

Research Article

Hygiene and Care Protocols for Implant-supported Dental Prostheses in Patients with Diabetes

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Abstract

Background: Prophylactic dental procedures following implant placement are critical to the long-term success of implants and are also dependent on the patient maintaining effective home care.

Purpose: Evaluation of the effectiveness of preventive measures in patients with diabetes during long periods after prosthetic treatment with implants.

Materials and methods: The study included 62 patients with diabetes with edentulism using 146 dental implants. Patients underwent constant monitoring, including regular occupational hygiene during follow-up examinations. Their frequency was set individually from 2 to 4 times A clinical index including Bleeding on Probing (BOP), Probing Depth (PD), and Marginal Bone Loss (MBL).

Results: In patients included in the preventive protocol after 12 months, the mean BOP was 1.4 ± 0.15 , and PPD was 2.46 ± 0.42 . After 12 months in patients mean MBL was 0.72 ± 0.6 mm, after 3 years MBL was 1.24 ± 0.25 mm. For patients who were excluded from preventive services after 12 months, the mean BOP 1.9 ± 0.25 , and the mean PPD was 3.56 ± 0.28 . After 12 months in patients mean MBL was 0.87 ± 0.7 mm, after 3 years MBL was 1.52 ± 0.32 mm ($p > 05$). Compared to persons enrolled in the preventive protocol, those in the group without services were more likely to develop peri-implantitis (42.4% vs. 12.6%). The survival rate of implants after 3 years was 98.4%. The survival rate of implants in those patients who were excluded from preventive services after 3 years was 95.4%.

Conclusion: For patients with diabetes, regular medical examinations, accompanied by professional oral hygiene procedures, prevent the development of negative reactions of the soft tissues surrounding the implant.

Introduction

Over the past decade and a half, dental implantation as a method of treating partial and complete edentulism has gained a strong position in modern prosthetic dentistry [1,2]. Dental implants for total or partially edentulous patients are an effective method of replacing natural teeth with long-term results [3-5]. Not so long ago, diabetes mellitus was a contraindication for implantation, but technology does not stand still and today such patients also have access to implant prosthetics [6-8]. Diabetes mellitus is a disease of the endocrine system in which the body lacks the pancreatic hormone insulin. Type 1 diabetes is

associated with low production of the hormone, type 2 - with its insufficient absorption and poor cell sensitivity [9-11]. A direct consequence of the disease is increased blood sugar. A person feels constant thirst and hunger, loses weight, and is bothered by frequent urination. Due to high sugar content in a type II diabetic patient metabolism in all its forms is disrupted [12-14], blood vessels suffer; immunity decreases; and bones become brittle.

In type II diabetic patients tissue regeneration slows down significantly, recovery processes are going very slowly, and wounds become infected, fester and become non-healing [15-18]. Deep metabolic disorders in the body

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lead to serious diseases of the teeth and gums [19-21]. The salivary glands produce little saliva in diabetic patients, tooth enamel is quickly destroyed and caries develop at an accelerated rate [22,23]. With a high concentration of carbohydrates, fungal flora is activated. It multiplies easily and affects previously healthy teeth [24]. Persistent foci of chronic infection arise in the oral cavity. When care is taken incorrectly, bacteria accumulate in tooth crevices and cavities, maintaining inflammation in them [25-28].

During surgery, dentists are faced with increased bleeding from the wound. Postoperative swelling and hematomas take a long time to resolve and cause significant pain [29-31]. The healing of the implant slows down, takes several months longer, and sometimes does not occur at all in diabetics [32,33]. This was an obstacle to implantation since complications often occurred in this group of patients after surgery. After extensive research it was established that dental implantation is quite possible in a compensated form of diabetes - when, against the background of constant treatment, the sugar level remains normal for 2 months - 3 months or more [34,35].

Patients with type 2 diabetes mellitus, who developed the disease more recently, tolerate implantation better and recover faster since their bone structure is more dense and the body is in good condition [36,37]. Today, an absolute contraindication for dental restoration using implants is decompensated diabetes mellitus, when the sugar level is much higher than normal and is not regulated in any way. Insulin-dependent patients and people with type 1 diabetes mellitus, who have significantly reduced bone density, which sharply increases the risk of implant failure, may also be refused [38]. Despite the fact that implantation in recent years has had a high level of success, an urgent problem in dentistry remains the possibility of long-term complications associated, first of all, with the development of inflammation of the tissues surrounding the osseointegrated implant, which can ultimately lead to the loss of the dental implants [39,40].

