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Research Article

**AIR POLISHING FOR DECONTAMINATION IN PERI-  
IMPLANTITIS**

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**Abstract:**

**Background:** Peri-implant disease is a condition of pathological inflammation that develop in the tissue surrounding a load-bearing implant which can lead to loss of the implant itself. Anaerobic plaque bacteria are considered risk factor with negative impacts on the peri-implant tissue health leading to peri-implantitis. Air polishing technique which first introduced as an alternative technique for removing biofilm and supragingival extrinsic stain.

**Aims:** define Air polishing technique and indicate the different between peri-implant mucositis and peri-implantitis and the risk factors related to them besides, evaluate the effectiveness of glycine powder air polishing on treatment of peri-implantitis.

**Methodology:** we depend on systemic review exploring different medical online databases about peri-implantitis and Air polishing techniques in any studies published from 2000 until 2019.

**Results:** 10 articles were included in the qualitative synthesis of the present review, three studies were systemic reviews, two studies were articles, one was an observational clinical trial and 4 studies were randomized Clinical Trial.

**Conclusion:** Peri-implantitis is one of the most complication of implant which has biological source considering that plaque is the most risk factors of peri-implantitis. Peri-implantitis occurrence is considering a critical risk factors of the success of the implant which can be a cause of implant loss if untreated. Different technique used to decontaminate the implant to prevent the infection and used also in treatment of peri-implantitis through complete debridement and removal of bacteria biofilm which have critical role in removing plaque. Air polishing seems to have a positive effect on improving oral hygiene of tissue surrounding the implant and decontaminate the implant of further plaque. Moreover, we found that air polishing using glycine powder is an effective way to remove the plaque, treatment of inflammation, improving oral hygiene and reducing bleeding on probing (BOP) with minimum side effect and prefect patients' compliance. However, we recommend further investigation to evaluate other powder than glycine powder and their effect on peri-implantitis. Moreover, further investigation should include exploring different factors affecting the efficiency of air polishing and factors that affect the success of implant itself.

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## INTRODUCTION:

Peri-implant disease is a condition of pathological inflammation that develop in the tissue surrounding a load-bearing implant. When this inflammation reaction takes place as well as with loss of supporting bone in the tissues that surrounds the implant, this called peri-implantitis. The incidence of peri-implantitis was reported to be between 5 % to 8% for selected implant systems. Some studies compared the prevalence of peri-implantitis with peri-implant mucositis which is another type of peri-implant disease, finding that the prevalence of peri-implant mucositis was ranged from 19 to 65 % compared with 1 to 47 % in peri-implantitis. While the weighted mean prevalence of periimplantitis was 22%, assessed in 2131 patients and 8893 implants.



Figure 1 Peri-implant diseases

In many studies, anaerobic plaque bacteria are considered risk factor with negative impacts on the peri-implant tissue health leading to peri-implantitis. This infection appears to occur at an incidence ranging from 0.5% to 3% per year. Another possible cause of peri-implantitis that it may related to inadequate distribution of chewing pressure on the tissue which surround the implant leading to loosening of the artificial supports as well as causing infection of the surrounding tissue and develop the inflammatory process.



Figure 2: Pre-implantitis and plaque buildup

Peri-implantitis is one of the biological complications that can lead to loss of the implant itself as it can result in bone loss around the implant. Considering that failed dental implant is lost implant

or one show peri-implant bone loss of greater than 1.0 mm in the first year and greater than 0.2 mm a year after. Dental implants supporting dental rebuilding are part of the oral environment of a significant proportion of the population and consequently, prevention of peri-implant diseases should be part of overall oral health care. Therefore, the optimal result of peri-implantitis treatment is regeneration of the lost implant supporting hard and soft tissues.

The bacterial infections of the mouth play a significant role in failure of the dental implants and considered a significant risk factor. The same bacteria are associated with both periodontitis and peri-implantitis. The most commonly known microorganism which is related to the failure of an implant are the gram-negative anaerobes as:

*Prevotella intermedia*

*Porphyromonas gingivalis*

*Aggregatibacter actinomycetemcomitans*

*Bacterioides forsythus*

*Treponema denticola*

*Prevotella nigrescens*

*Peptostreptococcus micros*

*Fusobacterium nucleatum*

To reduce effect of these agents that cause peri-implantitis, a healthy peri-implant tissue should be reserved as it plays an important role as a biological barrier which if destroyed, bacterial infection takes place and can spread directly to the bone causing its rapid destruction. Therefore, the oral microflora (the bacteria that is normally found in the mouth) seems to be a crucial factor for the success or the failure of a dental implant itself. However, once an implant surface is unprotected to the oral cavity, it becomes directly covered by a protein layer – the salivary pellicle – and is colonized by oral microorganisms, forming a microbial biofilm.

