



Case Report

Photobiomodulation- Yes or No?. following laser gingival depigmentation: A case report

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ABSTRACT

Gingival hyperpigmentation in many esthetic concern patient poses a psychological problem and embarrassment. Among the many procedures used for gingival depigmentation, diode laser is considered as one which is highly accepted by the patient due to the absence of bleeding during and after procedure and being a fast and effective method. Literature have also stated the beneficial effect of low dose laser therapy on wound healing due to its potential to increase mitochondrial function, adenosine triphosphate (ATP), RNA, and protein synthesis which may further increase the cellular metabolism resulting in enhancement in wound healing and acceleration of the inflammatory process. This case report presents the use of diode laser for gingival depigmentation followed by laser photobiomodulation in an attempt to fasten the healing.

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1. Introduction

Hyperpigmentation of gingiva results from melanin, a nonhemoglobin-derived brown pigment produced by melanocytes.¹ Patient often complaints of esthetic concern due to the darker appearance of the gums.

Gingival hyperpigmentation is considered to be multifactorial, physiological/pathological,² and according to Dummett (1964),³ the degree of pigmentation may be partially related to mechanical, chemical and physical stimulation. There is no difference in the number of melanocytes between individuals of fair and dark complexion, though, in dark complexion there is higher in chances of oral pigmentation.

There are numerous methods purposed by various authors for removal of gingival hyperpigmentation. But the application of diode laser by far is considered to be the safe and effective procedure. Advantages of use of diode laser includes its ease of usage, effective in removal of superficial benign pigmented lesions, minimal trauma

to patients, convenience in dental set ups and the ability to enhance wound healing when used in low doses - photobiomodulation (PBM).

2. Case Report

A 26 years old, male patient reporting to Department of Periodontology with a chief complaint of dark gums. History revealed that it was present since childhood suggestive of physiologic melanin pigmentation. Patient was systemically healthy without habits. Patients's oral hygiene was good. Dummett-Gupta oral pigmentation (DOP) index was used to determine the level of depigmentation, and the score was diagnosed as "4" for the patient (Figure 1 a and 1b). Patient was explained about the treatment options available and the possibility of re-pigmentation after certain period of time. Phase -I therapy was carried out during the initial visit.

Prior to the procedure, patient was instructed to rinse with 0.2% chlorhexidine gluconate. Before applying the laser, the patient and the operator wore special laser-protective eye glasses. Highly reflective instruments or

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instruments with mirrored surfaces were avoided. The diode laser (Biolase EpicX, Biolase Inc, CA, USA), with a fiber optic delivery system and beam diameter of 400 μ m, 940 nm wavelength was used and operated at a 1.5 W irradiation power, in a continuous contact mode (Figure 2). After application of topical anesthesia (lidocaine hydrochloride), tissue ablation was started from the mucogingival junction working towards the free gingival margin, including the papillae in a continuous contact mode with overlapping circles and the fiber tip was continuously moved across the site to avoid heat accumulation at any site. Then the area was wiped with gauze which was soaked in normal saline. The procedure was continued till no pigments were observed. The entire surface of gingiva that required treatment was irradiated and completed in a single session. After depigmentation, the depigmented sites were treated with PBM. PBM (also known as Low Level Laser Therapy-LLLT) using a diode laser(defocused) at 1 mm distance for 5 min with a power setting at 1 W in continuous mode was introduced to the depigmented sites (Figure 3). To control postoperative pain, the patient was prescribed paracetamol 500mg and was instructed to take only when pain occurred.

PBM was initiated immediately after surgery, on the 3rd and 7th day. Healing of the depigmented sites were also assessed using Healing Index (Landry et al. 1988)⁴ at baseline, 3rd day, 7th day and 15th day postoperatively (Table 1).

3. Result

In the present case report, no postoperative pain, bleeding or scarring occurred in the depigmented sites. The patient was observed at 1st day, 3rd day, 7th day and 15th day after the procedure and the healing was found to be uneventful. Immediately after the laser depigmentation procedure, no bleeding was observed (Figure 4). There was a presence of white fibrin slough which was easily scrapable over the depigmented sites with slight redness at the periphery of the operated sites and the adjacent mucosa and slight tenderness on the 3rd day (Figure 5). By day 15, complete healing of the operated sites with firm and resilient gingiva along with absence of hyperpigmentation and no pain was observed (Figure 6). The healing index score of the depigmented wound was 3 (good) on the 3rd day and on day 15th the score was 5 (excellent). The patient's acceptance of the depigmentation and PBM procedure was satisfactory and the result was excellent.



