

Justification of follow-up care and use of different types of individual oral hygiene means in patients with compensated form of type 2 diabetes mellitus during prosthetics with implant-supported fixed superstructures

U.R. Vasylyshyn,
V.S. Skibitskyi

Bogomolets National Medical University

Abstract. Diabetes mellitus significantly contributes to peri-implant diseases, with even well-controlled type 2 diabetic patients at higher risk. Oral hygiene is crucial for implant success, making a preventive care plan with regular monitoring, professional cleaning, and effective daily hygiene products essential for long-term implant outcomes. **The aim** of the study was to improve the effectiveness of orthopedic treatment for patients with a compensated form of type 2 diabetes mellitus (T2DM) undergoing prosthetics with implant-supported fixed superstructures by optimizing follow-up care and the selection of individual oral hygiene means. **Material and methods.** This study included 48 partially edentulous patients aged 28 to 57 years who applied to the Bogomolets National Medical University between 2021 and 2023 for prosthetics on endosseous implants and were diagnosed with a compensated form of T2DM. All subjects received oral hygiene instructions and participated in maintenance and follow-up exams at 3, 6, 9, and 12 months to identify visual signs of peri-implant inflammation, also the Schiller-Pisarev test (SPT) Probing Depth (PD), Bleeding On Probing (BOP), Marginal Bone Loss (MBL); oral hygiene and the level of plaque control were assessed using the Implant Hygiene Index (IHI). Patients were divided into 3 groups based on compliance with recommendations: group 1 (n=22) – regularly came for examination, used a mechanical toothbrush and interdental hygiene products, with other means used, occasionally; group 2 (n=19) – regularly came for examination, all recommended personal hygiene products were used, including an ultrasound brush and an irrigator; group 3 (n=7) – for re-examination appeared after 12 months or more, there were errors in care. **Results.** After 3 months the average value of the IHI was $0,89 \pm 0,34$ in patients of group 1, in patients of group 2 the IHI decreased and became $0,59 \pm 0,27$, after 6 months – $0,75 \pm 0,26$ and $0,47 \pm 0,18$ respectively.

Оригінальні дослідження

The best IHI values were recorded after 6-month examination period. There was no statistically significant difference in SPT, PD, BOP, MBL among patients in all groups. **Conclusions.** The use of an ultrasonic brush and irrigator showed a statistically significant improvement in hygiene performance compared to a manual brush. Regular professional maintenance with a recall periodicity of every 3 months during the first year after implant restoration ensures long-term implant success and peri-implant health in patients with controlled T2DM.

Keywords: type 2 diabetes mellitus, implant-supported fixed superstructures, individual oral hygiene means, peri-implant.

Despite advancements in healthcare and the development of preventive programs and new dental technologies, partial edentulism remains a critical issue in modern dentistry and medicine as a whole. Statistics indicate a progressive rise in tooth loss, with prevalence rates ranging from 40% to 84.5%, depending on region and research methodology [1]. Currently, the preferred approach in prosthetic dentistry for dental arch defects is implant-supported prosthetics, offering effective, long-term dental rehabilitation [2], according to the World Health Organization, is aimed at achieving an optimal standard of living (QoL – quality of life) and allows achieving a highly aesthetic and functional treatment results. The rise in dental implants has led to more implant failures, threatening long-term prosthetic success due to inflammatory responses, such as mucositis, in the surrounding soft tissues [3, 4].

Peri-implant mucositis is defined as an inflammation of the peri-implant soft tissues with BOP, without loss of supporting bone, with or without increased PD and with visual signs of inflammation [5]. Untreated peri-implant mucositis can progress to peri-implantitis with progressive soft tissue and bone loss [6]. A significant factor in this process is the presence of specific pathogenic microorganisms in the peri-implant sulcus, which, combined with inadequate oral hygiene and biofilm buildup, instigates early inflammatory reactions and can ultimately lead to implant rejection [6, 7]. Implant health checks include probing depth, bleeding on probing, evaluation of prosthetic/abutment components, implant stability, occlusion, and signs of disease activity (e.g., pain) [8].

