

# PIPS and retreatment

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Fig. 1\_Pre-op #18.

**Retreatment can be a difficult** and time-consuming endeavour. The first order of business is to figure out why the primary root canal treatment is failing. Sometimes the answer will be evident after the patient interview, clinical exam and radiographic analysis, but other times the root canal failure is a mystery. Some of the questions I recommend thinking about are: Was a rubber dam used? Is there a root fracture? Is there a missed canal? Did the practitioner use sodium hypochlorite and use proper irrigation

methods? Is the root canal undefined and/or under condensed?

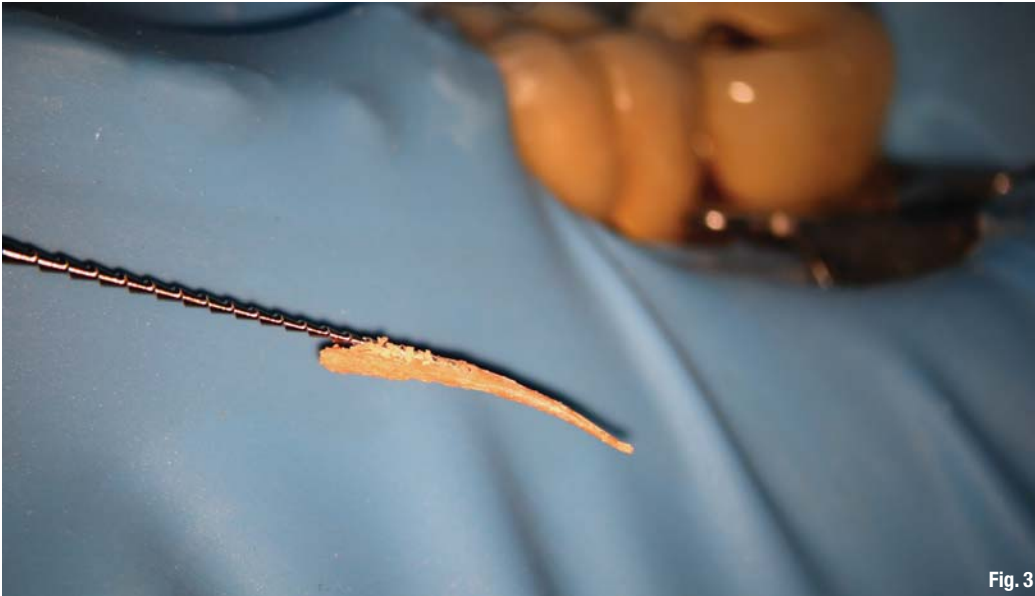
Is there periodontal involvement? If the supporting periodontium appears healthy and the root does not appear to be fractured, than typically the root canal failure is originating from inside the canal system. With all of these factors in play it is not surprising that the retreatment success in endodontics is lower than primary root canal success by 10 to 20 per cent. While retreatment success can vary from 70 to 90 per cent, non-surgical root canal treatment success hovers around 90 per cent. This article will review the Photon Induced Photoacoustic Streaming (PIPS) (Lightwalker Laser from Fotona) literature and discuss a retreatment case where the PIPS irrigation technique was instituted in hopes of increasing the success rate.

## \_PIPS introduction

PIPS is a technique that uses Erbium:YAG laser energy to agitate the irrigation solution inside a root canal system and cause a violent shockwave effect that can lyse bacteria cells and remove biofilm. By placing the tapered PIPS tip into the access and irrigation solution, subablative laser is used to push a tsunami of irrigation solution into the main root canal, the lateral, secondary and accessory canals, isthmuses and the deep complex apical anatomy of the treated tooth. PIPS creates an irrigant shockwave of bacterial destruction.

Fig. 2\_Intact gutta-percha cone removal.





