

How Subgingival Air Polishing Will Turn UP side Dental Hygiene DOWN

An interview with Dr. Thomas Flemmig, professor in the Department of Periodontics at the University of Washington. by Trisha E. O'Hehir, RDH, MS

Air polishing was first introduced to the North American dental profession in the 1970s as an effective means of quickly and easily removing extrinsic stains and soft debris from tooth surfaces. Despite scientific evidence showing it to be an effective and efficient means of plaque and stain removal, being at least three times faster than rubber cup polishing, it hasn't been widely accepted. This is likely due to the fact that dental hygiene programs don't routinely incorporate air polishing into the curriculum, preferring instead to focus on rubber cup polishing. Opposition often points to the mess of aerosolized sodium bicarbonate coating everything in the operator, people included.

Air polishing research has taken an interesting turn, focusing more recently on subgingival biofilm removal to control disease, rather than stain removal for aesthetic reasons. To do this, a new powder was needed that was significantly less abrasive than sodium bicarbonate yet effective for biofilm removal. Glycine powder is 80 percent less abrasive, safe on oral tissues and root surfaces, effective for biofilm removal, and comfortable for the patient. One of the leaders in this research endeavor is Dr. Thomas Flemmig, currently a professor at the University of Washington in Seattle. His work focuses on the subgingival effects of glycine air polishing as well as the economic and clinical practice implications. I recently had the pleasure of speaking with Dr. Flemmig on this subject.



Fig. 1

What peaked your interest in air polishing?

Flemmig: Several years ago I read a research abstract about how air polishing with sodium bicarbonate reduced subgingival biofilms in periodontal pockets. At the time, conventional wisdom suggested that sodium bicarbonate was so abrasive that it

caused root surface abrasion and traumatized gingival tissues. What we needed was a powder that was less abrasive than sodium bicarbonate and less harmful to the tissue yet still removed biofilm. With that as our goal, we looked into other powders, testing many types and finding glycine powder to be 80 percent less abrasive than sodium bicarbonate and safe for the gingival tissues. We tested the glycine powder in an air polishing unit with a standard, supragingival nozzle and found it effectively removed both supra and subgingival biofilm and was safe on root surfaces. With a standard air polishing nozzle the powder opened the sulcus to allow

the glycine powder to access the subgingival area to remove subgingival biofilm (Fig. 1).

How did you test the glycine powder clinically?

Flemmig: In a series of clinical trials, we compared hand instrumentation for subgingival biofilm removal and air polishing with glycine powder. In the first two clinical trials we found a significantly greater reduction in viable counts of subgingival bacteria following glycine air polishing with a standard nozzle

compared to hand instrumentation. No adverse effects were experienced by the patients; in fact, the patients preferred the air polishing to hand instrumentation. They found it to be more gentle and comfortable.

How much time was spent air polishing each tooth?

Flemmig: Without any previous studies to guide the time factor, we limited the time to five seconds per surface, which equates to approximately nine minutes for a full dentition. Recent data in our laboratory using a biofilm model indicated that the time may be cut in half, but that still needs to be confirmed in a clinical trial.

Many hygienists today use an ultrasonic power scaler to deplaque subgingival areas. How does this compare to air polishing?

Flemmig: Air polishing is more effective as the spray reaches much further than the localized effect of an ultrasonic scaler. To effectively remove subgingival biofilm, the ultrasonic tip must be moved in an overlapping fashion to touch the entire surface while the air polisher spray easily reaches a broader area.

What about reaching into a deep periodontal pocket rather than a healthy sulcus?

Flemmig: With a standard nozzle, air polishing with glycine powder has been shown to be significantly more efficacious in removing subgingival biofilm. EMS developed a subgingival nozzle to reach deeper sites. The subgingival nozzle will reach pocket depths up to 9mm (Fig. 2). In studies comparing the subgingival nozzle to hand instruments, air polishing is consistently more effective for biofilm removal.

How do you see air polishing with glycine powder being used clinically today?

Flemmig: In a healthy mouth or one with mild gingivitis with probing depths of 4mm, the standard nozzle with glycine powder will be effective. In sites with deeper probing depths of 5mm or more, the subgingival nozzle with glycine powder will be the instrument of choice. Air polishing is done first to remove biofilm, the primary cause of both caries and periodontal disease. When this is complete, calculus is easier to see and can be removed with a power scaler or hand instruments.

Clinicians feel strongly that air polishing is too abrasive and harmful to gingival tissues. Is the glycine powder both effective and safe?

Flemmig: Yes, the glycine powder is effective for biofilm removal and safe for gingival tissues and mucous membranes.

The low abrasive nature of glycine makes it safe for root surfaces and oral mucous membranes. Rather than the stinging feeling of air polishing with sodium bicarbonate, air polishing with glycine powder feels as gentle as the water syringe spray on the tissues. In fact, in a recently published clinical trial we have directed the air polishing toward all the mucous membrane tissues in the mouth with no damage or discomfort for patients.

Since much of the initial air polishing research took place in Europe and glycine powder is easily available there, has this approach been widely accepted?

Flemmig: Yes, reports suggest that supra- and subgingival air polishing with glycine powder is widely accepted in Europe.

Do you anticipate North American hygienists will embrace this approach to treatment as glycine powder becomes more widely available here?

