What's new for the clinician?

Summaries of and excerpts from recently published papers

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1. Antibiotics as adjuncts in the treatment of periodontitis in patients with Type 2 Diabetes

Tamashiro NS, Duarte PM, Miranda TS, Maciel SS, Figueiredo LC, Faveri M, Feres M. J Dent Res. 2016; 95:829-36.

Several clinical studies have established the relationship between diabetes and periodontitis. This relationship appears to be bidirectional, with diabetes being a risk factor for periodontitis whilst the severity of periodontitis is a factor influencing glycemic control and the development of complications in diabetic patients.[1] In addition, periodontal treatment may have a positive effect on glycemic control in diabetic patients.[1]

The clinical benefit of nonsurgical periodontal treatment is well documented. There is evidence that the use of antibiotics with nonsurgical periodontal therapy provides some benefit to systemically healthy patients, but their use is generally recommended only in specific clinical situations. Diabetes mellitus (DM) is recognized as a major risk factor for periodontal diseases, as patients with DM present increased prevalence and severity of periodontal destruction compared with those without DM.[2]

There is good evidence indicating that the clinical benefits observed in systemically healthy subjects with chronic and aggressive periodontitis who are treated with adjunctive metronidazole (MTZ) and amoxicillin (AMX) are accompanied by a beneficial change in the composition of the subgingival biofilm. However, no studies to date have comprehensively evaluated the changes occurring in the subgingival microbial profile in subjects with DM receiving MTZ, AMX, and undergoing scaling and root planing (SRP).

Tamashiro and colleagues (2016)[2] reported on a trial that sought to assess the changes occurring in the levels and proportions of oral bacteria in subjects with periodontitis and type 2 DM treated by means of SRP only or combined with systemic MTZ and AMX. A secondary aim was to compare the clinical efficacy of these two treatment protocols two years later.

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ACRONYMS

AMX: Amoxicillin
BoP: bleeding on probing
CAL: clinical attachment level
DM: diabetes mellitus
MTZ: metronidazole
PD: pocket depth
RCT: randomized clinical trial

MATERIALS AND METHODS

Adult patients with type 2 diabetes and generalized chronic periodontitis who met the following inclusion criteria were invited to participate in this trial: aged ≥35 y, diagnosis of type 2 DM during at least the past five years, glycated hemoglobin levels ≥6.5% to ≤11%, ≥15 teeth, >30% of the sites with pocket depth (PD) and clinical attachment level (CAL) ≥4 mm, and ≥6 teeth with at least one site with PD and CAL ≥5 mm and bleeding on probing (BoP). Exclusion criteria were as follows: pregnancy, lactation, smoking, SRP in the previous 12 months, systemic antibiotic treatment in the previous six months, need of antibiotic prophylaxis, systemic conditions (except DM) that could affect the progression of periodontitis, long-term use of anti-inflammatory or immunosuppressive medications, and allergy to MTZ and/or AMX. Subjects were informed of the nature, potential risks, and benefits of the study and signed a form of informed consent.

In this double-blinded, parallel-design, placebo-controlled randomized clinical trial (RCT), patients were randomly allocated subjects into one of the following groups: SRP + placebo (control; n = 29) or SRP + MTZ (400 mg thrice a day (tds) for 14 days) + AMX (500 mg tds for 14 days) (test; n = 29). Allocation concealment was ensured by means of sequentially numbered drug

containers of identical appearance. Subjects in the control group received two placebo pills tds for 14 days. Antibiotic/placebo administration started at the day of the first SRP session.

Initially, all subjects received supragingival plaque control and oral hygiene instructions. Two trained periodontists performed SRP in four to six appointments lasting approximately one hour each, using manual curettes and an ultrasonic device. An overall full-mouth SRP was performed during the first treatment visit to disrupt the subgingival biofilm and maximize the antibiotic effect from the beginning. Subsequently, one quadrant or sextant was treated per SRP session, depending on the number of deep pockets. Periodontal therapy was completed in 14 days. The clinicians and all participants were blinded to treatment assignment. All subjects received microbiological and clinical monitoring at baseline and three months, one, and two years post-therapy. Clinical measurements were also performed at six months. Periodontal maintenance was conducted at three, six, and nine months and one year and two years post-therapy and included oral hygiene instructions and supragingival/subgingival biofilm/calculus removal, as necessary.

