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The "Er:YAG laser-assisted periimplantitis total therapy (Er:LPTT)"-a novel procedure to perform periimplantitis treatment with bone regeneration therapy

Implant therapy improves masticatory performance and oral health-related quality of life and demonstrates a high success rate. However, plaque-induced periimplantitis is inevitable, and no standard protocol for periimplantitis treatment has been established yet. The Er:YAG laser is effective for implant surface debridement and has a bactericidal effect. It produces minimal thermal damage under a suitable energy output as the wavelength of the Er:YAG laser (2940 nm) is highly absorbed by water. In recent years, several studies have suggested favorable outcomes of treating periimplantitis with Er:YAG laser instead of using conventional plastic or titanium instruments, air-abrasion, or chemical methods.[1,2] Conventionally, following implant surface debridement, a bone graft is placed in the bony defect and then occasionally covered with a non-resorbable or resorbable membrane for guided bone regeneration (GBR). Additionally, recent studies have demonstrated the Er:YAG laser-assisted bone regenerative therapy, in which Er:YAG laser irradiation on the blood and bone graft without water spray aids bone regeneration.[3–5] Based on this technique, we described a novel procedure, the Er:YAG laser-assisted periimplantitis total therapy (Er:LPTT), which involved the total application of Er:YAG laser in various procedures of periimplantitis therapy, including from implant surface debridement, granulation tissue removal, and up to simultaneous regenerative therapy.

A 52-year-old woman visited our hospital with the chief complaint of pain and persistent pus discharge at the #33 implant, which was placed several years ago at a local dental clinic. The pocket depth around the implant was 13 mm with bleeding on probing, and a severe circumferential bony defect was observed (Fig. 1A and B). After flap elevation, the granulation tissue around the implant was removed and the implant surface was carefully debrided using Er:YAG laser in a near contact irradiation mode (SAPPHIRE Laser, LIGHTMED®, Kaohsiung, Taiwan) at 20 Hz and 50 mJ/pulse (Panel setting: 80 mJ/pulse) with water spray (Fig. 1C). There was no apparent thermal damage on the implant surface after laser debridement. Bovine bone mineral (InterOss®, SigmaGraft Inc, Fullerton, CA, USA) mixed with blood was grafted into the circumferential bony defect around the implant till the crest of implant fixture platform (Fig. 1D). Then, Er:YAG laser was irradiated without water spray under non-contact mode on the grafted bone material in order to form a blood clot coagulation on the surface before suturing the flap (Fig. 1E), and the grafted material was confirmed by radiography after suturing (Fig. 1F and G). After a two-year follow-up, favorable soft tissue healing was seen around the implant and the pocket depth reduced to 3 mm with no bleeding on probing (Fig. 1H), and radiographic examination showed that the original large and severe bone defect around the implant was almost repaired with bone-like dense tissue (Fig. 1I).

Er:YAG laser is effective for removing not only the granulation tissue during surgery, but also the calcified deposit and biofilm on the implant surface, with no thermal changes when applied under a suitable energy output with water spray. Moreover, the blood clot and bone graft can be easily stabilized by Er:YAG laser irradiation with no water spray by coagulation of the blood instead of using a GBR membrane. This technique prevents membrane-exposure and simultaneously simplifies bone regeneration in severe