Therefore, plaque removal considered a key strategy in prevention and management of peri-implant disease according to the cause-related concept of therapy. Air polishing technique which first introduced as an alternative technique for removing biofilm and supragingival extrinsic stain and deposits at natural teeth as well as dental implants. Air polisher, unlike other conventional mechanical polishing as using handpiece with rubber-cup and prophylaxis paste, uses a light handpiece similar to an ultrasonic scaler to generate a slurry of pressurized air, abrasive powder and water in order to remove plaque biofilm and stains. Based on the up-to-date available in-vitro data, air abrasive devices seem to be effective in removing the biofilm from both machined and micro structured implant components without causing marked surface changes as 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.

Air polishing was first introduced to the dental profession in the late 1970s. The first air polishing device (APD), the Prophy Jet Marck IV™, was marketed by Dentron, Incorporated (Corpus Christi, Texas). Air polishing is safe, efficient and contemporary approach to plaque biofilm and stain removal having the advantages of less time, less operator fatigue, more efficient stain removal and its ability to reach to difficult places and close root proximities if compared with rubber-cup polishing.



Figure 3 air polishing

Generally, polishing is depending on two approaches; abrasion and erosion. In the time that

traditional polishing with rubber cup and polishing paste depend on abrasion approach which creates finer and finer scratches along with series of finer and finer abrasion. Air polishing depend on erosion one which the removal of dental stain and plaque by suspended abrasive particles within a moving fluid. Dr. Robert Black was the first one to use air polishing in 1945 with his device known as Air dent which used compressed air, water and abrasive powder in order to reduce pain during cleaning the mouth of his patients. Today, there is many types of abrasive powder is using with air polishing including sodium bicarbonate calcium carbonate or glycine powder.

### 1. Sodium bicarbonate-based powders (NaHCO<sub>3</sub>)

Powders depending on Sodium bicarbonate were the first powders to be used in air polishing technology. It is especially processed to form fine powder with particle size of up to 250 μm. This powder is considered very safe for many types of implants including enamel, amalgam, gold, porcelain, titanium implants. Several studies had confirmed the safety and efficacy of NaHCO<sub>3</sub> in supragingival use when compared to conventional scaling and rubber-cup polishing. No studies had not reported damage of enamel when NaHCO<sub>3</sub> used. Researchers and manufacturers cautioned against prolonged use on cementum, dentin and certain restorative materials such as composites.



Figure 4: Sodium bicarbonate-based powders (NaHCO<sub>3</sub>)

### 2. Subgingival air polishing:

This type of air polishing is different from the previous one in the substance used in polishing. In this type, Glycine powder which is considered as a distinct type is used as abrasive powder to remove subgingival biofilm.



Figs 2a to 2d Clinical application of air polishing for the nonsurgical treatment of peri-implantitis. (a) Clinical situation at baseline indicating profound BOP. (b) Nozzle tip designed for submucosal application (monotherapy). (c) Glycine powder air polishing is performed for 5 seconds per aspect. (d) Clinical situation at 3 months pointing to a marked BOP reduction.

Figure 5 Subgingival air polishing using glycine powder

Glycine is a naturally-occurring, water soluble and non-salty taste amino acid which produced significantly less surface damage on restorative materials when compared to other types as  $\text{NaHCO}_3$  depending powder. Moreover, using air polishing with glycine powder for subgingival plaque removal has a superior effect when compared with hand instruments in the removal of subgingival plaque in periodontal pockets of 3 to 5 mm

### 3. Clinpro Prophy Powder:

Clinopro™ glycine powder is one of glycine depending powder with particle size of 63  $\mu\text{m}$  or less which is up to 4 times less than the size of the particles of  $\text{NaHCO}_3$ . Clinopro™ glycine powder is a unique revolution in the technique of air polishing which has the ability to remove the pathogenic bacteria in the periodontal pockets with higher efficiency than other conventional plaque removal procedures.

Clinopro™ glycine powder has many characters including

- 3.1 Used for supra- and subgingival plaque biofilm removal
- 3.2 Has the ability to remove biofilm in periodontal pockets more efficiently and tenderer on dental tissues than conventional measures using cures and scalers.
- 3.3 Safe removal of plaque biofilm from soft root surfaces, dental restorations, implants and around orthodontic brackets
- 3.4 It abrades enamel and dentine surfaces significantly lesser than conventional sodium/calcium bicarbonate powder

