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. Despite the success of implants as a treatment option, like teeth and periodontitis, they are susceptible to peri-implant diseases, which can significantly and rapidly compromise an implant and lead to loss. 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. The mean prevalence of these diseases respectively ranges from 19 to 65% for peri-implant mucositis and 1 to 47% for peri-implantits. As in periodontal disease, biofilm is the leading cause of peri-implant diseases, however several factors including the composition of a dental implants, placement/position, residual cement, and other biologic factors make implants susceptible to biofilm accumulation and inflammation. Regular professional maintenance and patient education on effective home care are imperative to preventing peri-implant diseases. Therefore, the identification and defining of peri-implant maintenance and non-surgical therapeutic protocols, coupled with home care protocols for patient education are critical.

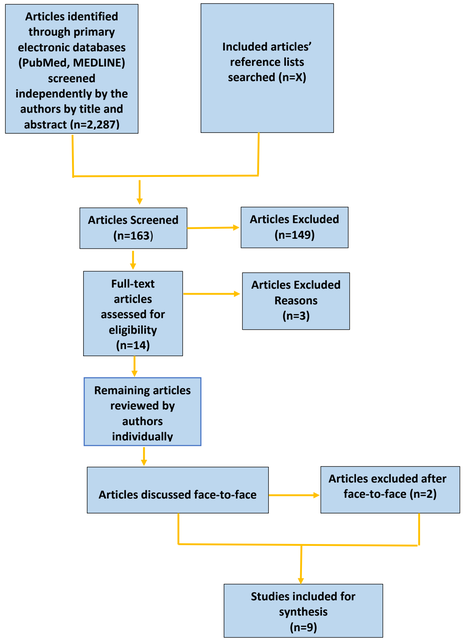
Subgingival air polishers (SAP) have been found to be safe and effective in implant maintenance and therapy. SAP are unique in that they use glycine, a water soluble amino acid that has been shown to be effective at removing subgingival biofilm and without damaging implant surfaces. The unique attachment of epithelium to the implant can make subgingival biofilm removal challenging for the clinician, and uncomfortable for the patient. SAP also minimizes the iatrogenic damage and discomfort that other instrumentation methods cause through the use of a specially designed nozzle that accommodates subgingival insertion into sulci and pockets. 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.

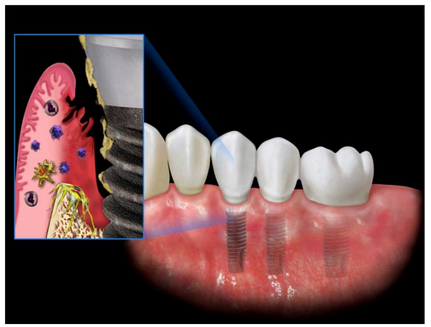
PURPOSE

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: Methods flow chart





Credit: https://www.facialartdentalforum.com/dentalcourses/mastermind/implant-care-practitioner-course/

