Press report

Er:YAG laser therapy in a new light

Gentle, rather painless and effective: Morita's AdvErL Evo laser lights up the scene in many dental indications

Although laser dentistry now enjoys wide appeal in clinical practice, hearing the word "laser" used in connection with their visit to the dentist probably still sounds a bit futuristic, a bit like sci-fi, for many patients. In fact, the virtual light sabers out of *Star Wars* are not all that far from reality: Scientists, for example, use high-power lasers to locate the position space debris 1,000 kilometers away to within five meters of precision, with the aim of ultimately destroying it by burning it up in Earth's atmosphere.[1] Dentistry, too, demands high-precision safety-first work. The AdvErL Evo Er:YAG laser offered by the traditional Japanese dental solution provider Morita is an innovative system that combines mature technology with a stylish design and "lightens up" the scene for many dental indications – including the widespread diseases periodontitis and dental caries, but also in oral implantology and endodontics.

From lowly laser pointers to distance-measuring equipment and medical applications such as laser vision correction – laser technology is part of everyday life in many areas. The term "laser" (Light Amplification by Stimulated Emission of Radiation) in itself simply denotes a light source. However, laser light differs from an ordinary lightbulb in that the light is much more intense and the (light) beam is more strongly focused. It has been 50 years since the first attempts to apply laser in dentistry.

1. Die Welt (2013): Hochleistungslaser soll Weltraumschrott beseitigen (High-power laser to remove space debris [German]) Dec. 12, 2013. Download from: http://www.welt.de/wissenschaft/article123298107/Hochleistungslaser-soll-Weltraumschrott-beseitigen.html

Today, different types of lasers such as CO_2, Nd:YAG, Er:YAG, diode, and argon lasers are in use. Their areas of application are defined by their biophysical interaction with the tissue. The effects of laser radiation in biological tissues is dependent on a variety of factors such as laser wavelength, duration of application, and especially the absorption coefficient. The higher the absorption coefficient, the lower the penetration depth and the less pronounced any thermal side effects, as the laser energy is already absorbed at the immediate (tissue) surface.

Especially useful for dental treatments is the Er:YAG laser with its wavelength of 2,940 nm, which falls within the range of infrared light. This is ideal because energy of this wavelength is absorbed by water, which after all makes up about 70 percent of the human body.

Er:YAG — the technology behind the technology

Unlike CO_2 and Nd:YAG laser beams, the Er:YAG laser beams do not penetrate too deeply into the tissue, protecting the body tissues and providing a minimally invasive treatment modality. Other advantages are equally obvious: The laser is practically silent and almost painless to apply. Unlike other methods, no relevant amount of heat develops in the tissue, and no anesthesia is required. Morita's AdvErL Evo lets the dentist work effectively, comfortably, and above all with extremely high precision. The principle is as follows: The laser light is generated by a yttrium-aluminum-garnet (YAG) crystal and transported to the handpiece, whose optical tip releases the laser beam to meet the body tissue, either in direct contact (soft tissue) or from a distance of about three to five millimeters (hard tissue). Twenty years of development efforts have culminated in this third laser generation, which especially benefits patients who suffer from periodontal disease or caries.

Periodontitis, peri-implantitis and caries in laser sight

Despite the roaring successes of dental prophylaxis in recent decades, common afflictions, periodontal disease and caries, are still in focus. According to figures from the Fourth German Oral Health Study,[2] the prevalence of both moderate and

2. Vierte Deutsche Mundgesundheitsstudie (Fourth German Study of Oral Health [German]) (2005). Kassenzahnärztliche Bundesvereinigung (German Federal Association of Contract Dentists) and

severe periodontal disease has increased by approximately one-quarter, especially in adults and seniors, compared to the previous survey . One reason is the fact that more natural teeth are preserved in members of this age group — the flip side of this otherwise highly desirable development has been an increased risk of periodontal disease with increasing age. The AdvErL Evo targets this affliction and can be used effectively for conservative hard- and soft-tissue treatment (e.g. in the removal of supra- or subgingival calculus or of inflamed tissue in gingival pockets as well as abscesses and granulomas).