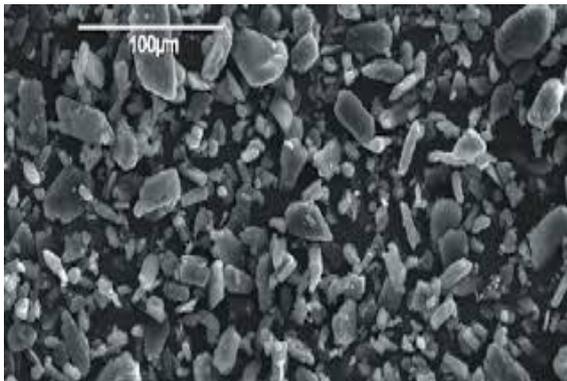


Figure 6: Clinpro Prophy Powder

### 4.AIR-FLOW® PERIO powder:

More finer grains of the abrasive powder allow the removal of unsafe biofilm and evacuate the microscopic organisms in subgingival pockets of up to 5mm. This product which depend glycine and because of the low specific-gravity of AIR-FLOW® PERIO powder and finer grain size of 25 microns, AIR-FLOW® PERIO powder is delicate and respectful of soft-tissue, gingiva, palatal areas and

natural tooth surfaces and can securely expel biofilm and light stain from the most sensitive of surfaces – inserts, rebuilding efforts, ortho materials, uncovered root surfaces, and so on. Besides, that the use of air flow units with this type of powder will be more agreeable for the patients due to its safety and that there is no thick or grainy surface and delayed flavor impression.

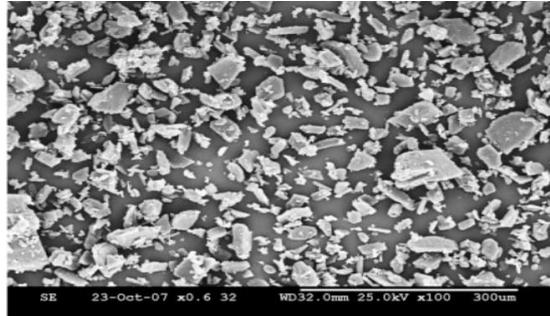


Figure 7 AIR-FLOW® PERIO powder

### 5.Air-Flow Soft powder:

It is another glycine-based particle of grain size ~ 65  $\mu\text{m}$  which is best used in patients who suffered from ill effect of sensitive teeth. The AIRFLOW powder SOFT has a good sweet taste and the ability to remove the biofilm and tooth stores while protecting delicate and hard tissue. It's ideal for youngsters, review and sensitive patients amid supragingival prophylaxis treatment.

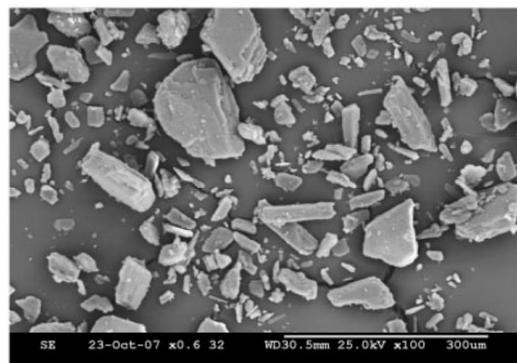


Figure 8 Air-Flow Soft powder

### 6.The AIR-FLOW® CLASSIC

The AIR-FLOW® CLASSIC is a powder that belong to bicarbonate powders which has quite recently been patched up with another equation: the CLASSIC COMFORT. The granule-metric size has been lessened by just about 40% for greatest patient solace, going from 65  $\mu\text{m}$  to 40  $\mu\text{m}$ . It's charming, it's delectable and similarly powerful at evacuating biofilm, stains, overwhelming pigmentation and youthful analytics.

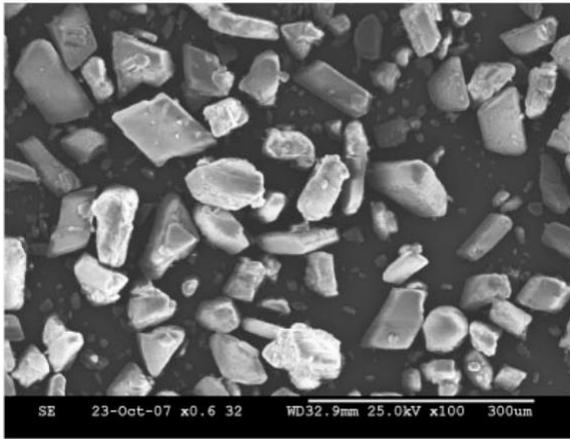


Figure 9 The AIR-FLOW® CLASSIC

### 7. Calcium sodium phosphosilicate powder:

Calcium sodium phosphosilicate powder is a bioactive glass which is developed exactly for use with air polishing procedures. A bioactive glass is a naturally occurring chemical compound which include calcium, phosphorus, silica and sodium. The manufacturer claims bioactive glass has been shown to promote the regeneration of damaged tooth surfaces creating an enamel-like layer when used in dental products and to have a more profound whitening effect as a polishing agent when compared to  $\text{NaHCO}_3$ . Properties related with bioactive glass allow Calcium sodium phosphosilicate powder to decrease dentinal hypersensitivity as well as get rid of plaque biofilm and stain. Calcium sodium phosphosilicate powder has ability to reduce dentin permeability by occluding the dentinal tubules when used during both of air polishing and conventional rubber-cup polishing procedures with a mechanism of action similar to  $\text{NaHCO}_3$ . Moreover, Calcium sodium phosphosilicate powder has the ability to reduce dentinal hypersensitivity when compared to  $\text{NaHCO}_3$ .