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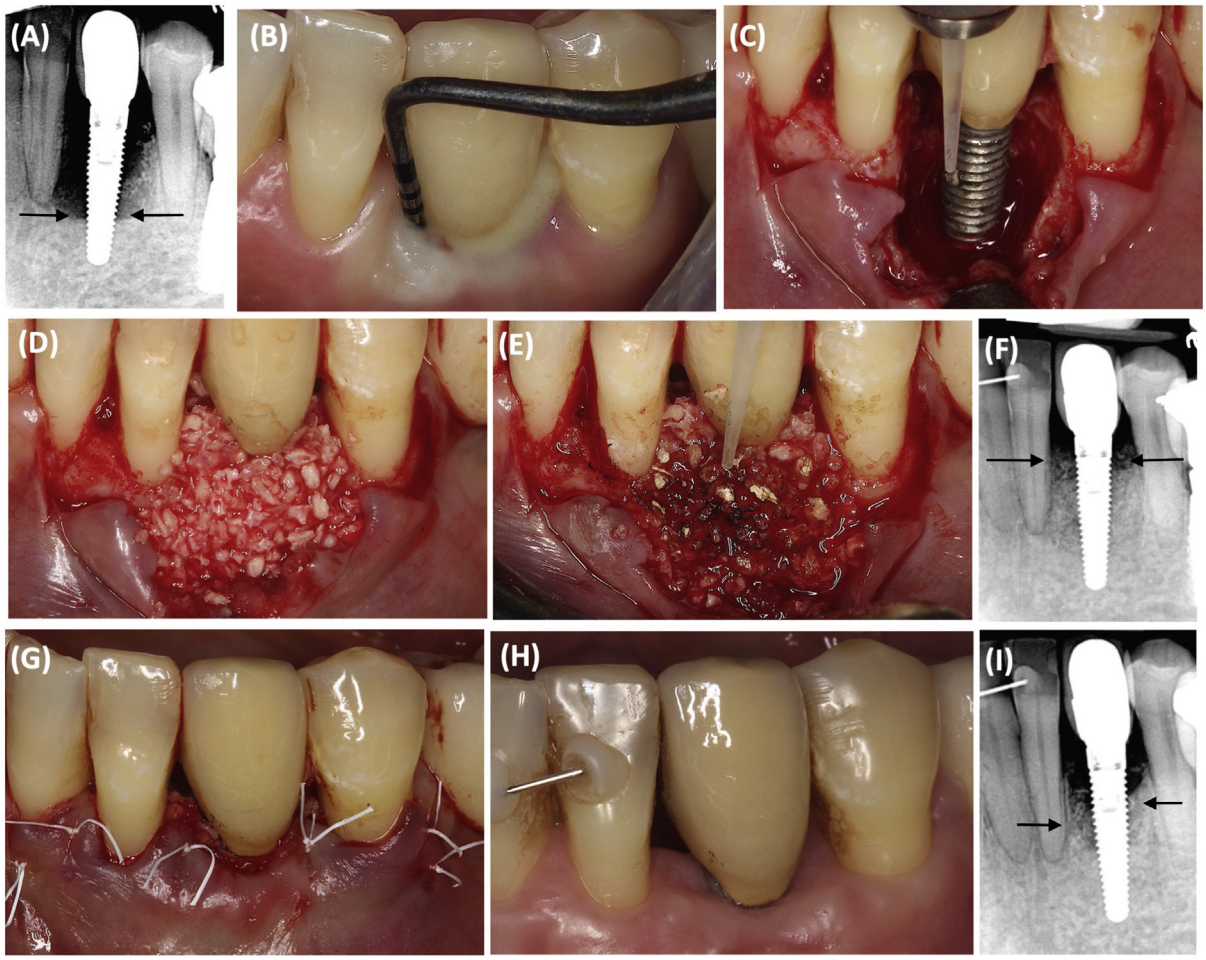

Figure 1 The clinical and radiographic photographs of our case. (A, B) The pocket depth around the #33 implant is 13 mm with bleeding on probing and exudate. Radiographic evaluation revealed a severe circumferential bony defect around the implant. Arrows indicated the bone defect. (C) Following flap elevation, granulation tissue was effectively removed, and implant surface debridement was performed using Er:YAG laser with a water spray. (D) After implant surface debridement by Er:YAG laser, a bone graft mixed with blood was placed into the bony defect and filled up to the crest of implant fixture platform. (E) Instead of using a collagen membrane, Er:YAG laser irradiation without water spray under non-contact mode was employed to stabilize the blood clot and bone graft by inducing thermal blood coagulation. (F) Bone material grafted was examined by radiographic evaluation. Arrows indicated the regenerated bone. (G) Suturing. (H, I) After a two-years follow-up, the soft tissue is favorable, and the pocket reduced to approximately 3 mm around the #33 implant without bleeding on probing, and the radiographic examination showed a favorable bone-like dense tissue around the implant and the original severe bone defect was almost successfully repaired. Arrows indicated the regenerated bone.

bone defects. This case report indicates that Er:LPTT is a novel procedure to treat periimplantitis and perform bone regenerative therapy simultaneously.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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