%
	Caries (1150)	1150/34,2%	223/19,9%	228/20,3%	211/18,9%	203/18,1%	140/12,5%	145/12,9%
			223/19,4%	228/19,8%	211/18,3%	203/17,6%	140/12,2%	145/12,6%
Quantity of examination of teeth according to the KPU index (2860/100 %)	Intact (476)	476/16,6%	128/11,4%	116/10,3%	88/7,8%	82/7,3%	27/2,4%	35/3,1%
			128/26,9%	116/24,4%	88/18,5%	82/17,2%	27/5,7%	35/7,3%
	Caries (730)	730/25,5%	144/12,85%	122/10,9%	146/13%	158/14%	90/8%	70/6,2%
			144/19,7%	122/16,71%	146/20%	158/21,6%	90/12,3%	70/9,6%
	Sealed (650)	650/22,7%	160/14,3%	143/12,8%	86/7,8%	77/6,9%	94/8,4%	90/8%
			160/24,61%	143/22,0%	86/13,23%	77/11,84%	94/14,46%	90/13,84%
	Removed (1004)	1004/35,1%	108/9,64%	125/11,16%	208/18,57%	214/19,10%	220/19,64%	129/11,51%
			108/10,75%	125/12,45%	208/20,71%	214/21,31%	220/21,91%	129/12,84%

The composition of the investigated filling material "Firuze-Grand" (DentalsPharmaGmbH): dimethacrylate oligomers (bis-GMA, TEGDMA, UDMA, bis-EMA, PEGDMA, AMD), a radiopaque combined filler made of modified aluminosilicate glass (0.02-2.0 μm) and nanosized particles of silicon oxide (5-20 nm). The proportion of inorganic filler is -80%, the curing process takes place under the influence of the visible light spectrum, with a wavelength of 400-500 nm. The material possesses the properties of fluorescence and color stability, radiopacity, also for the purpose of aesthetic imitation of tooth tissues, the material is produced in a range of shades according to the VITA color scale and three degrees of transparency using the Spectron-M color analyzer, and samples in the form of a disc with a diameter of 15 mm and a thickness of 1 ± 0.1 mm made of "Firuze-Grand" material, using silicone keys having the same shape and dimensions 5x7 mm.
Water absorption reflects the mass amount of water that is absorbed by the filling material sample after 7 days of exposure in distilled water at 37 ° C. The composite material with a slight excess was placed in a stainless steel mold, the bottom of which was a metal plate covered with a lavsan film, and a lavsan film and a second metal plate were placed on top, and the excess composite paste was removed. Curing was continued until complete polymerization, an average of 20 seconds for each of the five quadrants.

The determination of the strength and modulus of elasticity in bending of the Firuze-Grand filling material was carried out in the Instron apparatus by loading the prepared samples by the three-point bending method.
To determine the strength at diametral rupture, a compressive load was applied to the material samples in the diametral direction.
To determine the adhesive strength, during shear in connection with the hard tissues of the tooth, 10 samples of each composite material were made, while the removed premolars and molars of patients were used for orthodontic indications and due to periodontal diseases. Each tooth was sawn with a milling cutter in the sagittal direction using a dental micromotor with a rotation speed of 1500-3000 rpm and with constant air-water cooling and humidification. An adhesive bond with Firuze-Grand was created on the exposed tooth surface. The enamel and dentin surface was etched with 37% phosphoric acid, washed and dried, the Firuze-Grand adhesive system was applied to the treated surface, with light and rubbing movements for 15 seconds, then dried for 10 seconds, then the adhesive was cured with a light curing lamp in within 20 seconds. The shear adhesive strength was determined by moving the crosshead at a speed of 5.0 mm / min.
To determine the depth of curing of the filling material, a cylindrical shape of 6x4 mm was used, placed on a transparent film and filter paper, filled with a composite paste with a slight excess, and tamped to avoid the formation of pores and shrinkage cavities.
The results of the studies were processed with the calculation of the arithmetic mean, standard deviation and error of the arithmetic mean. To assess the differences in the arithmetic mean values of the two samples, the Student's t-test (t) and the probability of error (p) were determined using Microsoft Excel 2017 software.

III. DISCUSSION

The prevalence of primary caries in the surveyed groups of patients is shown in Table 1. When studying the prevalence of secondary caries, it was found (table No. 2) that the lowest rate of frequency of secondary carious lesions in the group of patients who used the composite "Firuze-Grand" for filling. The highest rate of frequency of secondary carious lesions was observed in the group of patients C and B. The total prevalence of carious lesions of the teeth -2210 (65.8%), of which with primary lesions - 148 (6.7%); with secondary caries - 72 (3.25%) within 12 months; in the next 24 months these indicators were 298 (8.9%) and 164 (5%), respectively.

Table 2. The number of 1-part and 2-part carious lesions of teeth after filling (after 12 and 24 months) with various composite filling materials.

