Severe peri-implantitis treated with the Er,Cr:YSGG laser

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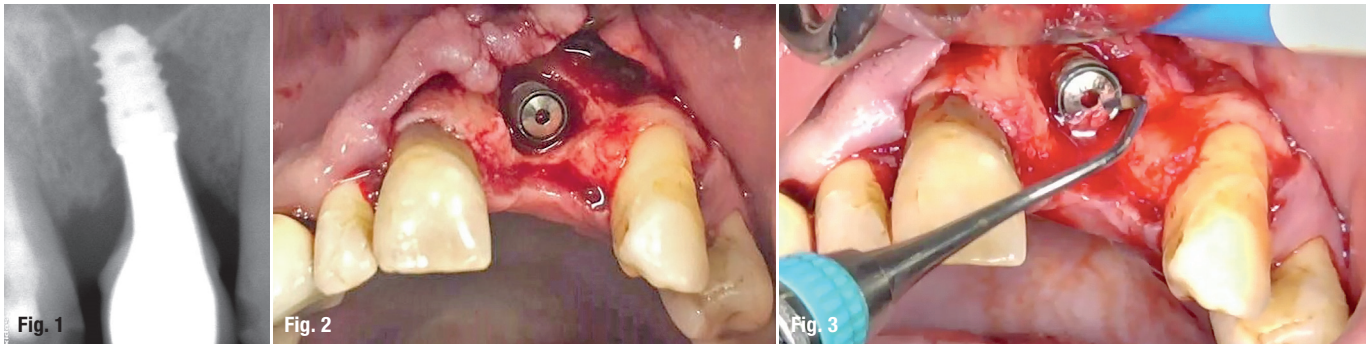
Introduction

Peri-implantitis is characterised by bleeding on probing, suppuration and radiographic evidence of bone loss.[1] The relevant literature has reported many methods for treating peri-implantitis.[2–6] Surgical access is recommended in defects of more than 2 mm in depth in order to achieve complete removal of granulation tissue and gain access for implant surface decontamination.[7,8] Many scientific articles have shown that the regenerative approach has better predictability when the presentation of the defect is infra-bony or circumferential.[9–11] Generally, methods of implant surface decontamination include mechanical debridement alone or in combination with saline, antiseptics, laser, photodynamic therapy, air–powder abrasion or implantoplasty.[2–6]

Recently, there has been a noticeable tendency towards laser application methods to vaporise the inflamed tissue in the peri-implant area and to detoxify the implant surface itself. The complicated peri-implantitis site consists of different kinds of tissue, as well as the titanium surface. This environment makes it difficult for the clinician to decide on method of treatment and the different tools required. Laser devices of different wavelengths are increasingly used, but only the erbium family of lasers can efficiently irradiate both soft and hard tissue and, moreover, the delicate implant surface. Under the correct parameters, erbium lasers can improve clinical outcomes by selective calculus removal, bactericidal and haemostatic effects, and titanium detoxification.[12–16] This case report will present a severe case of peri-implantitis that was treated with a therapeutic approach that combined a generative treatment using an Er,Cr:YSGG laser (2,780 nm) for debridement and decontamination.

Patient presentation

A 55-year-old male patient consulted our department for implant maintenance. The patient's medical history was clear, without any particular medical risk for dental care. Upon clinical examination, an implant in position #21 with a metal–ceramic restoration with pink porcelain on the cervical part was observed. The patient presented with suppuration, inflamed mucosa, deep peri-implant pockets (7–9 mm) and bleeding on probing. Radiographic examination showed vertical deficiency around the implant (Figs. 1 & 2). Excessive buccal implant positioning and flawed planning of the prosthetic restoration may have caused the condition at hand. Occlusal examination showed no equilibrated occlusal contacts on the mandibular teeth and traumatic interference. The patient's dentist had placed the implant three years earlier. At the time of initial consultation, he had already been on an antibiotic regimen for six days. The patient had had poor motivation but had not received proper instructions concerning plaque control techniques. One possible treatment option was removal of the implant, followed by bone and soft-tissue grafting and, finally, placement of a new implant. The alternative treatment option was to perform regenerative surgery in order to attempt to maintain the existing implant. The patient decided to proceed with the regenerative procedure.