**Fig. 3** Intact gutta-perchacone removal with Hedström file.

### \_PIPS and research

An article in 2011 showed that the PIPS technique was superior in removing bacteria when compared to standard needle aspiration and passive ultrasonic irrigation when using 6 per cent sodium hypochlorite in an extracted premolar tooth prepped to a size 20 foramen with an 07 taper.<sup>1</sup> Another article shows 100 per cent inhibition of regrowth of *Enterococcus faecalis* after using the PIPS irrigation technique for 20 seconds with 6 per cent sodium hypochlorite in a single rooted tooth. These teeth had soaked in an *Enterococcus faecalis* broth for four weeks.<sup>2</sup> PIPS also effectively removed biofilm from within the root canal system. In a bovine study model, PIPS outperformed standard needle irrigation, the EndoActivator, and passive ultrasonic irrigation in removing biofilm from infected bovine dentin.<sup>3</sup> In an article published this year, PIPS was shown to remove debris and increase canal space 2.6 times greater than standard needle irrigation in the isthmuses of lower molars.<sup>4</sup>

### \_PIPS and retreatment

A 62-year-old female patient presents with a chronic, persisting pain in the mandibular left second molar (#18) duration two weeks. The tooth had been endodontically treated approximately two years prior. The patient was unable to bite on #18 without significant discomfort.

Clinical testing revealed that #18 was percussion- and bite-stick-sensitive, while #19 and #20 tested normal to all tests. Radiographic analysis revealed that #18 had an adequate root canal without a periapical lesion (Fig. 1). Because of the positive clinical tests, it was determined that #18 needed a non-surgical root canal retreatment.

The patient was anesthetized and a rubber dam was placed. The composite core access was removed with a 701 carbide and 557 surgical length carbide bur. Upon inspection of the gutta-percha it appeared an uncontaminated "healthy" pink and did not contain any odor. It did not look or smell like the majority of retreatments where the gutta-percha appeared to be a mixture of black and pink colour with a nefarious odour.

Before using chloroform, the ProTaper Retreatment #2 and #3 rotary files (DENTSPLY Tulsa) were used at 500 rpm to carefully remove the majority of the coronal and middle gutta-percha. In two of the three canals the #2 or the #3 retreatment rotary file removed the entire cone from the canal, making it an extremely efficient retreatment and allowing extra

**Fig. 4** Post-op #18.



**Fig. 4**



**Fig. 5** PIPS in action. treatment time for 6 per cent NaOCl to soak inside the canal system.  
(Photos: Provided by Technology4Medicine)

The technique was as follows: Carefully drill into the gutta-percha with the retreatment rotary file and after a 5- to 10-mm bite stop rotation. Let it cool for a few seconds and then with one hand pull up on the rotary hand piece head while the other hand is protecting the maxillary teeth from any blunt trauma in case the hand piece head pulls out of the canal with high velocity.

In some cases if a single cone has been used and/or if the sealer did not set or was inadequately placed, the entire cone will come out in one piece.

In this case, two of the three cones were extracted fully intact while using the rotary technique mentioned above. The third cone was removed intact with a #35 Hedström file (Figs. 2 & 3). The canals were then "PIPSed" for 30 seconds with 6 per cent NaOCl as the irrigation solution and then patency and working length were established using hand files and an electronic apex locator (EAL). The canals were then reshaped with a reciprocating WaveOne Primary file (DENTYPLY Tulsa) and a final PIPS protocol was followed using 6 per cent NaOCl, distilled water, 17 per cent EDTA and then distilled water (Fig. 5). Because it appeared that a single cone technique was used and that the resin sealer did not fully set, or was not adequately placed into the canal, the case was completed in one visit. The canals were obturated with Bioceramic Gutta Percha coated cones and Bioceramic Sealer (Brasseler USA). A modified warm vertical condensation technique was used to help condense and pack the gutta-percha and sealer. The canals were backfilled with warm gutta-percha (Fig. 4).

