

REVIEW ARTICLE

Diabetes Mellitus and Dental Implants - An Overview

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ABSTRACT

Today, dental implants are one of the restorative methods to replace missing teeth. Dental implant surgery has developed to a widely used procedure for dental rehabilitation and is a secure and predictable procedure. Local and systemic risk factors can result in higher failure rates. Diabetes mellitus is a chronic disease that goes in with hyperglycemia and causes multifarious side effects. Diabetes as a relative contraindication for implant surgery is controversially discussed. As the number of patients suffering from diabetes increases, there are more diabetic patients demanding implant procedures. We conclude that patients with poorly controlled diabetes suffer from impaired osseointegration, elevated risk of peri-implantitis, and higher level of implant failure. The influence of duration of the disease is not fully clear. The supportive administration of antibiotics and chlorhexidine seems to improve implant success. When diabetes is under well control, implant procedures are safe and predictable with a complication rate similar to that of healthy patients.

Keywords: Dental implants, Diabetes mellitus, Glycemic control, Implant survival, Peri-implantitis

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INTRODUCTION

Today, dental implants are one of the restorative methods to replace missing teeth. Implant survival is initially dependent on successful osseointegration following placement.^[1] Subsequently, as an implant is restored and placed into function, bone remodeling becomes a critical aspect of implant survival in responding to the functional demands placed on the implant restoration and supporting bone. Diabetes mellitus is a chronic metabolic disorder that leads to hyperglycemia, which raises multiple complications caused by micro- and macroangiopathy.^[2-4] Diabetic patients have an increased frequency of

periodontitis and tooth loss, delayed wound healing, and impaired response to infection. In 1980, more than 150 million people worldwide were affected and that number had grown to 350 million by 2008.^[5-7] This trend highlights the need for better understanding of diabetes and its therapy and impact on dental implant rehabilitation. A sufficient dental rehabilitation allows the patient to improve nutrition and the metabolic control. The ability to anticipate outcomes is an essential part of risk management in dental implant surgery. Recognizing conditions that place the patient at a higher risk of complications will allow the surgeon to make informed decisions and refine the treatment plan to optimize the outcomes.^[8,9]

DIABETES AND PERI-IMPLANTITIS

A study of Aguilar-Salvatierra *et al.*^[10] started to evaluate 2 years after insertion and found that the number of patients suffering from peri-implant inflammation increases with elevated glycosylated hemoglobin (HbA1c) values. The population was divided into well-controlled (HbA1c 6–8%), moderately controlled (HbA1c 8–10%), and poorly controlled (HbA1c >10%), but there was no healthy control.^[11] On the other hand, the retrospective study of Turkyilmaz^[12] showed no evidence of diminished clinical success 1 year after implantation, defined by negative bleeding on probing, no pathological probing depth, and a marginal bone loss of 0.3 ± 0.1 mm in a population of type II diabetics. The bleeding on probing is more often in the poorly controlled population, but the probing depth is not increased.

DIABETES AND IMPLANT SURVIVAL

Implant survival is an easily defined and measured endpoint for dental implant therapy.^[13-17] The result of implant survival in diabetics is 100–96.4 %, which does not differ from the healthy control. The two studies without control group report a 100% the survival rate 4 months and 1 year after implantation.^[18] There is one work that demonstrates the survival rate of 85.6% after 6 years, which is lower than that in healthy population. The most implant failures were observed in the 1st year after prosthetic loading.^[19-26]

DIABETES AND BONE AUGMENTATION

A study done by Erdogan *et al.*^[15] consists of type II diabetics moderately and well-controlled (HbA1c

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6–7.5%) with a mean duration of disease of 7.5 years and a healthy control group. Augmentation of the maxilla was performed by guided bone regeneration with autologous bone from the mandibular ramus harvested by bone scrapers, a synthetic bone substitute, and collagen membrane. The result after 1 year is that patients with HbA1c levels <7.5% may undergo staged guided bone regeneration securely. The authors concluded that well- to fairly well-controlled diabetic patients with a mean HbA1c of 7.2% had the same overall survival rate as controls in conventional and advanced implant therapy. No difference was seen when looking at bone resorption.^[22]

INFLUENCE OF QUALITY OF GLYCEMIC CONTROL

The greater the impact of diabetes, the worse the patient handles with glycemic control. In international studies, the percentage of HbA1c is an indicator for glycemic levels from previous 6–8 weeks. Unfortunately, many studies do not provide data of HbA1c. Some authors call their patient “under well control” or “poorly controlled,” without representing any definition. Studies have shown three defined HbA1c 6–8% as good, 8–10% as moderately, and >10% as poorly controlled. Two studies called HbA1c <8% as better and >8% as poorly controlled and another <7% as well, 7–9% as moderately, and >9% as poorly controlled. While few studies conclude better implant survival and less peri-implant complications in the well-controlled group,^[11-16,27] the three others see no difference in implant success even in the poorly controlled patients.