Figs. 1 & 2: Pre-op radiograph showing the initial clinical situation: excessive buccal implant positioning. **Fig. 3:** Mechanical debridement around the implant surface was done.

Treatment

After removing the existing abutment and prosthesis, a cover screw was placed for two weeks. Initially, intrasulcular incisions were made and a full-thickness access flap was elevated in order to have perfect access to the defect site. An initial mechanical removal of calculus and inflamed soft tissue around the implant area was performed (Fig. 3). An Er,Cr:YSGG laser (2,780 nm; Waterlase MD, BIOLASE) was used in order to thoroughly remove, through the ablation mechanism, calculus deposits and the granulated soft tissue in the area (Fig. 4). Two different tips were used with the gold handpiece of the device. An MZ6 tip (diameter of 600 µm, length of 14 mm) was employed with the following parameters: average power of 2 W, pulse repetition rate of 50 Hz, pulse duration of 140 µs (H mode), and 20 % air and 60 % water ratio. This was combined with the use of an RFTP5 tip (diameter of 500 µm) with the following parameters: average power of 1.5 W, pulse repetition rate of 30 Hz, pulse duration of 140 µs (H mode), and 40 % air and 70 % water ratio. The two different tips gave us the optimal combination for removing the inflamed soft tissue around the implant, detoxifying the area, including the osseous surfaces, and safely decontaminating the implant surface.

Along with the thorough debridement of the surgical site, decortication was performed to promote osteogenesis. A non-resorbable titanium membrane (Surgitime Titanium, Bionnovation) was stabilised with three cortical bone pins (one in the palatal site and two buccally), followed by placement of bone grafting material (EthOss, EthOss Regeneration). The titanium mesh acts as a mechanical barrier for guided bone regeneration (GBR), helping in the formation of new bone and avoiding cell migration from the epithelium. Also, it has been designed to ensure the 3D reconstruction of alveolar bone defects. EthOss is a combination of beta-tricalcium phosphate and calcium sulphate, creating a calcium-rich environment ideal for bone growth. The site was sutured with a 5/0 non-resorbable silk suture. The standard postoperative instructions were given to the patient, who was recalled after 14 days for suture removal. At each subsequent visit every 15 days, oral hygiene instructions were reinforced. Six months postoperatively (Figs. 5 & 6), the non-resorbable titanium membrane was removed and soft-tissue augmentation with a connective tissue graft from the palatal site was performed (Figs. 9–11), increasing the amount of attached gingiva around the implant (Figs. 12 & 13). The radiographic examination showed good bone regeneration. Eight months after the regenerative procedure, the final prosthesis was placed (Figs. 14–16).

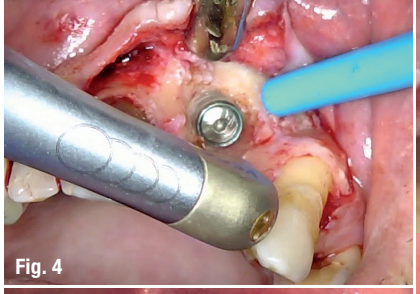
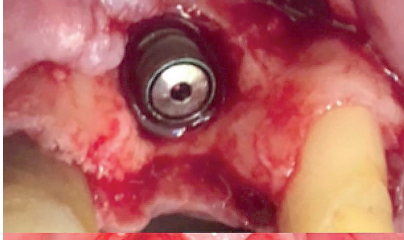
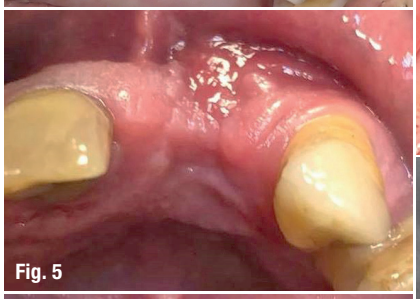


