Laser-assisted endodontics in general practice, or: How I learned to stop worrying and love root canals

Author Steven R. Pohlhaus, DDS, FAGD

I referred the majority of root canals in my office to specialists for much of my career. I would treat the simpler anterior and bicuspid cases, but all the rest would be sent to my friendly neighborhood endodontist for treatment. The molar or complex cases I attempted tended to be a time-consuming and sometimes frustrating affair in my hands. I was busy enough building my laser-based practice that I was content to have my skilled colleagues do excellent root canals and send the patient back ready for restoration. That is, until I was introduced to the concept of Photon Induced Photoacoustic Streaming (PIPS).

Having used dental lasers for many years with excellent results in many disciplines, I often thought endodontic applications would be useful. Nd:YAG, CO2, erbium lasers and diodes had been studied extensively as an adjunct to endodontic treatment. Many of these studies have shown improved smear layer removal and disinfection in the apical third of the tooth. However, there were often negative thermal effects within the confined space of the root canal.

The phenomenon known as PIPS allows dentists to thoroughly clean the root canal system without the damaging thermal effects of all other laser-assisted endodontic protocols. The extremely high peak power and affinity for water of the Er:YAG laser (LightWalker, Technology4Medicine/Fotona) creates an interesting phenomenon when specially shaped radial firing tips are placed in irrigant solutions. When these special tips are submerged in solution, each laser pulse sends a powerful wave of acoustic energy throughout the solution. The laser is used at a setting that creates very little thermal effect. The resultant shock wave propagates throughout the complete three-dimensional root canal system, even the tiniest accessory canals. Scanning electron microscope and microbiological studies have shown extremely thorough cleansing and disinfection of the total root canal complex. The PIPS technique allows the dentist to instrument less aggressively and still achieve a thoroughly clean root canal system.

It is useful to think of PIPS as “laser-assisted irrigation,” as its purpose is to send powerful waves of irrigants throughout the whole root canal system. The actual instrumentation technique is determined by the treating dentist. Given the excellent cleaning PIPS creates, one should consider the option of instrumenting canals in a more conservative manner. Minimally invasive endodontic instrumentation is possible given the profound cleansing abilities of PIPS.

PIPS made sense and, fortunately, I already had the laser that can perform it. I began using it on the simpler cases I would have done anyway. After seeing the excellent results and improved post-operative comfort, I started to take on more challenging cases. More research began to come out confirming the thorough cleansing and disinfection PIPS was achieving. Instrumentation that I felt complemented PIPS well, such as the Wave•One reciprocating single file system (Dentsply), was added, allowing me to do difficult cases more efficiently.
The Balanced Force Technique

The most effective way to cut dentin with a hand file.

Hands On | Media | Tips

Train With Us in Santa Barbara

- The Art of Endodontics 2-Day Laboratory Course
  - Oct. 11-12: Santa Barbara, CA
  - SOLD OUT

- Nov. 8-9: Santa Barbara, CA
  - 3 Seats Remaining
  - Register

- Dec. 13-14: Santa Barbara, CA
  - 13 Seats Remaining
  - Register

- Molars Only Alumni 2-Day Laboratory Course
  - Nov. 1-2: Santa Barbara, CA
  - 10 Seats Remaining
  - Register

Check back soon for 2013 dates on all Lab Courses.

TrueTooth™ Training Replicas

Not models... they are replicas of real dental anatomy!

Train With Us at Home

Coming Soon: DIY/CE™
Learn new procedures in your office with your staff using TrueTooth™ Replicas

Contribute Your Own Cases!

Inspire and be inspired by clinicians worldwide

Download our new procedural flowcharts FREE

This 17 page set is the most comprehensive flowchart series available, showing every aspect of conventional RCT, from access through obturation, and featuring strategies like the Balanced Force technique to address clinical challenges.
I now treat the majority of endodontic cases instead of referring. Cases with calcified canals, complicated retreats, very complex anatomy and the like are still sent to the endodontist. In the past, I referred approximately 80 percent of root canals. Now I treat about 80 percent.

Pictured are three examples of PIPS in action.

**Case No. 1**

These images are two views of the final fill on tooth #5 (Fig. 1). There are multiple lateral canals visible filled with EndoRez cement (Ultradent Products). EndoRez is a resin-based hydrophilic cement that is ideal for PIPS cases. It bonds nicely to the PIPS-cleaned dentin surfaces, and since it is hydrophilic it seeks out the moisture in damp lateral canals.

**Case No. 2**

Tooth #8 looks like a relatively simple case in the pre-operative film. Once opened and accessed, it is discovered the last few millimeters take a sharp turn and have a corkscrew shape. The file pictured exhibits the shape of the canal. Instrumenting the last few millimeters of the tooth traditionally would have been difficult without ledging or transporting the canal. The tooth was instead instrumented minimally but PIPS-ed thoroughly. The final film exhibits that not only was the corkscrew apex obturated, but two lateral canals are also evident (Fig. 2).

**Case No. 3**

Tooth #31 had become necrotic due to a vertical fracture. Endodontic treatment was performed using a combination of PIPS and the Wave•One system. The last image taken 10 weeks later for an unrelated problem on tooth #30 reveals that the extruded ENDORrez cement has almost completely resorbed (Fig. 3).

**Conclusion**

PIPS allows for more thorough three-dimensional cleansing of the root canal system. It allows for the possibility of less invasive instrumentation as well. The results I was seeing during the past three years encouraged me to begin taking on more challenging cases. The fact that I enjoy doing root canals much more than I used to is yet another case where integrating lasers into my routine has been a great asset for my practice.

**References**


**About the Author**

Steven R. Pohlhaus, DDS, FAGD, has been practicing laser dentistry in his private practice in suburban Baltimore since 2004. He is also on the dean’s faculty at the University of Maryland Dental School in the Department of Oncology and Diagnostic Sciences. He has lectured and trained for three different laser companies and is currently a trainer for Technology4Medicine. He is a member of the American Dental Association, the Academy of General Dentistry, the Academy of Laser Dentistry, the World College of Minimally Invasive Dentistry and the American Academy of Oral Medicine. He also runs the Dominican Dental Project, composing of a group of dentists and dental students that provide dental serviced in that country each summer. He may be contacted at spohlhaus@yahoo.com.