Twinlight Endo Treatment - How Er:YAG Completes our Nd:YAG Endoprotocol

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SUMMARY

Traditional protocols involve, at root level, the cleaning of the main root canal using standard mechanical procedures, combined with antibacterial rinsings. However, there are two major disadvantages of standard chemo-mechanical preparations. First, the bactericidal effect of the rinsing solutions is limited to the root canal and its immediate neighbourhood systems to a max depth of 100µm, due to the very complex anatomy of the dentinal tubules and the high surface tension of the liquids. But bacteria can penetrate over 1000µm from the canal lumen, remaining protected in deeper layers of dentin. The second important disadvantage is that a complete mechanical preparation of the complex side canal system, as well as the complete removal of the smear layer, are almost impossible with classical protocols.

Lasers with an efficient transmission into the lateral tubuli and a high peak-pulse power are now the gold standard for laser-assisted deep decontamination of root-canal systems. They are far more efficient than traditional chemical rinsings in the decontamination of the dentinal root mosaic. The wavelength of the Nd:YAG laser at 1,064nm has the most accurate transmission with an bactericidal effect up to 1000 µm.

In recent years, a new protocol has been developed that addresses also the second disadvantage of classically performed root-canal treatments. For the effective debridement and cleaning of the complex root-canal system, the extremely high absorption of the pulsed Er:YAG laser wavelength at 2,940 nm in water and chemical rinsings is utilized to create a "cleansing" photo-acoustic effect within the root canal system as a laser-assisted irrigation (LAI). The Er:YAG laser pulses are emitted from a thin side-firing endo tip, so they are immediately fully absorbed by the rinsing, creating shock waves that mechanically debride the root canal system even in otherwise difficult or impossible to reach side canals, with a minimal thermal impact on the dentin. It results in a complete removal of the smear layer with open dentinal tubules and an intact collagen structure, performing also a biomodulation of the fibroblasts and preparing the root-canal network for an almost perfect 3D filling.

Known as the Twinlight™ Endodontic Treatment (TET), this new protocol involves two complementary standard wavelengths: the Nd:YAG laser wavelength for the deep thermal disinfection of the dentin, and the Er:YAG laser wavelength for the non-thermal, photo-acoustic cleaning and debridement of the complex root canal system, accompanied by an efficient biomodulation of fibroblasts.

The TET procedure consists of three laser treatment steps:

First, the sophisticated hard-tissue ablative capability of the Er:YAG laser allows a selective and pressure-free, less painful access to the pulp chamber, decontaminating the area and ablating the irritated tissue. The bacterial load is not pushed into deeper root areas, significantly reducing the danger of spreading of the bacterial wave throughout the body system.

Secondly, the root-canal system is cleaned and debrided with Er:YAG-induced photo-acoustics. Two protocols are being used for this procedure, either Preciso side-firing tips with saline solution at 20–65 mJ and 15-25 Hz, or alternatively PIPS radial-firing tips at 10-20 mJ and 10-50 Hz with EDTA (15-17%) as rinsing.

During the third step, the root canal is rinsed, dried, and deeply decontaminated using the Nd:YAG 200 µm laser fiber at 1.5 W and 15 Hz.

The described combination of laser treatments using two "gold standard" dental laser wavelengths dramatically improves the prognosis of root-canal treatments.

Besides root-canal therapy, there are other excellent indications for the Twinlight™ treatment concept. In my practice we apply the Twinlight™ concept also to other laser-assisted dental procedures, as implant setting in surgery, with pin root canal management, or before cementation in prosthetic dentistry.

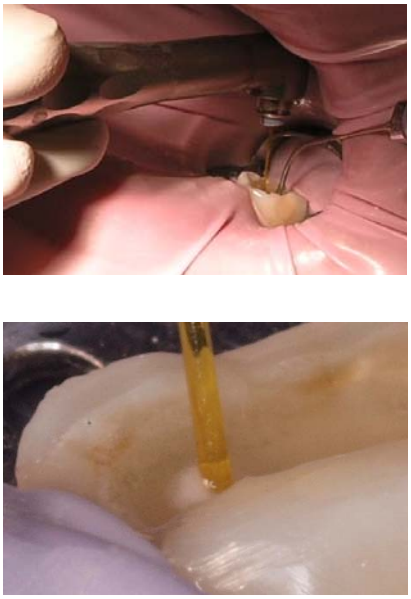

Fig. 1: TET (above) and PIPS in action