

laser

international magazine of

2²⁰¹¹

laser dentistry



| overview

The antibacterial effects of lasers in endodontics

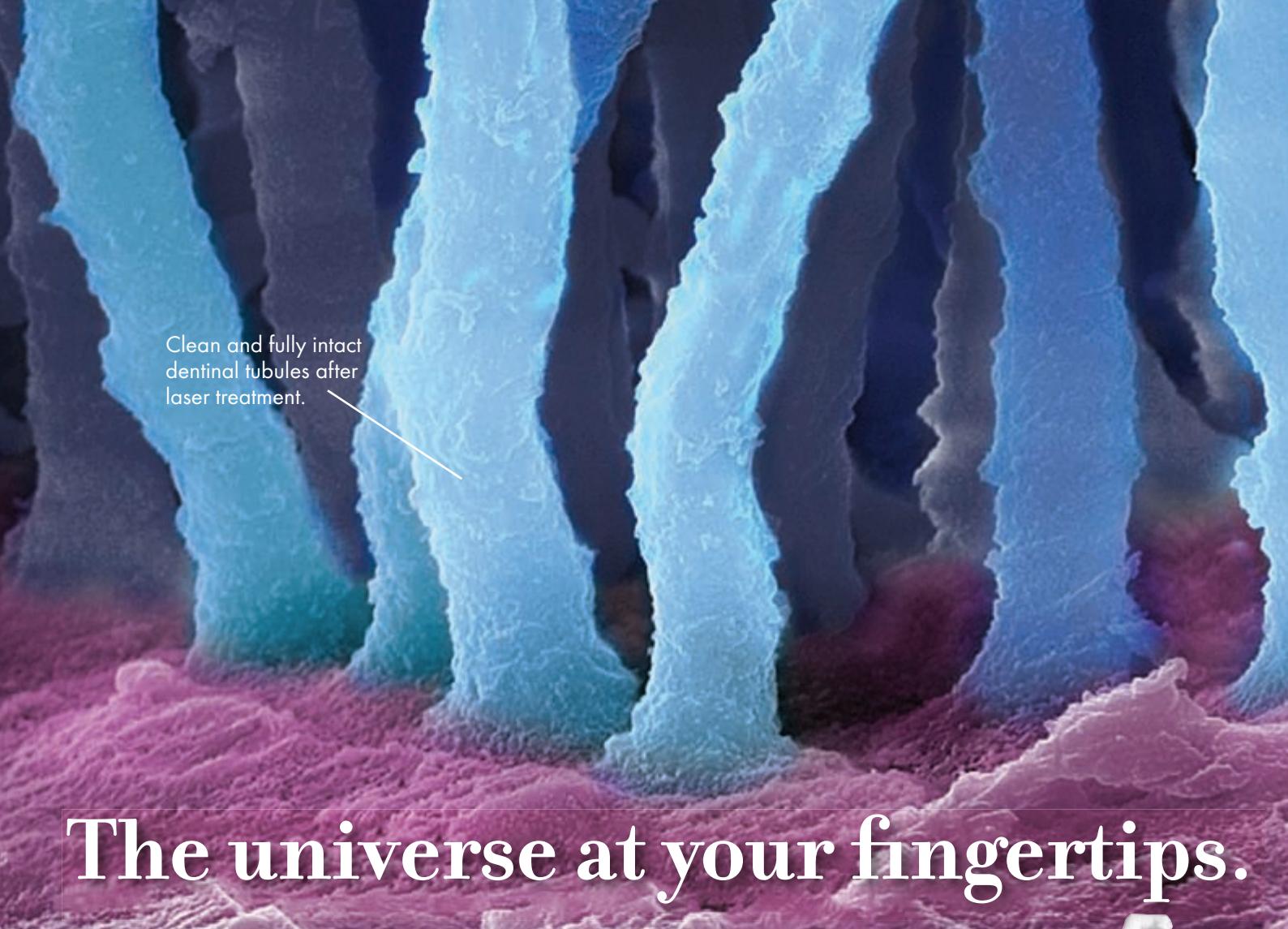
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IDS approves use of laser in dentistry



Prof Dr Norbert Gutknecht
WFLD President
Editor-in-Chief

The IDS—International Dental Show—in Cologne showed once again the further dissemination and awareness of laser therapy in dentistry. A significant higher number of distributors showed their laser devices to the dental world with new innovations and treatment concepts. Seeing this I am even more sure that laser therapy will play an improving role in the wide field of modern dental therapy.

