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Er:YAG laser-assisted periodontal regeneration with modified minimally invasive surgical technique (M-MIST) under microscope in an advanced periodontitis case with severe attachment loss beyond the root apex

Intra-bony defects are a risk factor for periodontitis progression; currently available regeneration procedures using biomaterials can successfully regenerate intra-bony defects. Regenerative therapy can potentially improve the prognosis of hopeless teeth, making it a suitable alternative for the extraction of severely compromised teeth with intra-bony defects to or beyond the root apex. Wound stabilization and closure must be optimized for primary healing to achieve favorable periodontal regeneration. Cortellini et al. developed a modified minimally invasive surgical technique (M-MIST) as a novel regenerative therapy for localized periodontal intra-bony defects; they reported excellent clinical results by securing blood clot stability in bone defects.[1] However, a limited operative field with only a tiny buccal flap elevation poses a challenge for thoroughly debriding the inflamed granulation tissue and root surfaces during surgery under M-MIST.

Er:YAG laser application in periodontal therapy has increased. Recently, Er:YAG laser-assisted comprehensive periodontal pocket therapy (Er-LCPT) has yielded excellent periodontal regeneration.[2–5] In clinical practice, the delicate contact tip of Er:YAG laser with 400–600 μm in diameter can effectively debride within the defect owing to high accessibility even in a limited field.[3] Therefore, the Er:YAG laser may be considered the most suitable instrument for debriding granulation tissue within bone defects using M-MIST. In this case report, we evaluated the effectiveness and safety of Er:YAG laser-assisted periodontal regeneration with microscope-assisted M-MIST in advanced periodontitis with severe attachment loss beyond the root apex.

A 55-year-old male patient presented with a probing pocket depth (PPD) of 9 mm and a clinical attachment level (CAL) of 10 mm with Grade II mobility in the upper left second premolar, referred from a local dental clinic, where the tooth had undergone scaling, root planing, and endodontic treatment (Fig. 1A). Before surgery, a PPD of 9 mm was evident at distal site (Fig. 1B). Following a single horizontal incision, a tiny buccal flap was elevated, the defect was completely debrided using an Er:YAG laser (Litetouch™, Light Instruments Ltd, Yokneam Lllite, Israel) (Fig. 1C) and the tooth root surface was debrided using a micro curette (Micro Mini-five Gracey curette, Hu-Friedy, Chicago, IL) and ultrasonic scaler (Fig. 1D). A micro-mirror was used to confirm the complete removal of inflamed granulation tissue at the bottom of the intra-bony defect (Fig. 1E). The enamel matrix derivative (*EMD*) was applied to the air-dried root surface (Fig. 1F), and a human freeze-dried bone allograft (FDBA) was grafted into the bony defect to the crest (Fig. 1G). The sutures were tightened to achieve primary closure of the defect-associated papilla (Fig. 1H). After 1 year, the PPD and CAL were significantly reduced to 3 mm and 5 mm without mobility, respectively (Fig. 1I). Baseline radiographs taken before periodontal and endodontic treatment showed deep intra-bony defects extending beyond the apex (Fig. 1J). The tooth was vital and endodontically

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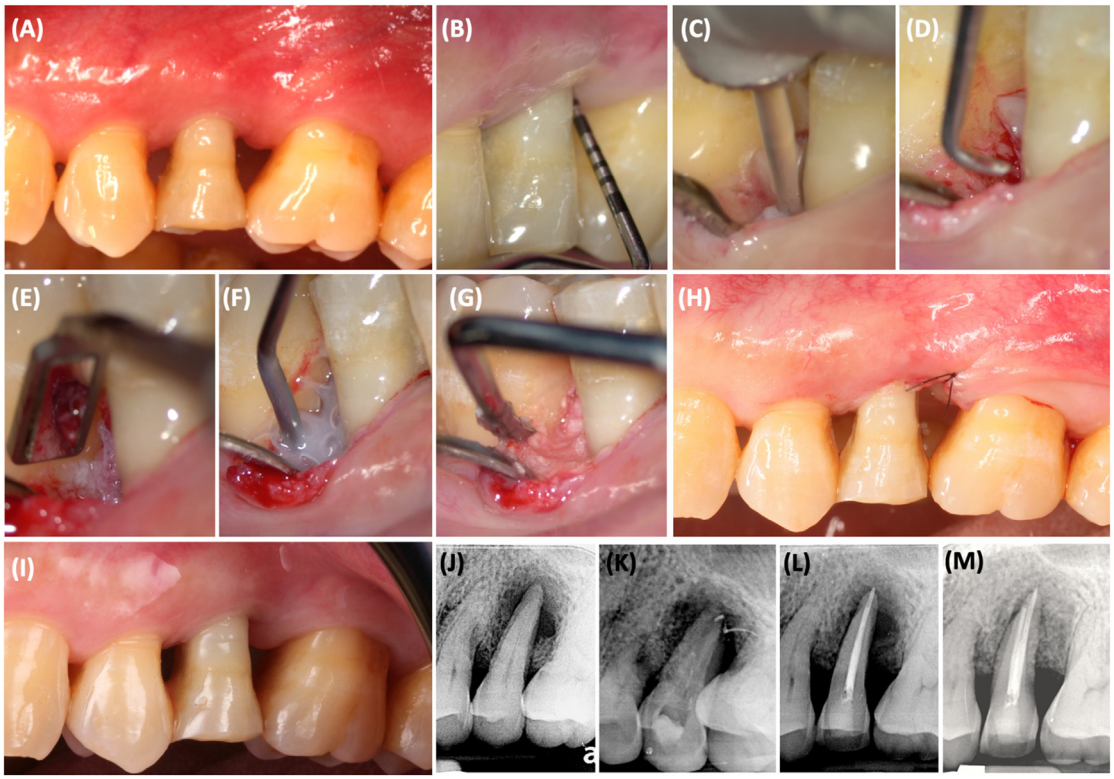