Numerous clinical studies, systematic reviews, and meta-analyses have identified various risk indicators for peri-implant mucositis and peri-implantitis [9]. Diabetes mellitus is a significant factor contributing to these conditions, with an estimated rise in affected people from 537 million in 2021 to 783 million by 2045 [10]. T2DM, accounting for over 90% of cases globally and with 45% undiagnosed,

impairs tissue regeneration and slows recovery, leading to infected, non-healing wounds and serious dental and gum diseases [11, 12].

Dental implants were previously avoided in diabetic patients due to concerns about delayed healing and complications [13]. However, research shows that implantation is feasible in compensated diabetes, where blood sugar remains normal for 2-3 months or more [14]. The results of the studies demonstrate that even with well-controlled glycemia, patients with T2DM are still at a higher risk of developing peri-implant diseases [15]. This suggests that, despite effective management of blood sugar levels, individuals with T2DM remain more susceptible to complications around dental implants compared to non-diabetic individuals [16].

That is why, to achieve success in servicing structures based on dental implants in patients with T2DM, a team of specialists is required to carry out professional preventive procedures for implant care [17]. Special attention should be paid to the planning stages, the dental implantation itself, the design of the prosthetic structure, and the choice of materials [18].

Oral hygiene is essential for the success of dental implants and managing metabolic and inflammatory processes in patients with T2DM [8, 19, 20]. Studies show that consistent oral hygiene can help reduce hyperglycemia and improve peri-implant tissue health [21]. Regular maintenance visits, including professional cleaning, evaluation of clinical parameters, radiographs, and proper home care, are key to ensuring implant longevity by lowering bacterial levels and reducing the risk of peri-implant complications, ultimately promoting better clinical outcomes [22].

The study authors emphasize the effectiveness of oral hygiene practices, including the use of various brushing techniques and specialized tools for brushing. Interproximal cleaning, mouthwashing, etc., should be highlighted to promote the long-term success of the implant and its restoration. Pa-

tient education and motivation play vital roles in preventing complications and maintaining implant stability over time [23, 24]. This is why a well-designed preventive care plan, which includes regular monitoring with professional cleaning and the selection of effective personal hygiene products for daily use, is a key factor in ensuring the long-term success of dental implants.

The aim of the study was to improve the effectiveness of orthopedic treatment for patients with a compensated form of T2DM undergoing prosthetics with implant-supported fixed superstructures by optimizing follow-up care and the selection of individual oral hygiene means.

Material and methods

The study protocol was approved by the Ethic Committee of the Bogomolets National Medical University (Protocol number 188, 28 October 2024). Participants gave their informed consent during the primary data collection.

This study included 48 partially edentulous patients aged 28 to 57 years who applied to the Department of Prosthetic Dentistry at Bogomolets National Medical University between 2021 and 2023 for prosthetics on endosseous implants and were diagnosed with diabetes. Given evidence of the impact of stress factors, including the ongoing war in Ukraine, on blood glucose levels and oral health in diabetic patients, this study focused on patients with a compensated form of T2DM (glycosylated hemoglobin HbA1c remained stable within 6.0% during the study period) [25].

Patients received 143 bone-level implants loaded using a two-stage approach, with osteointegration extended by 5-6 weeks. Professional and individualized oral hygiene training was provided before placing gum formers, extending gum contour shaping with standard or customized formers. Prosthetics included first-type fixed dentures on dental implants, replicating natural tooth crowns, crafted from zirconium dioxide and secured with screw fixation on standard titanium abutments [26, 27].

All subjects were given a standardized basic oral hygiene instruction, contained a description of the «Bass» brushing technique using ultrasound and mono-beam ultrasound brushes. Patients were instructed to use an oral irrigator once a day with 50 mL of water after toothbrushing and interprox-

imal cleaning in the evenings around the implants, using interdental hygiene products such as floss and interdental brushes. All patients returned for follow-up examinations and data collection after 3, 6, 9, and 12 months. In accordance with the recommendations, the patients were divided into 3 groups: group 1 (n=22) – regularly came for examination every 3 months, used a mechanical toothbrush and interdental hygiene products, with other means used, occasionally; group 2 (n=19) – regularly every 3 months came for examination, all recommended personal hygiene products were used, including an ultrasound brush and an irrigator; group 3 (n=7) – for re-examination appeared after 12 months or more, there were errors in care.

