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# Subgingival Air Polishing in Dentistry

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SUBGINGIVAL AIR POLISHING IN DENTISTRY

A Capstone Experience/Thesis Project

Presented in Partial Fulfillment of the Requirements for

the Degree Bachelor of Science with

Honors College Graduate Distinction at Western Kentucky University

By:

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2015

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## ABSTRACT

Modern statistics have shown that periodontal disease is highly prevalent in today's society. Periodontal disease has detrimental effects to the oral cavity, including: bone loss, recession, and tooth mobility. A strong correlation has been linked to the use of the subgingival air polisher on patients with active periodontal disease and the regression of the disease after being treated with the device. This is being compared to traditional hand-scaling beneath the gingiva margin which is less efficient in removing biofilm subgingivally. Recent studies (Petersilka et al.) are confirming this to be true by treating patients with both hand-scaling and the subgingival air polishing on root surfaces. This project will discover the correlation between periodontal disease regression and the subgingival air polisher. The results of this study indicated that the use of the subgingival air polisher is minimal, even though the benefits of its use on patients are prominent.

Keywords: Dental Hygiene, Subgingival Air Polisher, Periodontal Disease, Honors College

Dedicated to

My family and friends who have been my rock throughout my college experience.

Without the support that was given daily from them, this would not have been possible.

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## CHAPTER 1

### INTRODUCTION

According to the Centers for Disease Control (CDC), periodontal disease and tooth decay are the two biggest threats to dental health. A recent report from the CDC stated that 47.2% of adults who are 30 years and older have some form of periodontal disease. The report also stated that as the age of the population increases to 65 years and older, an alarming 70.1% of the population has periodontal disease.

Given the pervasiveness of periodontal disease in our society, one might wonder why periodontal disease is not being treated more seriously by individuals. A major issue may be that people are not visiting their dentist regularly concerning how to handle plaque removal and the techniques to do so. Another factor could be that patients are not doing as they should to keep their mouths as clean as they need to be. But, once periodontal disease is established in an individual, there is no reversing the effects of the disease. There will be no way to gain back the bone that has already been lost and patients will continue to see an increase in recession of their gingival tissue as well as mobility of the teeth unless the disease is stopped.

A new technology, known as subgingival air polishing, is now being utilized by dental personnel to create smooth, plaque-free surfaces beneath the gingiva of patients with active periodontal disease. Not only does the device have the ability to effectively

remove plaque from a tooth and root surfaces, it has the ability to lessen the chance that plaque will re-attach as easily to the surfaces as time passes.

## CHAPTER 2

### REVIEW OF LITERATURE

A review of the literature regarding subgingival air polishing in dentistry, and more specifically its use on patients with periodontitis, involves various topics. These topics include: knowing what periodontal disease is, knowing how the subgingival air polisher works, and knowing the end results after patients are treated with the device. From reviewing the different literatures, it is recognized that there is a positive effect in the oral cavity of patients with periodontitis after being treated with the subgingival air polisher. The chapter will summarize what has presently been published about the device, as well as suggest areas that will require more extensive research.

#### *Periodontal Disease*

With any disease, there is a prominent bacteria that influences the occurrence and progression of the disease. Many studies have been conducted in order to determine the main bacteria that reside in the oral cavity in regards to periodontal disease. The specific bacteria of periodontal disease have been established as being *porphyromonas gingivalis* and *actinomyces actinobacillosis*. In addition to these bacteria, there is also another factor that is present in these patients; bleeding. Periodontal disease, also known as periodontitis, is a disease that not only affects the gingiva of the oral cavity but, also the alveolar bone that holds the teeth in place. Destruction of this bone is what accounts for the increased mobility of teeth in the mouths of patients that have this disease.

### *Subgingival Air polisher*

Subgingival air polishing is a relatively new advancement for the dental community that has the potential to improve the overall oral health of patients with periodontitis. Supragingival air polishing has been around since the 1970's; however, it was not until recently that subgingival air polishing has been advanced to be offered as an adjunct to oral hygiene therapy. Dr. Thomas Flemmig has researched the device extensively. So, how does the subgingival air polisher work?

