PIPS and retreatment

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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 undefiled and/or under condensed?

Is there periodontal involvement? If the supporting periodontum appears healthy and the root does not appear to be fractured, then 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.
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.1 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.2 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.3 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.4

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 500rpm 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...
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