The upcoming European Division Congress of the WFLD in Rome promises to be an outstanding congress, especially with the location Rome as a special attraction. If you have not made your decision to participate in this congress it is more than high time now and I am sure you will not regret it!

Hope to see you in Rome!

A handwritten signature in black ink, appearing to read "Norbert Gutknecht".

Prof Dr Norbert Gutknecht
Editor-in-Chief



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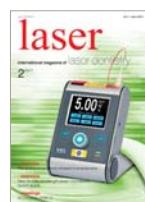
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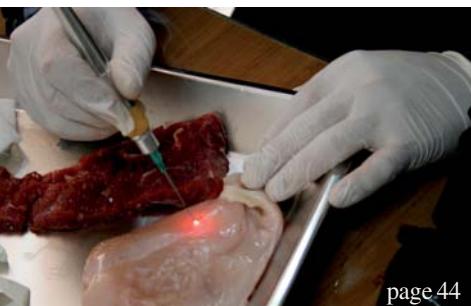
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DENTAL LASERS

Laser-assisted immediate implantation at infected site

Authors_Drs Avi Reyhanian, Natan Fuhrman, Israel & Costas Ioannou, Cyprus

Abstract

Osseointegration of dental implants has become a routinely recommended procedure in the clinical practice of dentistry.¹⁻⁴ Over the years, patients have begun to demand a shortened treatment time and that treatment be done in one visit, to the extent possible. This clinical case study will discuss and demonstrate the correct use of the Er:YAG laser (2,940 nm) in immediate placement of implants (in one visit) at the infected site: extraction, degranulation, decontamination, placing the implant, and treating the bone defect (guided-bone regeneration—GBR).

Fig. 1

Mobility and fistula
of tooth #11.

Fig. 2

X-ray image of teeth
11 and 21.

Fig. 3

The CO₂ laser used
for the frenectomy.

Fig. 4

The Er:YAG laser used
for incision.

Fig. 5

The intrasulcular and vertical
incisions and the frenectomy.

Fig. 6

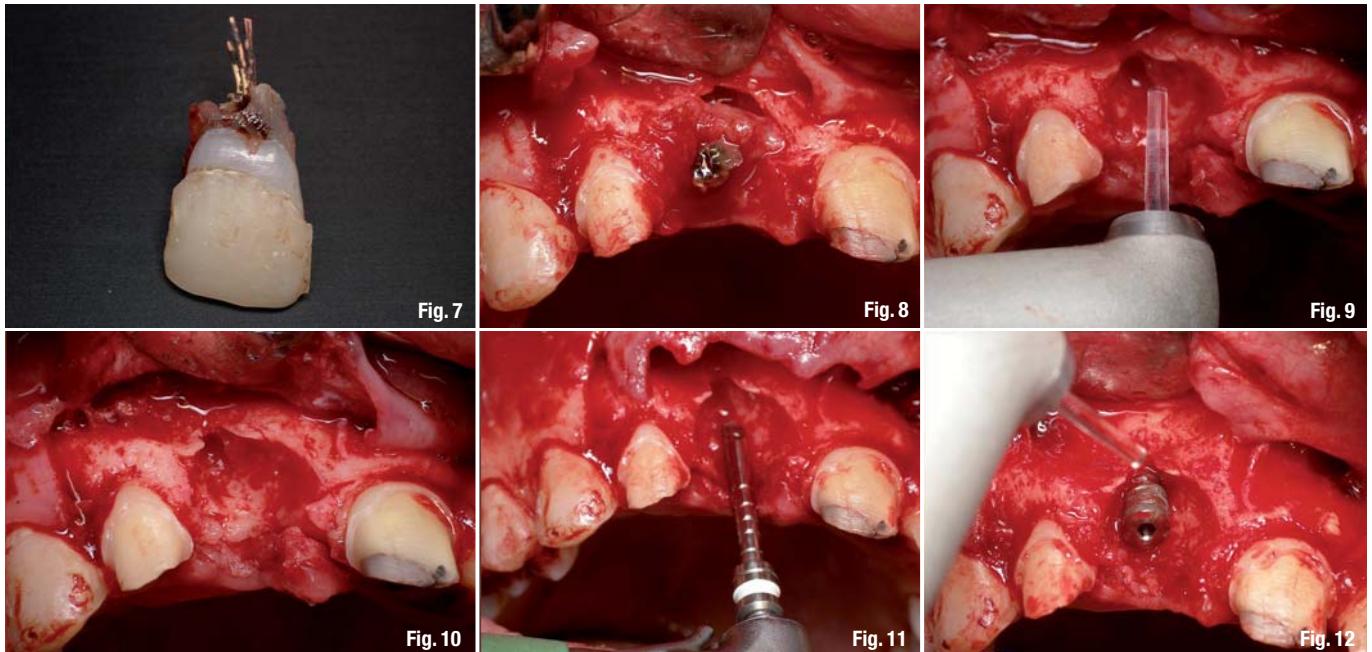
Lifting the flap.