The follow-up visits included the measurement of clinical data, professional oral hygiene, reinforcement, and remotivation. Periodontal/peri-implant maintenance program included full-mouth scaling on teeth and implant surfaces with an ultrasonic scaler and plastic tips for implant hygiene, air polishing with a Kavo Prophyflex 4 handpiece using glycine, manual instruments such as plastic curettes, and polishing with cups and brushes with paste, if necessary. During follow-up exams were assessed oral hygiene, plaque control and visual signs of peri-implant inflammation. Evaluations included PD, BOP, occlusion monitoring and radiographic examination. A baseline periapical radiograph was taken before the installation of gum formers to determine the levels of crestal bone for prospective radiographic assessments. MBL was evaluated in patients who had suspected peri-implant mucositis and recorded in millimeters on peri-apical radiographs. Clinical data were measured at four sites around the implant (mesio-buccal, disto-buccal, mesio-lingual, disto-lingual) [28]. The following clinical parameters were assessed: (a) PD in mm using a standard probe (Perio probe 549/4 Medesy CP15 UNC) from the mucosal margin to the bottom of the sulcus; (b) BOP – positive sites, evaluated by the presence or absence of bleeding within 30 seconds after probing, and presented as mean percentages per individual using the formula $BOP = (\text{number of bleeding points} / \text{number of measurement points}) \times 100\%$. The hygiene index of implant-supported superstructures was assessed using the IHI, modified based on the Green-Vermillion index (Debris index) [29]. Plaque presence on the abutment and crown was visually assessed after staining with biphasic dye (Paroplak). The scale ranged from 0 (no plaque) to 3 (plaque covering one-

Оригінальні дослідження

third of the crown). IHI was calculated as the sum of points divided by the number of crowns. An IHI of 0–0.6 (low) indicated good hygiene in the implant site; 0.7–1.6 (average) – satisfactory; 1.7–2.5 (high) – unsatisfactory; and >2.5 (very high) – poor hygiene.

The gum condition around implants was assessed visually (local swelling, redness, shininess, altered contour, fistulas) and with the SPT using Lugol's solution to detect glycogen, which increases during inflammation. The test was interpreted visually or numerically: no color change (negative), yellow (slightly positive), brown (positive). Quantitatively, SPT was scored with Svrakov's iodine number: 0 (straw-yellow), 2 (brown papilla), 4 (brown gingival margin), 8 (brown alveolar gums).

Statistical data analysis was conducted using the statistical package R v. 4.3.2 (EZR). To assess the normality of data distribution, Pearson's χ^2 criterion was applied. Statistical processing of the results included the following indicators: for parameters with a normal distribution: mean (M), standard deviation (SD), and one-way ANOVA analysis with a 95% confidence interval; for parameters with a distribution different from normal: mean (M), median error (ME), and nonparametric Kruskal-Wallis analysis with a 95% confidence interval. P-values <0.05 were considered statistically significant.

Results and discussion

In the study of the level of hygiene in patients of groups 1 and 2, it was established that at 3, 6, 9 and 12 months follow-up IHI was significantly higher among patients in group 1 as compared to group 2 (**Table 1**). Higher IHI in group 1 indicates a worse state of hygiene around the implants. It can be concluded that the use of irrigator and ultrasonic brush has contributed to a decrease IHI compared to persons who did not use these devices.

The best IHI values were recorded at the 6-month examination, which may suggest increased patient motivation following their first follow-up visit after 3 months, when the hygienic state of their teeth and implants was demonstrated using dyes (**Figures 1, 2**).

We have the opportunity to compare the indicators of patients in group 3 only at the 12-month mark, as their data are missing from previous studies. In group 3, the IHI was significantly higher after 12 months of follow-up compared to groups 1 and 2 (Table 1).

Table 1. The results of the study on the hygiene of implant-supported superstructures using the IHI (M \pm SD)

Groups	IHI			
	3 months	6 months	9 months	12+ months
Group 1 (n=22)	0.89 \pm 0.34	0.75 \pm 0.26	0.81 \pm 0.28	0.83 \pm 0.24****
Group 2 (n=19)	0.59 \pm 0.27*	0.47 \pm 0.18*	0.51 \pm 0.21*	0.58 \pm 0.16****
Group 3 (n=7)	-	-	-	1.36 \pm 0.49**

Note. * – p<0.05 compared to group 1, ** – p<0.05 compared to group 2, *** – p<0.05 compared to group 3.



