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Systematic Review

Efficacy of air polishing for the non-surgical treatment of peri-implant diseases: a systematic review

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Abstract

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

Material & Methods: After electronic database and hand search, 10 full-text articles were independently screened by two reviewers. Finally, a total of five studies (six publications) fulfilled the inclusion criteria. The weighted mean difference (WMD) [*p*; 95% CI] in bleeding on probing- (BOP) (primary outcome) and probing pocket depth- (PD) reductions was estimated using a random effect model.

Results: All studies reported on residual BOP scores after therapy. A narrative data synthesis did not reveal any major improvement of bleeding index/ BOP or disease resolution following air polishing over mechanical debridement at mucositis sites. At peri-implantitis sites, WMD in BOP reduction between test and control (mechanical debridement with or without local antiseptic therapy, Er:YAG laser) groups was −23.83% [$p = 0.048$; 95% CI (−47.47, −0.20)] favouring air polishing over control measures.

Conclusions: While glycine powder air polishing is as effective as the control treatments at mucositis sites, it may improve the efficacy of non-surgical treatment of peri-implantitis over the control measures investigated. A complete disease resolution was commonly not obtained.

Key words: air abrasion; clinical studies; peri-implant mucositis; peri-implantitis; systematic review

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Plaque accumulation is the major etiological factor in the development of peri-implant diseases (Renvert & Polyzois 2014), and the risk for a conversion from peri-implant mucositis to peri-implantitis increases in the absence of a proper maintenance care (Costa et al. 2012). Accordingly, the management of peri-implant mucositis is considered to be a key strategy for the prevention of peri-implantitis (Jepsen et al. 2015). A major objective of the cause-related concept of therapy is the disruption of the biofilm (Klinge et al. 2012). However, most of the commonly used instruments (e.g. curets) or devices (e.g. ultrasonic, erbium-doped yttrium aluminum garnet – Er:YAG laser) revealed a limited efficacy in completely eliminating the biofilm from exposed titanium implant surfaces

(Schwarz et al. 2005, 2006a,b). Moreover, non-surgical treatment of peri-implant mucositis (Schwarz et al. 2015) and peri-implantitis (Heitz-Mayfield & Mombelli 2014) with or without the adjunctive use of local antisepctics or local/ systemic antibiotics was commonly associated with residual bleeding on probing, indicating that a complete disease resolution was not obtained.

Previously, air polishing was introduced as an alternative approach for the supra- and submucosal cleansing of titanium implants (Tastepe et al. 2012). The repeated application of either amino acid glycine- or sodium bicarbonate powders were associated with a complete removal of bacterial plaque biofilms without causing major damages to sandblasted and acid-etched titanium surfaces (Schwarz et al. 2009). Based on the currently available in vitro data, air-abrasive devices may represent a promising tool for the treatment of peri-implant diseases (Tastepe et al. 2012).

Recent systematic reviews aimed at assessing the efficacy of non-surgical treatment procedures for the management of peri-implant mucositis and peri-implantitis (Muthukuru et al. 2012, Schwarz et al. 2015). However, the latter reviews pooled and compared data on air polishing with a variety of different test and control approaches, including machine-driven (i.e. ultrasonic) debridement, adjunctive local antiseptics, adjunctive local/systemic antibiotics or laser therapy. Moreover, one systematic review and Bayesian network meta-analysis employed probing pocket depth (PD) reductions rather than changes in peri-implant mucosal inflammation as primary outcome (Faggion et al. 2014). Accordingly, a more focused analysis is needed to assess the therapeutic effects of air polishing for the management of peri-implant mucositis and peri-implantitis.

Therefore, the aim of this systematic review was to address the following focused question: In patients suffering from peri-implant diseases, what is the efficacy of air polishing on changing signs of inflammation compared with control treatments?

Materials and Methods

This systematic review was structured and conducted according to the preferred reporting items of the PRISMA statement (Moher et al. 2009).