Table 1: Systematic review study design and results of included articles

Publication Study Design	Groups	Treatment Provided	N Patients	Follow up period (months)	Diagnosis	PD Mean (SD) mm	BOP% Mean (SD)#	BI	PI	CAL Mean (SD) mm	Radiographic BL changes Mean (SD) mm
Renvert et al. (2010) RCT	Laser	Er:YAG Laser	21	6	Peri-implantitis	0.8 (±0.5) (reduction)	**Absence of BOP:** 25.0% at 6 months	NA		NA	-0.3 (±0.9)
	Air-abrasive	PERIO-FLOW	21			0.9 (±0.8) (reduction)	**Absence of BOP:** 30.9% at 6 month				-0.1 (± 0.8)
De Siena et al. (2015) OCT	Control	POH maneuvers	15	6	Mucositis	2.9 (±0.4) to 3.0 mm ±0.6)	NA	9 patients did not present bleeding at 6 months	5 patients did not present with plaque at 6 months	NA	NA
	Test	Glycine SAP as adjunct to POH	15			3.0 (±0.4) BL to 2.4 (±0.5) *		13 patients did not present w/ bleeding at 6 months	12 patients did not present w/ plaque at 6 months*		
Sahm et al. (2011) Prospective RCT	AAD	Air Flow Master	15	6	Peri-implantitis	3.8 (± 0.8) to 3.2 (±0.9)	94.6 (±15.8) to 51.1 (±24.7)*	NA	1.2 (±0.8) to 1.1 (±0.7)	4.8 ±(1.3) to 4.4 (±1.3)	NA
	MDA	Carbon Curettes	15			4.0 (± 0.8) to 3.5 (±0.8)	95.3 (±9.6) to 84.3 (±15.5)*		1.0 (±0.9) to 0.8 (±0.7)	4.8 ±(1.3) to 4.3 (±0.9)	
Persson et al. (2011) RCT	Laser	Er:YAG Laser	21	6	Peri-implantitis	0.9 (± 0.8) (reduction)	100% sites to 57.7%	NA	NA	NA	NA
	Air-Abrasive	PERIO-FLOW	21			0..8 (± 0.5 reduction	100% sites to 70.9%				
Riben-Grundstrom et al. (2015) RCT	GPAP	PERIO-FLOW	19	12	Mucositis	≥4 *with bleeding/ suppuration*: 30% ± 27	43.9 (±7.3) to 12.1 (±3.8)	NA	NA	NA	NA
	US	Air-flow Master Piezon	18			35% ± 36	53.7 (±7.9) to 18.6 (± 6.4)				
John et al. (2014) Prospective RCT	AAD	Air Flow Master	18	12	Peri-implantitis	3.7 (±1.0) to 3.2 (±1.1)	99.0 (±4.1%) to 57.8 (±30.7)*	NA	1.2 (±1.1) to 1.8 (±1.1)	5.2 (±1.9) to 4.6 (±1.8)	NA
	MDA	Carbon Curettes & Chlorhexadine	12			3.9 (±1.1) to 3.5 (±1.2)	94.7 (±13.7) to 78.1 (±30.0)		1.2 (±1.0) to 0.9 (±0.7)	5.0 (±1.5) to 4.5 (±1.3)	
Ji et al. (2012) Pilot Clinical Trial	Control	OHI, traditional mechanical debridement	12	3	Mucositis	4.5 (±0.50) to 3.6 (±1.0)*	NA	1.7 (±1.0) to 0.9 (±1.1)*	0.6 (±0.68) to 0.4 (±0.53)	NA	NA
	Test	additional GPAP for PD> 4mm	12			4.6 (±0.50) to 3.7 (±0.95)*		1.7 (±0.93) to 1.1 (±0.98)*	1.4 (±1.06) to 0.4 (±0.61)		
Ziebolz et al. (2017) Randomized Practice Based Multicenter Study	A	Curettes, sonic scaler, polishing w/ prophylaxis brush	26	12	Implant maintenance	1.75 (±1.23) to 2.21 (±1.32)	0 to 4.2	NA	NA	NA	NA
	B	Curette, air polishing, polishing w/ prophylaxis brush	27			1.77 (±1.58) to 2.31 (±1.54)	11.5 to 11.5				
	C	Group A + CHX varnish	28			2.67 (±1.63) to 2.23 (±1.28)	0 to 100.25				
	D	Group B + CHX varnish	24			2 (±1.38) to 2.23 (±1.28)	4.8 to 1				
Al Ghazal et al. (2017) Pilot RCT	Control	Titanium Curette	10	12	Implant maintenance	5.0 (±0.81) to 4.2 (±0.78)	50.03 (±38.51) to 9.99 (±16.10)	NA	NA	NA	No pathologic bone loss observed in both groups
	Test	Air-flow Perio	9			4.3 (±1.49) to 3.4 (±0.83)	57.71 (±30.75) to 17.78 (±26.33)				

*Statistically significant (p<0.05)
RCT= randomized clinical trial; OCT= observational clinical trial; AAD= air -abrasive device; MDA= mechanical debridement; GPAP= glycine powder air-polishing; US ultrasonic debridement; PD= probing depth; BOP= bleeding on probing; BI= bleeding index; PI= plaque index; CAL= clinical attachment level; BL= bone level

DISCUSSION

Implant placement is now common place with 500,000 being placed annually in the US. As such, implant maintenance and prevention strategies concerning peri-implant mucositis and peri-implantits are of great significance. The clinical trials evaluated in this systematic review demonstrated:

- GAP has comparable clinical results to traditional treatment modalities in the removal of subgingival bacterial biofilm
- GAP has comparable clinical results to traditional treatment modalities in the treatment of peri-implant diseases
- GAP to be safe and effective in the removal of bacterial biofilm from dental implants without causing tissue trauma or damage to the implant
- A statistically significant reduction in BOP when using GAP alone vs. traditional implant instruments
- A statistically significant reduction in BOP when using GAP as an adjunct to traditional implant instrumentation
- GAP to be more effective than traditional debridement modalities (ultrasonic, curettes) in the removal of subgingival biofilm in pockets 4-6mm

Limitations to this systematic review included a paucity of literature on GAP, a wide range of follow up periods, and methodological differences among the clinical trials published.

CONCLUSIONS

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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