This technique using the Er:YAG laser presents several advantages compared with conventional treatment methods, and there are minimal post-operative complications coupled with a high success rate.

Introduction of the clinical case

A 21-year-old soldier presented to the clinic with the chief complaint of mobility of tooth #11. There was no medical history. He had undergone trauma to the tooth a year before, which had been untreated. Clinical examination revealed mobility grade 3+ at tooth #11 with fistula and a change of





colour of tooth #21. A periodontal probe indicated a depth pocket of 9mm and bleeding on probing. Radiographs revealed horizontal and vertical bone loss due to trauma around teeth #11 and 21 with root canal (Figs. 1 & 2).

Implant indications for laser treatment:

- frenectomy using the CO₂ laser;
- incision using the Er:YAG laser;
- lifting a flap.

Simultaneous (combined) approach:

- extraction;
- ablation of granulation tissue using the Er:YAG laser;
- insertion of immediate implant using the Er:YAG laser—lasing just the cortical bone;
- GBR using the Er:YAG laser;
- primary closure.

Treatment alternatives:

Using conventional treatment

- scalpel
- surgical bur
- high-speed rotary instruments
- GBR
- sutures

Multiple post-operative appointments: staged approach

Placement of the fixture after healing.

Diagnosis and treatment plan

Severe periodontitis with massive bone loss around tooth #11 was diagnosed. The treatment plan entailed lifting a flap, extraction of the tooth

and immediate placement of a submerged implant, using a CO₂ laser for the frenectomy, then using an Er:YAG laser for incision, ablation of granulation tissue, bone remodelling and shaping decortication for GBR. Uncovering of the submerged implant with an Er:YAG laser was to be done a year later.

Rational for treatment

The pulsed Er:YAG laser can cut and ablate tissue with excellent surgical precision without excessive heat or thermal injury. Healing time is shortened when compared with a scalpel or hand instruments. Using a CO₂ laser for a frenectomy results in no bleeding, no pain post-operatively, and a reduced healing time compared with conventional methods.

Indications/contra-indications and alternative treatment

There were no contra-indications for use of the laser on this patient. Care must be taken to set proper parameters and use a proper technique, so that both hard and soft tissues are not ablated when only one of the tissues is being targeted. Maximum water spray cooling must be used with the Er:YAG laser to avoid thermal damage.

Clinical technique, laser wavelength and laser operating parameters

The lasers selected for the frenectomy were a CO₂ laser (AquaLite, Lumenis Dental; 10,600 nm, 6 W, SP, non-contact), a free-running, pulsed Er:YAG laser (LiteTouch, Syneron Medical Ltd; 2,940 nm, repetition rate of 17–10 Hz, 400–700 mJ). The tips

Fig. 7_The extracted tooth.

Fig. 8_The bone defect.

Fig. 9_The Er:YAG laser ablates the granulation tissue.

Fig. 10_The bone defect after ablation and marking the location of the implant with the Er:YAG laser.

Fig. 11_The pilot hole.

Fig. 12_Decortication with the Er:YAG laser.