INFLUENCE OF DURATION OF DIABETES DISEASE

It is plausible that, with extended duration of diabetes, the systemic side effects increase. However, the influence of duration of the disease on implant surgery outcome is only very little examined.^[25] While Olsen concluded that the duration of diabetes may be associated with implant failure,^[25] Tawil *et al.* said that implant survival is independent from diabetes duration.^[22]

INFLUENCE OF SUPPORTIVE THERAPY

Although there is some controversy over the use of antibiotics in healthy patients, these are recommended in diabetic patients in implant surgery. The reason is the impaired immune system, which can lead to wound infections and healing complications. Some authors indicate the administration of antibiotics for 5–7 days postoperatively; others support the view that there is no significant reduction of wound infection when using antibiotics more than 1 day after surgery. This improvement in survival is greater for those in type II diabetic

group. These outcomes are clinically important and should be considered clinically significant.^[21,25]

CONCLUSION

Dental implants are safe and predictable procedures for dental rehabilitation in diabetics. The survival rate of implants in diabetics does not differ from the survival rate in healthy patients within the first 6 years, but in the long-term observation up to 20 years, a reduced implant survival can be found in diabetic patients. Patients with poorly controlled diabetes seem to have delayed osseointegration following implantation. Avoiding the immediate loading of the implants is advisable. In the 1st year after implant insertion, there seems to be no elevated risk of peri-implantitis; however, in the long-term observation, peri-implant inflammation seems to be increased in diabetic patients. Therefore, a risk-adapted dental recall is helpful to detect the early signs of gingivitis, which can easily be treated by dental/implant cleanings to avoid serious peri-implant infection. We found some hints that good glycemic control improves osseointegration and implant survival. Therefore, and to avoid other long-term side effects, the practitioner should ask for the HbA1c, and if necessary, the improvement of antidiabetic therapy should be aimed. Bone augmentation procedures such as guided bone regeneration and sinus lifts have a higher complication and failure rate in patients with well- to fairly well-controlled diabetes. To improve the implant survival and to reduce the post-operative complications, a supportive therapy consisting of prophylactic antibiotics and chlorhexidine mouth rinse is recommended.

REFERENCES

1. Moraschini V, Poubel LA, Ferreira VF, Barboza Edos S. Evaluation of survival and success rates of dental implants reported in longitudinal studies with a follow-up period of at least 10 years: A systematic review. *Int J Oral Maxillofac Surg* 2015;44:377-88.
2. Khader YS, Dauod AS, El-Qaderi SS, Alkafajei A, Batayha WQ. Periodontal status of diabetics compared with non-diabetics: A meta-analysis. *J Diabetes Complications* 2006;20:59-68.
3. Abiko Y, Selimovic D. The mechanism of protracted wound healing on oral mucosa in diabetes. *Review. Bosn J Basic Med Sci* 2010;10:186-91.
4. Danaei G, Finucane MM, Lu Y, Singh GM, Cowan MJ, Paciorek CJ, *et al.* National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: Systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2.7 million participants. *Lancet* 2011;378:31-40.
5. Chrcanovic BR, Albrektsson T, Wennerberg A. Diabetes and oral implant failure: A systematic review. *J Dent Res* 2014;93:859-67.

6. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Ann Intern Med* 2009;151:264-9, W64.
7. Viswanathan M, Ansari MT, Berkman ND, Chang S, Hartling L, McPheeters M, *et al.* Assessing the risk of bias of individual studies in systematic reviews of health care interventions; 2008.
8. Oates TW, Dowell S, Robinson M, McMahan CA. Glycemic control and implant stabilization in Type 2 diabetes mellitus. *J Dent Res* 2009;88:367-71.
9. Oates TW Jr, Galloway P, Alexander P, Vargas Green A, Huynh-Ba G, Feine J, *et al.* The effects of elevated hemoglobin A(1c) in patients with Type 2 diabetes mellitus on dental implants: Survival and stability at one year. *J Am Dent Assoc* 2014;145:1218-26.
10. Aguilar-Salvatierra A, Calvo-Guirado JL, González-Jaranay M, Moreu G, Delgado-Ruiz RA, Gómez-Moreno G, *et al.* Peri-implant evaluation of immediately loaded implants placed in esthetic zone in patients with diabetes mellitus Type 2: A two-year study. *Clin Oral Implants Res* 2016;27:156-61.
11. Ferreira SD, Silva GL, Cortelli JR, Costa JE, Costa FO. Prevalence and risk variables for peri-implant disease in Brazilian subjects. *J Clin Periodontol* 2006;33:929-35.
12. Turkyilmaz I. One-year clinical outcome of dental implants placed in patients with Type 2 diabetes mellitus: A case series. *Implant Dent* 2010;19:323-9.
13. Gómez-Moreno G, Aguilar-Salvatierra A, Rubio Roldán J, Guardia J, Gargallo J, Calvo-Guirado JL, *et al.* Peri-implant evaluation in Type 2 diabetes mellitus patients: A 3-year study. *Clin Oral Implants Res* 2015;26:1031-5.
14. Dowell S, Oates TW, Robinson M. Implant success in people with Type 2 diabetes mellitus with varying glycemic control: A pilot study. *J Am Dent Assoc* 2007;138:355-61.
15. Erdogan Ö, Uçar Y, Tatlı U, Sert M, Benlidayı ME, Evlice B, *et al.* A clinical prospective study on alveolar bone augmentation and dental implant success in patients with Type 2 diabetes. *Clin Oral Implants Res* 2015;26:1267-75.
16. Ghiraldini B, Conte A, Casarin RC, Casati MZ, Pimentel SP, Cirano FR, *et al.* Influence of glycemic control on peri-implant bone healing: 12-month outcomes of local release of bone-related factors and implant stabilization in Type 2 diabetics. *Clin Implant Dent Relat Res* 2016;18:801-9.
17. Alsaadi G, Quirynen M, Komárek A, van Steenberghe D. Impact of local and systemic factors on the incidence of oral implant failures, up to abutment connection. *J Clin Periodontol* 2007;34:610-7.
18. Khandelwal N, Oates TW, Vargas A, Alexander PP, Schoolfield JD, McMahan CA. Conventional SLA and chemically modified SLA implants in patients with poorly controlled Type 2 diabetes mellitus-a randomized controlled trial. *Clin Oral Implants Res* 2011;24:13-9.
19. Anner R, Grossmann Y, Anner Y, Levin L. Smoking, diabetes mellitus, periodontitis, and supportive periodontal treatment as factors associated with dental implant survival: A long-term retrospective evaluation of patients followed for up to 10 years. *Implant Dent* 2010;19:57-64.
20. Busenlechner D, Fürhauser R, Haas R, Watzek G, Mailath G, Pommer B, *et al.* Long-term implant success at the academy for oral implantology: 8-year follow-up and risk factor analysis. *J Periodontal Implant Sci* 2014;44:102-8.
21. Morris HF, Ochi S, Winkler S. Implant survival in patients with Type 2 diabetes: Placement to 36 months. *Ann Periodontol* 2000;5:157-65.
22. Tawil G, Younan R, Azar P, Sleilati G. Conventional and advanced implant treatment in the Type II diabetic patient: Surgical protocol and long-term clinical results. *Int J Oral Maxillofac Implants* 2008;23:744-52.
23. Moy PK, Medina D, Shetty V, Aghaloo TL. Dental implant failure rates and associated risk factors. *Int J Oral Maxillofac Implants* 2005;20:569-77.
24. Peled M, Ardekian L, Tagger-Green N, Gutmacher Z, Machtei EE. Dental implants in patients with Type 2 diabetes mellitus: A clinical study. *Implant Dent* 2003;12:116-22.
25. Olson JW, Shernoff AF, Tarlow JL, Colwell JA, Scheetz JP, Bingham SF, *et al.* Dental endosseous implant assessments in a Type 2 diabetic population: A prospective study. *Int J Oral Maxillofac Implants* 2000;15:811-8.
26. Erdogan O, Ucar Y, Tatli U, Sert M, Benlidayı ME, Evlice B. A clinical prospective study on alveolar bone augmentation and dental implant success in patients with Type 2 diabetes. *Clin Oral Implants Res* 2014;26:1267-75.
27. Daubert DM, Weinstein BF, Bordin S, Leroux BG, Flemming TF. Prevalence and predictive factors for peri-implant disease and implant failure: A cross-sectional analysis. *J Periodontol* 2015;86:337-47.