The subgingival air polisher goes beneath the gingival margin in order to gain access into deep or shallow periodontal pockets. The way that it is able to do this is through the design of the subgingival air polisher's nozzle. The nozzle is the portion that goes below the gingival margin and it consists of a thin and flat end that can painlessly ease into the involved pockets. Connecting to the nozzle is the tank which is used to hold the particles that are to be released from the nozzle. The tank can come in a variety of colors that can differentiate what flavor that is in the tank and the actual particles that are inside the tank. The purpose of coordinating these colors is to make choosing the correct tank easier for dental professionals.

Inside the tank, there is a substance called glycine powder. Glycine powder is the favored abrasive material of choice for its particle diameter size as stated by Flemmig (2007). The particles are small, averaging around 25  $\mu\text{m}$ , which is considerably smaller than the other abrasive materials that are used for the supragingival air polisher. The reason for choosing a material consisting of a small diameter size is because it reduces the discomfort to the patient and more importantly reduces the chance of trauma to the delicate tissues and surfaces of the tooth beneath the gingival margin.

The subgingival air polisher has specific steps to its use. The special subgingival air polishing nozzle is inserted beneath the gingival margin to access the sulcus of periodontal pockets. The glycine powder, combined with force from air and water, it then acts to remove debris and plaque from root surfaces. Biofilm is removed in a coronal to apical direction. While the nozzle is still inserted beneath the gingiva, the clinician will rinse briefly with water from the nozzle before insertion into the next pocket. The water helps to remove the excess glycine powder particles from the periodontal pocket and keep the tooth moist. Moëne (2010) has shown this to be the most effective way to cleanse the periodontally-infected sites.

#### *Patient Treatment*

There are several beneficial reasons for using subgingival air polishing. Petersilka et al. (2003) have shown that this method removes more biofilm from the tooth surface than traditional subgingival plaque removal with a curette. Their study consisted of treating 23 patients using the subgingival air polisher on two teeth (test) and then treating two additional teeth in the patient's mouth with a curette (positive control). Two supplementary teeth that were not treated with any periodontal therapy were also sampled for subgingival bacterial microflora to compare to the microflora left after being treated with the test and positive control.

The results of the study confirmed that there was a significantly greater reduction in subgingival bacterial counts on the teeth which were treated with the subgingival air polisher. The low abrasive use of the device is superior to curettes in removing subgingival plaque at sites with up to 5mm of probing depths. With biofilm superiorly

removed from the tooth surface, this will ensure that calculus and stain will not adhere as easily to the tooth and root surfaces.

Studies by Wennström et al. (2007) have shown a decrease in subgingival calculus formation between dental visits after subgingival air polishing is performed on patients. Additionally, their research has shown a decrease in gingival inflammation after a patient receives subgingival air polishing treatment. The study included using 20 recall patients who had previously been treated for chronic periodontitis. Sites with probing depths of 5-8mm that had bleeding were randomly assigned and used to be treated by the subgingival air polisher. Other sites with the same qualities were treated by ultrasonic instrumentation. A microbiological analysis of subgingival bacteria was performed immediately after the initial debridement and again at two and fourteen days after treatment.

Results from the study confirmed that both procedures removed significant amounts ( $p < 0.05$ ) of bacterial species that caused periodontitis but more bacteria was removed by using the subgingival air polisher containing glycine powder. The patient's gingiva presented with minimal inflammation immediately after at two days and again at fourteen days post-treatment.

When it comes to periodontal debridement, a major focus of the procedure is knowing the depths of each pocket. After removal of the calculus beneath the gingival margin, it is essential to leave each surface plaque-free, with no remaining stain that bacteria could potentially reattach to. A study researched by Pence (2015) proved that with the advantageous nozzle shape, plaque can be removed from deeper pockets that measure up to 10mm. This is important to take into consideration when using hand

instrumentation. Patients are not required to be numb for the use of the subgingival air polisher which is opposite when scaling beneath the gingiva. To combat this, most patients will require the use of a local anesthetic to numb the area in order for the clinician to gain access to the deepest portion of the pocket with a hand instrument. This is yet another reason why it is not only beneficial to the patient, but also strategic for the clinician.