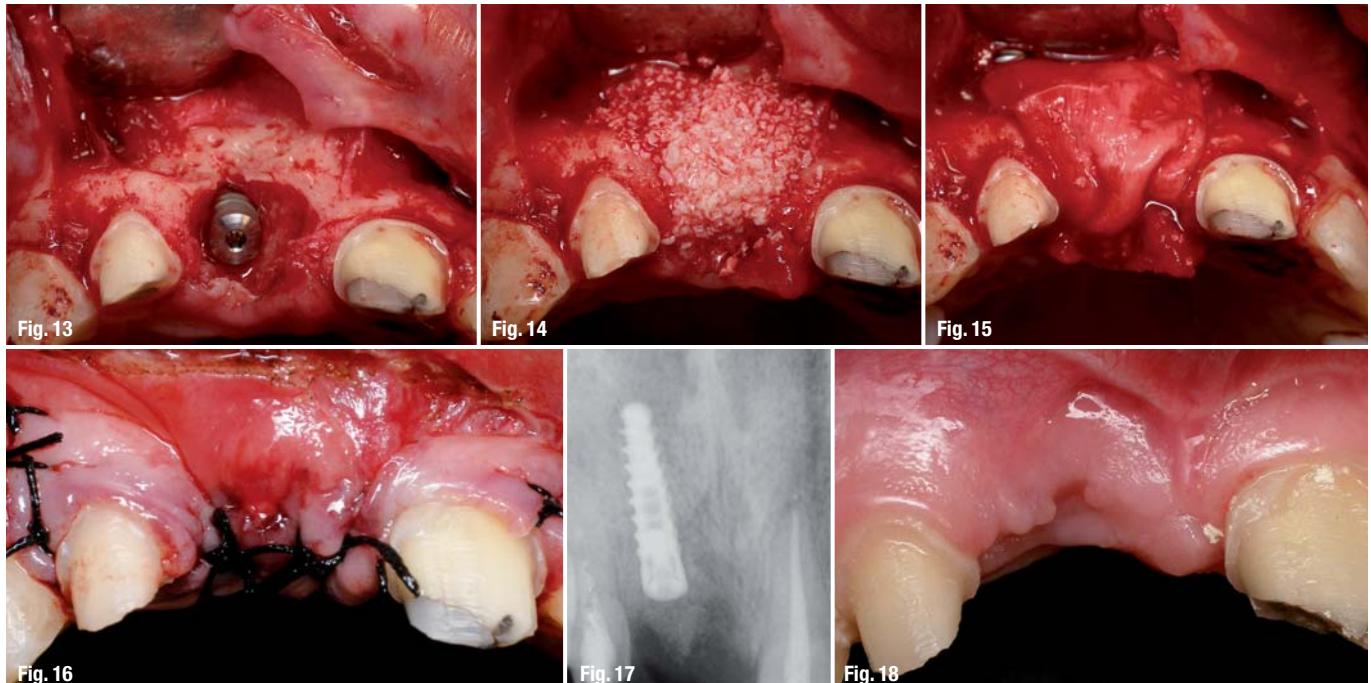


Fig. 13_Immediately after decortication.

Fig. 14_Xenograft using Bio-Oss for GBR.

Fig. 15_Resorbable membrane.

Fig. 16_Primary closure.

Fig. 17_X-ray image immediately post-op.

Fig. 18_Three months post-op.

used were 200 μ and 1,300 μ sapphire tips. The laser selected for uncovering the submerged implant was an Er:YAG laser (LiteTouch) with a 200 μ sapphire tip and a power setting of 300 mJ/25 Hz.

Treatment sequence

Verbal consent was obtained from the patient and his parents after explaining the advantages of laser treatment compared with conventional surgical techniques.

Local anaesthetic was first given to the patient. The frenectomy was then performed with the CO₂ laser set in non-contact mode and to 6 WSP (Fig. 3).⁵⁻⁷

Er:YAG lasers can be used to make an incision for flap lifting, such as crestal, intrasulcular or vertical release incisions, and produce a wet incision (some bleeding) as opposed to the dry incision (no bleeding) produced by the CO₂ laser.⁸⁻¹¹

The Er:YAG laser with a 200 μ sapphire tip and set in contact mode was used to perform intrasulcular incision and two vertical incisions (Figs. 4 & 5). A full-thickness flap was lifted (Fig. 6) and tooth #11 was extracted (Fig. 7).