Focused question

The focused question serving for literature search was structured according to the PICO format (Miller & Forrest 2001): "In patients suffering from peri-implant diseases, what is the efficacy of air polishing on changing signs of inflammation compared with control treatments?".

- Population: patients with peri-implant mucositis or peri-implantitis, based on case definitions used in respective publications
- Intervention: non-surgical treatment using air polishing
- Comparison: non-surgical treatment using control measures (i.e. alternative measures for plaque removal with or without adjunctive antiseptic and/ or antibiotic therapy)
- Outcome: changes in peri-implant mucosal inflammation (i.e. indices to measure mucosal bleeding)

Search strategy

The PubMed database of the U.S. National Library of Medicine and the Web of Knowledge of Thomson Reuters were used as electronic databases to perform a systematic search for relevant articles published in the dental literature between 1992 up to February, 2015. A commercially available software program (Endnote X7, Thomson, London, UK) was used for electronic title management. Screening was performed independently by two authors (F.S. and K.B.). Disagreement regarding inclusion during the first and second stage of study selection was resolved by discussion.

The combination of key words (i.e. Medical Subject Headings MeSH) and free text terms included:

"treatment" OR "nonsurgical treatment" OR "non-surgical treatment" OR "therapy" OR "nonsurgical therapy" OR "non-surgical therapy" OR "air abrasion, dental" (MeSH) OR "air abrasions, dental" (MeSH) OR "dental air abrasion" (MeSH) "dental air abrasions" (MeSH) OR "air abrasive device".

AND

"peri-implant disease" OR "periimplant disease" OR "peri-implant infection" OR "periimplant infection" OR "mucositis" (MeSH) OR "peri-implant mucositis" OR "periimplant mucositis" OR "periimplantitis" (MeSH) OR "peri-implantitis" (MeSH)

Electronic search was complemented by a hand search of the following journals:

Clinical Implant Dentistry and Related Research; Clinical Oral Implants Research; International Journal of Oral and Maxillofacial Implants; Journal of Clinical Periodontology; Journal of Periodontology. Finally, the references of all selected full-text articles and related reviews were scanned. If required, the corresponding authors were contacted and requested to provide missing data or information.

Study inclusion and exclusion criteria

During the first stage of study selection, the titles and abstracts were screened and evaluated according to the following inclusion criteria:

1 Prospective randomized controlled (RCT), or non-randomized controlled (CCT) trials (split-mouth or parallel group designs) in humans comparing air polishing with control measures for the non-surgical treatment of peri-implant mucositis and peri-implantitis.
2 Data on the clinical changes in mucosal inflammation (i.e. bleeding scores) after treatment.

At the second stage of selection, all full-text articles identified during the first stage were acquired. During this procedure, the pre-selected publications were evaluated according to the following exclusion criteria:

- Inclusion of less than five patients
- Lack of case definitions
- Surgical treatment protocols
- Lack of clinical data on the changes in peri-implant mucosal inflammation

Quality assessment of selected studies

A quality assessment of all selected full-text articles was performed according to the Cochrane collaborations's tool for assessing risk of bias (low, high, unclear) including the following domains: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, and incomplete outcome data (Higgins & Green 2011). Quality assessment was performed in two different phases. In particular, during phase I quality assessment was based on the published full-text article performed independently by both authors (F.S. and K.B.). In phase II, disagreements were resolved by discussion.

Data extraction

A previously generated data extraction template was used (F.S. and K.B.) and data based on the study design, population, case definition, observation period, interventions, comparisons, primary and secondary outcomes as well as the study quality were used (Schwarz et al. 2015). For data analysis, the changes in bleeding on probing (BOP) scores after respective healing periods were defined as primary outcome. Secondary outcomes included changes in PD as well as the resolution of peri-implant mucosal inflammation.

Method of analysis

Heterogeneity (I^2 statistics) between included RCT's, meta-analysis (weighted mean difference and 95% confidence interval, subject based analysis) and forest plots were assessed using a commercially available software program (Comprehensive Meta-Analysis V2, Biostat, Englewood, NJ, USA). Meta-analysis was based on a random effect model to account for potential methodological differences between studies. Tresholds for the interpretation of I^2 values were used as follows: 0–30% (low heterogeneity), 30–60% (moderate heterogeneity), >60% (substantial heterogeneity) (*Cochrane Handbook for Systematic Reviews of Interventions*, Version 5.1.0., http://handbook.cochrane.org).

