Successful endodontic treatment depends upon maximal debridement and disinfection of the entire root canal system. The root canal system must be shaped to a convention that permits adequate cleaning and disinfection by elimination of microbes. The literature is clear that as much as 35 percent or more of the root canal system remains untouched by any instrumentation technique. Essentially, no filing technique allows instruments to scout all canal walls and remove infected dentin. To decrease the bacterial load and achieve better debridement, irrigation protocols are used prior to obturation.

The efficacy of the irrigants to decontaminate the entire canal walls has been significant improvements recently. Both negative and positive apical pressure irrigation techniques have been surpassed by ultrasonically activated irrigants, photo-activated disinfection and laser-activated irrigants in their ability to improve cleanliness of the canal systems.

A new application of Laser-Activated Irrigation (LAI) has been recently introduced. Photon Induced Photoacoustic Streaming (PIPS) uses an Er:YAG laser to pulse extremely low energy levels of laser light to generate a photoacoustic shockwave, which streams irrigants throughout the entire root canal system.

Using extremely short bursts of peak power, laser energy is directed down the canal and the action actively pumps the debris debris out of the canal walls while cleaning, disinfecting and sterilizing each main canal, lateral canals, dentinal tubules and canal anastomoses to the apex. This movement of irrigant is achieved without the need to place the radial and stripped laser tip (PIPS tip, Fig. 2) into the canal itself, with other conventional hard and ultrasonic systems.

The tip is held stationary in the coronal aspect of the access preparation only. With the irrigant occupying the entire root canal system, the shockwave created by PIPS travels in all directions during activation and effectively debrides and removes organic tissue remnants. Through this laser-activated turbulent flow phenomenon, following the PIPS protocol are not required to place the tip into each canal, thus eliminating the need to enlarge and remove more tooth structure to deliver standard needle irrigation to the smaller and more delicate apical anatomy, commonly seen in the apical one-third. The results are canal convenience forms that are more conservative, minimally invasive and biomimetic (Fig. 3).

Unlike other laser-activated irrigation techniques, PIPS is not a thermal event, rather subablative. Properly executed, PIPS creates a turbulent photoooustic agitating of irrigants that move fluids three dimensionally throughout the root canal system even as far as the apical terminus, distant from the radial stripped tip location. By activating the tip in the access cavity and outside the root canal system, the extremely low energy needed to activate the particular (Er:YAG laser) is below the threshold of ablation for dentin. Linden and thermal effects that have plagued the widespread use of other laser systems is completely avoided at the energy levels used by the PIPS technique.

Recent testing, performed at the University of Tennessee by Dr. Adam Lloyd, chairman of the department of endodontics, objectively confirmed the improved cleaning and debridement of organic and inorganic tissue left by instrumentation.

Micro-computed tomographic scans were used to assess before and after volumetric change in the internal intaglio of lower first molars treated with PIPS protocol (Fig. 5). Sequential slicing beginning at 5 mm from the apex and moving down to the last 2 mm demonstrated that all slice images showed significant improvements after PIPS.

The importance of these findings is far reaching. PIPS now offers the dentist a less invasive, less sterile protocol, the PIPS technique that activates the sodium hypochlorite already present in the PIPS technique.

Lasers are utilized in many areas of dentistry. He is the founder and director of the Lasers in Endodontics and PIPS technique as innovative technologies in modern endodontics.

References
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Shofu Dental Corp. is holding product demonstrations at booth No. 1304, featuring its injectable hybrid restorative, BEAUTIFIL Flow Plus, now available in tips. Dentists will now have this preferred flowable in their fingertips. Also, make sure to visit the many lectures featuring BEAUTIFIL Flow Plus, including Dr. Carla Cohn, Dr. Jack Griffin, Dr. George Freedman and Dr. Brian Novy. Each will provide his or her own take on the hybrid material.

BEAUTIFIL Flow Plus combines hybrid-like strength and functionality, unique handling and stackability and a flowable delivery. Additionally, the material has 15 percent more radiopacity than enamel and offers the benefit of fluoride release and rechargability. Those interested in seeing the material firsthand are encouraged to come check it out at the Shofu booth.

According to Shofu, BEAUTIFIL Flow Plus represents the next step in the evolution of restorative materials based on its convenient flowable delivery system and physical properties and functionality that rival leading hybrid composites.

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BEAUTIFIL Flow Plus is available in two distinct viscosities. F00 (zero flow) offers precision stacking, and F03 (low flow) is an ideal base/liner. BEAUTIFIL Flow Plus is available in two introductory kits. The standard kit (PN 20000) offers two 2.2-gram syringes of both viscosities in shades A2 and A3, and the pedo kit (PN 2000P) offers two 2.2-gram syringes in both viscosities in shades A1 and bleach white. Both kits also contain samples of Shofu’s top-selling hybrid material, BEAUTIFIL II. The kit retails for $102.25 (a $160 value). Also available in shades B1, B2, and C2 in both viscosities.

Step by the Shofu booth, No. 1304, to see BEAUTIFIL Flow Plus for yourself for a product demo, or for more information, call (800) 827-4638 or visit www.shofu.com.

(Source: Shofu Dental Corp.)

PIPS technique used in endodontics treatment

By Prof. Giovanni Olivi, MD, DDS
University of Genoa, Italy

A patient asked for the option to save her teeth that were scheduled for extraction by another dentist. The lower-left first and second molars had high mobility (grade 2), were necrotic, with significant probing depths in the buccal aspect. The teeth were diagnosed for endo-perio treatment. Difficulties with this case included complex radicular anatomy, long anatomical access (26 and 27 mm, respectively, for #36 and 37) and the presence of a deep vertical bone loss in the buccal aspect. After scaling and root planning, the teeth were scheduled for root- canal therapy.

Before each treatment, the Photon Induced Photocoustic Streaming (PIPS™) technique was applied into the periodontal pockets of each tooth for refining the debridement, removal of biofilm from the root surfaces and pocket disinfection. The root-canal treatments were performed using PIPS-specific irrigation protocols with 5 percent NaOCl and 17 percent EDTA.

The canals were obturated with a flowable resin sealer (EndoRez, Ultradent, South Jordan, Utah) and gutta-percha points. A final treatment of the pockets using PIPS for disinfection was performed after completing each root canal therapy to remove any extruded sealer or residual biofilm. No post-op symptoms were reported and the mobility of the teeth progressively disappeared up to grade 0. The follow-up X-rays performed after one and four months showed healing ing in progress for both the teeth.

Lightwalker AT laser device with contact H14–C handpiece and PIPS fiber tip was used for the treatment.

Laser parameters:
- Laser source: Er:YAG
- Wavelength: 2940 nm
- Pulse duration: 15 mJ
- Frequency: 15 Hz

Disclosure: Dr. Olivi has relationships with several laser companies (including AMD-COMPUTEX, Biolase and Fotona) but receives no financial compensation for his research or for writing articles.

Editor’s note: See related article on page 8

About the author
Dr. Giovanni Olivi is an adjunct professor of endodontics at the University of Genoa School of Dentistry and a board member and professor in its master course in laser dentistry. He completed the postgraduate laser course at the University of Firenze and received laser certification from the International Society for Lasers in Dentistry. He earned advanced proficiency mastership from the Academy of Laser Dentistry and is the 2007 recipient of AID’s Leon Goldman Award for Clinical Excellence. He has a private practice in endodontics, restorative and pediatric dentistry in Rome. He can be contacted at olivilaser@gmail.com.