The Use of the Erbium Yttrium Aluminum Garnet (2940nm) in Laser-Assisted Implant Therapy and GBR Technique

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Introduction

Osseo-integration dental implants have become a routinely recommended procedure in the clinical practice of dentistry[1-4], and have been utilized as a successful treatment modality for over three decades with a reported success rate of greater than 90%[5-7,8]. The predictability and success of dental implants have secured their place as a standard treatment modality.

A clinical case study will demonstrate the use of the Er:YAG laser in the world of implantology. This technique using the Er:YAG laser presents several advantages vs. conventional treatment methods, and there are minimal post-operative complications coupled with a high rate of success.

Er:YAG is one of the most suitable wavelengths for bone applications. The 2940nm wavelength is highly absorbed in the water component of dental tissue, and provides efficient ablation without the risk of significant thermal damage[14]. This article will discuss the utilization of the LiteTouch laser (Syneron Medical Ltd.) for implantology.

The array of available clinical applications for laser assisted dentistry is growing rapidly, with the greater number of applications being for oral surgery. Er:YAG is a laser wavelength which is located in the infrared zone of the electromagnetic spectrum, is considered to be extremely safe, and is the dominant wavelength in dentistry today .

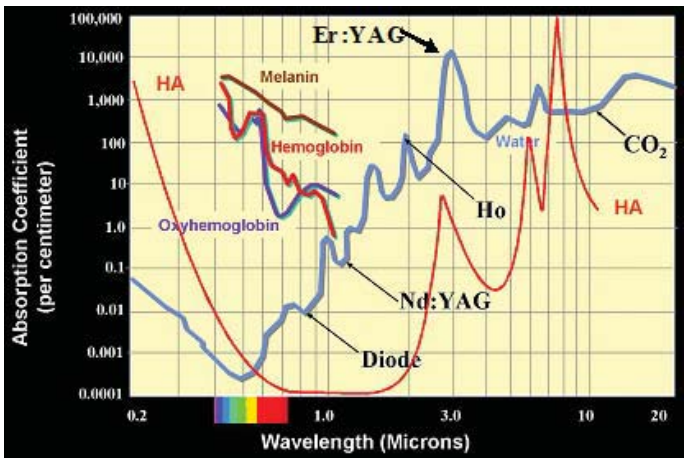
Most of the procedures performed at my practice are in the realm of surgery and they are all performed with the Er:YAG laser:

- Periodontal surgery, without the assistance of rotary equipment, scalpels or other hand tools
- Apicoectomy and bone manipulation - bone smoothing, harvesting and vaporization
- Guided bone regeneration (GBR)

How far can we advance with this technology? Where is the line between reality and fantasy - very clear at times, other times it can barely be seen, and yet at other times the line disappears altogether. What is the stage where I lay down the laser's handpiece and retreat to the conventional system and rotary equipment? Today we can observe an inordinate lack of knowledge and clarity concerning the clinical uses of the laser in the field of implantology, and with many doctors in the field reality does indeed mix with fantasy.

Er:YAG Lasers and Implants

- The Er:YAG laser generates a wavelength of 2940nm and emits as a free-running pulsed train of photons in the mid infrared portion of the electromagnetic spectrum (see Absorption Chart). Successive laser pulses are 100-200 microseconds in width. The prime chromophore of this laser wavelength is water, which makes it appropriate for ablating both hard and soft target oral tissue. Incident laser energy is absorbed by the chromophore, converted into thermal energy which results in expansive vaporization. Such action causes a dislocation of the tissue structure and ablation; often this is accompanied by an audible "popping" sound.
- The Er:YAG laser can perform incisions for flap lifting, such as a crestal incision, or an intrasulcular or vertical release incision. The laser produces a wet incision (some bleeding) as opposed to the dry incision (no bleeding) that is produced by the CO_2 laser[9-13].
- Vaporization of granulation tissue[14-15] (if any exists) after raising a flap is efficient with the Er:YAG laser, with a lower risk of overheating the bone[14,16,17] than those posed by the current diode or CO_2 lasers.
- Using the Er:YAG laser in non-contact mode (1.5-2 mm from the target tissue), the future location and angle of the implant is outlined; and the laser is used only on the cortical bone. As an important point of clarification, the laser does not replace the pilot drill; it is used to create a "pilot hole" for the drill. The entire length of the implant should not be lased with the laser.
- Ablating the bone with the Er:YAG laser - remodeling, shaping and ablating necrosis bone[13,18-21].
- Implant exposure
- Implants complications - Peri-implantitis



Absorption Chart

Reference:

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