



## Correspondence

# Clinical evaluation of ridge preservation and augmentation with buccal bone deficiency by Er:YAG laser-assisted bone regenerative therapy



The success rate of dental implantation has improved over the last decades. However, loss of alveolar ridge height was frequently described within the first 90 days after tooth extraction and resulted in insufficient bone width. Therefore, socket preservation should be considered to confine the degree of ridge resorption. Conventionally, bone grafting materials, such as resorbable collagen or non-resorbable high-density polytetrafluoroethylene membrane, are placed into the extraction socket to prevent soft tissue from migrating into the socket, resulting in better-guided bone regeneration for implant placement preparation.

Recently, the use of Er:YAG lasers (ErL) has increased in periodontal and peri-implantitis therapies because ErL can ablate both of soft and hard tissues effectively, and it can debride the titanium surface without obvious thermal damage.<sup>1–3</sup> In addition, ErL irradiation blood clot formation in the superficial areas of grafted bone without water spray is useful and convenient for bone regeneration procedures such as the Er:YAG laser-assisted bone regenerative therapy (Er-LBRT) developed by Taniguchi et al.<sup>4,5</sup>

This case report demonstrated an option for ridge preservation and augmentation after tooth extraction of buccal bone plate deficiency with bone grafts using the Er-LBRT technique without membrane coverage.

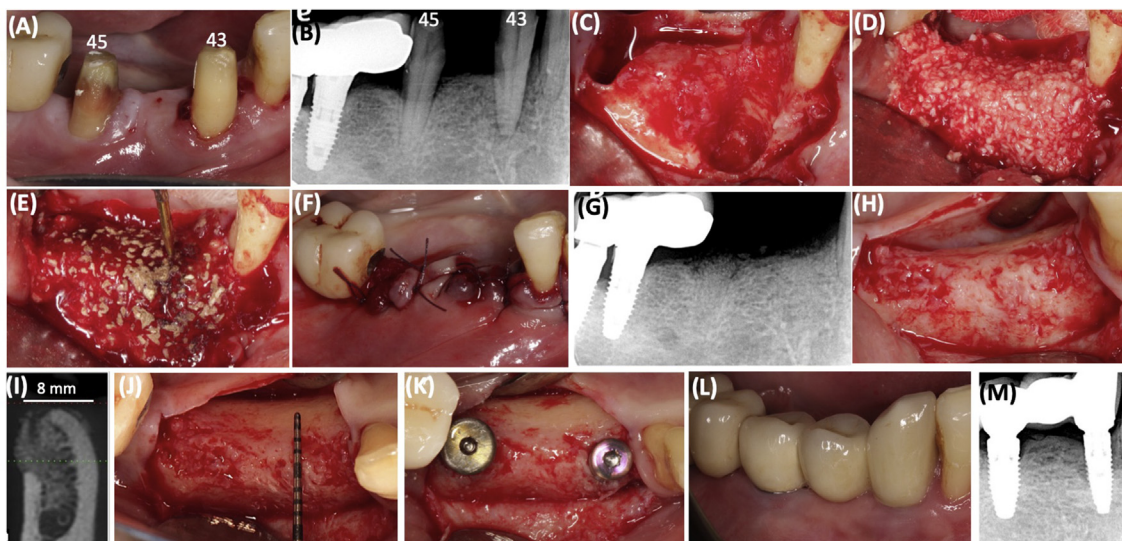
A 61-year-old female came to the Department of Periodontology, Chung Shan Medical University Hospital, with the chief complaint of pain and severe mobility at the tooth 43 and tooth 45 bridge. Since tooth 43 and tooth 45 suffered severe periodontitis, mobility II, and over 50% bone loss, they were prepared for extraction and subsequent replacement by dental implants (Fig. 1A and B). Following local anesthesia and flap elevation, we carefully removed tooth 43 and tooth 45 as well as granulation tissue (Fig. 1C). The severe buccal bone plate deficiency of tooth 43 was

evident. Freeze-dried bone allografts were mixed with blood and then packed into the extraction socket to repair the tooth 43 buccal bone plate deficiency (Fig. 1D). Then the blood clot forming procedure was performed using ErL (Erwin AdvErL™, J. Morita Mfg. Co., Osaka, Japan) at 20 Hz and 50 mJ/pulse (panel setting: 70 mJ/pulse) irradiation without water spray under non-contact mode (Fig. 1E), and the flaps were sutured (Fig. 1F). After follow-up for 6 months, the radiographic examination revealed favorable bone fill at the tooth 43 and tooth 45 sites (Fig. 1G), and a computerized tomography scan showed bucco-lingually, an approximate 8 mm bone width at the tooth 43 site (Fig. 1I). Following flap elevation before implant placement, the dense bone tissue was evident at the tooth 43 and tooth 45 sites, and no soft tissue invasion into the ridge at the tooth 43 site was noted (Fig. 1H). Clinically, an intact buccal bone plate with an approximate 8 mm bone width at the tooth 43 site was observed (Fig. 1J). Two dental implants (Nobel Biocare® ReplaceCC, 3.5 × 10 mm and 4.3 × 10 mm) were successfully placed into the tooth 43 and tooth 45 sites (Fig. 1K). The final implant restoration revealed favorable conditions with healthy soft and hard tissues (Fig. 1L and M). Thus, dramatic ridge preservation and augmentation were achieved without any post-surgical complications such as unusual infection, swelling, pain, and impaired wound healing.

ErL is very useful and convenient for forming blood clot on grafted bone and simplifies clinical procedures. No membrane is required, and blood coagulation may stabilize the grafted bone material following irradiation without water spray,<sup>4,5</sup> resulting in similar clinical outcomes observed with membrane coverage. The result of this case report indicates that the Er:LBRT technique is useful for ridge preservation and augmentation without the use of membrane; however, more basic and clinical research is

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**Figure 1** (A,B) Tooth 43 and tooth 45 suffered severe periodontitis and were prepared for tooth extraction. (C) Following flap elevation and tooth extraction, severe buccal bone plate deficiency of the tooth 43 site was evident. (D) Freeze-dried bone allografts were mixed with blood and then packed into extraction socket in order to repair the tooth 43 buccal bone plate deficiency. (E,F) The blood clot forming procedure was performed using Er:YAG laser irradiation without water spray under the non-contact mode, and the flaps were sutured. (G) After 6 months follow-up, the radiographic examination revealed favorable bone fill at the tooth 43 and tooth 45 sites. (H) Following flap elevation before implant placement, the dense bone tissue was evident at the tooth 43 and tooth 45 sites, and no soft tissue invasion into the ridge at tooth 43 site was noted. (I) A computed tomography scan showed buccolingually, an approximate 8 mm bone width at the tooth 43 site. (J) Clinically, an intact buccal bone plate with an approximate 8 mm bone width at the tooth 43 site was observed. (K) The dental implants were successfully placed into the tooth 43 and tooth 45 sites. (L,M) The final implant restoration revealed favorable conditions with healthy soft and hard tissues.

required to compare the treatment outcomes between membrane coverage and this procedure.

### Declaration of Competing Interest

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

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