

Air Polishing Is a Promising Nonsurgical Treatment Modality for Peri-implant Disease

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Original article being reviewed:

Efficacy of air
polishing for the
non-surgical
treatment of peri-
implant diseases:
A systematic review.
Schwarz F,
Becker K,
Renvert S. J
Clin Periodontol
2015;42:951–959.

Background

This article critically appraises a systematic review conducted in 2015 that evaluated the efficacy of air polishing on peri-implant disease when compared with other nonsurgical treatments.

Clinical question

In patients with peri-implant disease, what is the efficacy of air polishing on changing signs of inflammation compared with other nonsurgical treatments?

Summary of methods and results

Electronic and manual searches in related journals were performed. Two authors independently screened titles and abstracts of the identified studies, assessed the methodologic quality, and performed data extraction of the identified studies. Prospective randomized controlled trials (RCTs) or nonrandomized controlled clinical trials (CCTs) that compared air polishing with control measures for the nonsurgical treatment of peri-implant disease were included. Bleeding on probing (BOP) score was defined as the primary outcome, and a secondary outcome was the change in pocket depth (PD). The pooled data of two RCTs revealed that the weighted mean difference in BOP reduction between the two groups was $-23.83\% \pm 12.06$ ($P = .048$; 95% confidence interval [CI] = -47.47 to -0.20). The weighted mean difference in PD reduction was $-0.37 \text{ mm} \pm 0.23$ ($P = .119$; CI = -0.84 to 0.096).

Critical appraisal

This systematic review had a limited number of trials, which were judged to be at high risk of bias with small sample size. Therefore, the results should be interpreted with caution.

Practical implication

To maintain healthy tissues around dental implants, it is important to institute an effective preventive program. When a pathologic condition of the tissues around implants is diagnosed, a therapeutic intervention starting with simple nonsurgical modalities (eg, air polishing) should be initiated as soon as possible.

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Evidence Summary

Background

Bacterial plaque accumulation is the primary etiologic factor in the development of inflammatory changes in the soft tissues surrounding dental implants, a condition called *peri-implant mucositis*. This reversible disease can lead to advanced and irreversible inflammatory changes in the bone surrounding dental implants, called *peri-implantitis*, if not treated as early as possible.¹ Based on previous findings, the prevention or management of peri-implant mucositis is considered to be a key strategy for the prevention of peri-implantitis.^{2,3}



The principal objectives of the treatment of peri-implantitis are to reduce bacterial colonization of the implant surface, mechanically eliminate the bacterial microbiota, and introduce an environment capable of suppressing the subgingival anaerobic flora.^{4,5} Different treatment strategies for peri-implantitis have been suggested, including both surgical and nonsurgical modalities. Unfortunately, most of the commonly used hand instruments or devices (eg, ultrasonic and erbium-doped yttrium aluminum garnet [Er:YAG] lasers) have revealed a limited efficacy in completely eliminating the biofilm from exposed dental implant surfaces.⁶

Air polishing has been introduced as an alternative approach for the cleaning of titanium implants.⁷ The repeated application of either amino acid (glycine) or sodium bicarbonate powders has been associated with the complete removal of bacterial plaque biofilms without causing major damage to sand-blasted and acid-etched titanium surfaces.⁸ Because air-abrasive devices were so successful at removing plaque while minimizing harm to dental implants, it was deduced that air polishing might be a promising tool for the treatment of peri-implant disease.

Clinical question

In patients suffering from peri-implant disease, what is the efficacy of air polishing on changing signs of inflammation compared with control treatments (ie, alternative measures for plaque removal with or without adjunctive antiseptic and/or antibiotic therapy)?

Methods

Database searches of literature published between 1992 and February 2015 were performed in PubMed and Thomson Reuters Web of Knowledge. Also, a manual search was performed in many related journals. Reference lists were scanned for possible additional related studies. Moreover, the reviewers contacted the corresponding authors for missing data.

Two authors independently screened titles and abstracts of the identified studies. Any disagreements were resolved through discussion. Excluded studies were recorded with the reasons for exclusion.

The inclusion criteria was as follows: prospective randomized controlled trials (RCT) or nonrandomized controlled clinical trials (CCT) in humans that compared air polishing with control measures for the nonsurgical treatment of peri-mucositis or peri-

implantitis. Bleeding on probing (BOP) score was defined as the primary outcome. A secondary outcome was change in pocket depth (PD).

Two authors independently performed data extraction of the identified studies and assessed the methodologic quality according to the Cochrane Collaboration tool. Any disagreements were resolved through discussion. Meta-analysis was based on a random-effects model, and the analysis was conducted using a commercially available software program (Comprehensive Meta-Analysis).