Figure 1. After the 3-month follow-up, a patient from group 2 with implant-supported crowns on teeth 25, 26, and 36 had an IHI of 1,7; indicating an unsatisfactory level of hygiene at the implant site.



Figure 2. After the 6 months' follow-up, the same patient from group 2. IHI=0.9, satisfactory hygiene level at the implant site.

When comparing groups 1, 2, and 3 in terms of the percentage of patients with different hygiene levels after 12 months of follow-up, we can conclude that there is a tendency for an increase in the number of patients with a good level of hygiene in group 1, with the maximum in group 2, compared to group 3. In contrast, group 3 shows a higher percentage of patients with satisfactory and unsatisfactory hygiene levels (**Figure 3**).

The decrease in clinical BOP and SPT in group 2 compared to group 1 after 3, 6, and 9 months and significant predominance of the indicator SPT in group 3 compared to groups 1 and 2 after 12 months of follow-up is statistically insignificant (p>0.05) and may indicate the need for longer follow-up or the involvement of a larger sample of patients (**Table 2**).

However, higher values of SPT correlated with visual signs of peri-implant mucositis – local swelling, redness and shininess of the soft tissue surface (**Figures 4.A, 4.B and 4.C**).

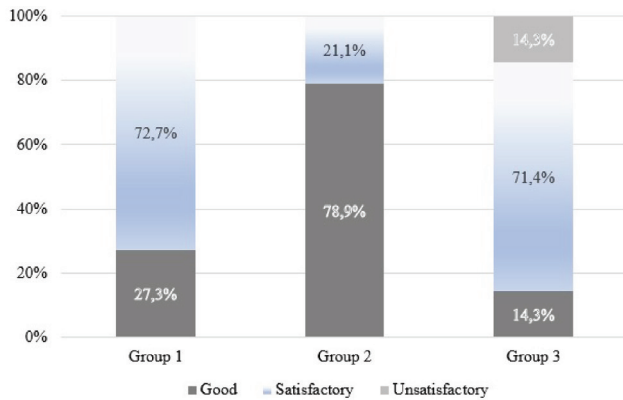


Figure 3. Percentage of patients with different levels of hygiene (Good/Satisfactory/Unsatisfactory) around implants after 12 months of follow up.

Table 2. The results of the study of the SPT and BOP

Groups	SPT			
	3 months	6 months	9 months	≥12 months
Group 1 (n=22)	0.73±1.06	0.55±0.79	0.45±0.70	0.64±0.93
Group 2 (n=19)	0.53±0.83	0.42±0.66	0.32±0.53	0.42±0.66
Group 3 (n=7)	-	-	-	2.29±2.12
BOP				
Group 1 (n=22)	1.99±3.43	1.14±2.07	1.76±3.04	1.59±2.63***,****
Group 2 (n=19)	1.64±2.94	0.99±1.87	1.32±2.35	1.32±2.35***,****
Group 3 (n=7)	-	-	-	8.04±9.18***

Note. * – $p < 0.05$ compared to group 1, ** – $p < 0.05$ compared to group 2, *** – $p < 0.05$ compared to group 3.



Figure 4. **A.** After 3 months, the patient from group 2. Slightly positive reaction of SPT, with Svrakov's iodine number = 4. **B.** After 6 months, the patient from group 2. Negative test of SPT, with Svrakov's iodine number = 2. **C.** After 6 months, the same patient from group 2. Visual signs of peri-implant mucositis are missing.

Since the p-value is < 0.05 in the case of the study BOP at 12 months, we can conclude that there is an effect of compliance with all recommendations and the use of an irrigator and ultrasound brush on means of BOP.

Analysis of the percentage of patients with existing signs of peri-implant mucositis at 12 months shows an increase of 6.2% of patients with these signs in the group 1, not using an ultrasound brush and irrigator compared to group 2, whose patients use all recommended hygiene products, and a more than two-fold increase in the percentage of individuals with mucositis in group 3 who did not follow the recommendations and monitoring schedules (**Table 3**).