Other benefits to the use of the subgingival air polisher include decreasing appointment times. A study performed by Davis (2013) showed that air polishing takes the hygienist only about five seconds per root surface, meaning the hygienist is able to subgingivally air polish an entire dentition in about nine minutes, which is much faster than traditional root debridement methods with hygiene instruments. On average, a hygienist can increase their patient turnover to twelve patients per day, which has the potential to increase the profit made by the dental office due to less time spent per patient.

Another important aspect of the subgingival air polisher is that it can be used on dental implants. Implants, a restorative alternative, are growing in popularity for the esthetic appeal as well as their success rate. Removing biofilm that may grow on the titanium can help to ensure better acceptance in the oral cavity of the dental implant. Davis (2013) confirmed that patients who have active peri-implantitis that were treated with the subgingival air polisher, saw dramatic healing in the area that was infected. Subgingivally air polishing the implant improved the stability of the implant and stopped further bone destruction.

A major concern about the use of the subgingival air polisher is that the pressure of the device may cause trauma to the gingival epithelium. A study was conducted by Petersilka and others (2008) in order to determine if there was any sulcular trauma in patients with at least 5mm periodontal pockets when treated with the device. Ten patients were selected to be treated with the subgingival air polisher and with the standard hand instrumentation. In each group subgingival biopsies were taken immediately after treatment and then again fourteen days later. The damaged epithelium was assessed by light microscopy and quantified by a histological score ranging between values of 1 to 4. The test used to determine the differences between the two groups being treated was the marginal homogeneity test.

The results of the study found that the areas in the patients' mouths that were treated with the subgingival air polisher had less damage to the sulcus (scores of 1 and 2) as opposed to the areas in the mouth that were treated with hand instrumentation (scores of 2-4). The areas that were treated with the subgingival air polisher showed that all of the gingival epithelium remained intact with minimal ulcerations. This study not only benefited the patients by removing irritating biofilm and bacteria from the surface but the resulting data also helped to support the safety and efficacy of this new debridement technique.

### *Summary*

This literature review has helped to elaborate on the importance of using the subgingival air polisher on patients with active periodontal disease. While the aspects of what periodontal disease is, what the subgingival air polisher is, and how patients have

responded to the therapy have been discussed, there is still more to be learned about the device.

The current study will include a survey for local periodontists containing six questions that will help to establish the success that they have had with subgingival air polisher. Although the device is new and many not be common in periodontal offices at the time, any information that can be gathered from these periodontists will be incorporated in the study. The next chapter will describe the methodology used to conduct the study.

## CHAPTER 3

### METHODOLOGY

A six-question survey (Appendix A) was created to be answered by periodontists about the subgingival air polisher. The target profession for the survey was periodontists because they are most likely the group of dental professionals to be working with patients who have active periodontal disease. The survey questions focused on whether or not the periodontist has purchased the device. If the participant answered yes, the remaining five questions were to be answered. If the participant answered no, the remaining questions would not be applicable to them.

The area chosen for the surveys were Elizabethtown and Bowling Green, Kentucky, where fifteen periodontal offices were contacted regarding the subgingival air polisher. As of April 15, 2015, the researcher discovered that none of the periodontal offices have purchased the technology. To compensate for the loss of information that was created from this specific area, published meta-analysis of articles was conducted to help compile enough information to provide an answer regarding the effectiveness of the subgingival air polisher. The next section will describe the results which were obtained.

