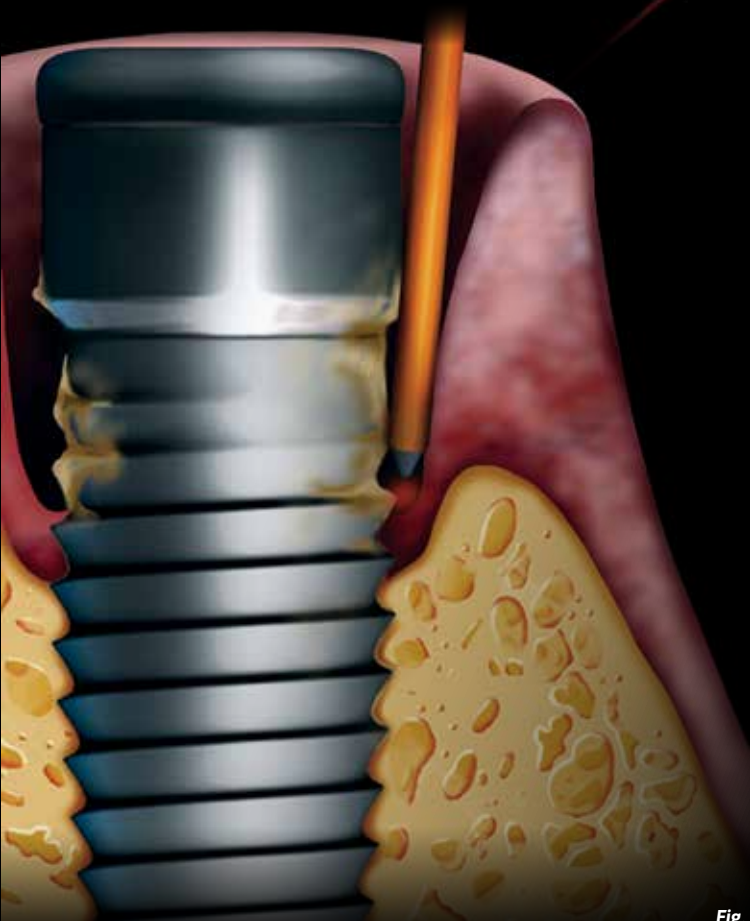


# LASER FOCUSED

UTILIZING LASER TECHNOLOGY TO MANAGE PERI-IMPLANTITIS



The dental implant market continues to observe a rising demand from the aging population and patients who have experienced dental trauma. The baby boomer generation has a high incidence of root caries and periodontal disease resulting in continued tooth loss. In addition, traumatic incidents can result in alterations of the dentition at any age. More than 3 million Americans now have implants, and that number is growing by at least 500,000 a year, according to the American Academy of Implant Dentistry.

When it comes to tooth replacement, implants are superior to removable and fixed prostheses in most cases. The implant, which mimics a natural tooth, maintains the patient's appearance, allows the patient to chew and speak normally, looks and feels like a natural tooth, and can preserve and stimulate the osseous structure. With quality continuing education and major advances in technology such as CAD/CAM, many dental health professionals are now placing implants.

*Fig. 1: Radial firing tip degranulating inflammation associated with peri-implantitis.*

While dental implants are largely successful, an associated complication is peri-implantitis, which results from inflammation of the soft tissue and a progressive loss of the supporting bone around the endosseous implant structure. The incidence of peri-implantitis, which can lead to the loss of the implant, has been reported to occur in a range of 10 to 47 percent based on systematic studies.

With approximately 500,000 dental implants being placed each year in the United States, this translates to tens of thousands of annual peri-implantitis cases. The psychological impact of peri-implantitis to a patient is significant since for many, this was considered their ultimate treatment for a lost natural dentition. Not surprisingly, studies have shown that peri-implantitis patients have an impaired quality of life and a low level of satisfaction. In a 2017 study from the *Journal of Periodontology*, 32 percent of respondents reported that living with the disease was “terrible.”

The incredible growth in dental implant placement makes it imperative for dental professionals to use the safest and most effective methods and least invasive options for the management of peri-implantitis. Laser dentistry is an alternative that allows dental professionals to avoid drawbacks associated with traditional treatment methods.

## Traditional approaches

The risk factors for peri-implantitis, some of which are similar to those for periodontal disease include a history of periodontitis, compromised oral hygiene, nicotine ingestion, drug abuse, genetic susceptibility and diabetes. Behavioral habits such as bruxism, clenching or grinding of the teeth, and iatrogenic or medical treatment factors such as faulty restorations, residual excessive cement and loose components are also risk factors.

Traditional methodologies range in a variety of protocols with minimal consensus. Most clinicians rely on a flap procedure for access with resulting mechanical debridement of the implant surface to remove biofilm. The anatomy of most implant fixtures

consists of threads where decontamination can be very complex and difficult, similar to the inaccessibility of the furcation in a natural tooth.

Several devices have been developed along with antimicrobials for decontamination with a secondary objective of not creating an adverse surface event. The potential damage to the implant surface caused by mechanical debridement can reduce the opportunity for re-osseointegration. Most therapies also include osseous augmentation with membranes to support regeneration and inhibit down growth of epithelium.

## The advantages of laser dentistry

With the advent of dental lasers in managing periodontitis, a similar approach has been utilized for managing peri-implantitis. However, there are distinct differences between the natural tooth surface versus the titanium surface. Not all laser wavelengths respond to the target tissue/surface the same. Erbium lasers represent a class of wavelengths suitable for decontaminating implant surfaces with no adverse events when used under the appropriate settings.

