In Practice

WITH DR. RONALD E. GOLDSTEIN

Alternatives to Conventional Tooth Preparation (Including Air Abrasion and Lasers)

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More than 50 years ago, my father had one of the world's first air abrasion units in his Atlanta, Georgia, practice. With no high-speed evacuation units, however, it made quite a mess and we had no bonded restorations with which to restore the rounded cavity preparations. That coincided with the high-speed handpiece being introduced, and the rest was history. Air abrasion virtually disappeared until the 1990s. Nevertheless, when the newer, much more precise version came out, and now being able to restore these preparations with conservative bonded restorations, I was one of the first to endorse its use. About 9 years ago, I co-authored an article with Frederick Parkins that was published in the Journal of the American Dental Association. Its focus was on using air abrasion to detect caries. So my use of this technology has been well founded. Then the world's first tooth-cutting lasers were introduced and I was again fascinated with this new technology. But it was not until Biolase Technologies, Inc developed its own version that I really became excited about the laser's cutting efficiency. Because of the laser's versatility my partners—David Garber, Maurice and Henry Salama—also enjoy its periodontal uses. Having the benefit of using both technologies in our practice, I wanted to conduct this symposium to get a comparison of the different technologies in different practices that had used both. I have always admired those forward thinking dentists who invest in the newest technologies and I appreciate these four colleagues sharing their opinions with us.

Q *Which technologies do you use in addition to the typical handpiece with burs and diamonds, and how long have you been using them?*

Richard J. Simonsen, DDS, MS—In about 1992, Ronald Goldstein and I were part of an evaluation team for a new aluminum-oxide abrasion system. At that time the only abrasion (or rather polishing) system available was the Cavitron® Prophy-Jet® (DENTSPLY Professional), which uses sodium bicarbonate particles. Air abrasion, as it has come to be called (although it should perhaps be more properly called particle abrasion) is a valuable tool for aggressive cleaning, or cleaning and conservative preparation, of pits and fissures. However, the disadvantages of the systems should not be overlooked, and most of the time I would prefer to use the typical handpiece with very small burs, such as Brasseler No. 3 (Brasseler USA®), for minimally invasive cavity preparation.

Angela Gribble Hedlund, DMD—I have been using air abrasion for more than 10 years.

Ron Kaminer, DDS—In my practice, I used air abrasion up until 5 years ago, when I began using the Waterlase® (ErCr:YSGG) (BIOLASE® Technologies, Inc). Unlike any other technology in recent memory, nothing has changed our practice more than the Waterlase®. Patient acceptance has been incredible. I have used the Waterlase® since 1999 and had used air abrasion since 1995.

Lawrence Addleson, DDS—We have been using the Waterlase® for more than 1 year. We also have an air abrasion system, which we have not used for almost 2 years.

Q *When do you choose to use either air abrasion or a laser instead of a bur for tooth preparation?*

Richard J. Simonsen, DDS, MS—At the present stage of development and cost, I rarely use air abrasion or lasers for tooth preparation. Air abrasion works well for minimally invasive procedures but there are disadvantages, including cost and the ability to control the dispersion of the aluminum-oxide powder (it gets everywhere and can be damaging to instruments in the modern dental office such as computers, magnification systems, and cameras). Whereas there are laser units with the US Food and Drug Administration's approval for both hard and soft tissue surgery and the marketing is in high gear, the paucity of peer-reviewed investigations for the systems, particularly in the case of hard tissue use, should give pause to those considering routine clinical use. It is prudent to await further developments of the technology.

Angela Gribble Hedlund, DMD—I use air abrasion when treating a virgin tooth with caries that seems to be superficial or shallow or when a patient has a high anxiety level and is intimidated by anesthesia or a handpiece. I also use it for cervical lesions or anterior Class 4 restorations [QA. Edit okay?] that are in a high stress area and could use additional surface area for retention. Air abrasion is also excellent for cleaning the tooth surface before final cementation of crowns or veneers.

