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What's new for the clinician– summaries of recently published papers

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1. The influence of physical activity on periodontal health in patients with type 2 diabetes mellitus.

Type 2 diabetes mellitus (T2DM) is the most common chronic disease in the Western world and developing countries have also shown an explosion in the incidence and prevalence of this disease.

Exercise therapy is essential for the management of diabetes. The American College of Sports Medicine and the American Diabetes Association have recommended at least 150 min/week of moderate (50%-70% of an individual's maximum heart rate) to vigorous (> 70% of an individual's maximum heart rate) physical activity for patients with type 2 diabetes (T2DM). Studies including lifestyle and health interventions have shown that they have a positive health effect on patients with T2DM. For example, physical activity has been shown to improve the metabolic condition of T2DM patients, reduce HbA1c levels and cardiovascular mortality, and improve the quality of life, lipid levels, and blood pressure.

Diabetes has been identified as an important risk factor for periodontitis. The risk of developing periodontitis and peri-implantitis is significantly increased in patients with diabetes compared to healthy control groups.[1]

Wernicke and colleagues (2021)[1] reported on a trial that sought to test the hypothesis that physical activity is a health-promoting measure with significant positive effects on periodontal health and HbA1c concentrations.

METHODS

Participants >18 years old with non-insulin-dependent type 2 diabetes mellitus were recruited by information sessions in a gymnastic hall and advertisements at regional doctors in a medium-sized town in Germany. The study aimed for the inclusion of a representative sample with respect to sex, age, and ethnicity. Informed oral and written consent was obtained from each participant.

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Inclusion criteria were non-insulin-dependent T2DM and the willingness to participate in a baseline and follow-up dental examination. Exclusion criteria were unstable coronary artery disease, any serious medical condition that prevented adherence to the study protocol, or the ability to exercise safely, advanced retinopathy, and current insulin therapy. Furthermore, patients with preexisting physical activity of ≥ 60 min per week were not eligible.

This was a 26-week, single center, randomized, controlled trial with a parallel group design. Previously inactive persons with type 2 diabetes were randomly assigned to 1 of 4 groups: aerobic exercise, resistance training, combined aerobic and resistance training, or a control group that reverted to pre-study exercise levels.

Altogether, 126 patients with type 2 diabetes were willing to participate. They were randomly assigned and matched 1:1 to the four study groups. After exclusion of 16 patients as screening failure, 110 patients remained. Thirty patients were assigned to the aerobic exercise group (group AE), 27 to the resistance-training group (RE), 25 to the combined training group (CE), and 28 patients to the control group (CG).

All participants were provided with a 6-month membership at an exercise facility. The membership fees were covered by the study funding to remove economic barriers to participation. Individual exercise supervision was provided with a fitness coach twice a week throughout the study. Attendance was verified through direct observation, exercise logs, and individual smart card controllers. Participants with >10% missed trainings were excluded.

The exercise was carried out twice a week for 6 months. Each exercise unit was preceded by a 10-min warm up period. The training duration and intensity gradually progressed after four and 13 weeks, respectively. The intervention groups exercised according to the study protocol of the assigned group. All participants in the intervention group took regularly part in the training.

The training method was structured as follows: Intervention group 1 (strength endurance) completed a

strength-endurance training after a general warm up and stretching in a group setting, followed by two passes of a strength-endurance circuit. The strength-endurance training consisted of eight machine-supported exercises that included all major muscle groups (leg abduction, leg adduction, back extension (lower back), dips, vertical row, vertical traction, leg press, abdominal crunch) and were performed for 1 min each. During the initial training session, a maximum force test with three attempts was performed. The best of the three tests was scored and used to define the exercise intensity at about 60% of the participant's maximum force for the first 2 weeks of training. For the subsequent weeks, the load was increased by 10% and again by 5% for the last 4 weeks. Intervention group 2 (endurance) completed a progressive endurance training 2 times a week. After a general warm up and stretching in a group setting a 30-min training on a treadmill (technogym run 500/technogym run 600) or a bicycle ergometer with or without backrest (lifefitness-lifecycle 9500 HR) was performed. Intervention group 3 (combination intervention) completed a training combining both programs: one time a week an endurance and one time a week a strength endurance training was performed. All participants of the intervention groups regularly participated in the training. Participation, correct exercise performance and execution, and the compliance of the participants were supervised by professional trainers under supervision of a sport scientist with doctors' degree.

All participants were advised not to change eating habits or to start diets during the study. Additionally, steps were taken to minimize medication co-interventions by sending letters to participants' physicians to inform about the study. The control group did not receive a sports program or any other lifestyle intervention.