An assistant monitored the compliance with antibiotic/placebo intake by calling the patients three times a week during the 14 days of medication. The subjects were asked to bring the empty bottles back at the end of each week, and these were checked for any possible remaining pills of antibiotics/placebos. On the fourteenth day, subjects answered a questionnaire about any self-perceived side effects of the medications.

A single calibrated examiner performed all clinical examinations. Presence or absence of plaque, marginal bleeding, BoP, suppuration, and PD and CAL measurements were assessed at six sites per tooth excluding third molars using the manual periodontal probe (North Carolina–Hu-Friedy). The examiner was blinded to the treatment allocation of the subjects.

After supragingival plaque removal, the subgingival biofilm samples were collected with individual sterile mini-Gracey curettes (#11–12) from six noncontiguous interproximal sites, two at each of the following baseline PD categories: shallow, PD ≤3 mm; intermediate, PD = 4 to 6 mm; and deep, PD ≥7 mm. These were evaluated for 40 bacterial species.

The clinical and microbiological data were evaluated using intention-to-treat analysis with last observation carried forward, and the level of significance was set at 5%.

RESULTS

Fifty-eight subjects were randomly assigned to receive SRP only (n = 29) or with MTZ (400 mg/tds) and AMX (500 mg/tds) (n = 29) for 14 days. Six subgingival plaque samples/subject were analyzed by checkerboard DNA–DNA hybridization for 40 bacterial species at baseline and three months, one year, and two years post-therapy. Ten patients in the control and 13 in the test groups were lost to follow-up between year one and year two.

Both treatments led to a significant reduction in the proportion of the red complex pathogens at three months (SRP: from 16.3% to 7.6%; SRP + MTZ + AMX: from 17.8% to 5.3%) ($P < 0.05$). The proportions of red complex pathogens were maintained up to two years in the antibiotic-treated group (5.5%) but increased to 9.8% at one year and to 12.1% at two years in the control group. The difference between groups for the proportions of this complex at two years was statistically significant (primary outcome).

Subjects with SRP-only treatment showed a significant reduction in the mean levels of *Tannerella forsythia* and *Porphyromonas gingivalis* ($P < 0.05$), while the levels of nine species were altered in the test group, including a reduction in the three red complex pathogens (*T. forsythia*, *P. gingivalis*, and *Treponema denticola*). The reduction in the levels of *T. forsythia* and *P. gingivalis* from baseline to two years posttreatment was greater in the test than in the control group ($P < 0.05$)

No statistically significant differences were observed between groups for the demographic, glycemic, and clinical parameters at baseline or for the number of adverse events reported

The percentage of sites with BoP and suppuration and full-mouth mean PD were significantly lower in the test group at one year and two years ($P < 0.05$). At one year, the antibiotic group had significantly fewer sites with PD ≥5 mm (primary outcome variable) than the control group, and this benefit was maintained up to two years (SRP = 14.7 ± 13.1, SRP + MTZ + AMX = 3.5 ± 3.4, $P < 0.05$); 75.8% of the subjects treated by SRP + MTZ + AMX and 22.3% who had SRP-only treatment were at low risk at two years. The antibiotic-treated group showed a greater reduction in mean PD and gain in mean clinical attachment at initially moderate and deep sites ($P < 0.05$) than the control group at one and two years posttreatment.

Stepwise forward logistic regression analysis showed that, of all predictor variables included in the model, the treatment with MTZ + AMX was the only variable that significantly increased the probability of a subject reaching the low risk profile for future disease progression and not having any site with PD ≥6 mm (odds ratio [OR], 14.3; $P = 0.0000$) at the two-year posttreatment (OR, 20.9; $P = 0.0000$).

CONCLUSION

The researchers concluded that the adjunctive use of MTZ + AMX in the active phase of periodontal treatment improved the microbiological and clinical outcomes of SRP in subjects with generalized chronic periodontitis and type 2 DM, up to two years post-treatment

IMPLICATIONS FOR PRACTICE

Type 2 diabetes is a major public health problem in South Africa. This trial has conclusively shown the additional benefits of metronidazole and amoxicillin as adjuncts in the non-surgical management of patients with type 2 diabetes.