Table 3. The percentage of patients with existing signs of peri-implant mucositis and positive SPT at 12 months, n (%)

Category	Group 1 (n=22)	Group 2 (n=19)	Group 3 (n=7)
Yes	6 (27.30%)	4 (21.10%)	4 (57.10%)
No	16 (72.70%)	15 (78.90%)	3 (42.90%)

At 3, 6, 9 and 12 months of follow-up, there was no statistically significant difference in peri-implant PD among all groups (**Table 4**).

Table 4. The results of the study of PD

Groups	PD			
	3 months	6 months	9 months	≥12 months
Group 1 (n=22)	2.55±0.54	2.45±0.53	2.44±0.54	2.36±0.49
Group 2 (n=19)	2.45±0.43	2.37±0.41	2.33±0.46	2.28±0.47
Group 3 (n=7)	-	-	-	2.56±0.51

There was no statistically significant difference in peri-implant MBL among patients in all groups due to inflexible sampling, and the values were within 2 mm at the 12-month follow-up, excluding 2 patients from group 3. These patients showed gingival margin hyperemia and bleeding around the implant, with a bone pocket and MBL of 2,5-4,5 mm. Additionally, exacerbated chronic periodontitis and supra- and subgingival deposits resulted in a high hygiene index, indicating poor oral hygiene.

Conclusions

This study demonstrated an increase in the level of implant hygiene with the integrated application of all cleaning products and interproximal hygiene. However, the use of ultrasonic brush and irrigator showed a statistically significant improvement in hygiene performance compared to a manual brush.

Оригінальні дослідження

At the same time, a higher percentage of people with poorer oral hygiene and in particular implants, as well as with visual signs of peri-implant mucositis in the group that did not comply with the recommended monitoring deadlines, indicates the need for regular professional maintenance, with recall appointments every 3 months for the first year after implant restoration. Maintenance should be consistent and involve an evaluation of the restoration and surrounding tissues, followed by professional cleaning of prostheses, implants, and abutments. Additionally, it should include updated instructions to enhance the patient's home care routine, by remotivating the patient ensuring long-term implant success and tissue health.

Despite these findings, more long-term, well-controlled clinical studies are necessary to better define the relationship between oral hygiene levels and peri-implant health in patients with controlled T2DM, particularly when using multiple oral hygiene devices. Such research would provide clearer insights into how specific hygiene practices impact on implant success in this population.