A qualified dentist interviewed the participants on pre-existing periodontal diseases and habits including smoking and frequencies of dental check-ups. Body mass index (BMI) and weight in kilograms were recorded at baseline and after 6 months. Furthermore, any history of periodontitis was recorded. For each patient, periodontal probing depth (PPD), bleeding on probing (BOP), and plaque scores were measured. PPD measurements were done at 6 sites per tooth (mesio-buccal, buccal, disto-buccal, mesio-oral, oral, and disto-oral) and BOP were recorded at 4 sites (mesio-buccal, disto-buccal, buccal, and oral). Furthermore, a periodontal anamnesis collected data on history of periodontitis. Full-mouth plaque index (API) was measured in percentage scores.

In addition to the dental examination, blood samples of each patient were collected in the morning after fasting and hsCRP and HbA1c levels were measured in mg/L or % at baseline and after 6 months.

RESULTS

A total number of 108 participants (women n=65, men n=43, age range 46 to 73 years) met the inclusion criteria and were randomized to the physical exercise or control groups. Thirty-one patients were excluded after the start of the study because patients did have no teeth (n=5) or refused a dental examination (n=26) leaving 77 at the baseline assessment. Thirty-seven participants were available for the final assessment with 20 participants of the physical activity group and 17 patients of the control group. The mean HbA1c for all participants was 6.7% with a range between 5.6 and 9%. A mean BMI of 32.2 with a range between 21.9 and 46.1 was calculated. The mean hsCRP concentration was 0.86 mg/L with a range between 0.1 and 6.1 mg/L at baseline.

No significant differences between the intervention and control group for changes between baseline and final assessment were found for weight (P= 0.103), BMI (P= 0.144), and plaque index (P= 0.06). Significant differences were found for HbA1c concentration (P= 0.011), hs CRP concentration (P= 0.040), BOP (P= 0.002), PPD (P= <0.001), and periodontal staging (P= <0.001). HbA1c levels, BOP, PPD, and periodontal staging significantly improved in the intervention compared to the control group. The hsCRP concentrations increased significantly in the control compared to the intervention group. A multivariate regression analyses with HbA1c as the outcome variable showed that HbA1c improved significantly in study participants who participated in a sports intervention (p = 0.037) compared to control.

CONCLUSIONS

the researchers concluded that physical activity is an oral health-promoting measure in patients with T2DM and physical activity significantly reduces HbA1c concentrations.

Implications for practice: The link between general health and its impact on improved oral health outcomes was clearly shown in this trial.

Reference

1. Wernicke K, Grischke J, Stiesch M. et al. Influence of physical activity on periodontal health in patients with type 2 diabetes mellitus. A blinded, randomized, controlled trial. Clin Oral Invest 2021; 25: 6101–6107.

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2. Can implants be successfully placed in patients with uncontrolled diabetes mellitus type 2?

Type 2 diabetes mellitus (T2DM) is a widespread disease affecting both rich and poor countries. It is described as a group of metabolic disorders which is characterized by high serum glycemic levels either due to insufficient insulin levels, defective function or both.[1] Hyperglycemia, being seen in uncontrolled T2DM, may be a potentially important factor in the development of biologic complications in dental implants. Prospective data on implant performance in diabetes patients are scarce. Most studies evaluating the effects of diabetes on implant success have studied patients with well-controlled diabetes.[1]

Recent studies indicated that dental implants may show a poorer outcome in high glycemic level patients with regard to probing pocket depth (PPD) and marginal bone loss (MBL) as compared with systemically healthy individuals.[1] Narrow diameter implants were developed for sites with diminished ridge dimensions which result from numerous clinical reasons. The use of titanium-zirconium (TiZr) alloy implants for narrow implants has significantly increased biomechanical resistance, widening the indication range and making the use of narrow diameter implants in the posterior possible.[1] Friedmann and colleagues (2021)[1] reported on a trial that sought to compare clinical parameters and marginal bone level changes at narrow diameter implants placed in the posterior maxillary and mandibular zones and loaded by fixed prosthesis in uncontrolled T2DM and normo-glycemic patients.

METHODS

Thirty-two patients aging between 53 and 82, with a mean age of 67, participated in this prospective clinical study. Sixteen patients known to suffer from T2DM and diagnosed with an HbA1C > 6.5% were considered as "uncontrolled" hyperglycemic and assigned for the test group, whereas 16 non-diabetic patients (HbA1C ≤ 6.0%) were allocated as controls. HbA1C was assessed by the patient's general practitioner, who submitted the results to our clinic. The exclusion criteria were as follows: Immobility; Periodontal surgery and/or antibiotic therapy within the last 6 months prior to baseline; Pregnancy and lactation period; Full Mouth Plaque Score (FMPS) > 25%; Untreated periodontitis; Smoking > 10 cigarettes/day; Insufficient crestal width which affords an augmentation procedure even in the case of NDI; Previously performed ridge augmentation procedure for a staged implant placement; Permanent medication affecting blood perfusion rate and bone metabolism.

