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The Evolution of the Bubble: Does it Matter?

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At present laser-activated irrigation can be considered as an established cleaning and disinfection method in endodontics.

With the development of shorter pulse durations, and different cavitation bubble dynamics (single- versus double-pulse regime), there is a question of whether the enhanced fluid dynamics will lead to improved 3D root canal cleaning efficacy of the isthmus.

Transparent resin blocks containing two standardized root canals (apical diameter of 0.3 mm, 6% taper, 16 mm long, with a coronal reservoir) connected by an isthmus (0.15 mm wide, 2 mm high) were used as the test model. The isthmus was filled with a hydrogel-containing dentine debris (biofilm mimicking hydrogel – BMH). The canals were filled with irrigant, and the models were randomly assigned to the following activation groups (n = 20): Eddy, ultrasonically activated irrigation (UAI) with an Irrisafe 25 mm length, size 25 file and LAI with a 2940 nm Er:YAG-laser in PIPS mode (a 600/9 tip - 20 Hz, 20 mJ, PIPS tip at the canal entrance – (1) 50 μs and (2) 25 μs) and AutoSWEEPS mode (600/9 - 20 Hz, 20 mJ). All protocols were executed for 3 × 20 s. Needle irrigation (NI) with a 27G needle served as the control. Standardized images of the isthmus were taken before and after irrigation, and the amount of removed hydrogel was determined using image analysis software. Differences in the amount of removed hydrogel were subjected to statistical analysis ($P \leq 0.05$).

The fluid motion and the BMH removal pattern from the isthmus were visualized by means of high-speed image films.

Enhanced fluid streaming with Erbium laser matters: UAI < EDDY < (PIPS 50 μs ≤ PIPS 25 μs ≤ AutoSWEEPS).

Laser-activated irrigation has proven its superiority over UAI, and overcomes the problems of spatial hindrance encountered with instruments and tips vibrating within the confines of the root canal system.

A Non-invasive Application of Er:YAG Laser for De-cementation of Prosthetic Restorations

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During dental procedures, we can encounter failures with prosthetic restorations. Cementation failures in fixed partial dentures are caused by several factors other than the type of cement, such as crown height, resistance and retention, remaining tooth structure after preparation, occlusion, chewing habits and other issues. For many years, metal ceramic restorations were the gold standard in dentistry. However, patients' aesthetic demands for natural-looking teeth have driven dentists to use all-ceramic restorations. Removal of cement-retained implant crowns can be difficult and often requires sectioning of the prosthesis by rotary instruments. Dental implants and associated restorations are growing in popularity among the proposed treatment solutions. With the increase in implants use, there is a growing number of complications that lead to prosthetic revisions. Replacing cemented all-ceramic crowns or retrieving a cemented crown to gain access to a loose abutment screw can be a common problem in a dental office. In such cases a novel usage of Erbium laser can be applied. It can be used to remove fixed prostheses by irradiation, leading to the evaporation of water and monomer molecules in luting cement between the abutment and crown. Er:YAG laser has been explored in the debonding of various dental restorations and appliances, including veneer restorations, orthodontic brackets and crowns from natural teeth, without damaging or causing excess thermal disturbance to the dental pulp.

The goal for this lecture is to present the study of non-invasive retrieval of lithium disilicate crowns from implant abutments cemented in two different permanent cements using safe parameters with Erbium laser.