Results

Study selection

A total of 288 potentially relevant titles and abstracts were found during the electronic and manual search. During the first stage of study selection, 276 publications were excluded based on title and abstract. For the second phase, the complete full-text articles of the remaining 12 publications were thoroughly evaluated. A total of six papers had to be excluded at this stage because they did not fulfil the inclusion criteria of the present review (Table 1).

Finally, a total of five studies (corresponding to six publications) fulfilled the inclusion criteria required for this systematic review (Fig. 1).

Quality and risk of bias assessment of selected studies

The review author's judgement about each risk of bias item for each included RCT is presented in Table 2. In particular, the percentages across all included RCT's for high, low and unclear risk of bias items were 72.0%, 20.0% and 8.0% respectively (Table 2).

Subdivision of selected studies

All selected publications were subdivided according to the primary diagnosis:

- Non-surgical treatment of peri-implant mucositis (two RCT's and one CCT) (Table 3)
- Non-surgical treatment of peri-implantitis (two RCT's) (Table 4)

Methodological description of the included studies

Non-surgical treatment of peri-implant mucositis

Two RCT's reported on the clinical efficacy of glycine powder air polishing (Air Flow Master®, Perio-Flow® nozzle, EMS, Nyon, Switzerland) used either as an adjunct to mechanical debridement (i.e. ultrasonic scalers) (Ji et al. 2014) or as repeated monotherapy (Riben-Grundström et al. 2015) when compared with mechanical debridement (i.e. ultrasonic scalers) alone. In both studies, the air-abrasive device was applied for 5 s per surface aspect. Test and control treatments were commonly supported by oral hygiene instructions and followed over a period of up to 12 months (Riben-Grundström et al. 2015) (Table 3). Basically, both studies considered PD≥4 mm and BOP to assess mucosal inflammation, however, also employed different radiographic threshold levels for case definition. In the study by Riben-Grundström et al. (2015), implants with a bone loss >2 mm were not included whereas Ji et al. (2014) did not include individuals with detectable loss of supporting bone as compared with periapical radiographs immediately after restoration. In one CCT, glycine powder air polishing (Air Flow Master®, Perio-Flow® nozzle) was used as an adjunct (i.e. 5 s per surface aspect) to mechanical debridement. The case definition included BOP, PD ≤3.5 mm and a radiographic bone loss ≤3.0 mm (De Siena et al. 2014).

Non-surgical treatment of peri-implantitis

In two RCT's (three publications), the efficacy of glycine powder air polishing (Air Flow Master ®, Perio-Flow®

Table 1. Excluded clinical studies at the second stage of selection and the reason for exclusion

Publication	Reason for exclusion
Duarte et al. (2009)	Observational study
Maximo et al. (2009)	Observational study
Bassetti et al. (2013)	Test and control groups received air polishing treatment
McKenna et al. (2013)	No application of air polishing
Persson et al. (2011)	Microbiological analysis of the study population reported by Renvert et al. (2010)
Schär et al. (2013)	Test and control groups received air polishing treatment