Results

The authors identified five studies, four RCTs and one CCT, for inclusion. All selected trials compared glycine-powder air polishing, either as an adjunct to mechanical debridement or as monotherapy, with other nonsurgical treatment modalities. All selected trials were subdivided according to the primary diagnosis: three trials (two RCTs and one CCT) evaluated the nonsurgical treatment of peri-mucositis, and two trials (both RCTs) evaluated the nonsurgical treatment of peri-implantitis.

Only two of the five included studies^{9,10} were included in the meta-analysis, which considered the primary and secondary outcomes reported after 6 months of healing. The weighted mean difference (WMD) in BOP reduction between test and control groups was -23.83% (SD = 12.06; $P = .048$; 95% confidence interval [CI] = -47.47 to -0.20), favoring air polishing over control measures (P value for heterogeneity: .128; $I^2 = 56.88\%$ = moderate heterogeneity). The WMD in PD reduction between test and control groups was -0.37 mm (SD = 0.23; $P = .119$; CI = -0.84 to 0.096), favoring air polishing over control measures but not significantly (P value for heterogeneity: .940; $I^2 = 0.00\%$ = low heterogeneity).

Conclusions

The authors concluded that the glycine-powder air polishing was as effective as other nonsurgical modalities for the treatment of peri-mucositis. However, air polishing may improve the efficacy of nonsurgical treatment of peri-implantitis over the control measures investigated.

Critical appraisal

AMSTAR¹¹ was used for critically appraising this review and meta-analysis. The predominant strength of this systematic review and meta-analysis is in the authors' use of PRISMA. The PRISMA guidelines methodology helps to ensure a more consistent, higher-quality outcome. The authors used a well-defined and focused PICO question, which enabled them to summarize their objectives and inclusion criteria and aided their evidence-based search strategy.

The authors contacted the corresponding authors of selected studies regarding missing information or unpublished data, although they did not attempt to search for gray literature. The authors clearly stated the inclusion and exclusion criteria. The authors included tables clearly describing the characteristics of the five included studies.

More than one reviewer screened titles and abstracts, extracted the data, and assessed the quality of included trials. Disagreements were resolved through discussion.

Although more than one database was searched, Thomson Reuters Web of Knowledge is a collection of databases; the two best known are the Journal Citation Reports and the Web of Science, the latter of which only covers around 2,700 journals in the social sciences and humanities. Although its worldwide coverage has recently been improving, it still has a North American bias in many disciplines as well as a bias toward English periodicals, particularly in the natural sciences.¹² Therefore, the use of a broader range of databases is recommended and may have identified additional studies.

The current systematic review was based on five studies that comprised a limited number of patients (a total of 165 patients, 91 in the peri-mucositis studies and 74 in the peri-implantitis studies) with substantial variations in methodology. One study in the current meta-analysis¹⁰ included patients with peri-implant bone loss < 30% of the implant length, while another trial⁹ included patients with peri-implant bone loss > 3 mm. Furthermore, the air-abrasive device was used either as an adjunct to mechanical debridement or as repeated monotherapy and was applied for differing lengths of time. Only two RCTs were involved in the qualitative synthesis, with

no clarification from the authors as to why the other studies were excluded. Thus, the current systematic review and meta-analysis provides limited evidence about the efficacy of air polishing on the management of peri-implant disease when compared with other nonsurgical modalities and the results should be interpreted with caution.

Publication bias was not assessed due to inadequate sample size, as only five studies were included in this systematic review. The statistical examination of publication bias is not required if there are less than 10 included studies because of the lack of power of statistical tests to detect bias.¹³

A previous Cochrane review¹⁴ that was broader in covering all treatments included surgical approaches for the management of peri-implantitis; four of the nine included trials were concerned with surgical intervention and five with nonsurgical intervention. The Cochrane review concluded: "There is no reliable evidence suggesting which could be the most effective interventions for treating peri-implantitis. This is not to say that currently used interventions are not effective."¹⁴

Peri-implantitis could present in patients with dental implants and poor hygiene. The prevalence of peri-implantitis could increase along with the increase in dental implant placement, as well as with adherence to an infrequent or otherwise inadequate preventive program. It is important to institute an effective preventive program for preservation of healthy tissues around dental implants, and when signs of infection are diagnosed, a therapeutic intervention starting with simple nonsurgical modalities (eg, air polishing) should be initiated as soon as possible.

The evidence of this systematic review is limited. Well-designed studies that follow the CONSORT statement, include a larger sample size, have a longer follow-up, and take into consideration possible confounding factors are needed to clarify the effect of different treatment modalities on the management of peri-implant disease.

Acknowledgments

The author reports no conflict(s) of interest.



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