

Minimally Invasive Er:YAG Laser-assisted Gingival Depigmentation

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ABSTRACT

Oral pigmentation is a discoloration of the oral mucosa or gingiva associated with several exogenous and endogenous factors such as melanin pigmentation, which is caused by melanin granules in the gingival tissue. The aim of this study was to evaluate the efficacy of gingival depigmentation techniques using an erbium:yttrium-aluminum-garnet (Er:YAG) laser. A patient with melanin pigmentation of the attached gingiva, free gingival margin and interdental papilla was treated by Er:YAG laser. The patient was satisfied with the aesthetically significant improvement and preservation of papillae and free gingival margins, however, some pigment still remained on the attached gingiva and papilla. The results of this case suggest that ablation of the gingiva by an Er:YAG laser is convenient to achieve aesthetic clinical results with normal wound healing without infection or severe pain. Cautions about the gingival condition, such as the gingival biotype, thickness and amount of pigmentation, along with appropriate assessment, are needed when performing ablation with Er:YAG laser.

Key words: hyperpigmentation; erbium laser; melanin; pigmentation.

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I. INTRODUCTION

Oral pigmentation is a discoloration of the oral mucosa or gingiva associated with several exogenous and endogenous factors. Oral pigmented lesions can have various aetiologies, including drugs, heavy metals, genetics, endocrine disturbance, and inflammation [1]. Also, smoking may stimulate melanin production and cause melanin pigmentation [2], this type of oral pigmentation is mostly located in the anterior labial gingiva, affecting females more than males [3].

Melanin pigmentation is caused by melanin granules in gingival tissue, which are produced in

melanosomes of melanocytes. Melanocytes are primarily located in the basal and suprabasal cell layers of the epithelium. The colour of the oral melanin pigmentation may vary from light to dark brown or black, depending on the amount and distribution of melanin in the tissue. Physiologic melanin pigmentation is not a medical problem; nevertheless, patients may complain that their dark coloured gums are unesthetic. Numerous procedures have been developed for depigmentation of the gingiva, such as epithelial abrasion [4], free gingival graft [5], gingivectomy [6], and laser surgery [7-12].

Laser ablation is recently suggested as a most effective and reliable technique for depigmentation of melanin hyperpigmented gingiva. To date, different lasers have been used for gingival depigmentation (CO₂, diode, Nd:YAG, Er:YAG and Er,Cr:YSGG lasers). The use of Er:YAG laser for depigmentation of melanin hyperpigmented gingiva has gained increasing importance in recent years [10]. The Er:YAG laser has been studied and applied effectively to periodontal soft tissue management without causing major thermal damage. The Er:YAG laser has a wavelength of 2,940 nm, and the rate of absorption of this laser's energy by water is high. Because of the high energy absorption by water, Er:YAG laser irradiation results in minimal heating of the surroundings tissue [13, 14].

This case report describes Er:YAG laser depigmentation techniques in patient for removing melanin pigmentation of gingiva: The Er:YAG laser was used with the purpose to preserve healthy gingival connective tissue, while the epithelium with melanin was removed below the basal lamina. The post-operative results were evaluated clinically on a weekly basis.

II. CASE PRESENTATION

A 46-year-old female who had a chief complaint of un-aesthetic melanin pigmentation in the anterior part of the maxillary gingiva was referred to the Department of Oral Medicine and Periodontology, Dental Clinic, University Clinical Centre Ljubljana. She

was systemically healthy without any significant medical history, but she had been smoking 10 cigarettes per day on average for the last 15 years. Diffused melanin hyperpigmentation was found on the labial surface of the maxillary arch (Fig. 1).



Fig.1: Two diffuse melanin pigmentation lesions on attached gingival, free gingival margin and interdental papilla on teeth 12 and 21.

a) Er:YAG laser assisted treatment:

The patient was treated with local anaesthesia (mepivacaine 20mg/0.01mg epinephrine). The Er:YAG laser (Fidelis Plus, Fotona d.o.o., Slovenia) was set at 60 mJ, 30 Hz, SP mode, 5 water, 2 air spray, and non-contact method. The 400 μ m fibre tip (Varian 400/9, Fotona d.o.o., Slovenia) was perpendicularly kept away from the tissue, with continuous movement of the beam, overlapping the laser spots by approximately 20 to 30%. The laser was cautiously used to avoid damage to the tooth surface or exposure of bone tissues during the ablation. The papillary edges and free gingival margins were treated most cautiously, continuously observing the undesired change in tissue colour during the laser ablation, to decrease the risk of gingival recession (Fig. 2).



Fig.2: Minimally invasive Er:YAG laser ablation of pigmented gingival tissue. Note the normal pink colour of gingival margin on teeth 12 and 21.

After surgery, the denuded connective tissue was covered with a periodontal pack (Reso-Pac, Hager & Werken GmbH & Co. KG, Germany). In addition,

clinical parameters, such as wound healing, gingival colour, pain, discomfort and tissue deformity, were recorded at 1, 2, 3 and 4 weeks after the procedure. The duration of ablation of the gingiva by the Er:YAG laser was about 10 to 15 minutes.

One week after surgery, the patient reported minor discomfort in the ablated area without pain, post-operative bleeding was not observed, and the connective tissue was still partially exposed. After 2 weeks, re-epithelization was complete and the gingiva showed a normal appearance with pink colour and keratinization along with recovered thickness (Fig. 3).



Fig.3: Complete re-epithelisation with a normal pink colour appearance and recovered thickness after two weeks.

The patient was satisfied with the significant improvement in colour. Tissue deformities, e.g., gingival recession and loss of papilla, were not observed after 4 weeks and the papillary edges and free gingival margins were preserved. However, some pigments remained on the attached gingiva and papillary area.

III. CONCLUSIONS

Gingival melanin pigmentation causes aesthetic concerns, and minimally invasive cosmetic therapy is becoming important for patients suffering from this problem. The Er:YAG laser has proven its effectiveness in depigmentation by ablation of pigmented gingiva. Because of the Er:YAG laser's high absorption by water, very thin layers of tissue may be ablated can minimize the damage to deep tissue and prevent scarring from the laser application. It is also favourable for wound healing and has a bactericidal effect [15] and provides photobiostimulation (low-level laser therapy) [16]. However, technical difficulty should be taken into account in using the Er:YAG laser for de-epithelization. Most of the melanin and melanocytes are located in the basal and suprabasal cell layer of the epithelium. Generally, the range of ablation is limited

to within the epithelium and the recurrence is probably due to incomplete removal of melanin and melanocytes from deep portions of rete pegs.

In summary, depigmentation of gingival melanin pigmentation can be performed safely and effectively by Er:YAG laser resulting in healing and an aesthetically significant improvement of gingival discoloration. The depigmentation using an Er:YAG laser might yet be technique-sensitive, especially for patients with a thin biotype.

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