References

- Kassebaum NJ, Smith AGC, Bernabe E, Fleming TD, Reynolds AE, Vos T, et al. Global, regional, and national prevalence, incidence, and disability-adjusted life years for oral conditions for 195 countries, 1990-2015: a systematic analysis for the global burden of diseases, injuries, and risk factors. *J Dent Res*. 2017 Apr;96(4):380-7. doi: 10.1177/0022034517693566.
- Orishko A, Imber JC, Rocuzzo A, Stdhli A, Salvi GE. Tooth- and implant-related prognostic factors in treatment planning. *Periodontol 2000*. 2024 Jun;95(1):102-28. doi: 10.1111/prd.12597.
- Renvert S, Lindahl C, Persson GR. Occurrence of cases with peri-implant mucositis or peri-implantitis in a 21-26 years follow-up study. *J Clin Periodontol*. 2018 Feb;45(2):233-40. doi: 10.1111/jcpe.12822.
- Lee CT, Huang YW, Zhu L, Weltman R. Prevalences of peri-implantitis and peri-implant mucositis: systematic review and meta-analysis. *J Dent*. 2017 Jul;62:1-12. doi: 10.1016/j.jdent.2017.04.011.
- Korsch M, Robra BP, Walther W. Cement-associated signs of inflammation: retrospective analysis of the effect of excess cement on peri-implant tissue. *Int J Prosthodont*. 2015 Jan-Feb;28(1):11-8. doi: 10.11607/ijp.4043.
- Wada M, Mameno T, Otsuki M, Kani M, Tsujioka Y, Ikebe K. Prevalence and risk indicators for peri-implant diseases: A literature review. *Jpn Dent Sci Rev*. 2021 Nov;57:78-84. doi: 10.1016/j.jdsr.2021.05.002.
- Cheung MC, Hopcraft MS, Darby IB. Patient-reported oral hygiene and implant outcomes in general dental practice. *Aust Dent J*. 2021 Mar;66(1):49-60. doi: 10.1111/adj.12806.
- Ramanauskaitė A, Obreja K, Schwarz F, Jepsen K, Cosgarea R, Bunke J, et al. Reliability of probing depth assessments at healthy implant sites and natural teeth. *Clin Oral Invest*. 2023 Jun;27(6):2533-45. doi: 10.1007/s00784-022-04810-5.
- Jepsen S, Caton JG, Albandar JM, Bissada NF, Bouchard P, Cortellini P, et al. Periodontal manifestations of systemic diseases and developmental and acquired conditions: consensus report of workgroup 3 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. *J Periodontol*. 2018 Jun;89 Suppl 1:S237-48. doi: 10.1002/JPER.17-0733.
- Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, et al. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Res Clin Pract*. 2022 Jan;183:109119. doi: 10.1016/j.diabres.2021.109119.
- Xourafa G, Korbmacher M, Roden M. Inter-organ crosstalk during development and progression of type 2 diabetes mellitus. *Nat Rev Endocrinol*. 2024 Jan;20(1):27-49. doi: 10.1038/s41574-023-00898-1.
- Wagner J, Spille JH, Wiltfang J, Naujokat H. Systematic review on diabetes mellitus and dental implants: an update. *Int J Implant Dent*. 2022 Jan 3;8(1):1. doi: 10.1186/s40729-021-00399-8.
- Jiang X, Zhu Y, Liu Z, Tian Z, Zhu S. Association between diabetes and dental implant complications: a systematic review and meta-analysis. *Acta Odontol Scand*. 2021 Jan;79(1):9-18. doi: 10.1080/00016357.2020.1761031.
- Javed F, Romanos GE. Impact of diabetes mellitus and glycemic control on the osseointegration of dental implants: a systematic literature review. *J Periodontol*. 2009 Nov;80(11):1719-30. doi: 10.1902/jop.2009.090283.
- Lagunov VL, Sun J, George R. Evaluation of biologic implant success parameters in type 2 diabetic glycemic control patients versus health patients: A meta-analysis. *J Investig Clin Dent*. 2019 Nov;10(4):e12478. doi: 10.1111/jicd.12478.
- Alasqah MN, Alrabiah M, Al-Aali KA, Mokeem SA, Binmahfooz AM, ArRejaie AS, et al. Peri-implant soft tissue status and crestal bone levels around adjacent implants placed in patients with and without type-2 diabetes mellitus: 6 years follow-up results. *Clin Implant Dent Relat Res*. 2018 Aug;20(4):562-8. doi: 10.1111/cid.12617.
- Humphrey S. Implant maintenance. *Dent Clin North Am*. 2006 Jul;50(3):463-78, viii. doi: 10.1016/j.cden.2006.03.002.
- Sadid-Zadeh R, Willis J, Forgo G, Haraszthy V. Comparative analysis of biofilm formation on materials used for the fabrication of implant-supported prostheses. *Braz Dent J*. 2020 Sep 4;31(4):380-4. doi: 10.1590/0103-6440202003385.
- Pons R, Nart J, Valles C, Salvi GE, Monje A. Self-administered proximal implant-supported hygiene measures and the association to peri-implant conditions. *J Periodontol*. 2021 Mar;92(3):389-99. doi: 10.1002/JPER.20-0193.
- Carvalho AP, Moura MF, Costa FO, Cota LO. Correlations between different plaque indexes and bleeding on probing: a concurrent validity study. *J Clin Exp Dent*. 2023 Jan 1;15(1):e9-e16. doi: 10.4317/jced.60039.
- Al Amri MD, Kellesarian SV, Al-Kheraif AA, Malmstrom H, Javed F, Romanos GE. Effect of oral hygiene maintenance on HbA1c levels and peri-implant parameters around immediately-loaded dental implants placed in type-2 diabetic patients: 2 years follow-up. *Clin Oral Implants Res*. 2016 Nov;27(11):1439-43. doi: 10.1111/clr.12758.
- Bunk D, Eisenburger M, Hdckl S, Eberhard J, Stiesch M, Grischke J. The effect of adjuvant oral irrigation on self-administered oral care in the management of peri-implant mucositis: A randomized controlled clinical trial. *Clin Oral Implants Res*. 2020 Oct;31(10):946-58. doi: 10.1111/clr.13638.
- Salles MM, Oliveira VC, Macedo AP, do Nascimento C, Silva-Lovato CH, Paranhos HFO. Brushing associated with oral irrigation in maintaining implants and overdentures hygiene – a randomized clinical trial. *Odontology*. 2021 Jan;109(1):284-94. doi: 10.1007/s10266-020-00543-7.
- Todescan S, Lavigne S, Kelekis-Cholakias A. Guidance for the maintenance care of dental implants: clinical review. *J Can Dent Assoc*. 2012;78:c107.
- Ingrassio DMF, Primavera M, Samvelyan S, Tagi VM, Chiarelli F. Stress and diabetes mellitus: pathogenetic mechanisms and clinical outcome. *Horm Res Paediatr*. 2023;96(1):34-43. doi: 10.1159/000522431.
- Gowd MS, Shankar T, Ranjan R, Singh A. Prosthetic consideration in implant-supported prosthesis: a review of literature. *J Int Soc Prev Community Dent*. 2017 Jun;7(Suppl 1):S1-S7. doi: 10.4103/jispcd.JISPCD_149_17.
- Hosseini M, Worsaae N, Gotfredsen K. Survival rate of implant-supported, single-tooth restorations based on zirconia or metal abutment in patients with tooth agenesis: a 5-years prospective clinical study. *J Evid Based Dent Pract*. 2024 Jun;24(2):101970. doi: 10.1016/j.jebdp.2024.101970.