Fig. 4

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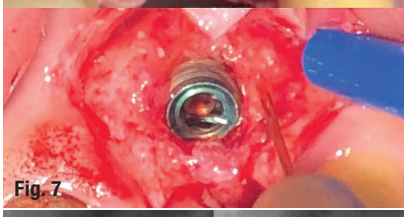
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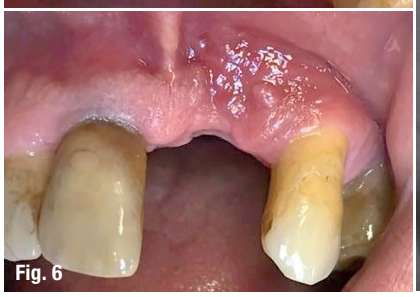
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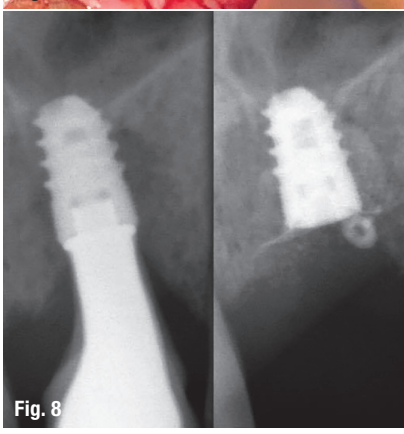
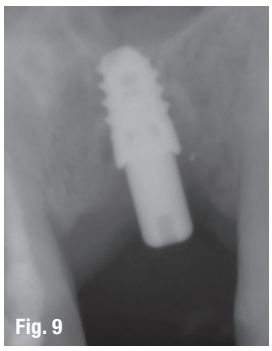


Fig. 8

Fig. 4: Er,Cr:YSGG laser debridement around the implant surface was done. **Figs. 5 & 6:** Clinical situation six months after the GBR procedure. **Figs. 7 & 8:** Clinical and radiographic evaluation (initial situation and six months post-op).

Results

The clinical results of the regenerative procedure showed a noticeable improvement in periodontal probing depth (4–6 mm) and in clinical attachment level at the nine-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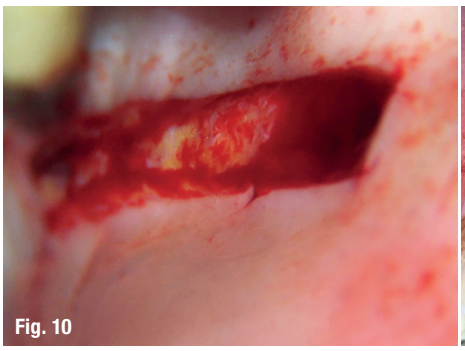
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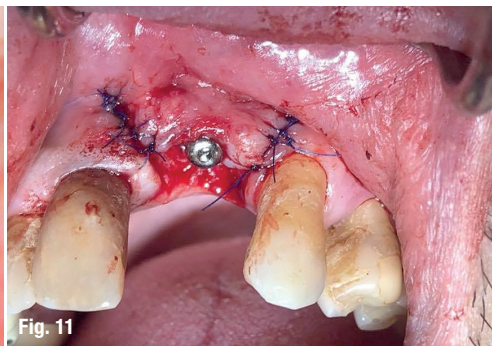


Fig. 11

Figs. 9–11: Second surgical phase: placement of healing cap and soft-tissue augmentation around the implant using a connective tissue graft from the palate.