Vaporisation of granulation tissue (if any exists) after lifting a flap can be done efficiently with the Er:YAG laser, with a lower risk of overheating the bone than with the current diode or CO₂ lasers.^{11,17,14} There is no need for any hand instruments. Results from both controlled clinical and basic studies have pointed to the high potential of the Er:YAG laser. Its

excellent ability to ablate soft tissue effectively without producing major thermal side-effects to adjacent tissue has been demonstrated in numerous studies.¹²⁻¹⁵

Granulation tissue was ablated with the Er:YAG laser with a 1,300 μ tip in non-contact mode and with a power setting of 600 mJ/12 pps (Figs. 8 & 9). Detoxification of the infected site was done by lasering directly on the bone, using a low-energy setting. In this way, the target tissue was disinfected without injuring the bone. The laser is bactericidal.^{15,16} The necrotic bone was ablated using the Er:YAG laser with a 1,300 μ sapphire tip in non-contact mode and with a power setting of 350 mJ/20 pps.^{8,10,17,18}

The placement site for the implant was marked with the Er:YAG laser (Fig. 10), and the entire length of the implant was prepared using rotary instruments (Fig. 11). The laser does not replace the pilot drill; it is used to create a pilot hole for the drill. The preparation for the entire length of the implant should not be lased with the laser.

An implant with a length of 13 mm and diameter of 3.75 mm (MIS Implants Technologies Ltd) was placed manually (Fig. 12). The bone defect required GBR. Decortication was performed with the Er:YAG laser with a 1,300 μ sapphire tip in non-contact mode and with a power setting of 400 mJ/12 pps (Figs. 12 & 13). The bone defect around the implant was filled with Bio-Oss bone substitute (Geistlich Biomaterials) and covered with Bio-Gide (Geistlich Biomaterials), an absorbent, bilayer membrane



(Figs. 14 & 15). Sutures were applied and primary closure was achieved (Fig. 16). An X-ray was taken to confirm the placement of the implants (Fig. 17).

Biological rationale for immediate implantation

- Simplified procedure that reduces the surgical stages;
- conservation of bone volume surrounding natural tooth;
- combination of post-extraction healing phase with osseointegration;
- maximum stimulation of natural healing processes;
- shortened healing phase and rehabilitation time;
- positive psychological effect on the patient.

Post-operative assessment

The patient was prescribed Clindamycin (150 mg x 50 tabs) to avoid infection. He was also given Motrin (800 mg x 15 tabs) for pain. Instructions were given to rinse with a 0.2% chlorhexidine mouth-wash, starting the next day for two weeks (three times a day). The patient returned for his first follow-up the next day with a moderate swelling and pain. The flap was closed. At ten days, the patient returned for the stitches to be removed and there were no signs of swelling haematoma or pain. After one month, the soft tissue had healed. A three-month evaluation of the area showed complete healing and no complications (Fig. 18). The soft tissue had healed over the bone and there were no bony projections observed under the soft tissue. The prognosis was excellent.

Complications

The patient had no complications related to laser treatment either during or after laser therapy. There was no soft or hard tissue damage.

Follow-up and long-term results

The patient was assessed once a week in the first month, at six weeks, three months and six months after the start of the treatment. At the fifth-month supportive periodontal therapy appointment, the patient had excellent healing and had improved tissue colour, contour and consistency (Fig. 19).

A year post-treatment the submerged implant was uncovered with the Er:YAG laser with an 800 μ sapphire tip in non-contact mode and with a power setting of 400 mJ/25 pps (Figs. 20–23). Five months after this, the rehabilitation was completed: three crowns on teeth #12, 11 (eight implants) and 21 (Figs. 24 & 25).

This case was followed-up for three years and two months (Figs. 26 & 27). An X-ray image shows a small absorption of bone around the neck of the implant.

Conclusion

We conclude that using the 2,940 nm wavelength laser for these procedures offers many advantages compared with conventional methods, such as the reduction of patient discomfort, enhancement of the surgical site and reduced treatment time.²¹ This

Fig. 19_Five months post-op, showing complete closure.

Fig. 20_A year post-op.

Fig. 21_Using the Er:YAG laser to uncover the submerged implant.

Fig. 22_The uncovered implant.

Fig. 23_The abutment.

Fig. 24_The alloy part of the rehabilitation – porcelain-fused-to-gold crowns.