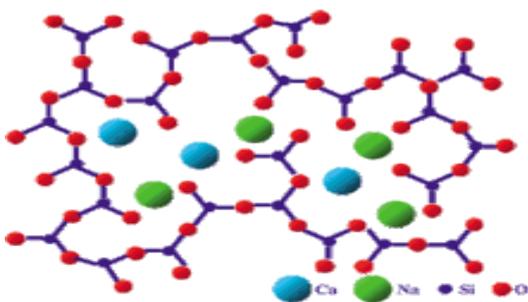


Figure 10 Bioglass of Calcium sodium phosphosilicate powder.

**8. Calcium carbonate ( $\text{CaCO}_3$ ) (Prophypearls™)**  
**Prophypearls™** is another air polishing powder that is characterized with its spherically agglomerated crystals. It is assumed that use of this mass of uniformly shaped round crystals will minimize surface abrasion when compared to the irregularly shaped particles found in other powders. **Prophypearls™** granules has the particle size of 45  $\mu\text{m}$  which is less than  $\text{NaHCO}_3$ , but similar in size to the particles in glycine. However, **Prophypearls™ has higher** efficiency and effectiveness for stain removal, defects produced on root dentin were greater than that of  $\text{NaHCO}_3$ .

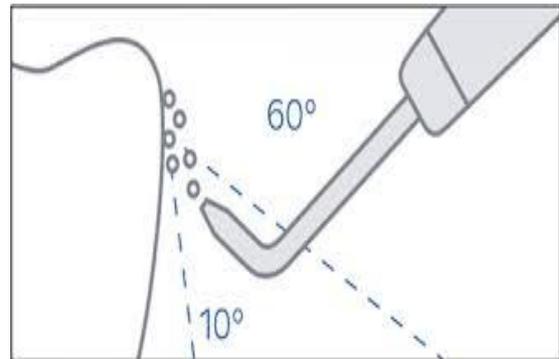


Figure 11 The effect of spherically agglomerated crystals

### 9. Aluminum trihydroxide ( $\text{Al}(\text{OH})_3$ ) (JET-Fresh™)

Aluminum trihydroxide is an alternative air polishing powder for patients on sodium restricted diets. Aluminum trihydroxide particles are harder but comparable in size to sodium bicarbonate. When the effects of aluminum trihydroxide on certain restorative materials, including amalgam, gold, hybrid and microfilled composites, glass ionomers and porcelain had been examined, it was determined that aluminum trihydroxide should be avoided on cast restorations, luting cements, glass ionomers and resin composites.

#### Study objectives:

- 1- Define Air polishing technique and indicate the different between peri-implant mucositis and peri-implantitis
- 2- Exploring the different risk factors of peri-implantitis.
- 3- Evaluate the effectiveness of glycine powder air polishing on treatment of peri-implantitis
- 4- Identify the different side effect of using Air polishing
- 5- Evaluate the efficacy and safety of non-surgical treatment of peri-implantitis.
- 6- Identify efficacy of air polishing on changing signs of inflammation compared with control treatments

5- Suggest some requirements in designing air polishing in way support its work safety.

### The Statement of the problem

One of the most causes of failure of implants is peri-implantitis which result from the formation of sub-gingival biofilm due to the inflammation of peri-implantitis. Plaque is the most risk factor for peri-implantitis which is a result of the rough surface of the implant which support bacteria invasion of implant causing inflammation and pain. Therefore, periimplantitis is considered as infection caused by bacteria. peri-implant mucositis or peri-implantitis happen as a result to plaque or biofilm colonization around the implant surface. Peri-implant mucositis and peri-implantitis consider a increasing problems that threaten the efficacy and success of implants and may lead to implant loss. The incidence of peri-implantitis was reported to be between 5 % to 8% for selected implant systems. Therefore, finding an effective and safe technique to clean and decontaminate the implant is very critical to ensure the success of implant itself and increasing implant survival rates. Air polishing is one of the techniques used today to improve oral hygiene of the surrounding place of implant in order to support the implant. Besides, air polishing is an effective way to clean the infected implant. Besides, Air polishing is considering a safe, efficient and contemporary approach to plaque biofilm and stain removal having the advantages of less time, less operator fatigue, more efficient stain removal. However, it is essential to assess the efficacy of air polishing technique in improving oral hygiene and ensure its safety and if it accompanied with any side effects. In this study, we focused on glycine powder as it is one of the techniques with promising effects and produce significantly less surface damage on restorative materials when compared to other types as NaHCO<sub>3</sub> depending powder.

