Efficacy of Glycine Air Polishing for the Maintenance of Dental Implants and Treatment of Peri-Implant Diseases: A Systematic Review

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BACKGROUND

Dental implants have become a widely-used, successful treatment option for edentulous and partially edentulous patients. Due to the biological composition of a dental implant, it is common for bacterial biofilm to adhere to both the implant as well as the gingiva encompassing it, causing inflammation. If left untreated, the accumulated plaque could lead to periodontal diseases such as peri-implant mucositis and peri-implantitis. Peri-implant mucositis defined by the American Academy of Periodontology is a reversible condition classified by inflammation around the soft tissues of the dental implant without signs of bone loss. When bone loss accompanies the inflammation, the condition is referred to as peri-implantits. Cement remnants have also been identified as risk factors for peri-implant diseases. The mean prevalence of these diseases respectively ranges from 19 to 65% for peri-implant mucositis and 1 to 47% for peri-implantits, therefore it is imperative to identify therapeutic nonsurgical maintenance protocols to remove subgingival biofilm and cement remnants. Subgingival air polishers (SAP) use a specially designed nozzle that accommodates subgingival insertion into sulci and pockets. Glycine powder, is a water soluable amino acid that has been shown to be effective at removing subgingival biofilm and safe to use on implant surfaces. When utilized with glycine powder, SAP has been shown to be a feasible and safe option in both implant maintenance and treatment of peri-implant diseases. SAP also minimizes the iatrogenic damage and discomfort that other instrumentation methods cause. Although studies have shown SAP to improve probing depths (PD), bleeding on probing (BOP) around dental implants, it is unclear if SAP is more superior to other nonsurgical methods in maintaining the health of dental implants and treating peri-implant diseases.

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OBJECTIVE

The purpose of this systematic review was to evaluate the clinical effectiveness of glycine air polishing (GAP) for the maintenance of dental implants with or without peri-implant diseases including per-implant mucositis and peri-implantitis.