References

1. Santos CMML, Lira-Junior R, Fischer RG, Santos APP, Oliveira BH. Systemic antibiotics in periodontal treatment of diabetic patients: A systematic review. Murdoch C, ed. PLoS ONE. 2015;10:e0145262.
2. Tamashiro NS, Duarte PM, Miranda TS, Maciel SS, Figueiredo LC, Faveri M, Feres M. Amoxicillin plus Metronidazole therapy for patients with periodontitis and type 2 diabetes: A twoyear randomized controlled trial. J Dent Res. 2016; 95:829-36.

2. Success of 6-mm Implants with Single-Tooth Restorations: A RCT

Sahrmann P, Naenni N, Jung RE, Held U, Truninger T, Hämmerle CH, Attin T, Schmidlin PR.. JDR 2016; 95: 623-628.

Dental implant therapy is widely accepted by patients and dentists as a reliable method for oral rehabilitation. When bone volume is not sufficient for a standard implant installation, different solutions are available to augment bone volume- these include onlay and inlay bone grafts, maxillary sinus elevation, guided bone regeneration, edentulous ridge expansion, or distraction osteogenesis, all of which involve prolonged healing time, higher morbidity, and higher costs. Alternatively shorter implants have been introduced for use, especially in cases with limited vertical bone dimension.

The use of short implants, however, may implicate the risk of increased load on the peri-implant bone, potentially resulting in enhanced loss of marginal bone or even in premature implant loss.[1] However, whether a high crown-to-implant ratio may lead to a higher degree of occlusal load, resulting in a negative influence on successfully osseointegrated implants, remains controversial.[1]

A considerable number of clinical studies assessed implant survival rates as well as marginal bone-level changes for short implants when loaded with single crowns but these are based on data over short time periods only. Sahrmann and colleagues (2016)[1] reported on a randomized controlled clinical two-centre trial that sought to assess survival and marginal bone loss of 6-mm and 10-mm implants supporting single crowns in the posterior jaws. The null hypothesis was that implants of both lengths would perform similarly with regard to survival and change in marginal bone level.

MATERIALS AND METHODS

This RCT considered systemically healthy patients who met the following inclusion criteria:- patients had to present with a single-tooth gap in the premolar or molar region of the upper or lower jaw and an existing antagonist (tooth or implant-borne reconstruction). The missing tooth had to have been extracted at least six months prior to implant placement. No periodontal probing depths (PPDs) exceeding 5mm in the residual dentition were accepted. A minimum of 2mm of keratinized mucosa had to be present at the prospective implant site. Regarding bone dimensions, a minimal vertical bone height of 10mm in the lower jaw (alveolar crest to the mandibular canal) and 6mm of bone height in the maxilla (alveolar crest to the sinus floor) was required. Internal sinus floor augmentation (modified Summer's technique) but no lateral guided bone augmentation procedures were allowed when placing the implants.

Exclusion criteria comprised general contraindications against surgical interventions and smoking of more than 19 cigarettes per day. The need for a preceding lateral bone augmentation with radio-opaque filler materials, prior therapeutic radiation of the jaw, severe bruxism or clenching habits, and any mucosal disease except sporadic localized gingivitis were further exclusion criteria. Insufficient oral hygiene and inadequate compliance were additional reasons for exclusion.

ACRONYMS

PPDs: periodontal probing depths

Implant placement was performed at two clinics by calibrated surgeons who were well trained with the implant system. The randomization of the patients to either the test (6-mm implant) or control group (10-mm implant) was determined using a computer-generated randomization list. After administration of a local anesthetic, sulcular incisions at the adjacent teeth and a midcrestal incision were performed, allowing a full-thickness flap to be raised. At this stage, the randomization concealment was broken and the surgical site was prepared according to the manufacturer's instructions (SLActive standard plus soft tissue level implants; Straumann). The minimum primary stability had to reach 20 Ncm. All implants were covered with a healing cap. Flaps were closed with nonresorbable sutures, leaving the implants for transmucosal healing. Patients had to refrain from brushing at the surgical site and instead had to rinse with a 0.2% chlorhexidine solution for one minute twice a day until suture removal. Analgesics were provided for optional intake during the first postoperative days. After a healing period of six to ten days, sutures were removed. Three weeks later, oral hygiene was monitored, instructions for site-specific hygiene were repeated, and supragingival tooth cleansing was performed. Eight weeks after implant placement, impressions were taken using a standardized tray and a polyether impression material. The impression of the opposite jaw was taken with alginate. No provisional restorations were inserted. Screw-retained porcelain fused to metal (PFM) crowns were incorporated with a torque of 35 Ncm. After insertion of the reconstruction, a clinical examination (baseline) was performed measuring peri-implant and periodontal probing pocket depths, presence or absence of plaque, and bleeding on probing at six sites per implant and the neighbouring teeth. In addition, a standardized x-ray film was taken.