The following are characteristics necessary for a dental laser to have a positive response on reducing inflammation around an implant and enhancing survival:

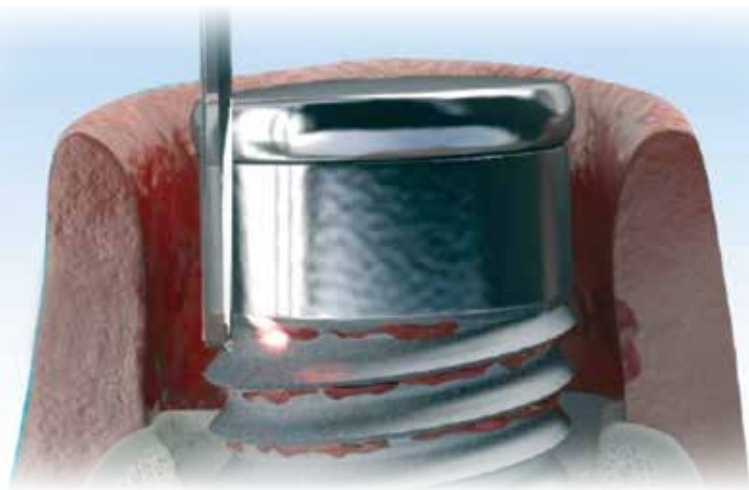
- Several studies demonstrate the ability of the erbium laser as the Er,Cr:YSGG to have a significant antibacterial effect on various titanium surfaces. A May 2017 study in the *Journal of Periodontology* reported, for instance, that an Er,Cr:YSGG laser with a radial firing tip and water spray was able to effectively ablate more than 95 percent of microbial biofilm on all types of tested titanium surfaces, using clinically relevant power settings, without causing measurable physical changes to the surfaces.
- Lasers have the precision to perform subgingival debridement of the

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**Fig. 2:** Side firing tip detoxifying the implant-contaminated implant surface.



**Fig. 3a:** Preoperative radiograph of implantitis.



**Fig. 3b:** Postoperative two-year radiograph utilizing an Er,Cr:YSGG laser.

inflamed soft tissue surrounding the implant surface. This enhances wound healing by essential biofilm removal and, moreover, degranulation of the site.

- Implant surfaces associated with peri-implantitis present with a variety of contaminants such as biofilm, endotoxin, calculus, cement and possibly titanium oxide, resulting in corrosion of the surface. The erbium laser demonstrates the ability to detoxify the surface and promote BIC (bone implant contact) for regeneration. Access to the threads as described earlier can be a challenge in an open or closed flap environment. Recent tip innovations include not only radial firing tips with laser energy moving in 360 degrees (Fig. 1, p. 94), but “side firing” tips where the energy moves directly into the pitch of the threads for effective detoxification (Fig. 2).
- An essential component of regeneration in either guided *tissue* regeneration or guided *bone* regeneration is decortication to enhance biologic mediators. The Er,Cr:YSGG wavelength with water irrigation can decorticate osseous structures, generating minimal thermal conduction (Figs. 3a and 3b).

As for adverse events, the clinician must discriminate on the selection of an appropriate laser wavelength in managing implant conditions including second-stage implant recovery. Diode lasers and especially Nd:YAG wavelengths can create significant thermal reactions resulting in cracking and melting of the implant surface with DE osteointegration. Erbium lasers have an excellent safety record for adverse events when used with the water coolant.

Due to the minimal invasive nature of small diameter laser tips, the clinician can now utilize a closed flap protocol under certain conditions. When the suprastructure of a crown can be removed during the procedure for access, clinicians can operate the laser energy through the sulcus. Another requirement is that less than one-third of the threads are exposed with no bone implant contact. When a very convex crown is present that cannot be removed and when there is substantial bone loss, a flap should be reflected to have effective laser access to the threads.

In addition to clinical effectiveness, lasers also assist in the following manner:

- **Increase speed and accuracy.**  
Increased access to hard-to-reach areas is a benefit of dental lasers for a wide range of treatments but is especially true in peri-implantitis because of the difficulty of detoxification of

the threads. This process does not require mechanical energy contact since laser energy seeks the target.

- **Improve patient outcomes.** Lasers have been demonstrated to enhance wound healing. While the mechanisms by which this is achieved are not currently well-understood, some studies have shown that exposure to a laser stimulates the mitochondria, the powerhouse of the cell, to produce energy, which in turn allows the cell to increase the production of proteins used for tissue repair. This area is described as photobiomodulation and is utilized in medicine for such conditions as diabetic foot wound healing.
- **Enhance positive patient related outcomes.** Patients enjoy the minimally invasive concept, which supports their lifestyle with decreased reliance on analgesics and quicker recovery. A 2010 study in the journal *Lasers in Medical Science* found that the Er,Cr:YSGG laser minimized postoperative pain and shortened rehabilitation time.

## Incorporating lasers into the dental practice for implant conditions

As the number of patients requiring implants continues to grow, dental professionals should consider incorporating lasers into their practices as a major component in managing peri-implantitis. Diagnosing with early intervention is the key to a successful implant. For implant mucositis, novel glycine air polishing for biofilm control by the dental hygienist is a must for preventing and/or reducing inflammation.

However, for peri-implantitis, the Erbium laser is an essential device in the toolbox. Laser technology has advanced with user-friendly devices and companies now afford quality training for their respective laser users. With our transient society, dentists will now “inherit” peri-implantitis patients who are distraught with considering the alternative of removing the implant and replacement with another. We now have a solution with minimally invasive laser therapy to stabilize the “sick” implant and add life to the implant dentition. ■

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