### The questions of the study

- 1- What is the difference between peri-implant mucositis and peri-implantitis?
- 2- What is the definition of air polishing?
- 3- What is the advantage of glycine powder over other powders?
- 4- What does the impact of air polishing on a titanium surface?
- 5- What is the efficacy of air polishing on preventing Inflammation associated with dental implant?

### The methodology of the study:

In this review, we depend on systemic review exploring different medical online databases as Google Scholar NHS evidence, TRIP database, PubMed database Cochrane library, Cambridge LibGuides and EMBASE about peri-implantitis and Air polishing techniques in any studies published from 2000 until 2019. Moreover, Keyword, medical

subject heading (MeSH) and text words related to peri-implantitis and air polishing were chosen carefully to reach the most proper studies from each database. Air polishing, glycine powder, peri-implantitis, peri-implant mucositis, efficacy and safety are the most key word used. In addition, the reference lists of the included articles as well as of relative reviews were searched for the identification of possibly relevant studies. For studies published in more than one language, the English version is used. After choosing studies, each article was tested for reliability of authors, publisher and university where study conducted.

## RESULTS:

### Study selection

The electronic search strategy conducted in this review ended in 6126 hits which after removing of duplicated reduced to 2130 studies. These number reduced to 80 studies after sequential elimination of 2050 studies on the basis of title and abstract. These 80 studies were considered eligible for further evaluation, from which 70 studies were excluded for different reasons; some problem in credibility, conducted on animal samples, or being a kind of authors' ideas or review. At end, 10 articles were included in the qualitative synthesis of the present review (figure 1).

### General results: ❖

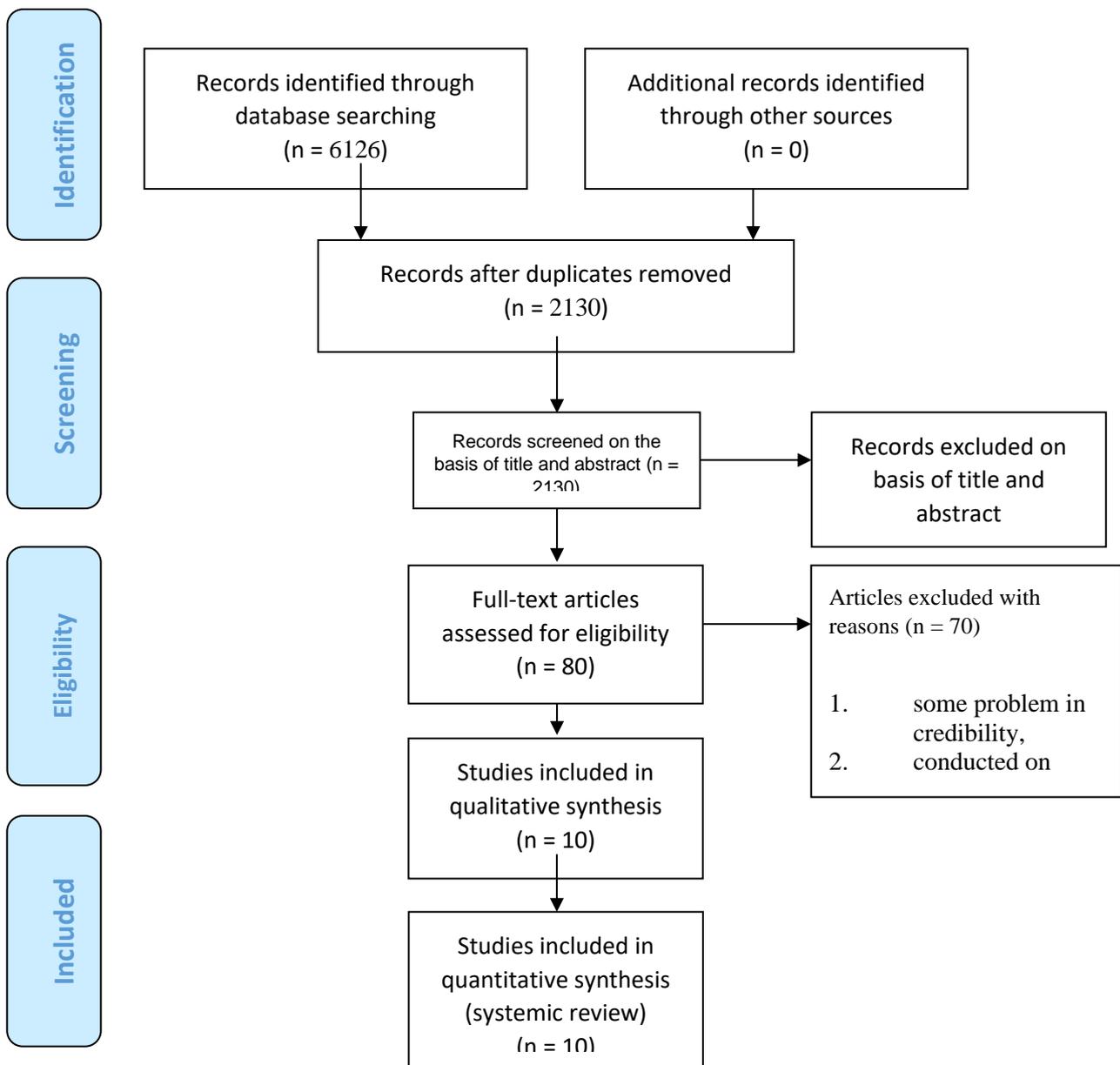
The general characteristics of the ten included articles are presented in brief in Table 1. Three studies were systemic reviews (2, 5, 6), two studies were articles (1, 7), one was an observational clinical trial (8) and 4 studies were randomized Clinical Trial (3, 4, 9, 10). The majority of these studies took place in University settings in different countries (Germany, Turkey, Switzerland, Italy, USA, Ireland and Sweden) and had been published as journal papers and/or dissertations in English between 2000 and 2020.