## CHAPTER 4

### RESULTS

This chapter will examine findings from the survey that was created for the periodontists in the Elizabethtown and Bowling Green, KY areas. The survey assessed the success of the subgingival air polisher and its frequency of use. A total of fifteen periodontists were contacted in order to initiate the study. Each of the periodontists was a Caucasian male who had been in practice for at least five years. All of the fifteen periodontists contacted stated that they were not currently using the subgingival air polisher nor were they planning on purchasing the device. Results show that the main reason for the lack of information gathered from the surveys was that the periodontists were not including the use of the subgingival air polisher into their treatment-plans. Previously published research indicated that periodontists were not purchasing the device due to the relatively expensive price.

## CHAPTER 5

### CONCLUSION

The previous chapter analyzed the data on the usage of the subgingival air polisher in periodontal offices. Subgingival air polishing has yet to become a worldwide phenomenon in the dental field. None of the periodontists who were surveyed in the cities of Elizabethtown and Bowling Green, KY are currently utilizing the device. What is the reason for the lack of the subgingival air polisher's use? After an analysis of the research, a number of published articles stated that the device was priced relatively high and would not benefit the office more than traditional hand-scaling. A representative from the company that makes the product stated that the price of a subgingival air polishing unit is between \$7,200.00 and \$8,900.00. The lower end of price would be for a unit that solely preforms subgingival air polishing and the higher price is indicative of a unit that can both supragingival air polish and subgingival air polish. A table has been created to summarize the comparison of the subgingival air polisher and a metal hand instrument (Appendix B).

Since subgingival air polishing has numerous ways to promote superior oral health, it is important to educate professionals about the benefits the device has to offer patients. Since 47.2% of the population, ages 30 and up, are experiencing periodontal issues (CDC 2015) it is apparent that periodontists need to be better educated and aware of the effects subgingival air polishing can have on their patient's periodontal recovery

process. It is important for periodontists to be up-to-date on the benefits of the device. Not only does subgingival air polishing eradicate biofilm and stain from beneath the gingival margin more superiorly than hand-scaling, it also reduces the chance that the injurious tooth adherent particles will return.

Suggestions for future research would involve expanding the survey to more areas of Kentucky or to even more states. Another suggestion would include asking a wider variety of questions. These questions would not be limited to the results of using the subgingival air polisher but, would also include why periodontists may not be using the device. This study was less successful than intended to be due to the lack of use of the subgingival air polisher. The difficulty that came with contacting dental offices and speaking to the actual dentist was a challenge in itself. Fortunately, the literature review included enough information to formulate this study and to help draw conclusions from information that was unintentionally lacking. A further review in regards to the subgingival air polisher will be necessary in order to make more conclusive data about the benefits of the device.

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APPENDIX A

**Capstone Experience/ Thesis Survey**

**Subgingival Air Polishing In Dentistry**

1. Have you purchased a subgingival air polisher?  
a. Yes                      b. No
  
2. How many patients do you treat a month with the subgingival air polisher?  
a. 0-10 patients      b. 11-20 patients      c. 21-30 patients      d. 31+ patients
  
3. How long of a recall were the patients placed on after its use?  
a. 1 month or less      b. 3 months              c. 6 months              d. 1+ year
  
4. Was there a decrease in calculus and stain accumulation beneath the gingival margin?  
a. 0-5 sites              b. 6-10 sites              c. 11+ sites      d. no decrease noted
  
5. In treatment of these patients with the subgingival air polisher, was an ultrasonic scaler used as well?  
a. No ultrasonic scaler was used      b. Yes ultrasonic scaler was used
  
6. Did the patients who were treated with the subgingival air polisher have active periodontal disease?  
a. All patients had active periodontal disease  
b. One or more patients did not have active periodontal disease

APPENDIX B

Comparison Chart

<b>Instrument</b>	<b>Price</b>	<b>Depth of Penetration</b>	<b>Patient Comfort</b>	<b>Implant Use</b>	<b>Time per Tooth Surface</b>
Subgingival Air Polisher	\$7,200.00	10mm with no surgical intervention	Yes	Yes	5 seconds
Metal Curette	\$30.00	4-5mm non-surgical	Yes (with anesthetic)	No	Clinician dependent