Ron Kaminer, DDS—I feel that the best instrument for rou-

tine cavity preparation today is the Waterlase®. For virgin caries or if the tooth was previously restored with composite, the Waterlase® is always my first choice. If the tooth was previously restored with amalgam, I still prefer the traditional handpiece to remove the alloy. Whereas you can use the Waterlase® to prepare a tooth for a crown (and I have done many), I still prefer the handpiece as it is a bit quicker. I never use my air abrasion anymore to prepare teeth because to me it offers no advantages over the laser.

Lawrence Addleson, DDS—I use the laser on Class 1, 2, and 5 restorations. Also, when the amount of decay (as shown in an x-ray or diagnosed by an oral exam or the DIAGNOdent from KaVo America Corporation) appears minimal, I choose the laser instead of a traditional handpiece. Another determining factor is whether or not the tooth has an existing restoration. I do not use the laser to remove amalgam.

Air abrasion eliminates the vibration associated with tooth preparation using a bur.

What are the advantages of either air abrasion or a laser or both over using burs or diamonds for tooth preparations?

Richard J. Simonsen, DDS, MS—Air abrasion eliminates the vibration associated with tooth preparation using a bur. It is well accepted by patients and some would say that it avoids the use of anesthesia, although for the small kinds of preparations where it may be ideal, it is doubtful that anesthesia would be needed for conventional methods of tooth preparation. A big advantage of air abrasion is that it eliminates the formation of microcracks in adjacent tooth enamel during tooth preparation and also in other brittle substances undergoing cutting, such as porcelain. Similar advantages can be associated with the use of lasers in tooth preparation. In two recent Meta [QA. What does this stand for?] studies on lasers, there was a significant improvement in wound healing and tissue regeneration, and there was less pain involved. [QA. Edit okay?]

Angela Gribble Hedlund, DMD—When using air abrasion, the patient has less discomfort and anxiety, the preparation can be more conservative, and, often, conventional anesthesia is not necessary. Not having to use conventional anesthesia cuts down on the time and armamentarium needed and lowers the medical risk of the procedure.

Ron Kaminer, DDS—When comparing air abrasion and lasers, air abrasion offers no advantages to the patient that the laser does not. The mess traditionally associated with air abrasion is a big disadvantage and therefore I rarely use air abrasion in my practice today. The laser offers many advantages over traditional rotary instrumentation and air abrasion. When using the

laser, many procedures can be done without the need for local anesthetic (80% to 90% of the time). The laser also removes the smear layer making the surface ideal for bonding. The laser preparation is very precise, giving new meaning to the word microdentistry. It also disinfects as it cuts, minimizing any postoperative sensitivity. Microcracks typically associated with high speed drilling are eliminated when using the laser. Finally the light popcorn popping sound is more pleasant to listen to than the traditional whine of the drill.

Lawrence Addleson, DDS—I have found that patients are more comfortable with the use of lasers, and it takes less time to complete the restoration. It seems that microfractures in the enamel are lessened compared to prepping with rotary instruments.

Have you had positive patient reaction from alternative means of tooth preparation, and if so with which age group?

Richard J. Simonsen, DDS, MS—Patients in general react positively to any treatment that is, or is perceived to be, less painful or quieter, or that has less vibration associated with the procedure. Young children and dental phobics in particular react badly to noise and vibration and frequently translate them into painful sensations. Thus, if practical, and if given the choice, patients would generally prefer to have air abrasion used for cavity preparation rather than conventional air turbines. The new electric options in handpieces, however, also improve the patient's experience in terms of noise and vibration and, along with the further development of lasers, provide a very optimistic future for these technologies.

Angela Gribble Hedlund, DMD—Yes. Children and adults alike are thrilled to not have a "shot" or their teeth "drilled."

Ron Kaminer, DDS—Patients are always in awe after treatment with the Waterlase®. There are no shots, no pain, no sound of a drill when using the Waterlase®. The laser is a real hit with kids as well as adults. Patients come in asking for the laser and do not want their dentistry done any other way. The laser has really revolutionized my practice.

> *Since acquiring the laser, we have totally abandoned the use of air abrasion.*

Lawrence Addleson, DDS—Yes, almost universally and it extends through all age groups. Patients prefer the laser because we almost never need to use anesthesia.