28. Dowell S, Oates TW, Robinson M. Implant success in people with type 2 diabetes mellitus with varying glycaemic control: a pilot study. *J Am Dent Assoc.* 2007 Mar;138(3):355-61; quiz 397-8. doi: 10.14219/jada.archive.2007.0168.
29. Pawlaczyk-Kamiecka T, Torlicska-Walkowiak N, Borysewicz-Lewicka M. The relationship between oral hygiene level and gingivitis in children. *Adv Clin Exp Med.* 2018 Oct;27(10):1397-401. doi: 10.17219/acem/70417.

Abbreviations

BOP – Bleeding on Probing
IHI – Implant Hygiene Index
MBL – Marginal Bone Loss
PD – Probing Depth
SPT – Schiller-Pisarev test
T2DM – type 2 diabetes mellitus

Обґрунтування динамічного моніторингу та застосування різних видів засобів індивідуальної гігієни ротової порожнини в пацієнтів із компенсованою формою цукрового діабету 2-го типу при протезуванні незнімними конструкціями з опорою на імплантати

У.Р. Васишлин, В.С. Скібіцький

Національний медичний університет ім. О.О. Богомольця

Резюме. Цукровий діабет значною мірою сприяє періімплантним захворюванням, навіть із добре контрольованою формою цукрового діабету 2-го типу пацієнти є в зоні підвищеного ризику. Оскільки гігієна ротової порожнини має вирішальне значення для функціонування імплантату, план профілактичного догляду з регулярним контролем, професійною гігієною та ефективні щоденні гігієнічні засоби є необхідною умовою довгострокових результатів імплантації. **Мета дослідження** – підвищення ефективності ортопедичного лікування пацієнтів із компенсованою формою цукрового діабету 2-го типу незнімними супраконструкціями з опорою на внутрішньокісткові імплантати шляхом оптимізації подальшого догляду та підбору індивідуальних засобів гігієни порожнини рота. **Матеріал і методи.** У дослідженні брали участь 48 пацієнтів із частковою втратою зубів віком від 28 до 57 років із компенсованою формою цукрового діабету 2-го типу, які зверталися до Національного медичного університету ім. О.О. Богомольця впродовж 2021-2023 років із метою протезування на внутрішньокісткових імплантатах. Усі суб'єкти отримали рекомендації з гігієни порожнини рота та підлягали подальшому догляду та моніторингу через 3, 6, 9 та 12 місяців для виявлення візуальних ознак періімплантату, а також визначення тесту SPT, PD, BOP, MBL, IHI. Згідно з дотриманням рекомендацій пацієнти були поділені на 3 групи: група 1 (n=22) – регулярно приходили на повторні огляди, застосовували механічну зубну щітку і міжзубні засоби гігієни, інші засоби використовували епізодично; група 2 (n=19) – регулярно приходили на повторні огляди, застосовували всі рекомендовані засоби особистої гігієни, включаючи ультразвукову щітку та іригатор; група 3 (n=7) – на повторний огляд з'явилися через 12 місяців і більше, були помилки в догляді. **Результати.** Через 3 місяці в пацієнтів 1 групи середнє значення IHI становило 0,89±0,34, у пацієнтів 2 групи IHI зни-

