

# What's new for the clinician?

## Excerpts from and summaries of recently published papers

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Compiled and edited by V Yengopal

### 1. The maintenance of peri-implant health: air-abrasive debridement with glycine powder versus manual debridement and chlorhexidine

Lupi SM, Granati M, Butera A, Collesano V, Rodriguez Y, Baena R. *Int J Dent Hygiene* 2017; 15: 287–94.

Replacing lost teeth by artificial tooth roots (implants) in combination with artificial dental crowns has become part of mainstream dentistry and is now regarded as a routine procedure with predictable results and success rates over long term (greater than five years) being routinely reported in the published literature. Concomitantly though, we are witnessing a number of complications related mainly to the soft and hard tissues surrounding the implant.

A reversible inflammation around the implants is called peri-implant mucositis, while peri-implantitis occurs when the disease involves the loss of peri-implant bone, thus causing irreversible injury.<sup>1</sup> Peri-implant mucositis can progress to peri-implantitis which might finally lead to implant loss. The relation between these diseases and plaque accumulation is well established<sup>1</sup> and the problem is worryingly common, exceeding 80% of the implant population.<sup>1</sup>

Mechanical debridement has been proposed for the maintenance of healthy tissues around implants.<sup>1</sup> The administration of chlorhexidine seems to promote the reduction of inflammation parameters.<sup>1</sup> Air polishing with glycine powder has showed adequate ability to remove plaque and biofilm from both the dental and the implant surfaces without altering their surface structure.<sup>1</sup> Furthermore, this powder has been used in the treatment of peri-implantitis and recently of mucositis.

Lupi and colleagues (2017)<sup>1</sup> reported on a trial that sought to evaluate air polishing with glycine powder compared with manual debridement and chlorhexidine administration for the maintenance of peri-implant tissue health and to evaluate its effectiveness for the prevention of peri-implantitis.

#### ACRONYMS

AAD: air-abrasive debridement with amino acid glycine powder

BOP: bleeding index

BS: bleeding score

BS = 0: No signs of inflammation

CAL: clinical attachment level

MDA: mechanical debridement and antiseptic therapy

PD: probing depth

PI: plaque index

#### MATERIALS AND METHODS

This trial was a single-masked, randomized six-month clinical intervention trial with two study groups.

The following criteria were used to exclude subjects from the study: (I) poorly controlled diabetes mellitus (HbA1c > 7.0); (II) the use of anti-inflammatory medications, or antibiotics within the preceding three months or during the study; (III) the use of medications known to have an effect on gingival growth; (IV) subjects requiring prophylactic antibiotics; (V) smokers and (VI) patients with severe periodontal problems (CPI > 2). The following criteria were used for the selection of patients: (i) the presence of at least one sandblasted and etched surface screw implant with a fixed or removable prosthetic rehabilitation; (ii) the absence of clinical (i.e. probing depth (PD) ≥4 mm, suppuration) and radiographic signs (bone resorption ≥30% compared with the initial situation) of peri-implantitis; (iii) lack of implant mobility; (iv) single or multiple restorations without overcontours; (v) the absence of occlusal overload; (vi) the presence of at least 2mm of keratinized peri-implant mucosa and (vii) the absence of systemic diseases that could somehow affect the results of treatment. Hollow cylindrical implants were excluded from the study.

The study population consisted of 46 patients with partial or total edentulism where the peri-implant tissues had no signs of inflammation or sign of mucositis. The implants were randomly assigned (coin toss) to the following procedures

**V Yengopal:** Dept. of Community Dentistry, School of Oral Health Sciences, Faculty of Health Sciences, University of the Witwatersrand

by the same operator: (i) air-abrasive debridement with amino acid glycine powder (AAD) or (ii) mechanical debridement using plastic curettes and antiseptic therapy with chlorhexidine digluconate (MDA).