Do you have a preference of either air abrasion or tooth cutting lasers for alternative means of tooth preparation?

Richard J. Simonsen, DDS, MS—The major drawback of air abrasion and laser systems so far has been the high cost of some of the systems compared to the conventional methods using the air turbine handpieces. The high cost of the investment may not be acceptable until the next generation of lasers is on the market. Presently, the majority of dentists using lasers are mainly the entrepreneurs and the enthusiasts. One has to weigh the cost-to-benefit ratio for both the dentist and the patient. At the present time, the electric handpieces would seem to be the most cost-effective and evidence-based application. Whereas more scientific evidence is necessary for tooth cutting lasers, laser fluorescence for caries diagnosis is a viable method of gathering useful information, treatment planning, and decision-making.

Angela Gribble Hedlund, DMD—I have only used air abrasion on my patients.

Ron Kaminer, DDS—As I said previously, I love the laser. While there are a few limitations, it does a lot of things very well. At this point, with the level of expertise I have achieved with the Waterlase®, if I never turned on my air abrasion unit again I would not miss it.

Lawrence Addleson, DDS—Since acquiring the laser, we have totally abandoned the use of air abrasion. The laser is simply easier to use and quicker in my hands.

Do you have any suggestions for modifications of existing alternative tooth preparation technologies?

Richard J. Simonsen, DDS, MS—There are obviously numerous potential improvements that can be incorporated into both the air abrasion and the various laser systems, as well as electric handpieces. Using air abrasion, it is difficult to overcome the disadvantage of the potential damage to sensitive equipment from the airborne aluminum-oxide particles; although if this could be accomplished, it would be a big step forward. Without some significantly improved evacuation and air filtration systems, the use of air abrasion systems will always be risky. Even with a foolproof evacuation system one would have to question whether the benefit is worth the cost. Since air abrasion is primarily indicated for small preparations, the choice of an electric handpiece and ultra-small burs is hard to beat.

Angela Gribble Hedlund, DMD—Making the units smaller, more portable, and less noisy and costly. Also more control over the width and depth of the cut would be beneficial.

Ron Kaminer, DDS—I think the next generation of lasers should have a fiber-optic light for better visibility and have the dual wavelength of ErCr:YSGG/diode built into the same box. While the Waterlase® is great for soft tissue (almost all procedures done without local as well), the diode is a better soft tissue laser. Having them both built into one box would be ideal. Also while the size of the units have come down a lot, eventually table top ErCr:YSGG lasers will be available, but that might be many years away

Lawrence Addleson, DDS—It would be nice if the laser created a smooth finish line so it could be more easily adapted to crown and bridge preparations.

Which technology do you see as the future for tooth preparation?

Richard J. Simonsen, DDS, MS—For the short term, I see the electric handpiece as having the potential to become the most widely used preparation instrument of choice in dentistry. It is more precise; it is quieter and has less vibration than the conventional air turbine high-speed handpiece. For the longer term, I believe lasers have great potential for future applications beyond the widely accepted soft tissue uses of today. Whereas the Erbium:YAG laser (potential for tooth preparation in certain selected situations), the carbon dioxide laser (a valuable tool in oral surgery), the Argon laser (used in minor surgery and resin composite curing), and the Nd:YAG (used in pocket debridement, tissue retraction and more) are all useful adjunct preparation and surgical instruments, much work remains to be done. The future, however, is exciting and full of potential.

Angela Gribble Hedlund, DMD—I think both have great potential for advancement and improvement in the years to come.

Ron Kaminer, DDS—I think that anyone who has used a Waterlase® or the like will agree that the future is bright for lasers in dentistry. While the technology is here today, patient education on its availability is still low. When patients become more educated about the technology, they will demand it, and dentists will have to incorporate a laser into his/her practice to keep up with patient requests. Presently hard tissue lasers have only a 3% or so market infiltration, but this number will jump dramatically as patients learn that dental visits do not have to be scary anymore.

Lawrence Addleson, DDS—It certainly seems, at this time, that the dental laser stands head and shoulders above air abrasion. The gap is slowly closing between laser tooth preparations vs conventional burs. ○