Flemmig: We are creatures of habit and the longer we are in practice, the harder it is to change. The idea of replacing hand instrumentation and prophyl cup polishing with a few minutes of air polishing with glycine powder feels to clinicians as though their patient care is put into question. Change comes slowly when it turns a long-held approach upside down. Traditionally the approach to deplaquing subgingival areas has been to insert instruments to the base of the pocket and move the biofilm in an apical to coronal direction. With subgingival air polishing with glycine powder, the approach is coronal to apical.

Were you immediately convinced that air polishing effectively removed subgingival biofilm?

Flemmig: I was skeptical at first, as I expect most clinicians would be. After subgingival air polishing with glycine powder I went back and checked with the probe and currettes to see if in fact it was effective. My colleagues did the same. We weren't ready to trust that this easier, faster approach was as good as our old ways. When we were convinced it was effective and had sound evidence from randomized controlled clinical trials, we embraced the change in patient care as it led to better treatment in less time with more comfortable patients. It takes time to overcome skepticism of this new approach.

There is some worry that this technology will cause emphysema by forcing air and powder into the tissues. What are the statistics on this?

Flemmig: Based on the published cases with air emphysema following glycine powder air polishing, the estimated incidence of air emphysema is 1 in 666,666. That means that a hygienist



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would have to perform glycine powder air polishing on all of her patients for 350 years to experience one emphysema case. Furthermore, all of the three reported emphysema cases following glycine powder air polishing resolved without treatment. It has not been a serious issue.

Is there still a use for sodium bicarbonate air polishing powder?

Flemmig: Yes, for supragingival areas with heavy stain, sodium bicarbonate powder, which is much more abrasive than glycine powder, is the powder of choice. For deplaquing, glycine is the powder of choice because it is effective, safe and comfortable for the patient.

I realize your research has been with glycine powder for subgingival air polishing. Are there other powders on the market for subgingival deplaquing?

Flemmig: There are several other powders on the market for supragingival air polishing: sodium bicarbonate, calcium carbonate, aluminum trihydroxide and calcium sodium phosphosilicate. When selecting an air polishing powder for subgingival deplaquing, it must be safe on root surfaces and gingivae. Many of these other powders are safe on enamel, but too abrasive for root surfaces and gingivae. Check abrasiveness before using powders other than glycine subgingivally. There are more than 30 publications demonstrating that glycine powder is safe on a variety of restorative materials, orthodontic brackets and root surfaces, and is approximately five times less abrasive than sodium bicarbonate.

Besides being safe on root surfaces, you showed that glycine powder is safe on all the oral tissues. What prompted you to go beyond tooth surfaces for biofilm removal?

Flemmig: The concept of full-mouth disinfection led us to consider using the air polisher for all oral tissues: tongue, buccal mucosae and palate. Bacteria are not limited to supra- and subgingival tooth surfaces. The oral cavity is a reservoir for recolonization. These tissues harbor microflora contributing to new biofilm formation on the teeth so it makes sense to include them in the deplaquing approach and not limiting the air polishing to just the teeth. Air polishing with glycine powder is faster and much easier than profuse irrigation of the entire mouth and oral tissues with chlorhexidine. Our goal with these studies was a Proof of Principle that a low abrasive air polishing approach to full-mouth disinfection was a safe and effective option (Fig. 3). We were able to show in a clinical trial that in patients with periodontitis, full-

mouth glycine air polishing significantly reduced the oral load of *Porphyromonas gingivalis* compared to conventional treatment using hand instruments. Our future research will be conducted including this approach.

How do you see subgingival air polishing with glycine powder impacting dental hygiene care in the future?

Flemmig: This new technology will make work easier and faster for the RDH. It will reduce the amount of time and effort needed to effectively deplaque the mouth. Prophylaxes accounts for approximately one quarter of the national expenditures for dental services. Here is an example of how adding this new technology that takes less time will impact the business of dental hygiene and the practice. For this I will use nationwide surveys by the ADA to compare an average restorative dental practice with three operatories and no hygienist to the same practice plus an additional operatory for a dental hygienist seeing eight patients a day or 1,900 prophylaxis or periodontal maintenance visits per year. The take-home income of the dentist employing an RDH is 40 percent higher than the dentist working alone. If the RDH now incorporates subgingival air polishing with glycine powder and saves 12 minutes per appointment, allowing him/her to see 10 patients per day, the costs don't go up but the profit doubles, providing a financial benefit to both the hygienist and the dentist. On the business side, this new approach to patient care provides a benefit for the patient of greater health and comfort, an easier appointment for the hygienist and increased income for both the dentist and the hygienist. Embracing new technology provides benefits for all involved: the patient, the RDH and the dentist.



Thank you Dr. Flemmig for your focus on the future, your exciting research findings and your dedication to improving patient oral health. ■



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Author's Bio

Dr. Thomas Flemmig is a Professor in the Department of Periodontics at the University of Washington. He earned his dental degree at the University of Freiburg in Germany and training in Oral Surgery at the University of Hamburg in Germany and in Periodontics at UCLA. His PhD is from the University of Würzburg, and MBA and certificate in Health Sector Management from Duke University. He also maintains a periodontal practice in Seattle, Washington. He has served on the editorial board of several scientific journals and published more than 150 scientific papers.