Each patient received one to maximum two Narrow Diameter Implant (NDI) at an edentulous posterior region of either maxilla or mandible. Exclusively narrow diameter (3.3-mm) tissue level titanium-zirconium alloy implants (Roxolid®) with the SLActive® surface characteristic were used (Institut Straumann). All implants were placed by two experienced periodontists, according to the instructions of the manufacturer regarding the osteotomy. The surgical approach was standardized. The implants were planned to restore the site by either a single crown or a fixed partial denture (FPD). The screw or cementum retention was unrestricted by the protocol; however, all restorations used either SynOcta® or Variobase® abutments (Straumann®, Institut Straumann). If two implants were placed, the most posterior one served as the study implant for this patient. Completing the surgery, all implants were radiographically documented using the parallel technique for periapical X-rays.

The post-op regimen included the patient's instruction to abstain from mechanical plaque control in the treated area for 1 week and to use chlorhexidine mouth rinse (0.2%) twice a day instead. The administration of systemic antibiotics was restricted to individual needs. There was no prescribing policy by protocol, and analgesic medication (Ibuprofen 600 mg/3× daily) on demand was recommended. A follow-up visit after 3 days was scheduled, and sutures were removed after 7–10 days. After 12 weeks, the next follow-up was to evaluate the osseointegration before starting the reconstruction. At 1 year (Visit 7), the reported measurements were obtained. Chipping of the porcelain coating, screw loosening, de-cementation, fracture of any component or other maintenance requirements were considered technical complications and recorded during the observation period.

The peri-implant PD, CAL and recession were estimated by gentle probing with a PCP-11 probe (Hu-Friedy) at 4 sites per implant. Additionally, the PPD of the adjacent tooth at 4 sites of the tooth was assessed, representing a native reference for each study implant. The measurements were carried out immediately after loading (visit 3) and 12 months after implant surgery (visit 7) on both the integrated implants and teeth. Furthermore, the bleeding on probing (BOP) and papilla bleeding index (PBI) on the buccal aspect were investigated at visit 7. The digital radiograph from immediately after implantation ("initial") and 1 year later ("12 months") was also assessed.

RESULTS

In 32 patients, a total of 48 osseointegrated implants qualified for the prosthetic loading at the 3-month pre-load analysis. Some patients discontinued treatment after this inspection unintentionally; thus, the T2DM group experienced a decline by 3 patient dropouts with a total of 4 implants, respectively. Thus, 13 NDI study implants from the T2DM group remained to compare to 16 NDI study implants from the normo-glycemic group after completing the restorative phase. Accounting for the dropouts, the mean statistical HbA1c value was calculated with 7.34% for the diabetic group.

All restored implants were under functional load after 12 months, resulting in an overall survival rate of 100% for both groups, respectively. Three single crowns in two patients were screw retained; all other crowns or bridge frameworks were cemented using glass-ionomer luting cementum (Ketac Cem). There were no complaints; no biological or technical complications or adverse events

related to the implant treatment were reported by the patients after 1 year of function regardless the glycemic status.

The mean peri-implant probing depth (PD) at 3 months was measured at 2.6 ± 0.8 mm for the normo-glycemic group, whereas the T2DM group exhibited a mean PD of 2.7 ± 0.5 mm before loading. After 12 months, the mean values changed towards 2.4 ± 0.5 mm and 2.6 ± 0.4 mm in the groups, respectively. Thus, the mean values for the clinical parameters assessed at 3 and 12-month visit revealed statistically non-significant differences ($p = 0.6$ and $p = 0.29$, respectively). The BOP index, however, appeared slightly increased in the T2DM compared to the control group (63% to 54%) at visit 7, whereas the papilla bleeding index (PBI) remained indifferent ($p = 0.351$) in both groups.
The radiographic analysis revealed a non-significant change of the marginal bone level (MBL) for both study groups.

CONCLUSION

In terms of short-term implant success and implant survival, there were statistically non-significant differences between normo-glycemic and diabetic patients after a minimal invasive surgery was applied for implant placement.

Implications for practice: uncontrolled diabetics could potentially be considered for implant treatment. The management of these patients will be key to determining treatment success.

Reference

1. 1. Friedmann A, Winkler M, Diehl D, et al. One-year performance of posterior narrow diameter implants in hyperglycemic and normo-glycemic patients—a pilot study. Clin Oral Invest 2021; 25: 6707–6715.