Four weeks before the start of treatment, each patient was subjected to a single session treatment of oral hygiene on teeth and implants with rubber cups and polishing paste and was given oral hygiene instruction according to the individual needs. From the beginning of treatment (baseline, T0) and on a monthly basis, all patients were subjected to oral hygiene sessions with air-abrasive or manual technique and chlorhexidine.

Clinical measurements were performed by a single experienced operator, from whom the specific treatment was concealed, and the data was reported on a special form. Study subjects were instructed not to discuss therapy with the study examiner.

The clinical measurements were performed with a plastic periodontal probe with a standardised probing force of 0.2N.

At the beginning (T0) and after three (T3) and six months (T6), the following periodontal indices were evaluated and recorded: (i) plaque index (PI) (ii) bleeding index (BOP), scored as positive if bleeding occurs within 30 seconds from the stimulation, conversely, negative, (iii) probing depth (PD), measured from the gingival margin to the apex of the probing pocket, (iv) clinical attachment level (CAL), measured from the implant platform to the apex of the probing pocket and (v) bleeding score (BS) assessed as the bleeding of the peri-implant mucous tissue giving a score from 0 to iii as follows: (0) the absence of bleeding, (i) a point bleeding, (ii) a line of bleeding and (iii) the formation of a drop of blood.

The primary outcome variable was PD, this and CAL being evaluated in six positions for each implant, that is, mesio-vestibular, vestibular, disto-vestibular, disto-lingual, lingual and mesio-lingual. BOP and PI were assessed in four positions for installation, that is, mesially, buccally, lingually and distally. BS was assessed along the entire circumference of the implant as a unique result. The evaluations were performed by a previously purposely trained blinded observer.

All treatments were performed by the same experienced operator. Air polishing was performed by means of air-abrasive device (AIR-FLOW Master 4) with glycine powder (AIR-FLOW Powder SOFT). The active treatment lasted less than half a minute for each implant in the simplest cases and up to two minutes on the most difficult cases.

Mechanical debridement was performed using plastic curettes (Implant Deplaquers) followed by pocket irrigation with a 0.1% chlorhexidine digluconate solution (CHX) and submucosal application of 1% CHX gel. The active treatment lasted from two minutes in simple cases to more than five minutes per implant in more difficult cases. In this group, treatment was applied until the operator felt that the implant surfaces were adequately debrided. All the procedures were performed without anaesthesia.

## RESULTS

A total of 46 patients (24 air polishing group (AAD); mean age  $54.58 \pm 15.52$  and 22 MDA; mean age  $53.77 \pm 12.18$ ) were enrolled with a total of 88 implants. Thirty-five patients

were partially, and 11 were totally, edentulous, with no statistical difference between the two groups. No signs of inflammation (BS = 0) were observed in eight patients and 16 implants in the air polishing group, and in one patient and four implants in the MDA group. All subjects completed the study, and no implant was lost.

On average, each subject carried  $1.91 \pm 0.93$  implants, with no statistically significant differences between the two groups ( $P > 0.05$ ). PD did not differ statistically significantly between the two groups at baseline (average: AAD: 2.51 mm; MDA: 2.39 mm,  $P = 0.89$ ). In the AAD group, probing depth reduced significantly in six months ( $P < 0.001$ ), while in MDA group a slight and not significant increase was observed after three ( $P = 0.78$ ) and six months ( $P = 0.09$ ). In addition, the PD mean values were significantly different at three ( $P < 0.05$ ) and at six months ( $P < 0.001$ ) in the two groups.

In summary, the AAD treatment was found to be effective in reducing PD at six months, while in group MDA no modification was observed, and the differences between the two treatments were significant.

PI did not appear to be different in the two groups at baseline (average: AAD = 85%, MDA = 85%,  $P = 1$ ). In both groups, the PI decreased although not significantly at three months (AAD:  $P = 0.15$ ; MDA:  $P = 0.71$ ); at six months, AAD group showed a significant decrease ( $P < 0.001$ ), while the MDA did not ( $P = 0.62$ ). In addition, the two groups appeared similar at three months ( $P = 0.94$ ), but not at six ( $P < 0.05$ ).