### Results of individual studies ❖

Firstly, we defined Air polishing as an alternative technique for removing biofilm at natural teeth and dental implants. Considering biofilm of dental implants, air abrasive devices seem to be effective in removing them from machined and micro-structured implant components without causing marked surface changes. Air polishing is applicated with specific device using a reduced air pressure and a plastic nozzle in order to increase submucosal accessibility and prevent emphysema formation during nonsurgical treatment of peri-implant mucositis and peri-implantitis (1). The difference between peri-implant mucositis and peri-implantitis is summarized as peri-implant mucositis is an inflammation of the soft tissues adjacent to a dental implant diagnosed with bleeding on gentle probing. However, if the clinical signs are combined with bone loss, it is then called peri-implantitis. Both conditions are resulted when the oral cavity is

exposed which is lead to colonization of microorganism on the implants. Then this accumulation of microorganism would lead to formation of biofilm on the implant surface which in turn triggers the host response and initiates the inflammation reaction and cause peri-implant tissue destruction (9). In considering peri-implantitis, we explored the risk factors which is defined as environmental, behavior or biological factor that its presence increases the chance of occurring a disease and vice versa. The most common risk factor that related significantly with peri-implantitis is plaque accumulation on implants. Other risk factors include smoking which considered an independent risk

factors, exposure to radiation therapy, diabetics, gender and function time of implants (2). Risk factors related to peri-implantitis is related to recipient site, inaccessibility to oral hygiene measures, smoking and susceptibility to periodontitis as well as remnants of cement (9). Considering plaque is the most common risk factor in peri-implantitis, anti- infective therapy must applicated including professional mechanical plaque removal, application of antiseptics and administration of antibiotics as well as effective oral hygiene home care program in order to reduce the number of pathogens (3).



NO.	Authors	Publish year	tools	Country	Aims
1	H. Düsseldorf et. al	2015	article	Germany.	Air polishing definition
2	Jepsen S et. al.	2015	systemic review	Germany;	Risk Indicators for Peri-implant Mucositis  Efficacy of Measures to Manage Periimplant Mucositis
3	Ates- Parlar	2009	randomized Clinical Trial	Turkey	The aim of this study was to develop an experimental model in which the effects of both decontamination methods and implant surface configurations on both bone volume gain and re-osseointegration of dental implants exposed to peri-implantitis can be evaluated.
4	Andrea Cochis	2012	randomized Clinical Trial	Italy	The aim of the present study was to evaluate morphological changes induced by glycine powder air polishing on titanium surfaces and its effect on bacteria recolonization in comparison with sodium bicarbonate powder.
5	Manoj Muthukuru	2012	a systematic review	USA	to evaluate the efficacy and safety of non-surgical treatment of peri-implantitis.
6	Schwarz F	2015	a systematic review	Ireland	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)?
7	ELENA FIGUERO	2000	article	unknown	
8	F De Siena	2014	an observational clinical trial	Italy	The aim of this study was to make a comparative evaluation of professional oral hygiene with or without the

					adjunct of glycine air-powder system for the treatment of peri-implant mucositis.
9	Caroline Riben-Grundstrom1	2015	randomized clinical trial	Sweden,	To evaluate the clinical treatment effects of a glycine powder air-polishing or ultrasonic device on peri-implant mucositis.
10	Thomas F. Flemmig	2011	randomized Clinical Trial	USA	This study assesses efficacy and safety of subgingivally applied glycine powder air polishing (SubGPAP) in moderate-to-deep periodontal pocket