The etiology of implant failure is complex; among the etiological factors, it is emphasized by the colonization of the peri-implantation sulcus by specific pathogenic microorganisms, initiated by the initial stage of inflammatory processes ending in implant rejection [41,42]. Guaranteed success in servicing structures based on dental implants requires a team of specialists to carry out professional preventative procedures for the care of implants [43]. Implant health checks include probing depth, bleeding on probing, prosthetic/abutment components, implant stability, occlusion, and signs of disease activity (eg, pain) [43,44].

Various studies have published evidence that regular patient monitoring, implant care, and supportive care are key to preventing peri-implantitis in patients [45,46].

There are few articles demonstrating the value of an implant care protocol compared to implants that have been out of care for a long time and lack professional hygiene. This article discusses the importance of oral hygiene when caring for implants.

Materials and methods

This prospective study included 62 partially or fully edentulous patients using 154 dental implants at the Department of Oral and Maxillofacial Surgery, Yerevan State Medical University, Yerevan, Armenia, between 2021 and 2023. The ages of the patients ranged between 26 and 43 years (34 males and 28 females). The study was reviewed and approved by the Ethical Committee of Yerevan State Medical (N 23 20 /03 2021) and in accordance with those of the World Medical Association and the Helsinki Declaration. Patients were informed verbally and in writing about the study and gave written informed consent.

Patients underwent a thorough clinical examination according to a generally accepted scheme. Patients after implantation were subject to constant monitoring, including regular professional hygiene during control examinations. Clinical index including; Bleeding On Probing (BOP), Probing Depth (PD), and Marginal Bone Loss (MBL) were recorded.

Their frequency was set individually - from 2 to 4 times. Calculus and plaque removal were performed using Steri-Oss scalers (Yorba Linda, California) made of graphite-reinforced nylon; subgingival irrigation with an antiseptic such as peroxide, Listerine or chlorhexidine using a plastic irrigation tip (Figures 1-4).



Figure 1: Before carrying out hygienic measures, calculus and plaque are observed on the removed fixed prosthetic structure screw-fixed to the lower jaw implants.



Figure 2: After removing the prosthetic structure, it is cleaned and polished.



Figure 3: Removable complete denture of the upper jaw, screw fixation of the prosthetic structure on implants of the lower jaw.



Figure 4: The patient's oral cavity after installation of the prosthetic structure.

In the case of early-stage peri-implantitis, local application of microencapsulated minocycline (Arestin) and 0.12% chlorhexidine gel reduced the depth of pockets and bleeding during probing.

Clinical and radiographic controls were made regularly, during dynamic observation, oral hygiene and the level of plaque control were assessed; probing depth, mobility, and bleeding during probing; assessment of any mucogingival deformities; occlusion monitoring; X-ray examination. The most common signs of peri-implantation mucositis are discoloration and bleeding on probing. The criteria for implant success were assessed. Criteria for failure included: implant mobility (> 1 mm), and radiographic bone loss ($> 1/3$ implant height).

Statistical analysis

Statistical were carried out using SPSS (SPSS Software Company, Chicago, IL, USA). The differences between follow-up periods were tested by paired Student's t-test, and the p-values < 0.05 were considered statistically significant.

Results

In patients included in the preventive protocol the mean BOP after 12 months BOP 1.4 ± 0.15 ($p > 0.05$), and PPD after 12 months was 2.46 ± 0.42 . After 12 months in patients mean MBL was 0.72 ± 0.6 mm, after 3 years MBL was 1.24 ± 0.25 mm ($p > 0.05$). Clinical indicators for patients who were

excluded from preventive services after 12 months mean BOP 1.9 ± 0.25 ($p > 0.05$), and PPD after 12 months was 3.56 ± 0.28 . After 12 months in patients mean MBL was 0.87 ± 0.7 mm, after 3 years MBL was 1.52 ± 0.32 mm ($p > 0.05$).