CAL did not appear to be different in the two groups at baseline (average: AAD = 1.06 mm, MDA = 0.55 mm,  $P = 0.51$ ). In the AAD group, a non-significant decrease in the average value of the index was observed at three and six months. In the MDA group, a minimal but not significant loss of attachment was observed at either three or six months.

The AAD and MDA groups were found to be different at baseline with regard to the evaluation of the indexes BOP and BS. In the AAD group, a significant decrease in BOP by 25% at six months ( $P < 0.001$ ) and a significant decrease in BS at three ( $P < 0.05$ ) and six months ( $P < 0.01$ ) were observed. In the MDA group, a BOP significant decrease by 14% at six months ( $P < 0.05$ ) and also a BS decrease at three ( $P < 0.05$ ) and six months ( $P < 0.01$ ) were observed.

## CONCLUSIONS

Within the limits of the study, treatment with glycine seems appropriate in the maintenance of peri-implant health and is more effective than the traditional treatment with plastic curette and chlorhexidine.

## IMPLICATIONS FOR PRACTICE

Maintenance therapy with glycine powder was effective in maintaining periodontal indices of the peri-implant tissues within physiological parameters. The time taken for treatment was shorter. Clinicians should be aware that this trial had a six month follow up. Long term (beyond six months) trials are needed to confirm longer term effectiveness.

## Reference

1. Lupi SM, Granati M, Butera A, Collesano V, Rodriguez Y Baena R. Air-abrasive debridement with glycine powder versus manual debridement and chlorhexidine administration for the maintenance of peri-implant health status: a six-month randomized clinical trial. *Int J Dent Hygiene* 2017; 15: 287–94.

## 2. The effects of different levels of brush end rounding on gingival abrasion: a double-blind randomized clinical trial

Hennequin-Hoenderdos NL, Slot DE, Van der Sluijs E, Adam R, Grender JM, Van der Weijden GA. *Int J Dent Hygiene* 15, 2017; 335–44.

Effective plaque control is critical in the maintenance of oral health, because plaque is the primary etiological factor in the introduction and development of both caries and periodontal disease.<sup>1</sup> Plaque removal with a manual toothbrush is the most frequently used method of oral hygiene in Western Society.

The most recent development in toothbrush manufacturing technology has been in the individual filaments of the toothbrush. Now, in addition to the standard round shape, filaments are available in square, hexagonal and other shapes with varying surface textures ranging from smooth to rough. There are also variable lengths of toothbrush filaments and those with tapered and/or feathered ends.<sup>1</sup> The degree of hardness and stiffness of the filaments is influenced by the their diameter and length and the material from which they are made. Toothbrushes with larger filament diameters (>0.2 mm) are harder and less flexible. This increased stiffness results in the filament ends not bending back during brushing, with the potential of damaging the gums, thus destroying the protective keratin layer.<sup>1</sup>

Gingival abrasions (GAs) are often related to sharp filament tips.<sup>1</sup> Terms such as soft tissue or gingival abrasion, damage, injury, laceration, lesion, recession and ulceration are used interchangeably. The depth of epithelial lesions caused by tooth brushing is influenced by the quality of rounding of the filament end.<sup>1</sup> Soft nylon filaments with rounded ends are less traumatic to the tissue than medium or hard bristles, and they can be directed into the gingival sulcus, minimizing pain, lacerations or gingival or cervical abrasions.<sup>1</sup> The American Dental Association (ADA) recommends that the toothbrush bristle ends be 'free of sharp or jagged edges and endpoints' to minimize gingival and dental abrasions.<sup>1</sup> The degree of filament end rounding found in commercially available manual toothbrushes shows great variation, ranging from rounded to sharp edged. Although information on the stiffness of the bristles is generally provided by manufacturers, many products still do not contain information on their bristle end-rounding properties. Each toothbrush may have a different level of filament end rounding. Hennequin-Hoenderdos and colleagues (2018)<sup>1</sup> reported on a trial that sought to assess the effect of different levels of filament end rounding on GAs. In addition, the size of the abrasions and their location were evaluated.