звився до 0,59±0,27, через 6 місяців відповідно 0,75±0,26 і 0,47±0,18. Найкращі значення IHI були зафіксовані в 6-місячний період спостереження. Серед пацієнтів усіх груп не було статистично значущої різниці в показниках SPT, PD, BOP, MBL. **Висновки.** Використання ультразвукової щітки та іригатора показало статистично значуще покращення гігієнічних показників порівняно з ручною щіткою. Регулярний професійний догляд із періодичністю кожні три місяці протягом першого року після протезування з опорою на імплантати забезпечує тривалий успіх імплантації та періімплантне здоров'я в пацієнтів із контрольованим цукровим діабетом 2-го типу.

Ключові слова: цукровий діабет 2-го типу, незнімні супраконструкції з опорою на імплантат, індивідуальні засоби гігієни порожнини рота, періімплант.

Для цитування: Васишлин УР, Скібіцький ВС. Обґрунтування динамічного моніторингу та застосування різних видів засобів індивідуальної гігієни ротової порожнини в пацієнтів із компенсованою формою цукрового діабету 2-го типу при протезуванні незнімними конструкціями з опорою на імплантати. *Ендокринологія.* 2024;29(4): 317-323. DOI: 10.31793/1680-1466.2024.29-4.317.

Адреса для листування: Васишлин Уляна Ростиславівна, vasylyshynu@gmail.com; НМУ ім. О.О. Богомольця, бульв. Шевченка, 13, м. Київ 01601, Україна.

Відомості про авторів: Васишлин Уляна Ростиславівна, канд. мед. наук, доцентка кафедри ортопедичної стоматології НМУ ім. О.О. Богомольця, ORCID: 0000-0002-7587-8120; Скібіцький Вадим Станіславович, канд. мед. наук, доцент кафедри ортопедичної стоматології НМУ ім. О.О. Богомольця, ORCID: 0009-0009-1425-2261.

Особистий внесок: Васишлин УР. – аналіз проблеми, концепція й дизайн дослідження, аналіз та статистична обробка результатів дослідження, написання та редагування тексту, оформлення статті; Скібіцький В.С. – підбір та клінічне обстеження пацієнтів, аналіз літератури, аналіз даних, редагування та консультації під час оформлення статті.

Фінансування: ініціативна стаття.

Декларація з етики: автори задекларували відсутність конфлікту інтересів і фінансових зобов'язань.

Стаття: надійшла до редакції 27.09.2024 р.; перероблена 22.11.2024 р.; прийнята до друку 26.11.2024 р.; надрукована 30.12.2024 р.

For citation: Vasylyshyn UR, Skibitskyi VS. Justification of follow-up care and use of different types of individual oral hygiene means in patients with compensated form of type 2 diabetes mellitus during prosthetics with implant-supported fixed superstructures. *Endokrynologia.* 2024;29(4): 317-323. DOI: 10.31793/1680-1466.2024.29-4.317.

Correspondence address: Vasylyshyn Uliana Rostyslavivna, vasylyshynu@gmail.com; Bogomolets National Medical University, Blvd. Shevchenko, 13, Kyiv, 01601 Ukraine.

Information about the authors: Vasylyshyn Uliana Rostyslavivna, Ph.D., Associated Prof. of the Department of Prosthetic Dentistry of the Bogomolets National Medical University, ORCID: 0000-0002-7587-8120; Skibitskyi Vadim Stanislavovich, Ph.D., Associated Prof. of the Department of Prosthetic Dentistry of the Bogomolets National Medical University, ORCID: 0009-0009-1425-2261.

Personal contribution: Vasylyshyn U.R. – analysis of the problem, concept and study design, analysis and statistical processing of the research results, writing and editing of the text, and article formatting; Skibitskyi V.S. – selection and clinical examination of patients, analysis of literature, data analysis, editing and consultation during the design of the article.

Funding: initiative article.

Declaration of ethics: the authors have declared no conflicts of interest or financial obligations.

Article: received September 27, 2024; revised November 22, 2024; accepted November 26, 2024; published December 30, 2024.