www.sada.co.za / SADJ Vol. 78 No.6

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

SADJ July 2023, Vol. 78 No.6 p318-320

Edited and compiled by Prof V Yengopal, Faculty of Dentistry, University of the Western Cape

1. CLEANSING EFFICACY OF AN ORAL IRRIGATOR WITH MICROBURST TECHNOLOGY FOR ORTHODONTIC PATIENTS

Interdental cleaning devices in the form of dental floss and interdental brushes have traditionally being used as adjuncts to plaque removal in the interproximal areas of teeth. However, their routine use among younger adolescents has been reported in many studies to be less than optimal.

In orthodontic patients, fixed braces promote supra- and subgingival accumulation of biofilm by impeding oral hygiene resulting in an altered oral microbiome, enamel decalcification and gingivitis[1]. It was recently shown that patients with upper and lower multibracket appliances are affected significantly more frequently by gingivitis (65%) and white spot lesions (30%).[1] Additionally, in the predominantly young orthodontic patients, interdental spaces are often too narrow to use interdental brushes and flossing is challenging and time-consuming. Oral irrigators are easy to use even in the presence of orthodontic braces and are therefore favoured by many patients. Most oral irrigators use a stream of water only to mechanically remove plaque from interproximal areas but there are also oral irrigators which use a mixture of air and water, called microburst technology.

Wiesmüller and colleagues (2023)[1] reported on a randomised, single-blinded crossover study trial that sought to compare the cleansing efficacy of microburst technology with that of dental flossing in orthodontic patients with fixed braces after 4 weeks of home use. The null hypothesis was that there would be no difference between the two methods.

MATERIALS AND METHODS

Twenty adults who had fixed braces attached buccally at a minimum of four teeth per quadrant and existing contact points between all teeth were included in this trial. Patients were excluded if they were pregnant or had a history of oral or systemic diseases other than gingivitis. Teeth with ceramic restorations and implants were excluded from analysis due to different plaque adhesion compared to natural teeth. Data collection was performed from January 26 2021 to June 30 2021.

The cleansing efficacy of the microburst technology (*Airfloss*®, Philips) versus interdental cleaning with dental floss (*Superfloss*®, Oral-B) was evaluated in a randomised-controlled, examiner-blinded crossover study.
The study design consisted of four appointments for each subject.

At baseline, hygiene indices were evaluated using the Rustogi Modified Navy Plaque Index (RMNPI) after plaque disclosing and the gingival bleeding index (GBI). The RMNPI splits every buccal and lingual tooth surface into nine sections (A–I) that are assessed for the presence or absence of plaque. The index allows to draw a distinction between marginal areas of the teeth (A–C), interdental areas (D, F) or overall surface areas (A–I). RMNPI is calculated as the percentage of biofilm adhering sites to measured sites. For the assessment of the GBI, a periodontal probe (PCP 12) was inserted into the gingival sulcus to decide dichotomously at six sites per tooth (mesiobuccal–buccal–distobuccal–mesiolingual–lingual–distolingual) if bleeding occurred or not. The percentage of bleeding sites to measured sites was calculated. Teeth that were not integrated in the fixed orthodontic treatment were excluded. All examinations were conducted by one trained examiner.

Randomisation of the test products was computer generated prior to investigation and was conducted by study assistants, who also thoroughly instructed the subjects to use the products through hands-on training to ensure that the examiner did not know which product was used and so could collect the data blindly. *Airfloss*®, the oral irrigator with microburst technology, was filled with water and activated once per interdental space with the default setting of three sprays per activation. The participants were also instructed on how to use the control product *Superfloss*®.

Regarding toothbrushing, the participants were asked to stick to their usual routine and product. After detailed instruction with the first randomised assigned test product, professional tooth cleaning was conducted on the participants. After 28 days using the first test product, the study subjects presented for their second visit. The hygiene indices and inclusion/exclusion criteria were surveyed again. After a wash out phase of 28 days where the patients practiced their usual oral hygiene procedures, they presented for the third visit. Again, plaque was disclosed, and the subjects were thoroughly instructed to use the second product followed by a professional dental cleaning. In analogy to the first test phase, the subjects used the product for 28 days and then presented for examination of the plaque and gingival index in the context of the fourth and final appointment of the study.

RESULTS

Twenty individuals were recruited and 17 participants (seven females and 10 males) finished the study with a mean age of 27.12 ± 9.23 (range 18–49) years. The drop-out rate was 15%. One participant quit because of scheduling difficulties; two participants were excluded because of antibiotic treatment during the test phase. A total of 446 teeth were included in this study.