### MATERIALS AND METHODS

This was a three-treatment, crossover, contra-lateral, split-mouth, double-blind, randomized study with professional brushing by a hygienist. A double randomization (DES) was performed a priori for the three different test products and professional brushing in two contra-lateral quadrants (1st and 3rd quadrants OR 2nd and 4th quadrants). The randomization resulted in 12 sequences (block size = 4 × 12 and allocation ratio = 1:1), in which every product was tested at two visits (out of three), once in the 1st and 3rd quadrants and once in the 2nd and 4th quadrants.

Participants were randomized to one of the 12 sequences. The examiner and the participant were blind to the treatment

### ACRONYMS

GAs: Gingival abrasions

DES: Double randomization

randomization, and the records of earlier examinations were not available at each re-examination. All brushing took place in an area separated from the examination area so that the examiner was not aware of the test products and location used by the hygienist.

Forty six (n=46) non-dental students were recruited and screened based on the following eligibility criteria: ≥18 years of age, in good general physical and oral health, minimum of five evaluable teeth per quadrant, no crowns, no carious lesions requiring immediate treatment, no orthodontic appliances or removable partial dentures, and no periodontitis or active treatment for periodontal disease (by investigator description, anyone presenting a probing depth ≥ 5 mm with bleeding on probing and attachment loss ≥ 2 mm). Participants were considered systemically healthy through assessment with a medical questionnaire.

Use of any antibiotics within two weeks prior to study initiation, anticipation of taking any antibiotics during the course of the study, and self-reported pregnancy or nursing were prohibited. Participants received SMS (Short Message Service) reminders before screening to ensure that all oral hygiene procedures were stopped 48 h before each appointment.

Home-use products sufficient for approximately four weeks were distributed in labelled kit boxes by the clinical research coordinator (and dental hygienist) at the screening visit. The kit boxes contained a manual toothbrush and two 75 ml tubes of dentifrice (NaF containing 1450 ppm F). The soft manual toothbrush was an Oral-B® Indicator 40 (>90% end-rounded filaments). Participants were instructed to use these home-use study products twice daily (morning and evening) in their customary manner for the duration of the study. The home-use dentifrices were weighed before distribution at the screening and after collection at Visit Three.

The test products used for the professional brushing exercise were Oral-B Indicator 40 Soft manual toothbrushes with 0% end-rounded filaments (prototype), 40–50% end-rounded filaments (prototype) and >90% end-rounded filaments (commercially available). The percentages refer to the degrees of end rounding, which is a gradual process that ranges from blunt cut filaments with no end rounding (0%) to those that have a perfect, dome-shaped tip (100%).

At the screening, a comprehensive oral soft tissue examination was conducted to evaluate the oral and perioral regions, including hard and soft tissues.

Participants visited the clinic after refraining from all oral hygiene procedures for approximately 48 h prior to the first assessment appointment. An oral soft tissue examination was carried out, similar to that performed at the screening visit. The gingiva was stained with disclosing solution for

better visualization of the areas where the surface of the oral epithelium had been abraded. After staining, participants were instructed to rinse their mouths with water (one sip only) and to expectorate carefully.

The gingiva was dried with an air blast. A GA assessment was undertaken, and abrasions were recorded for each buccal and lingual quadrant of the incisor and canine, premolar and molar regions. Marginal (cervical-free gingiva), interdental (papillary-free gingiva) and mid-gingival (attached gingiva) aspects of the gingiva were assessed for small ( $\varnothing \leq 2.5$  mm), medium ( $\varnothing > 2.5$  mm, but  $\leq 5$  mm) and large ( $\varnothing > 5$  mm) GAs. A lesion in the interdental area between two teeth was assigned to the closest tooth area. The mid-gingival area comprised the gingival tissues up to the muco-gingival junction. In the upper jaw, this area included the whole palate.