Figure 1 An advanced periodontitis case with severe attachment loss beyond the root apex treated by Er:YAG laser-assisted periodontal regeneration with a modified minimally invasive surgical technique (M-MIST) under microscope. (A) Pre-operative image of an upper left second premolar presenting with a probing pocket depth (PPD) of 9 mm and a clinical attachment level (CAL) of 10 mm with Grade II mobility. (B) Before surgery, a PPD of 9 mm was evident at distal site. (C) Following only one horizontal incision, a tiny buccal flap was elevated, the defect was completely debrided by Er:YAG laser with a straight sapphire tip with a 600 μm diameter at approximate 50 mJ/pulse (panel setting 70 mJ/pulse) and 20 Hz in contact mode under water spray, note the inter-dental papilla was un-elevated. (D) Following Er:YAG laser debridement, the tooth root surface was debrided by micro curette and ultrasonic scaler. (E) A micro-mirror was used to confirm the complete removal of inflamed granulation tissue at the bottom of the intra-bony defect. (F) The enamel matrix derivative (*EMD*) was applied to the air-dried root surface. (G) A human freeze-dried bone allograft (FDBA) was grafted into the bony defect to the crest. (H) Primary closure has been provided with an modified internal mattress suture after Er:YAG laser-assisted periodontal regeneration with a modified minimally invasive surgical technique (M-MIST). (I) After 1 year, the PPD and CAL were significantly reduced to 3 mm and 5 mm without mobility, respectively. (J) Baseline radiographs taken before periodontal and endodontic treatment showed deep intra-bony defects extending beyond the apex. (K) The radiograph was taken during endodontic treatment. The vital tooth was endodontically treated before regeneration, the reason for the endodontic treatment of this vital tooth was the need to debride the apex of the root involved by the severe periodontal defect. (L) Five months after the endodontic treatment, a severe intra-bony defect remained at the distal site. (M) The 1-year radiograph showed an almost complete defect resolution.

treated before regenerative surgery (Fig. 1K). Five months after the endodontic treatment, a severe intra-bony defect remained at the distal site (Fig. 1L). The 1-year radiograph showed an almost complete defect resolution (Fig. 1M).

The present case report indicates that Er:YAG laser-assisted periodontal regenerative surgery is very effective and safe for debriding the intra-bony defect with M-MIST under a microscope in the case of severe attachment loss beyond the apex tooth.

Declaration of competing interest

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

References

1. Cortellini P, Tonetti MS. Clinical concepts for regenerative therapy in intrabony defects. *Periodontol* 2000 2015;68:282—307.
2. Aoki A, Mizutani K, Mikami R, et al. Er:YAG laser-assisted comprehensive periodontal pocket therapy for residual periodontal pocket treatment: a randomized controlled clinical trial. *J Periodontol* 2023. https://doi.org/10.1002/JPER.22-0552. e-pub, 4 April 2023.
3. Mizutani K, Aoki A, Coluzzi D, et al. Lasers in minimally invasive periodontal and peri-implant therapy. *Periodontol* 2000 2016; 71:185—212.
4. Lin T, Ng MY, Aoki A, Yu CH. Er:YAG laser-assisted comprehensive periodontal pocket therapy (Er-LCPT) under microscope in a severe periodontitis with type 2 diabetes mellitus patient: a case report. *J Dent Sci* 2023;18:924—6.

5. Lin T, Taniguchi Y, Aoki A, Chen CC. Management of furcation-involved molar using Er:YAG laser-assisted bone regenerative therapy: a case report. *J Dent Sci* 2022;17:1836—8.

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