After six months, oral hygiene was controlled and reinstructed if needed. Thereafter, patients were recalled at regular intervals between six and 12 months for dental hygiene treatments according to their individual needs. At one year of loading and once every year thereafter, patients underwent a clinical examination of the study implant and the neighbouring teeth. These appointments were conducted by one examiner per clinic and included measurements of peri-implant and periodontal probing pocket depths, presence or absence of plaque, and bleeding on probing at six sites per implant and at the adjacent teeth. At these follow-up appointments, technical failures such as chippings or loosening of abutment

screws were recorded. In addition, intraoral photographs were taken as well as a standardised x-ray film positioned when applying the parallel technique.

History of periodontitis was determined as general attachment loss exceeding 5mm at more than 30% of the periodontal sites or tooth loss due to periodontitis.

Digitalized x-ray images of all implants were magnified 10-fold and size-calibrated by their known length, width, and interthread distance. Mesial and distal bone levels as well as the crown lengths were determined. Clinical lengths of crowns and implants were calculated by adding the supra-osseous part of the implant (composed of 1.8mm of machined implant neck and potential bone-level changes from the nominal bone level at the margin of rough and machined implant neck of the standard plus implant type) to the measured (technical) crown length and subtracting that distance from the length of the whole implant.

All measurements were performed by two independent examiners who had previously been calibrated. Statistical analyses were performed with the average values of the measurements recorded by both examiners'.

RESULTS

Initially, 96 patients could be included in the study. Two patients of the control group, however, did not receive the complete treatment according to the study, thus were excluded from further assessment. At three years of loading, 81 patients could be reassessed, while 13 patients did not show up for the appointments, skipped their recall due to personal reasons, or had moved abroad in the meantime. Of the remaining patients, 78 had x-ray films which could be analyzed.

All patients were in good general health at the follow-up appointments. One implant from the test group became mobile during the second year of loading without any radiographically detectable marginal bone-level change and had to be removed. All implants from the control group were still in place at the three year follow-up. This resulted in an overall survival rate of 98% for test and 100% for control implants. This difference was not statistically significant. No implant displayed peri-implantitis in terms of pocket depths >5 mm in combination with suppuration and/or progressive marginal bone loss. The mean crown-to-implant ratio in the test group (1.48 ± 0.33) was significantly higher ($P < 0.001$) than in the control (0.86 ± 0.18).

Over three years, the marginal bone-level changed by −0.19 ± 0.62 mm (test) and −0.33 ± 0.71 mm (control). These values for the bone levels at baseline and at three years showed no statistically significant difference for each group. No significant intergroup difference was found at three years.

A significantly higher number of implants with PPD of ≥5 mm was found in the test group ($P = 0.023$). These probing depths, however, had already been observed during the baseline examination and showed neither progression nor suppuration at any later time point. Regression analysis of the changes of the marginal bone level at the three year follow-up showed a nonsignificant effect of implant length (estimated effect 0.38 for more bone loss for the long implants with $P = 0.152$) when adjusting for the set of potential confounders (smoking, history of periodontitis, bone level at baseline, crown-to-implant ratio). With decreased initial bone level at baseline, regression analysis showed a distinct effect on future bone loss. No chipping of the veneering ceramic occurred and loosening of the abutment screw happened in three cases.

CONCLUSION

The researchers concluded that this randomized controlled trial found no difference between test and control implants supporting single crowns in the posterior jaw at three years with regard to the primary outcome parameters of survival and change in the marginal bone level. Technical complication rate was low, measuring 3.8%, whereas no biological complications were observed.

IMPLICATIONS FOR PRACTICE

The trial supports the use of shorter implants (6mm) for use for single tooth restoration which has the added benefit of reducing the invasiveness of implant surgery. Additionally, these could mean decreased patient morbidity, shorter surgical treatment time, and a minimized risk of damaging neighboring anatomical structures.

Reference

1. Sahrmann P, Naenni N, Jung RE, Held U, Truninger T, Hämmerle CH, Attin T, Schmidlin PR. Success of 6-mm implants with single-tooth restorations: A three-year randomized controlled clinical trial. JDR 2016; 95: 623-8.