The water jet emerging from the tip of the nozzle in itself may not be sufficient in removing subgingival biofilm because previous studies have found no reduction in viable bacterial counts after subgingival irrigation with water alone. Amino acid "glycine" particles seem to be less abrasive with the same effectiveness in removing biofilm when compared with sodium bicarbonate (Density = 2.16 and 1.61 g/cm<sup>3</sup>, respectively) (1). When comparing glycine powder air polishing with other mechanical debridement with or without local antiseptic therapy, or Er:YAG laser monotherapy, glycine powder air polishing was as effective as the control treatments at mucositis sites and it resulted in a significantly higher bleeding on probing (BOP) reduction following nonsurgical treatment of peri-implantitis. Moreover, no studies showed an adverse effect after air polishing using glycine powder in nonsurgical treatment of mucositis and peri-implantitis. Application of pressurized spraying with sterile saline for 3min using an air polishing device gave the most favorable results in situ cleansing of the contaminated ELLC (3). Considering evaluating the efficiency and safety of Glycine powder, glycine powder air polishing seems to be quickly effective at reducing the subgingival cultivable microflora in shallow periodontal pockets. It was accompanied with no side effect on gingiva which cause less damage to gingival epithelium in pockets less than curette instrumentation may do. This technique using glycine powder is useful in other application as transcutaneous bone implant devices. However, the study did not indicate a statistically significant difference in modifying the grade 2 titanium surface between the air polishing procedures and baseline. Although it gives good results considering inhibition of biofilm formation on the surface previously treated with both air-polishing techniques (4). Moreover, non-surgical treatment of peri-implantitis using glycine powder air polishing resulted in statistically significant higher BOD reduction than mechanical debridement + local antiseptic therapy

(i.e. chlorhexidine digluconate) at 3, 6 and 12 months after the therapy however, no difference had been noticed between assessment at different interval with no signs of inflammation complication, allergic reactions in form of redness of the surrounding soft tissue or emphysema after treatment with glycine powder air polishing. Furthermore, the adjunctive single application of glycine powder air polishing was associated with lower incidence of bleeding sites with no complaints or discomfort reported by any of patients when compared with the control group treated with other techniques. As well as, the application of glycine powder air polishing was associated with significantly higher bleeding index (BI) and PD reduction when compared with mechanical debridement alone (6). In contrast to air-abrasive system using air-spray of sodium bicarbonate that used only for polishing and removing tooth stain and cannot be used for implant instrumentation due to their high abrasiveness that cause damage if hard and soft tissue, air abrasive glycine powder is effective method in removing of biofilm from the root surface without damaging hard and soft tissue. Therefore, air abrasive glycine powder is recommended for debriding implant surfaces. Air abrasive glycine powder is sprayed using specially designed nozzle consists of thin, flexible, plastic tube that is fitted with three orthogonally orientated holes. This design is the cause of horizontal exit of the air-powder mixture and the reduced pressure which is related with low incidence of emphysema in the adjacent tissue (7). It was noticed that resolution of inflammatory conditions were slightly superior positively in patient treated with professional oral hygiene including debridement of plaque and calculus from the abutment and prosthetic surface using manual Teflon curettes followed with submucosal glycine application through air-abrasive device rather than patients treated with only professional oral hygiene without using glycine powder after 6 months in terms of BI and PI (8). When comparing glycine powder with

other standard air-abrasive powder, it was noticed that glycine powder was not produce any alteration in the titanium surface characteristics and this was not affected by the distance or the angulation of the air-abrasive spray with positive effect on the mitochondrial activity of SaOs-2 cells, which possess several osteoblastic features that may lead to an increase of biofilm formation and plaque accumulation (8). However, the results showed after the treatment with both glycine powder air-polishing and ultrasonic device showed positive efficiency as a non-surgical treatment of peri-implantitis. Glycine powder air polishing showed higher effectiveness in removing plaque as 8 % of the sites in glycine powder air polishing compared to 17 % of the sites in ultrasonic treatment were still diseased after 12 months after treatment (9). It is found that subgingivally applied glycine powder air polishing (SUBGPAP) is associated with lower total viable bacterial counts indicating its efficacy in removing biofilm in moderate- to-deep periodontal pockets when compared to SRP. This results may related to the low abrasive property of the glycine powder air jet and its subgingival delivery by the air-polishing device that was used. After SubGPAP alone, recolonization of putative periodontal pathogens in moderate-to-deep periodontal pockets has been found as early as 7 and 14 days after debridement (10).