METHODS & RESULTS

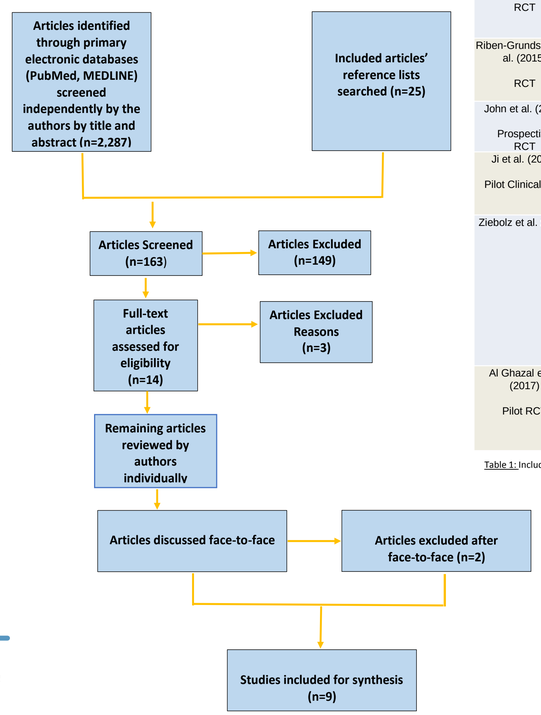

Figure 1: Flow diagram of literature search and inclusion

Publication Study Design	Groups	Treatment Provided	N Patients	Follow up period (months)	Diagnosis	Key Statistical Outcomes
Renvert et al. (2010) RCT	Laser	Er:YAG Laser	21	6	Peri-implantitis	**Mean PD reduction:** 0.8mm ±0.5 **Absence of BOP:** 25.0% at 6 months. Decrease was significant (p<0.001) **Suppration:** Decrease was significant (p<0.001) **Radiographic assessment:** Loss of 0.3mm (SD +0.9)
	Air-abrasive	PERIO-FLOW	21			**Mean PD reduction:** 0.9mm +0.8) **Absence of BOP:** 30.9% at 6 months. Decrease was significant (p<0.001). **Visible plaque:** Less plaque at 6 months compared to laser group. **Suppration:** Decrease was significant (p<0.001). **Radiographic assessment:** Loss of 0.1mm (SD + 0.8)
De Siena et al. (2015) OCT	Control	POH maneuvers	15	6	Mucositis	**PD:** 2.9mm ±0.4) BL to 3.0 mm ±0.6 (6 months) **BI:** 9 patients did not present bleeding at 6 months
	Test	Glycine SAP as adjunct to POH	15			**PD:** 3.0mm ±0.4 (BL) to 2.4mm ±0.5 (6 months); Significantly lower at 6 months compared to control group **BI:** 13 patients did not present bleeding at 6 months
Sahm et al. (2011) Prospective RCT	AAD	Air Flow Master	16	6	Peri-implantitis	**BOP:** 43.5 ± 27.7% **PD reduction:** 0.6mm ± 0.6 **CAL:** 0.4mm ± 0.7
	MDA	Carbon Curets				BOP: 11.0 ± 15.7% **PD reduction:** 0.5mm ± 0.6 **CAL:** 0.5mm ± 0.8
Persson et al. (2011) RCT	Laser	Er:YAG Laser	21	6	Peri-implantitis	**PD reduction:** 0.9mm ± 0.8
	Air-Abrasive	PERIO-FLOW	21			**PD reduction:** 0.8mm ± 0.5
Riben-Grundstrom et al. (2015) RCT	GPAP	PERIO-FLOW	19	12	Mucositis	**BOP:** 43.9 ±7.3% (BL) to 12.1 ± 3.8% (12 months). **PD ≥4 mm with bleeding/suppuration:** 30% ± 27
	US	air-flow Master Piezon	18			**BOP:** 53.7 ± 7.9 (BL) to 18.6 ±6.4 (12 months). **PD ≥4 mm with bleeding/suppuration:** 35% ± 36
John et al. (2014) Prospective RCT	AAD	Air Flow Master	18	12	Peri-implantitis	**BOP:** 41.2 ± 29.5%. **CAL:** 0.6mm ± 1.3 **PD:** 0.5mm ± 0.9
	MDA	Carbon Curetts & Chlorhexadine	12			**BOP:** 16.6 ± 33.4%. **CAL:** 0.5 ± 1.1 **PD:** 0.4mm ± 0.9
Ji et al. (2012) Pilot Clinical Trial	Control	OHI, traditional mechanical debridement	12	3	Mucositis	**PD reduction:** 0.91mm ± 0.98 **BI subject level:** 1.5 ±0.65 (BL) to 1.0 ±0.85 (3 months) **BI implant level:** 1.7 ±1.0 (BL) to 0.9 ±1.1 (3 months)
	Test	additional GPAP for PD≥ 4mm	12			**PD reduction:** 0.93mm ±0.93 **BI subject level:** 1.4 ± 0.57 (BL) to 1.1 ± 0.58 (3 months) **BI implant level:** 1.7 ± 0.93 (BL) to 1.1 ± 0.98 (3 months)
Ziebolz et al. (2017)	A	Curettes, sonic scaler, polishing w/ prophylaxis brush	26	12	Implant maintenance	**PD:** 1.75mm ± 1.23 (BL) 2.21mm ± 1.32 (12 months) **BOP%:** 0 (BL) 4.2 (12 months)
	B	Curette, air polishing, polishing w/ prophylaxis brush Group A + CHX varnish	27			**PD:** 1.77mm ± 1.58 (BL) 2.31mm ± 1.54 (12 months) **BOP%:** 11.5 (BL & 12 months)
	C	Group B + CHX varnish	28			PD: 2.67mm ± 1.63 (BL) 2.23 mm± 1.28 (12 months) **BOP%:** 0 (BL) 100.25 (12 months)
	D		24			**PD:** 2.00mm ± 1.38 (BL) 2.05mm ± 1.32 (12 months) **BOP%:** 4.8 (BL) 1 (12 months)
Al Ghazal et al. (2017) Pilot RCT	Contol	Titanium Curette	10	12	Implant maintenance	**PD:** 5.0mm ± 0.81 (BL) 4.2mm ± 0.78 (12 months) **BOP%:** 50.03 + 38.51 (BL) 57.71 ± 30.75 (12 months)
	Test	Air-flow Perio	9			**PD:** 4.3mm ± 1.49 (BL) 3.4 mm± 0.83(12 months) **BOP%:** 57.71 ± 30.75 (BL)17.78 ± 26.33(12 months)

Table 1: Included studies- Non-surgical treatment of peri-implant diseases and maintenance care

DISCUSSION

As dental implants continue to increase in popularity to replace missing teeth, implant maintenance and prevention strategies concerning peri-implant mucositis and peri-implantits are of great significance. All treatment modalities, including GAP concluded to be effective in the removal of subgingival bacterial biofilm as well as in the treatment of peri-implant diseases. The clinical trials evaluated in this systematic review also demonstrated:

- GAP to be a safe and effective way to remove bacterial biofilm from dental implants without causing tissue trauma or damage to the implant
- Of the nine studies, two showed a statistically significant reduction in BOP when using GAP
- When utilized in pockets 4-6mm, GAP is more effective in removing subgingival biofilm than other modes of debridement such as manual and ultrasonic instruments

Literature regarding the effectiveness of GAP is limited and therefore was a limitation to this systematic review. Other limitations included; the wide range of follow up periods and methodological differences between clinical trials

CONCLUSION

The use of GAP has beneficial effects in the maintenance of dental implants by significantly decreasing BOP, PD, and PI. Furthermore, GAP is effective in non-surgical treatment of peri-implant diseases. More clinical studies are needed to evaluate and develop standardized protocols for the use of GAP for the maintenance of dental implants and non-surgical treatment of peri-implant diseases.

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