Discussion

Long-term functioning of implants requires ongoing maintenance and monitoring, which additionally includes an assessment of the patient's general and oral health, professional implant maintenance and careful home care. Not all patients are aware that poor oral hygiene is a significant risk factor for the development of peri-implantitis mucositis, which can be reversible with early treatment, can progress to peri-implantitis, and can ultimately lead to implant loss [47-49]. In patients with implants, if there is a tendency to inflammation of the tissues around the implants, daily home cleaning with chemotherapeutic agents in the form of rinsing with chlorhexidine solutions and applying an anti-infective ointment to the site of inflammation is important [50-54].

The study included patients with diabetes mellitus who underwent prosthetics using dental implants. In order to confirm the importance of hygienic measures, the clinical indicators of implants and the effectiveness of implantation in the postoperative period were studied in patients who were under observation and received professional hygiene and as well in those patients who were left out of control and did not receive professional hygiene after implantation and consulted a doctor about various post-implantation problems. Compared to persons enrolled in the preventive protocol, those in the group without services were more likely to develop peri-implantitis (42.4% vs. 12.6%). The survival rate of implants after 3 years was 98.4%. The survival rate of implants after 3 years for those patients who were excluded from preventive services was 95.4%. To reduce the risk of implant failure and provide optimal conditions for rehabilitation and osseointegration, it is important to properly organize oral hygiene at home. This requires: carrying out thorough and as gentle cleaning as possible twice a day; using a soft or ultra-soft brush and toothpaste without whitening components or abrasives to care for your teeth; using a rinse recommended by the implantologist; treating the oral cavity with an antiseptic solution after each meal (treatment is carried out as a rinse); using an irrigator for high-quality cleansing of hard-to-reach places - it can be used a week after implantation of artificial roots. The main requirement when installing implants is stable compensation of the disease if the blood sugar level is less than 7 mmol/l.

In the subcompensated form, this figure is higher but does not exceed 14. Surgery in such a situation is extremely undesirable and is dangerous with complications. In the case of decompensated diabetes, elective surgery cannot be performed. Implantation is possible when the patient is

in satisfactory condition. Diabetes mellitus is compensated, and the patient constantly receives maintenance therapy. An endocrinologist individually selects medications and confirms the stabilization of the process. There are no chronic disturbances in the functioning of the cardiovascular and circulatory systems: The patient does not smoke - nicotine constricts blood vessels, and insufficient blood flow greatly complicates healing; The diet is strictly observed - the diet is high in vitamins and low in carbohydrates, meals are frequent and in small portions; Dosed daily physical activity, stress effects are minimized; Oral hygiene is carried out extremely carefully; professional teeth cleaning has become a regular and familiar procedure. Implantation for diabetes mellitus is contraindicated in the following cases: developed complications - diabetic damage to the heart, kidneys, and liver; excess body weight; persistently high blood pressure; unstable course of the disease, the need to frequently adjust sugar levels; bleeding disorders. All these factors aggravate the course of the underlying disease and prevent any surgical procedures.

When planning dental implantation in patients with diabetes, it is fundamentally important to eliminate infectious diseases of the teeth and gums present in the oral cavity. After intervention, they can become a dangerous source of inflammation in bones and soft tissues, causing many complications. Problematic teeth should be treated in advance. In case of inflammation of the gums, periodontal treatment is performed. Professional oral hygiene is mandatory - it helps reduce the concentration of microorganisms on the teeth and mucous membranes. Potential inflammatory agents are removed along with soft and hard plaque. To monitor possible clinical changes, the patient should be examined every 6 months for the first year after implant restoration and problems identified by the presence of probing depth, bleeding on probing, suppuration, etc.

Carrying out the proposed preventive measures will increase the success of dental implantation in patients with diabetes. In general, these observations confirm the importance of individual prevention programs and constant monitoring. Study limited sample size (62) study focuses on a period, 2021 - 2023).

Conclusion

The lack of preventive measures in diabetic patients with functional dental implants has a negative impact on the long-term prognosis of the development of secondary inflammatory complications. patients with diabetes, regular medical examinations, accompanied by professional oral hygiene procedures, to prevent the development of negative reactions.

Declaration

Competing interest: The author declares that he has

no competing interests. None of the authors have relevant financial relations with a commercial interest.

Ethical approval and consent to participate: The study was reviewed and approved by the University Ethical Committee and in accordance with those of the World Medical Association and the Helsinki Declaration.

Consent for publication: Patients were informed verbally and in writing about the study and gave written informed consent.

Availability of data and materials: All data generated or analysed during this study are included in this published article.

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