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INVESTIGATION AND ASSESSMENT OF THE USE OF A NOVEL DOMESTIC BIOACTIVE GLASS-CERAMIC MATERIAL FOR DENTAL IMPLANT SURFACE COATING

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Previously, implant treatment was performed delayed after tooth extraction in 95% of cases [1, p. 83; 2, p. 29]. However, the stepwise approach has a number of disadvantages, in particular atrophy of the alveolar bone, which adversely affects the condition of soft tissues, and the need for additional interventions. These consequences significantly complicate the achievement of a high aesthetic result [3, p. 201]. Immediate implantation and immediate prosthetics with temporary structures contribute to the preservation or improvement of the contour of the alveolar ridge and soft tissues [4, p. 493]. Therefore, the aim of the study was to improve the quality of comprehensive treatment of dental patients with indications for tooth extraction by accelerating the process of osseointegration and stabilization of implants during direct implantation compared to the classic delayed treatment by applying the developed technique of coating the implant surface with a new domestic bioactive calcium phosphate silicate glass ceramic.

The study was conducted at the clinical base of the Department of Orthopedic Dentistry "Silk" of Kharkiv National Medical University. To achieve the goal, the study involved 39 patients with indications for the extraction of 47 teeth in the lateral department, aged 19 to 59 years, including 15 men and 24 women. All of them were divided into 2 groups – I (main – 13 women, 7 men), patients who underwent immediate implantation immediately after extraction, and the surface of the implants was covered with bioactive calcium phosphate silicate glass ceramics; patients in the II (control – 10 women, 9 men) group underwent delayed implantation according to the standard protocol for the use of conventional implants. Each group was divided into subgroups with immediate loading and delayed. Patients in the first subgroup were made single temporary crowns directly in the oral cavity using a silicone template. Analysis of implant stability was determined using the AnyCheck device (NeoBiotech, South Korea) [5]. Measurements were taken after 1, 3, 6, and 12 months.

The study showed that a significant difference between the main and control groups with immediate loading at the level of $p<0.001$, and with delayed loading at the level of $p<0.01$ was established already at stage 1, that is, 1 month after implantation. In patients of the main group with implantation on the upper jaw and immediate loading, the indicator was (69.4±2.7) IST, while in the control group it was 36.6% lower and equal to (50.8±2.5) IST. A similar situation developed with implants installed on the lower jaw – (71.2±2.8) IST and (51.3±3.3) IST, respectively, for the main and control groups ($p<0.05$), that is, a 38.8% difference. Regarding delayed loading, the indicators of the main group are also significantly ($p<0.01$) better – 1 month after implantation, the average values for the upper and lower jaws are (70.9±2.3) IST and (72.6±2.4) IST, respectively, which is 21.3% more compared to the control group. The next stage of the study was conducted after 3 months. According to the results obtained, it was found that the stability of the implants in the main group continued to grow and increased on average by 12% with immediate loading and by 10.8% with delayed ($p<0.05$). Thus, when implanted on the upper jaw,

the indicator increased to (78.3±3.4) IST, and on the lower jaw to (79.2±2.9) IST with immediate loading and to (79.1±3.1) IST and (79.9±2.9) IST, respectively, with delayed loading. When analyzing the results of the control group, it was found that IST with immediate loading on the upper jaw increased from (55.8±2.9) IST to (65.1±2.9) IST – by 16.7%, on the lower jaw – from (59.3±3.7) IST to (66.3±3.1) IST – by 11.8%, i.e. on average by 14.6%. Studies with delayed loading also have positive results – in the upper jaw, the increase from (58.2±3.6) IST to (66.2±2.8) IST – by 13.7%, and in the lower jaw from (60.1±2.7) IST to (67.2±3.4) IST – by 11.8%, therefore, on average by 12.8%. However, when comparing the indicators of the main and control groups at the second stage of the study, it was found that IST with a significance level of $p<0.01$ is higher in the main group by 16.9% and 16.3% with immediate loading on the implants of the upper and lower jaws, respectively. As for delayed loading, the indicator of the main group is significantly higher in the upper jaw by 11.6% ($p<0.01$), and in the lower jaw by 15.9% ($p<0.05$).

At the third stage of the study, the difference in results gradually decreases, which is associated with the positive effect of time and the regenerative properties of the body on the osseointegration of all implants. Compared ith the previous stage, in patients of the main group, IST increased on average by 4.25% with immediate loading, and by 3.95% with delayed loading and lies in the range from (81.8±3.1) IST to (83.2±1.7) IST. The results of the control group improved by 8.95% and 8.6% with immediate and delayed prosthetics, respectively, and are from (70.4±3.1) IST to (73.6±3.4) IST. However, despite the higher percentage of IST growth in the control group, the results obtained with immediate implantation using bioactive calcium phosphate silicate glass

ceramics were significantly ($p<0.05$) higher by 14.4% than with the standard implantation protocol.

The last stage of the study, after 1 year, a decrease in the rate of IST growth was detected in both study groups. Thus, in the main group, the increase occurred on average by 1.6%, and in the control group by 7.3% compared to the results of the previous stage. However, the indicators of the first group achieved an almost ideal result, ranging from (83.1±1.7) IST to (84.1±0.9) IST, while in the control group from (76.5±2.8) IST to (78.1±1.2) IST, which is no less significant than at the level of $p<0.05$, i.e. by 8.6%, and with delayed loading, the reliability of the difference in results is generally 99.9%.

Thus, the results of the study of the use of a new domestic bioactive glass-ceramic material for coating the surface of implants during implantation immediately after tooth extraction showed that a significant difference between the main and control groups with immediate loading at the level of $p<0.001$ (37.7%), and with delayed loading at the level of $p<0.01$ (21.3%) was established already at stage 1, i.e. 1 month after implantation. Therefore, when using the proposed method, one can without hesitation carry out immediate loading at least on the upper jaw, at least on the lower, since the degree of osseointegration in both cases after 1 month is greater than 65 IST, which cannot be said about the results of patients in the control group. In addition, it was experimentally proven that there was no statistical difference in the IST index between the results with immediate and delayed loading at all stages, while when using the standard implantation technique, this difference was statistically significant ($p<0.05$) at the first stage.

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