### DISCUSSION:

In this review, we aimed to define both of peri-implantitis condition and Air polishing technique. As well as, determining efficacy of air polishing on preventing Inflammation associated with dental implant and efficacy of glycine powder and the impact of air polishing on a titanium surface. In order to achieve the aim of the study, we explore database of PubMed about studies exploring these questions. The research ended in ten studies which their citation provided at the end of this review.

The results of this study can be summarized in the next points:

- 1.The definition of the peri-implant mucositis is an inflammation of the soft tissues adjacent to a dental implant. While the definition of peri-implantitis is the peri-implant mucositis combined with bone loss.
- 2.Air polishing is defined as alternative technique for removing biofilm at natural teeth and dental implants using specific device using a reduced air pressure and a plastic nozzle. Chowdhary, Z, 2018, defined the polishing as the implementation of making the tooth surface smooth and lustrous.
- 3.Risk factors of peri-implantitis including mainly plaque, smoking, exposure to radiation, gender and function of time of implants.

- 4.Amino acid "glycine" particles seem to be less abrasive with the same effectiveness in removing biofilm when compared with sodium bicarbonate
- 5.Glycine powder air polishing was as effective as the control treatments at mucositis sites and it resulted in a significantly higher bleeding on probing (BOP) reduction following nonsurgical treatment of peri-implantitis.
- 6.Glycine powder air polishing was accompanied with no side effect on gingiva which cause less damage to gingival epithelium in pockets less than curette instrumentation may do.
- 7.Air abrasive glycine powder is recommended for debriding implant surfaces.
- 8.Glycine powder did not produce any alteration in the titanium surface characteristics which was not affected by the distance

### Literature review:

Petersilka et al., described the effect on periodontal tissues (gingiva) of glycine powder air-abrasion versus bicarbonate powder and hand-instrumentation. The authors showed that glycine powder resulted in minor erosions of the gingival epithelium if compared to other treatment options. This might be considered in the light of the results of the present study, because a less traumatic effect on tissue could have caused the beneficial effect on PD measurements.

**Chowdhary** et. al. showed that the main purpose of polishing is to smoothen the surface of the tooth and minimize the deposition of plaque to allow a healthy periodontal maintenance post scaling. They ended in that polishing with rubber cup was more effective and statistically significant when compared to bristle brush polishing and air polisher for the crown and root surface smoothening and debris removal

Hongsathavij who conducted his study to to compare the stain removal efficacy of sodium bicarbonate powders with grain sizes of 65 and 40  $\mu\text{m}$  finding that the 40  $\mu\text{m}$  sodium bicarbonate powder removed dental stains as efficiently as the 65- $\mu\text{m}$  powder. Powder handling. They also assess the compliance of patients of both particle size finding that most of the patients' answers corresponded to the categories of "good" and "excellent", and there was no significant difference in patient acceptance between the two powders.

### Recommendations of the study:

1- Firstly, we should notice that there is a need for investigations to evaluate other powder than glycine powder and their effect on peri-implantitis. Moreover, further investigation should include exploring different factors affecting the efficiency of air polishing and factors that affect the success of implant itself.

2- Glycine powder seems to have advantage over other powder used in air polishing. It accompanied with less abrasive effects on soft tissue, higher bleeding on probing (BOP) reduction following nonsurgical treatment of peri-implantitis and with no side effect on gingiva.

3- Special design for air polishing is required to debride the implant surfaces. This design should have special nozzle, which should be thin adaptable with plastic tube. The design also needs to have horizontal exit of the air-powder mixture and reduced pressure

### CONCLUSION:

Peri-implantitis is one of the most complication of implant which has biological source considering that plaque is the most risk factors of peri-implantitis. Peri-implantitis occurrence is considering a critical risk factors of the success of the implant which can be a cause of implant loss if untreated. Different technique used to decontaminate the implant to prevent the infection and used also in treatment of peri-implantitis through complete debridement and removal of bacteria biofilm which have critical role in removing plaque. Air polishing seems to have a positive effect on improving oral hygiene of tissue surrounding the implant and decontaminate the implant of further plaque. Moreover, we found that air polishing using glycine powder is an effective way to remove the plaque, treatment of inflammation, improving oral hygiene and reducing bleeding on probing (BOP) with minimum side effect and perfect patients' compliance. However, we recommend further investigation to evaluate other powder than glycine powder and their effect on peri-implantitis. Moreover, further investigation should include exploring different factors affecting the efficiency of air polishing and factors that affect the success of implant itself.

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