A major advantage of laser therapy in periodontitis treatment is that the working field is automatically sterilized. The AdvErL not only eliminates the inflamed tissue but also fights the resident bacteria with high efficiency and nearly precludes the risk of bacteremia. Surfaces are reactivated by so-called micro-explosions that occur when laser energy is absorbed by water, whose volume is made to increases 800 to 1,000 times in the next instant. This effectively ensures disinfection of the treatment field.

In oral implantology, this innovative approach facilitates an effective approach to peri-implantitis treatment.[3] While established procedures allow for successful peri-implantitis treatment only up to CIST class C, the innovative treatment approach using AdvErL Evo now also covers cases of class D.

The incidence of peri-implantitis is increasing with the growing popularity of implant dentistry. But dental caries — like periodontitis, as mentioned — continues to be a widespread public-health problem. Not only younger patients are at risk but especially adults and seniors, not least in the form of root caries.[2] The Nd:YAG laser has many advantages in initial caries treatment, in cervical fillings and when excavating caries in close vicinity to the dental pulp. Other benefits in addition to substance conservation include reduced trauma to the tooth and improved bonding of adhesively connected restorations. Morita's AdvErL Evo covers a wide range of

Bundeszahnärztekammer (German Dental Association). Download from: http://www.bzaek.de/fileadmin/PDFs/presse/dms/brosch.pdf

3. ZMK (2012). Wegweisende Behandlung bei Periimplantitis auf der Europerio 7 (Pioneering treatment for peri-implantitis at Europerio 7 [German]). Download from: http://www.zmk-aktuell.de/dentalindustrie/messe-highlights/product/wegweisende-behandlung-bei-periimplantitis-auf-der-europerio-7.html

indications. from caries removal and cavity preparation to the surface roughening in class I, II, III, IV and V cavities.

Innovative and effective in the endodontic domain

As a specialist manufacturer in endodontics, Morita now heralds in a “soft” revolution with the new Evo AdvErL that facilitates conservative treatment modalities. The laser system is used in surgical procedures (e.g. apical resections or the removal of cysts or tumors) and in the context of root-canal treatments, to name just a few.

The AdvErL Evo is particularly suitable for endodontic debridement. Studies have shown that Er:YAG lasers are more effective in removing debris than alternative methods.[4] The first step in every laser treatment is a proper diagnosis. Accurate and high-resolution 3D images are helpful, such as those taken by cone-beam computed tomography (using system such as Morita’s 3D Accuitomo 170 or Veraviewepocs 3D R100). These, too, have numerous features that facilitate a gentle yet highly precise diagnosis.

The best comes last: patient benefits

Whether in periodontitis, caries or peri-implantitis — the benefits of laser medicine such as the tooth-conserving procedure or the simultaneous disinfection are undisputed. But what are the benefits for the patients? Polling them, the answer quickly becomes evident: Patients perceive the local treatment with its disinfection effect and without anesthesia as far more comfortable than previous methods. AdvErL Evo offers patients a treatment result that is hardly achievable with the classical methods: The procedure is minimally invasive and almost painless, does not produce major vibration or excessive heat and is tissue conserving and therefore pleasant for the patients. This improves not only patient’s quality of life, but also offers a high level of comfort for the treatment team. Morita’s AdvErL Evo represents an innovative milestone as we move toward the future of laser dentistry. It has numerous advantages over conventional therapies and alternative laser

4. Yao K, Ide A, Satake K, Ichikawa M, Watanabe S, Anjo T, Ebihara A, Kobayashi C, Suda H (2014). Er:YAG Laser-activated irrigation for lateral canals. 14th World Congress for Laser Dentistry. Paris, July 2–4 2014. Abstract #64558. Download from: http://www.wfld-paris2014.com/images/Abstracts%20book%20OIWC%20&%20WFLD.pdf

technologies. This benefits the patient first and foremost — and confirms what practitioners know: Morita's lasers show better performance!