At baseline, the median of overall RMNPI (Plaque score) was 61.35% (53.29–69.56).

After 28 days of interdental cleaning with microburst technology, the median of overall RMNPI was 54.96%

(46.91–66.05). This was statistically significantly higher than after 28 days of interdental cleaning with the control procedure dental flossing (median of overall RMNPI 52.98%; range 42.75–65.60) (p = 0.029). Compared to baseline, a statistically significant difference could be seen after using the dental floss (p = 0.020), but not after using the oral irrigator (p = 0.105). Subgroup analysis revealed that the higher cleansing efficacy of the dental floss is mainly attributable to buccal and marginal areas and not to approximal areas. There was a statistically significantly lower plaque index after 28 days of dental flossing compared to microburst technology on marginal areas (median 61.25% and 68.45%, respectively; p = 0.010) but not on approximal areas (median 78.85% and 76.19%, respectively; p = 0.215).

At baseline, the median of GBI was 26.45% (range 14.49–31.55).

After 28 days of interdental cleaning with the oral irrigator, GBI was 12.96% (7.14–24.31) and statistically significantly higher compared to 8.33% (5.84–15.33) after interdental cleaning with dental floss (p = 0.030). Both tested products, the dental floss and the oral irrigator, reduced gingivitis in the statistically significantly compared to baseline (p < 0.005). Subgroup analysis revealed that unlike the plaque index, gingival bleeding was statistically significantly different not only at marginal sites but also at approximal sites. There was a statistically significantly higher gingival bleeding index after 28 days of home use of the oral irrigator compared to dental flossing on marginal areas (12.96% and 8.33%, respectively; p = 0.030) and on approximal areas (16.35% and 9.38%, respectively; p = 0.019). Again, the difference was more pronounced on buccal than on lingual/palatal surfaces. The GBI was also statistically significantly higher in anterior teeth after using the oral irrigator compared to dental flossing (median 9.72%, range 5.56–20.83 and median 5.56%, range 2.78–6.94, respectively; p = 0.012) but not in posterior teeth (median 14.10%, range 8.33–31.94 and median 8.54%, range 7.14–14.67; respectively; p = 0.056).

CONCLUSION

The researchers concluded that oral irrigators were still in need of substantial technical improvements and did not remove plaque and reduce gingival bleeding as efficiently as dental floss in regions that were easy to reach. However, in posterior regions, where the patients struggled with the application of dental floss, the oral irrigator showed similar results.

IMPLICATIONS FOR PRACTICE

Clinicians and patients should be cautious about the claims of clinical effectiveness made by product brochures and sales agents about the efficacy of oral irrigators.

REFERENCES

1. Wiesmüller, V, Kasslatter, M, Zengin, B et al. Cleansing efficacy of an oral irrigator with microburst technology in orthodontic patients—a randomized-controlled crossover study. Clin Oral Invest 2023; **27**, 2089–2095

2. THE INFLUENCE OF SMOKING ON THE INCIDENCE OF PERI-IMPLANTITIS: A SYSTEMATIC REVIEW AND META-ANALYSIS

One of the most common conditions affecting implants is peri-implantitis which is a plaque-associated pathological condition characterised by inflammation in the peri-implant mucosa and subsequent progressive loss of supporting bone.[1] The onset of peri-implantitis might occur early, within 3 years of function in most cases, and it progresses in a non-linear and accelerating pattern.[1] Local and systemic factors have been shown to increase the susceptibility of developing peri-implantitis. Patients with a history of chronic periodontitis, poor plaque control and no regular maintenance care after implant therapy are known to have a higher risk of developing peri-implantitis. There is high quality evidence from systematic reviews that have also identified smoking as an important risk factor for periodontitis and periodontitis-associated tooth loss.[1] Reis and colleagues (2023)[1] reported on systematic review to assess the influence of smoking on the incidence of peri-implantitis according to the available evidence from prospective cohort studies.

METHODOLOGY

This review was performed according to the 2020 Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) reporting guidelines. The research question was as follows: What is the incidence of peri-implantitis in smokers with dental implants, when compared to non-smokers, in prospective cohort studies?

The breakdown according to PECOS was as follows:

- Population (P): Patients with dental implants.
- Exposition (E): Cigarette smoking.
- Comparison (C): Non-smoking.
- Outcome (O): Incidence of peri-implantitis.
- Study design (S): Prospective cohort studies.

The following inclusion criteria for studies were applied.

