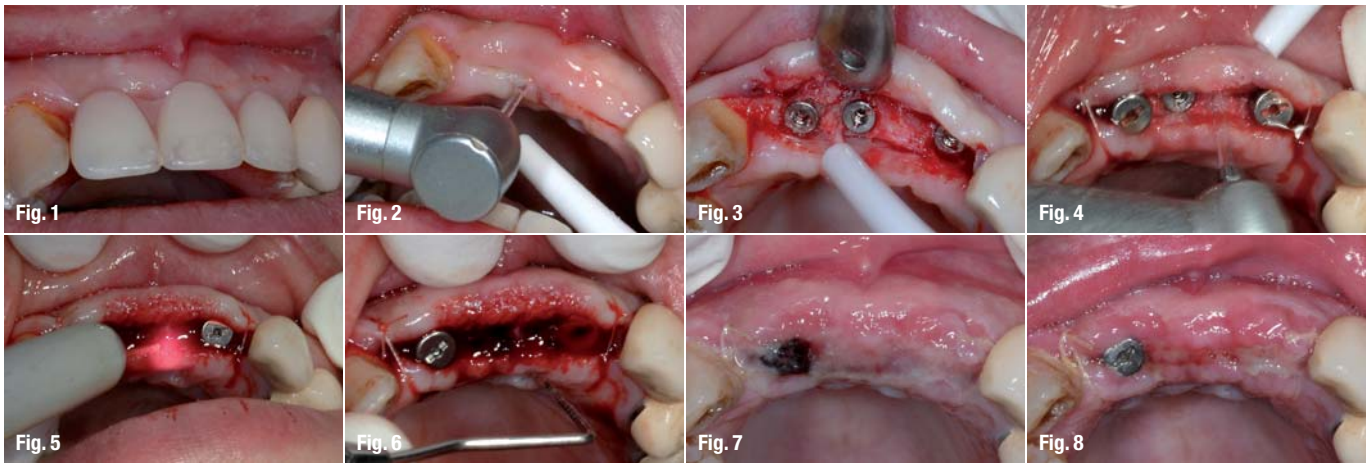
A Novel technique of laser-assisted blood coagulation for tissue regeneration in implant dentistry

author_Kenneth Luk, Hong Kong



_Abstract

Various laser wavelengths have been demonstrated in assisting implant surgery such as uncovery of implant sites, flap incision, gingival management in restorative phase. Recently, researches in treatment of peri-implantitis and preparation of osteotomy sites with Erbium-doped:Yittrium-Aluminium-Garnet (Er:YAG) lasers have been reported. The Er:YAG laser is used for ablation of dental hard tissue and bone with the benefit in decontamination and removal of smear layer. Er:YAG laser also ablates soft tissue efficiently with low collateral thermal damage but poor in haemostasis. Haemostasis, coagulation and biostimulation in soft tissue management are major advantages in the use of diode laser with 810 nm wavelength. The aim of this case report is to demonstrate the effect of laser-assisted blood coagulation (LBC) on soft tissue regeneration in a space between opened flaps prepared by intentional flap-positioning around implant.

A combination of two lasers, digital pulse diode laser (DPL) 810 nm and Er:YAG laser 2,940 nm were employed for the LBC technique. Fibroblastic proliferation covering the entire wound was observed two days after treamtment. The increase in tissue bulk at the pontic areas improved the emergence profile and aesthetics of the bridge and soft tissue support. In this case, palatal connective tissue graft was avoided. The LBC technique is a useful adjunct to tissue/wound management and holds a promise for tissue regeneration.

_Case Outline

A 40-year-old lady attended the office for restorative phase of implant (Fig.1). Three implants were placed on 11, 21 and 22 by her maxillofacial surgeon (Dr. Richie Yeung) five months ago. A removable acrylic denture was worn by the patient during the healing phase.

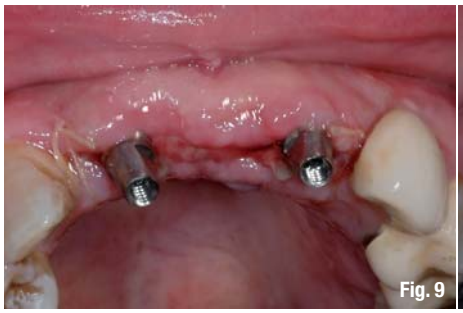

Fig. 9


Fig. 10


Fig. 11

_Treatment Plan

I. Incision with Er:YAG laser
II. Exposure of implants and placement of gingival former
III. Induce bleeding into open wound
IV. Haemostasis and coagulation with DPL.

_Treatment procedures

Elexxion Dental Laser (Delos) was used in this case report. This is a combination laser unit housing both Er:YAG 2,940 nm laser and DPL laser. Local anaesthetic was administered. Incision was made on the ridge of 11 to 22 sites by Er:YAG laser (2,940 nm) under water irrigation at 70 mJ/100 µsec pulse and 20 Hz using a 400 µm tapered sapphire tip (Fig. 2). Full thickness flap was raised with periosteal elevator. The flap was loosened along the buccal and palatal side of the ridge (Fig. 3). It was decided that only two implants were to be used as abutments. Gingival formers (3 mm in height by 4 mm diameter) were placed at 11 and 22 sites.

One suture was placed at each end of the flap. The flap was intentionally kept open supported by two gingival formers without sutures in between. Gingival mucosa of the flap was de-epithelialized by Er:YAG laser with water irrigation at 70 mJ/pulse and 20 Hz using a 400 µm tapered sapphire tip (Fig. 4). The periosteum was also ablated by Er:YAG laser to induce bleeding to fill up the open wound. Relieving incisions were also made with No.15 scalpel to induce sufficient blood volume. Blood was coagulated by DPL at 20 W, 16 µsec and 20,000 Hz in de-focused mode using a 600 µm fiber (non-initiated) (Fig. 5). Coagulation (pink in colour) may be observed while avoiding charring (black in colour) on the surface of the clot (Fig. 6).

_Post-operative Care

The patient was asked not to disturb the clot while wearing the removable denture at all times. Toothbrushing near the site should to be avoided.

Warm salt mouth bath was recommended. Patient was advised not to use antiseptic mouth rinse. No antibiotics or analgesics were prescribed.

_Result

Patient reported no adverse signs or symptoms. Fibrin mash covering the entire wound was observed two days after treatment (Fig. 7). The gingival former for 22 was covered by the newly laid fibrin while the remains of the clot was still covering the gingival former at 11. On day three, impression was taken for the fabrication of provisional bridgework (Fig. 8 & 9). Five weeks post-op showed the profile of the provisional bridgework (Fig 10). Three months (Fig. 11) and six months (Fig. 12) post-operative reviews showed complete keratinisation of the soft tissue (Fig 13). The patient was happy with the aesthetics of the screw-retained prostheses (Fig. 14).

_Conclusion

The increase in tissue bulk at the pontic areas improved the emergence profile and aesthetics of the bridge and soft tissue support. In this case, palatal connective tissue graft was avoided. The LBC technique was very effective for tissue regeneration with minimal side effects and complication. The LBC technique is a useful adjunct to tissue/wound management and holds a promise for tissue regeneration._

_contact laser

Kenneth Luk BDS; DGDP (UK); MGD (CDSHK)
2601-4,
9 Queen's Road Central,
Central,Hong Kong, China
Phone: +852/2537 8500
Fax: +852/2537 8509
E-mail:drkluk@mac.com


Fig. 12


Fig. 13


Fig. 14