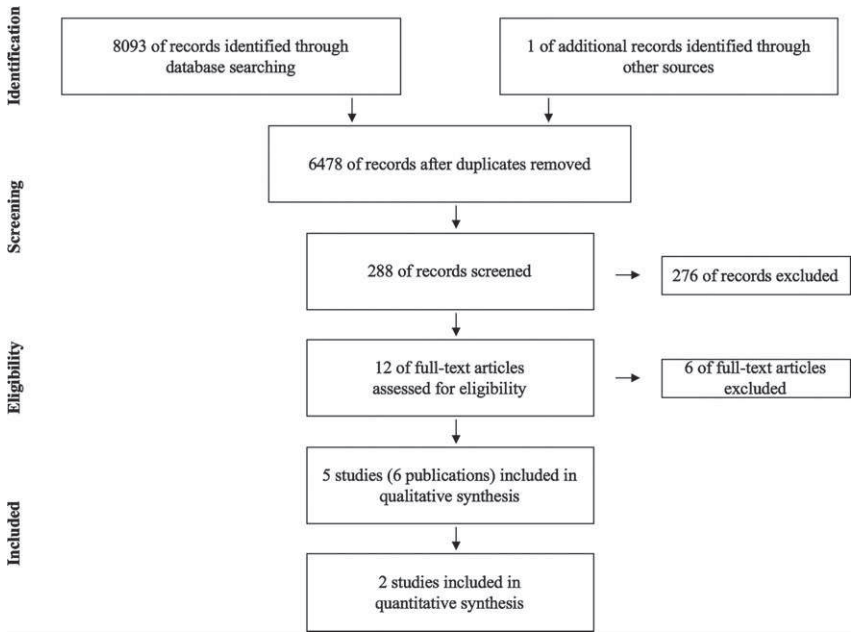


Fig. 1. Flow diagram of literature search and inclusion.

nozzle) was compared with that of either mechanical debridement (Sahm et al. 2011, John et al. 2015) or Er:YAG laser (energy density of 12.7 J/cm^2) monotherapy (Renvert et al. 2010). The air-abrasive device was either applied 5 s per surface aspect (Sahm et al. 2011) or approximately 15 s at four sites per implant (Renvert et al. 2010). Test and control treatments were supported by oral hygiene instructions and followed over a period of up to 12 months (John et al. 2015) (Table 4). For the case definition, both studies considered different amounts of interproximal bone loss (i.e. ≤ 33% *versus* >3 mm) in addition to peri-implant mucosal inflammation.

Treatment outcomes

Non-surgical treatment of peri-implantit mucositis

At 3 months after therapy, both test and control groups resulted in significant improvements in bleeding index and PD values. The adjunctive single application of glycine powder air polishing was associated with a lower frequency of sites without bleeding when compared with the control group (29.3% *versus* 42.1%). There were "no complaints or discomfort" reported by any of the patients investigated (Ji et al. 2014). At 6 months, the adjunctive single use of glycine powder air polishing resulted in a significantly higher bleeding index (BI) and PD reduction when compared with mechanical debridement alone. There was "no complication or soft tissue recession" noted after therapy (De Siena et al. 2014).

A repeated application also resulted in significant BOP reductions after 12 months of healing. In both groups, the number of diseased sites (pocket depth ≥4 mm with bleeding/suppuration) was significantly reduced between baseline and 12 months. However, no significant differences were noted between groups at 12 months or in the reduction in number of diseased sites from baseline to 12 months (Riben-Grundström et al. 2015) (Table 3).

Due to a large heterogeneity in the clinical parameters defined for the assessment of mucosal inflammation (i.e. different modifications of BI, BOP), a meta-analysis was not feasible.

Non-surgical treatment of peri-implantitis

At 3, 6 and 12 months after therapy, glycine powder air polishing resulted in a statistically significant higher BOP reduction than mechanical debridement + local antiseptic therapy (i.e. chlorhexidine digluconate) [3 months: 51.6 (SD = 28.6)% *versus* 24.8 (SD = 29.8)%; 6 months: 43.5 (SD = 27.7)% *versus* 11.0 (SD = 15.7)%; 12 months: 41.2 (SD = 29.5)% *versus* 16.6 (SD = 33.4)%]. Between-group comparisons failed to reveal any significant differences in mean PD reductions at 3, 6, and 12 months. No signs of inflammation, complications or allergic reactions in the form of swellings or redness of the surrounding soft tissues could be observed. After treatment with air polishing, no emphysema could be detected (Sahm et al. 2011, John et al. 2015).