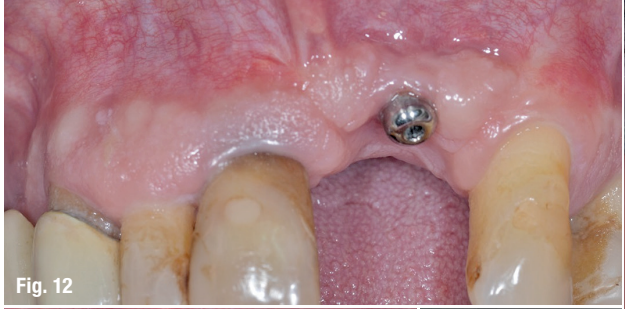
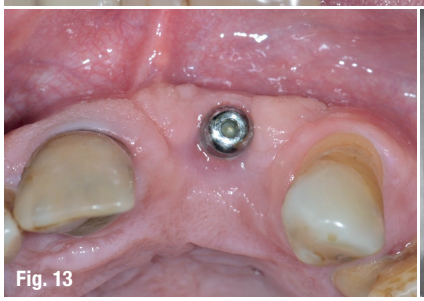


Fig. 12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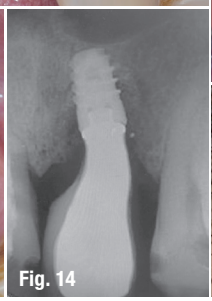
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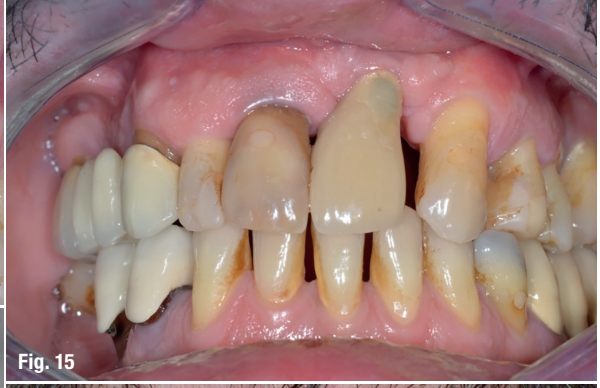
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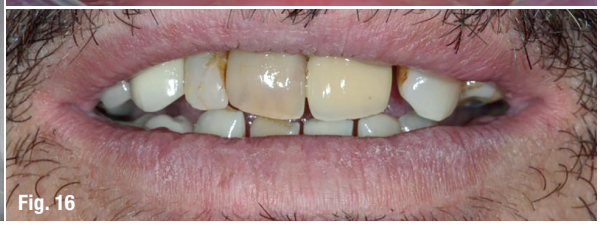
Fig. 16

Figs. 12 & 13: Five weeks after soft-tissue augmentation. **Figs. 14 & 15:** Final restoration—radiographic and clinical examination showed an acceptable result for a compromised case. **Fig. 16:** The final clinical result.

month observation. Also, the absence of inflamed mucosa and bleeding on probing indicated a healthy periodontal condition in the regenerative area. Radiographic findings demonstrated the improvement of the bone deficiency in all peri-implant sites. The overall conclusion on the utilisation of Er,Cr:YSGG laser as an adjunct to peri-implantitis treatment is undoubtedly positive. It has been shown that erbium lasers cause no visible changes to the titanium surface under appropriate irradiation parameters.[17] Other *in vitro* studies have demonstrated that the ablation process through the use of water spray does not create temperature elevations of titanium during laser irradiation.[18] Finally, erbium lasers are capable of effectively removing calculus and plaque from contaminated abutments and removing biofilms grown on high-roughness titanium surfaces.[18,19] The results are highly promising but—as a result of the variation of the parameters used in the studies—further clinical trials are needed to achieve a certain verdict.

Conclusion

This case has demonstrated the possibility of successfully treating severe peri-implantitis using an Er,Cr:YSGG laser. In this particular case, three factors played a crucial part in the final outcome: patient motivation, laser decontamination with effective GBR and the absence of traumatic jiggling forces in the surgical area. The access flap permitted successful Er,Cr:YSGG laser debridement and decontamination of the exposed implant surface. This was confirmed by the clinical and radiographic examinations. However, the final restoration may have been a compromise in terms of an optimal aesthetic outcome, but often clinicians must be mindful of the necessity of accommodating the patient's wishes. After the last re-evaluation at the six-month follow-up, the patient was included in an implant maintenance programme with regular visits for peri-implant probing and prophylactic implant scaling.