Inclusion criteria comprised:

- Prospective cohort studies that evaluate the incidence of
- peri-implantitis.
- Studies with smokers and a non-smoking control group.
- Studies that contain "incidence" or provide "risk prediction" of peri-implantitis.
- Studies that reported results related to the effect of smoking on the incidence of peri-implant diseases.
- Adult patients (18 years old and above).
- Original articles published in all languages.

Exclusion criteria comprised:

- Studies that do not evaluate the effect of smoking as an independent factor.
- Studies that did not present a diagnosis of peri-implantitits.
- Patients with immunological health conditions and/or other confounders (eg HIV-positive).

Four electronic databases – National Library of Medicine (MEDLINE-PubMed), SCOPUS, EMBASE and ISI Web of Science – were selected to search relevant articles. The databases were last searched on November 30 2022 and there were no time restrictions for when the studies were published. Main terms included "Peri-Implantitis", "Periimplantitis", "Smoking", "Cigarette" and "Tobacco". In addition, OpenGrey (http://www.opengrey.eu) and Grey Literature Report (http://www.greylit.org) were used to supplement the search for grey literature. The reference list of included studies was hand-searched to identify additional potentially relevant studies.

After searching on the electronic databases, the retrieved

articles were subjected to a three-phase screening process by two authors independently. In the first phase, titles and abstracts were selected based on the eligibility criteria. Studies appearing to meet the inclusion criteria, or those with insufficient information in the title and abstract to make a clear decision, were selected to evaluate the full manuscript. Lastly, full-text versions of potentially relevant studies were screened. Studies fulfilling all selection criteria were processed for data extraction. Disagreements were solved by discussion and consensus and consultation with a third reviewer if necessary.

Data from selected trials were independently extracted from the included studies by two reviewers and disagreements were resolved via discussion and consensus or by consulting a third reviewer.

The risk of bias was assessed using a modified version of the Newcastle–Ottawa scale (NOS) which assessed the selection of study groups (ie representativeness of current and former smokers), comparability of the groups, outcome (criteria used to assess tooth loss and adequacy of follow-up) and statistical analysis. Furthermore, NOS was converted to Health Research and Quality (AHRQ) standards to categorise the studies as good, fair and poor. The GRADE method (Cochrane library) and the GRADEpro tool were used to determine certainty of evidence for each outcome.

The analysis of the data was performed using Review Manager (RevMan) software, version 5.4.1. Smoking status was categorised into smokers and non-smokers. Random-effects meta-analyses was conducted for peri-implantitis incidence (dichotomous outcome) at patient and implant levels. A subgroup analysis was performed in the implant-based analysis to analyse separately studies that used the World Workshop definition of peri-implantitis. The estimates were presented as pooled risk ratios (RR) and their respective 95% confidence intervals (CIs). Statistical heterogeneity among studies was assessed with the Cochrane *Q* test and I^2.

RESULTS

After screening the titles of papers for possible inclusion, 486 articles were considered. After applying the inclusion and exclusion criteria, 480 papers were excluded and six were included in this review. These six prospective cohort studies comprised 702 patients and 1,959 implants. The follow-up period ranged from 3 to 16 years.

In terms of the quality of the included studies, four were rated good quality and two were rated fair.

For the pooled meta-analysis, there was a significant difference between smokers and non-smokers for the risk of peri-implantitis in the implant-based ($p < .0001$) and patient-based analysis ($p = .01$). A strong association between smoking and the risk for peri-implantitis was verified at the implant level (RR: 2.04, 95% CI: 1.46–2.85) and the patient level (RR: 2.08, 95% CI: 1.17–3.71). The subgroup analysis of the studies that used the World Workshop definition at the implant level also showed a higher risk for peri-implantitis development when comparing smokers and non-smokers. On the other hand, the study that did not use the World Workshop classification showed no significant difference between the groups.

The certainty of evidence from the GRADE approach for the incidence of peri-implantitis was rated as moderate for implant-based and patient-based analysis.

CONCLUSION

The reviewers concluded that the strength of the evidence suggesting that smoking is associated with peri-implantitis compared to non-smoking at the patient and implant levels was moderate.

IMPLICATIONS FOR PRACTICE

Smoking continues to be a major contributor and confounder to many oral and systemic diseases and oral health professionals MUST contribute to reducing the prevalence of this bad habit.

REFERENCE

1. Reis IN, do Amaral GC, Hassan MA, Villar CC, Romito GA, Spin-Neto R, Pannuti CM. The influence of smoking on the incidence of peri-mplantitis: A systematic review and meta-analysis. Clinical Oral Implants Research. 2023 Jun;34(6):543-54