A single subgingival instrumentation using glycine powder air polishing or an Er:YAG laser (energy density of 12.7 J/cm^2) (control) resulted in significant BOP reductions at 6 months. The difference between both groups failed to reach statistical significance. A positive treatment outcome (i.e. defined as PD reduction ≥ 0.5 mm and gain or no radiographic bone loss) at the implant level was noted in 47% of the test sites and 44% of the control sites (Renvert et al. 2010).

Table 2. Risk of bias (+ low/ − high/ ? unclear) summary for finally selected randomized studies

	Random sequence generation	Allocation Concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data
Renvert et al. (2010)	+	?	−	+	+
Sahm et al. (2011); John et al. (2015)	+	+	−	+	+
Ji et al. (2014)	+	?	−	+	+
Riben-Grundström et al. (2015)	+	+	−	+	+

Table 3. Included studies – Non-surgical treatment of peri-implant mucositis

Publication	Design	Population	Case Definition	Period	Test	Control	Mean (SD) Outcome
Ji et al. (2014)	RCT, parallel	24 Patients 33 implants molar/premolar sites 1 Implant System	PD ≥ 4 mm, BOP + No radiographic bone loss compared with baseline (i.e. immediately after prosthesis installation)	3 months	OHI+ Mechanical debridement (ultrasonic scaler with carbon fibre tips) + air-abrasive device, glycine powder (sites with PD ≥ 4 mm)	OHI+ Mechanical debridement (ultrasonic scaler with carbon fibre tips)	Test BI: 1.4 (SD:0.57) (BL) to 1.1 (SD:0.58) (3 months, Subject Level) BI: 1.7 (SD:0.93) (BL) to 1.1 (SD:0.98) (3 months, Implant Level) (sign.) Sites without bleeding: 29.3% PD: 3.6 (SD:0.47) (BL) to 3.2 (SD:0.48) mm (3 months, Subject Level) (sign.) Control BI: 1.5 (SD:0.65) (BL) to 1.0 (SD:0.85) (3 months, Subject Level) BI: 1.7 (SD:1.0) (BL) to 0.9 (SD:1.1) (3 months, Implant Level) (sign.) Sites without bleeding: 42.1% PD: 3.5 (SD:0.5) (BL) to 3.1 (SD:0.38) mm (3 months, Subject Level) (sign.)
De Siena et al. (2014)	CCT, parallel	30 patients No information on number and types of implants	BOP or spontaneous bleeding with local swelling PD ≤ 3.5 mm Bone loss ≤ 3.0 mm	6 months	OHI+ Mechanical debridement Teflon curets, polishing) + air-abrasive device, glycine powder	OHI+ Mechanical debridement Teflon curets, polishing)	Test PD: 3.0 (SD:0.4) (BL) to 2.4 (SD:0.5) mm (6 months, Subject Level) (sign.) 13 patients did not present bleeding at 6 months Control PD: 2.9 (SD:0.4) (BL) to 3.0 (SD:0.6) mm (6 months, Subject Level) (n. sign.) 9 patients did not present bleeding at 6 months BI and PD scores sign. lower in the test group at 6 months

Table 3. (continued)

Publication	Design	Population	Case Definition	Period	Test	Control	Mean (SD) Outcome
Riben-Grundström et al. (2015)	RCT, parallel	37 patients One implant per subjet used. Test $N = 19$ Control $N = 18$	PD ≥ 4 mm, BOP + with or without suppuration Bone loss ≤ 2 mm from implant shoulder	12 months	OHI+ air-abrasive device, glycine powder Repeated treatment at 3 and 6 months	OHI+ Mechanical debridement (ultrasonic scaler with plastic coated tips) Repeated treatment at 3 and 6 months	Test BOP at implant (%) (12 months, Subject Level): 43.9 (SD:7.3) (BL) to 12.1 (SD:3.8) (sign.) Number of diseased sites (pocket depth ≥4 mm with bleeding/ suppuration) 38% (BL) to 8% (12 months, Subject Level) (sign.) Control BOP at implant (%) (12 months, Subject Level): 53.7 (SD:7.9) (BL) to 18.6 (SD:6.4) (sign.) Number of diseased sites (pocket depth ≥4 mm with bleeding/ suppuration) 52% (BL) to 17% (12 months, Subject Level) (sign.) No significant differences between groups for either reduction in BOP or in diseased sites

BI, bleeding index; BOP, bleeding on probing; CCT, non-randomized controlled clinical trial; OHI, oral hygiene instructions; PD, probing pocket depth; RCT, randomized controlled clinical trial; SD, standard deviation.