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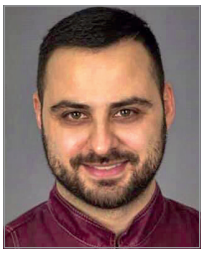
Dr Dimitris Strakas completed his M.Sc. in Lasers in Dentistry at RWTH Aachen University in Germany in 2006. In 2017, he obtained his PhD from the Aristotle University of Thessaloniki, and in 2013, he founded the laser clinic department there. Since 2017, he has been a university scholar in the Department of Operative Dentistry of the same university. He runs a private laser dental clinic in Volos in Greece. In addition, he is the Secretary General of the International Society for Laser Dentistry.



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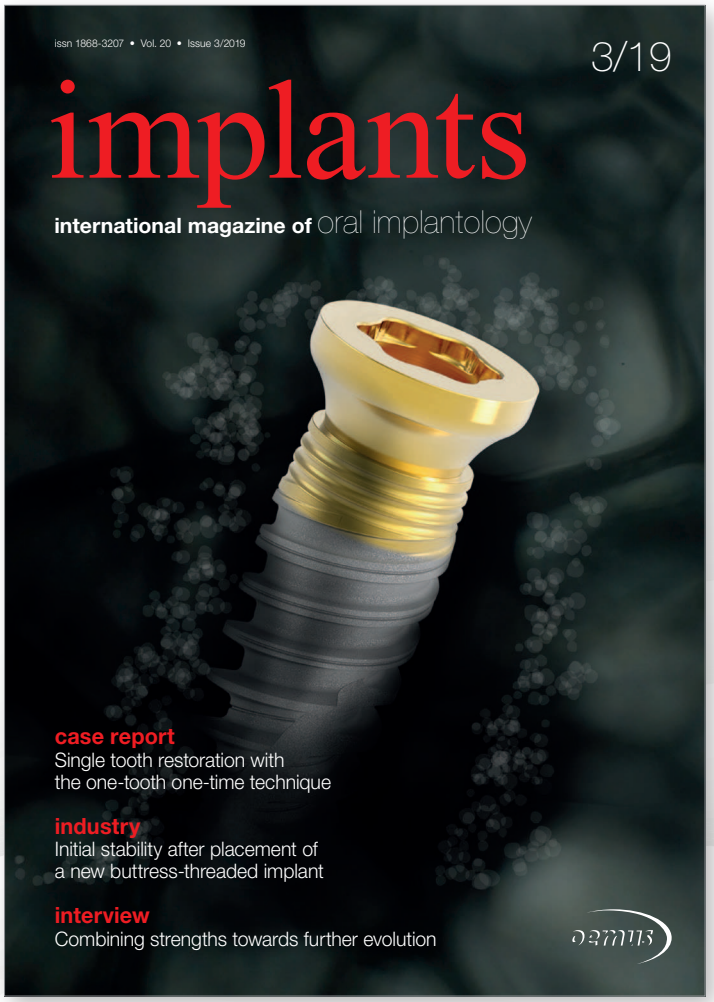

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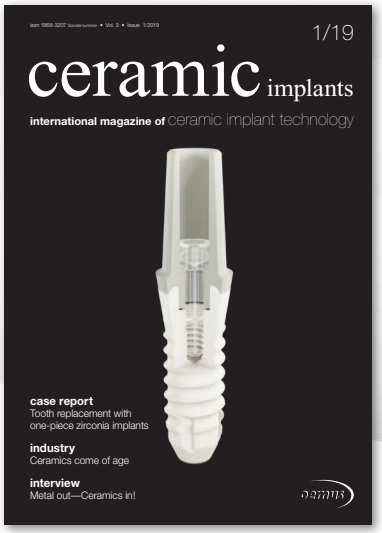

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