A PQ-William's periodontal probe, placed across the long axis of the lesions, was used to measure the size of the abrasions. The greatest diameter of the abrasion lesion determined the size. Loosely attached discolorations were excluded from evaluation. When plaque or abrasions at the gingival margin were difficult to assess, the examiner carefully tried to remove the staining. Staining that could not be removed was assessed as an abrasion. The number and site location of the GAs were recorded on the case record form, with the exclusion of the third molars and central incisors. The rationale for not including the central incisors was to avoid results from overlapping brushing of adjacent quadrants.

In the next phase of the study, a trained dental hygienist brushed the 1st and 3rd quadrants with the assigned toothbrush according to the randomization sequence. Brushing was performed using the modified Bass method. No dentifrice was used. A timer was used to control the duration of a one-minute brushing procedure per toothbrush and a 15-second procedure per buccal/lingual aspect of one quadrant. This process was repeated for the 2nd and 4th quadrants with the alternate toothbrush. Following brushing, the comprehensive oral soft tissue examination was repeated and the gums and the teeth were re-stained for post-brushing GAs. Throughout the study, all examinations were performed by the same examiner under the same conditions.

Participants visited the clinic for second and a third appointment. To minimize carry-over effects, the minimum time between visits was approximately seven days. Visits Two and Three involved the same procedures as Visit One and described previously: prebrushing measurements, professional brushing exercise and post-brushing measurements.

## RESULTS

In total, 56 participants were screened and six participants were excluded. Thus, 50 participants were enrolled in the study, and of those, four dropped out before visit One. In total, 46 participants, 14 males (30%) and 32 females (70%) with a mean age of 22.5 (SD 2.51) years, and a range of 18–31 years, completed the study and were included in the analyses.

With regard to overall Gingival Abrasions (GAs), the 0% end-rounded brush showed an increase of 10.38, while the 40–50% brush had an adjusted mean increase of 8.56 abrasions

and the >90% brush had an increase of 8.80 abrasions. The difference between the pre- and post-brushing adjusted mean scores differed significantly ( $P < 0.001$ ) for the 0%, 40–50% and >90% end-rounded brushes. The average pre-brushing scores were comparable ( $P = 0.713$ ) for the three brushes. All brushes showed a significant ( $P = 0.002$ ) increase in the total numbers of abrasions post-brushing. The 0% brush differed significantly from the 40–50% brush ( $P = 0.001$ ) and the >90% brush ( $P = 0.005$ ) regarding abrasion increase (pre- to post-brushing).

There was no statistically significant difference between the 40–50% and the >90% brushes ( $P = 0.671$ ). Sub-analyses relevant to the size of the GAs showed a statistically significant increase from pre-brushing for small- and medium-sized abrasions for all brushes. For small-sized abrasions, the 0% brush had a significantly higher increase in abrasions compared with the 40–50% brush ( $P = 0.002$ ) and the >90% brush ( $P = 0.008$ ).

There were small-sized GAs in the marginal, interdental and mid-gingival areas. Analysing the data relative to the marginal abrasions in each of the regions showed a significant difference between the 0% brush compared with both the 40–50% brush ( $P < 0.001$ ) and the >90% brush ( $P < 0.001$ ).

## CONCLUSIONS

Based on the results of this experiment involving professional brushing, it can be concluded that 40–50% or greater end-rounded filaments can provide a significant reduction in gingival abrasions compared with non-end-rounded filaments.

Implications for practice: This trial showed that a 0% end-rounded manual toothbrush is unsafe to use. A 40–50% (or higher) end-rounded brush provides a significant reduction of gingival abrasions. Manufacturers should consider including bristle end-rounding data in their product information for dental care professionals and consumers.

## Reference:

1. Hennequin-Hoenderdos NL, Slot DE, Van der Sluijs E, Adam R, Grender JM, Van der Weijden GA. The effects of different levels of brush end rounding on gingival abrasion: a double-blind randomized clinical trial. *Int J Dent Hygiene* 15, 2017; 335–344.