Meta-analysis (random effect model) considered the primary and secondary outcomes reported after 6 months of healing (Renvert et al. 2010, Sahm et al. 2011).

The weighted mean difference (WMD) [SD; *p*; 95% CI] in BOP reduction between test and control groups was −23.83% [SD = 12.06; $p = 0.048$; 95% CI (−47.47, −0.20)] favouring air polishing over control measures (*p* value for heterogeneity: 0.128, $I^2 = 56.88\%$ = moderate heterogeneity) (Fig. 2a). The weighted mean difference (WMD) [SD; *p*; 95% CI] in PD reduction between test and control groups was −0.37 mm [SD = 0.23; $p = 0.119$; 95% CI (−0.84, 0.096)] not favouring air polishing over control measures (*p* value for heterogeneity: 0.940, $I^2 = 0.00\%$ = low heterogeneity) (Fig. 2b).

Due to the low number of available RCT's ($n = 2$), a publication bias assessment was not possible.

Discussion

The present systematic review was conducted to address the following focused question: In patients suffering from peri-implant diseases, what is the efficacy of air polishing on changing signs of inflammation compared with control treatments?

Due to noted heterogeneous case definitions used in the currently available literature, it was decided to include studies reporting on the treatment of both peri-implant mucositis and peri-implantitis. This issue mainly refers to the definition of peri-implantitis cases, which should consider "changes in the level of crestal bone, presence of BOP and/or suppuration; with or without concomitant deepening of peri-implant pockets" (Lang et al. 2011). Therefore, when interpreting the present analysis, it must be kept in mind that in two studies, a radiographic bone loss of up to 3 mm has been accepted for defining peri-implant mucositis cases (De Siena et al. 2014, Riben-Grundström et al. 2015).

Basically, all studies investigated employed the same type and configuration of an air-abrasive device. Moreover, supra- and submucosal debridement was commonly accomplished using glycine powder, which