## Conclusion

PIPS is a ER:YAG laser-enhanced irrigation technique where laser energy is used to violently agitate canal irrigant. Studies have shown that it is more effective in killing bacteria, removing biofilm, removing canal debris and increasing canal space than standard needle irrigation, sonic irrigation and passive ultrasonic irrigation.

In my experience of "PIPSing" over 2,000 cases, I see an increase in the obturation of lateral canals and deep complex apical anatomy. PIPS also aids in removing pulp stones, retreatment canal debris and separated files that have been loosened by ultrasonics. Photon induced photoacoustic streaming gives the clinician confidence that they are doing everything in their power to clean the entire root canal system.

## References

1. Peters OA, Bardsley S, Fong J, Pandher G, Divito E. Disinfection of Root Canals with Photon-initiated Photoacoustic Streaming. *J Endod* 2011;37:1008–1012.
2. Jaramillo DE, Aprecio RM, Angelov N, Divito E, McClammy T. Efficacy of photon induced photoacoustic streaming (PIPS) on root canals infected with *Enterococcus faecalis*: A pilot study. *Endodontic Practice* 07/2012.
3. Ordinola-Zapata R, Bramante CM, Aprecio RM, Handsides D, Jaramillo DE. Biofilm removal by 6% sodium hypochlorite activated by different irrigation technique. *International Endodontic Journal*; 10/2013.
4. Lloyd A, Uhles JP, Clement DJ, Garcia-Godoy F. Elimination of Intracanal Tissue and Debris through a Novel Laser-activated System Assessed Using High-resolution Micro-computed Tomography: A Pilot Study. *J Endod* 2014;40:584–587.

## about the author

roots



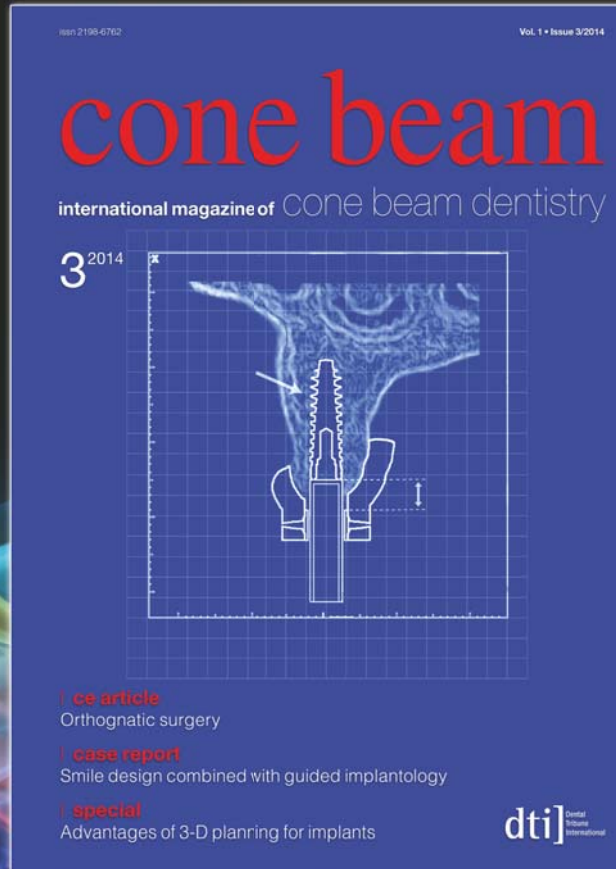
**Dr Reid Pullen, DDS, FAGD**, graduated from USC dental school in 1999 and served three years in the US Army as a dentist in Landstuhl, Germany. While in the Army, he completed a one-year advanced education in general dentistry residency. After the military, Pullen practiced as a general dentist for two years in southern California, prior to attending the endodontic residency at the Long Beach Veterans Hospital in 2004. He graduated from the endodontic residency in 2006 and has maintained a private practice limited to endodontics in Brea, Calif., since 2007. Pullen obtained his endodontic board certification in 2012.

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