Number of examined teeth (total –3345 (12 months), and 3304 (24 months)).		**Group A (40 people and 1120 physiological teeth (100%))**		**Group B (40 people and 1120 physiological teeth (100%))**		**Group C (40 people and 1120 physiological teeth (100%))**	
		1	2	1	2	1	2
Qty. new carious teeth = 220 / 6.57% (12 month)	1st caries 148/67,3%	15/10,2%	20/13,5%	20/13,5%	22/14,9%	20/13,5%	23/15,5%
		15/1,3%	20/1,8%	20/1,8%	22/1,9%	20/1,8%	23/2,1%
	2nd caries 72/32,7%	8/11%	12/16,7%*****	11/15,3%	15/20,8%*****	11/15,3%	15/20,8%*****
		8/0,07%	12/0,1%*****	11/0,09%	15/0,1%*****	11/0,09%	15/0,1%*****
Qty. new carious teeth = 242 / 7.3% (24 month)	1st caries 150/67,3%	15/10%	26/17,3%	18/12%	38/25,3%	21/14%	32/21,3%
		15/1,3%	26/2,3%	18/1,6%	38/3,4%	21/1,8%	32/2,8%
	2nd caries 92/32,7%	10/10,8%	17/18,5%*****	14/15,2%	18/19,6%*****	15/16,3%	18/19,6%*****
		10/0,08%	17/0,15%*****	14/0,1%	18/0,2%*****	15/0,1%	18/0,2%*****

*** Note:** comparison of the values of the frequency of 1-part and 2-part caries is statistically significant in all second groups. 1st line, indicators of the total number of carious teeth; 2nd line indicators of the total number of survey. teeth.
Analysis of the data on the frequency of development of primary and secondary caries showed that the most often found carious cavities of class II according to Black (contact surfaces of the chewing teeth) in patients

of the 2nd group: primary caries - 14.06%, secondary - 6.06%. Less often, Black class I carious lesions were observed, 11.37% of cases of primary and 8.69% of cases of secondary caries, respectively, were found in patients of the same study group.

Analysis of the research results showed that secondary caries is more often found in carious cavities of teeth of I, II and III classes according to Black in groups 2 A, 2B and 2B, due to a violation of the marginal adhesion of the fillings. This may be due to the complexity of the restoration of hard dental tissues in case of carious lesions of the contact surfaces.

Also, the results of the study showed that secondary caries is more often found in carious cavities of teeth of I, II and III classes according to Black, due to a violation of the marginal adherence of the fillings.

The obtained results of determining the color and color fastness show that the transparency coefficient = 44.2 ± 5.8%; the value of the indicator on a white background ΔE = 3.04 ± 0.20, on a black background ΔE = 3.12 ± 0.12 of the composite filling material "Firuze-Grand" does not change.

When determining water absorption, it was found that for all studied samples of the composite material "Firuze-Grand" this indicator was within the limits (water absorption Wwp = 34.4 ± 2.1 μg / mm3; solubility Wwr = 4.2 ± 0.4 μg / mm) established GOST standards (45.8 ± 4.4 μg / mm).

The results of determining the strength and modulus of elasticity in bending of the composite material "Firuze-Grand": bending strength - σbend = 82.44 ± 8.4 MPa; modulus of elasticity in bending - Ebr = 7112.34 ± 496.2 MPa.

According to the results of determining the diametral strength or the strength at diametrical rupture of the composite material "Firuze-Grand" Tr = 42.8 ± 1.9 MPa, according to the requirements of GOST R 31574-2012, the strength at diametrical rupture of the composite materials must be at least 34 MPa.

According to the results of determining the strength of the adhesive bond of the composite material "Firuze-Grand" Asdw = 18.4 ± 2.8 MPa as required by GOST R 31574-2012 and ISO 4049: 2009 "Polymer restorative materials" adhesion to dentin of composite materials must be at least 7 MPa.

The results of determining the depth of curing of the composite material "Firuze-Grand" - the depth of curing is 2.1 ± 0.2 mm, as required by GOST 31574-2012 and ISO 4049: 2009 "Polymeric reducing materials", if all three values of the height of cured samples are more than 2 mm - the material meets the requirements.

IV. CONCLUSION

Light-cured composite material "Firuze-Grand" for filling carious cavities of various localizations, has a long-term effect in the treatment and prevention of the development of secondary dental caries.

Domestic composite material "Firuze-Grand" is not inferior to foreign counterparts in its physical and mechanical properties, such as - strength in bending and diametrical rupture; water absorption and curing depth; adhesive bond and color fastness.

REFERENCES

1) Borovskij, E.V. Mikroflora polosti rta v norme i pri patologijah / E.V. Borovskij, V.K. Leont'ev // Biologija polosti rta. - M.: Medicina, 1991. - S. 227-237.
2) Leont'ev, V.K. Jevoljucija predstavlenij o prichinah vozniknovenija kariesa zubov / V.K.Leont'ev, L.A. Mamedova // Stomatologija. - 2000. - №1. - S. 68-72.
3) Nikolaev A.I. Prakticheskaja terapevticheskaja stomatologija: uchebnoe posobie /A.I. Nikolaev, L.M. Cepov. - 9-e izd., pererab. i dop. - M.: MED pressinform, 2016. – 927 s.
4) Gafforov S.A. Yrieva O.O. Importance of medical and social Factors in etiology of carious and non-carious diseases of children. International Journal of «Pharmaceutical Research». Vol11, Issue 3, July-Sept, 2019
5) Farrugia C, Camilleri J. Antimicrobial properties of conventional restorative filling materials and advances in antimicrobial properties of composite resins and glass ionomer cements-A literature review. DentMater 2015;31(4): e 89-99
6) Sensitivity to titanium / P.A. Lalor, P.A. Revell, A.B. Gray et al. // J. Surg. 1991. — № 73-B. - P. 25-28.