Table 4. Included studies – non-surgical treatment of peri-implantitis

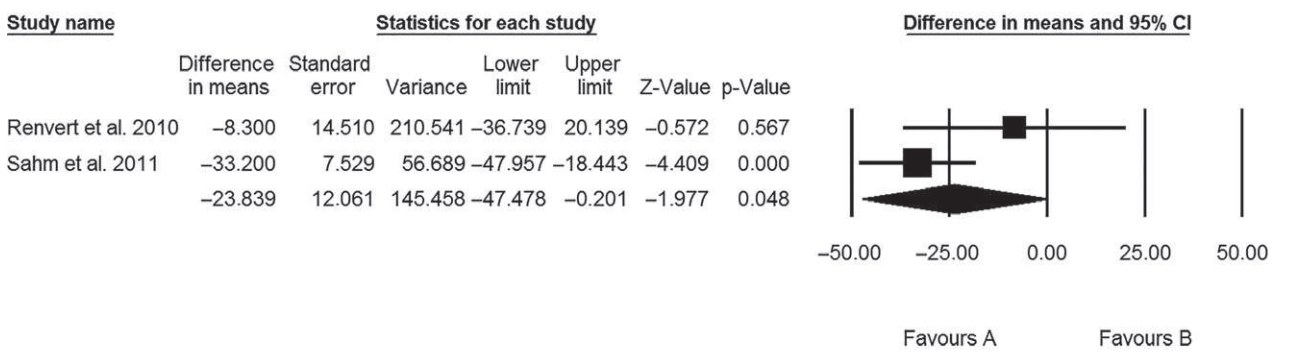
Publication	Design	Population	Case Definition	Period	Test	Control	Mean (SD) Outcome
Renvert et al. (2010)	RCT, parallel	42 patients 100 implants machined and medium-rough surfaces	PD ≥ 5 mm, BOP + and/or pus Bone loss > 3 mm	6 months	OHI+ air-abrasive device, glycine powder	OHI+ Er:YAG Laser	Test absence of BOP: 30.9% (6 months, Implant Level) mean PD reduction: 0.9 (SD:0.8) (6 months, Subject Level) Control absence of BOP: 25.0% (6 months, Implant Level) mean PD reduction: 0.8 (SD:0.5) (6 months, Subject Level) Treatment outcome "no PD ≥ 5 mm, no BOP and no suppuration" at 6 months could not be obtained in any of the cases investigated
Sahm et al. (2011) John et al. (2015)	RCT, parallel	32 Patients (BL) 25 patients (12 months) 36 implants 8 Implant Systems	PD ≥ 4 mm, BOP+ with suppuration Bone loss ≤ 33%	12 months	OHI+ air-abrasive device, glycine powder	OHI+ Mechanical debridement (carbon curets + 0.1% CHX)	Test BOP: 99.0 (SD:4.1) (BL) to 57.8 (SD:30.7) (12 months, Subject Level) PD: 3.7 (SD:1.0) (BL) to 3.2 (SD:1.1) mm (12 months, Subject Level) Control BOP: 94.7 (SD.13.7) (BL) to 78.1 (SD:30.0) (12 months, Subject Level) PD: 3.9 (SD:1.1) (BL) to 3.5 (SD:1.2) mm (12 months, Subject Level) BOP: significant difference between groups at 3, 6 and 12 months

BL, baseline; BOP, bleeding on probing; CHX, chlorhexidine digluconate; OHI, oral hygiene instructions; PD, probing pocket depth; RCT, randomized controlled clinical trial; SD, standard deviation.

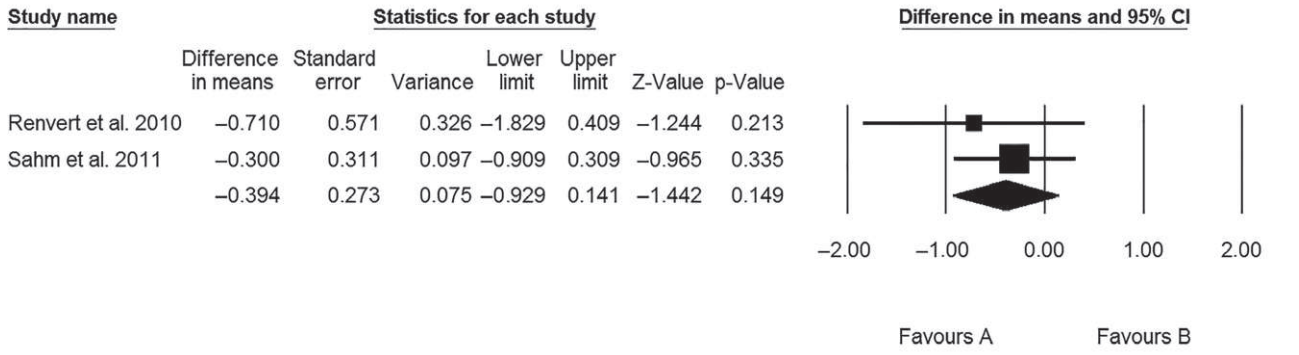
has been demonstrated to be less abrasive to titanium surfaces than sodium bicarbonate (Schwarz et al. 2009).

Both available RCT's failed to identify any superior effect of air polishing (i.e. adjunctive use and monotherapy) over mechanical debridement in either reducing clinical signs of inflammation (i.e. BI and BOP) or obtaining disease resolution at mucositis sites (Ji et al. 2014, Riben-Grundström et al. 2015). A significantly higher BI reduction in adjunctive air polishing was merely observed in one CCT (De Siena et al. 2014).

However, the present data analysis has pointed to an improved efficacy of glycine powder air polishing in reducing BOP scores after non-surgical treatment of peri-implantitis. WMD in BOP reduction between test and control groups was −23.83%. In this context, it must be emphasized that the rational for conducting a meta-analysis was to facilitate understanding rather than to strengthen the level of the available evidence (Jepsen et al. 2015). Moreover, due to methodological differences noted between both RCT's (Renvert et al. 2010, Sahm et al. 2011), the calculated WMD must be interpreted with caution. However, when considering the follow-up observation of the latter study population, it was noted that these improvements were maintained over a period of up to 12 months. The reported differences in mean BOP scores were 41.2 (SD:29.5)% in the test group and 16.6 (SD:33.4)% in the control group respectively (John et al. 2015). However, despite these clinically important improvements, a complete disease resolution could not be obtained by any of the treatment and maintenance protocols investigated (Renvert et al. 2010, Sahm et al. 2011, John et al. 2015). When further evaluating the outcomes of non-surgical treatment of peri-implantitis, it was also noted that WMD in PD reduction between test and control groups failed to reach statistical significance. In this context, it must be emphasized that BOP is the key parameter for the diagnosis of peri-implant mucositis (Lang & Berglundh 2011). Therefore, the "resolution of peri-implant



(a)



(b)

Fig. 2. Forest plot indicating weighted mean difference (95% CI) in the reduction of primary and secondary outcomes for the treatment of peri-implantitis. (a) Bleeding on probing. (b) Probing pocket depths.

mucosal inflammation as evidenced by the absence of BOP" was the suggested endpoint following non-surgical treatment of mucositis lesions. At peri-implantitis sites, a "composite outcome of disease resolution including the absence of deep PD with bleeding and suppuration" should be considered (Sanz et al. 2012). However, PD at implant sites may be influenced by several local factors, including the soft tissue thickness or vertical implant positioning, and therefore the classification of a "deep" pocket needs to be accomplished on an individual basis. Moreover, the definition of severity and extent of the disease must also include "proportions of affected implants per patient in the presence of multiple implants" (Jepsen et al. 2015). When considering the threshold levels for "deep" PD's, as employed in both studies investigated, the respective analyses also failed to identify any superiority of air polishing in reducing these critical pockets over control measures (Renvert et al. 2010, Sahm et al. 2011, John et al. 2015). Currently, there is only one study reporting on the microbiological outcomes following non-surgical treatment of peri-implantitis using an air-abrasive device. At 6 months after therapy, both test and control (i.e. Er:YAG laser) procedures failed to reduce the bacterial load (Persson et al. 2011), thus explaining at least in part, the frequency of residual BOP scores at specific sites (Renvert et al. 2010, Sahm et al. 2011). This might be due to a limitation of both devices to effectively remove hard deposits such as calculus from exposed implant surfaces (Speelman et al. 1992, Schwarz et al. 2003).

Finally, it must be emphasized that air polishing was not associated with any adverse events (e.g. emphysema formation), thus demonstrating clinical safety of this specific device for the supra- and submucosal debridement at mucositis and peri-implantitis sites (Renvert et al. 2010, Sahm et al. 2011, De Siena et al. 2014, Ji et al. 2014, John et al. 2015, Riben-Grundström et al. 2015).

In conclusion, the present systematic review and meta-analysis has indicated that glycine powder air polishing is as effective as the control treatments at mucositis sites. However, it may improve the efficacy of non-surgical treatment of peri-implantitis over the control measures investigated.

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Clinical Relevance

Scientific rationale for the study: This systematic review focused on the efficacy of air polishing on changing signs of inflammation following non-surgical treatment of peri-implant diseases.

Principal findings: While air polishing using glycine powder did not reveal any major improvement of bleeding index/ BOP or disease resolution at mucositis sites, it resulted in a significantly higher BOP reduction at peri-implantitis sites when compared with control measures (i.e. mechanical debridement with or without local antisepctic therapy, Er:YAG laser).

Practical implications: Air polishing may improve the efficacy of non-surgical treatment of peri-implantitis.