Fig. 1: Preoperative view of hyperpigmented maxillary gingiva; 1b- Preoperative view of hyperpigmented mandibular gingiva

Table 1: Landry Healing Index

Healing index score clinical findings	
Very poor	Tissue color: 250% of gingiva red Response to palpation: Bleeding Granulation tissue: Present Incision margin: Not epithelialized, with loss of epithelium beyond incision margin Suppuration: Present
Poor	Tissue color: 50% of gingiva red Response to palpation: Bleeding Granulation tissue: Present Incision margin: Not epithelialized, with connective tissue exposed
Good	Tissue colour. > 25% and 50% of gingiva red Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed
Very good	Tissue colour: <25% of gingiva red Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed
Excellent	Tissue color. All tissues pink Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed



Fig. 2: Diode Laser (Biolase EpicX, Biolase Inc, CA, USA) along with the contour handpiece for application of PBM



Fig. 3: Application of PBM



Fig. 4: Immediate postoperative picture (Day 1)



Fig. 5: 3rd day postoperative view



Fig. 6: 15th postoperative picture

4. Discussion

Melanin hyperpigmented gingival tissue results in unaesthetic appearance of the gums. It often forces esthetic concern patients to seek treatment to lighten the colour of the gingiva. Although it does not present any medical problem, complaint of dark gum and a demand for its treatment is common. There are several depigmentation modalities which include simple slicing method to free gingival grafts or “push back” operation have been suggested in the literature.⁵ Recently, laser ablation have been considered one of the most effective, reliable and comfortable techniques for gingival depigmentation.⁶ The diode laser is an excellent soft tissue surgical laser due to absence of dental hard tissue interaction. Thermal effects of diode laser are attributed to ‘hot tip’ effect caused by accumulation of heat at the end of fiber and due to this effect it results in production of a thick coagulation layer on the treated surface thus preventing bleeding at the operated sites. Smaller and handy size of the unit, and also no detrimental effects on alveolar bone and root surface are some of the other advantages of using diode laser. The healing of wounds in diode laser is slower and needs longer time than conventional scalpel wounds.⁷ However, scalpel surgery results in unpleasant bleeding at the operated sites during and after operation and requires periodontal dressing to cover the surgical wound. A sterile inflammatory reaction has been observed in gingival tissues following the use of diode laser.⁵ Also, the blood vessels in the surrounding tissue up to a diameter of 0.5mm are sealed; thus, the primary advantage is hemostasis and a relatively dry operating field.

Wound healing is a complex process comprising parallel overlapping events: the hemostatic phase leads to sealing of the wound by a clot formed by extravasated platelets and other blood-derived cells in a network composed of fibrin, fibronectin, and vitronectin.⁸

Numerous animal models and human clinical studies have addressed the effects of PBM and their positive impact during the inflammation, proliferation, and remodeling phases for acceleration of reepithelialization.^{9–12} Particularly, after PBM applications, TGF- β pathway has been reported to have a central role in mediating a diverse range of biological functions, such as inflammatory response, vascularization, extracellular matrix synthesis and deposition, and collagen expression.^{13,14} Mendez et al¹⁵ had reported that high doses of biostimulation could provide significant improvements because a large amount of energy is left to act within the tissues after attenuation. However, in a recent systematic review, it was highlighted that low doses of PBM can be more effective in wound healing (<2 J/cm²), whereas higher doses (>16 J/cm²) may act mostly as suppressive.¹⁵ On the other hand, the wavelengths of laser applications have differed between the previous studies (range of 660–980 nm).^{12,16} Gupta et al.¹⁷

had also evaluated the healing effects of PBM at different wavelengths (635, 730, 810, and 980 nm) and stated that healing better at 635 and 810 nm light photobiostimulation.

In this case report, the effect of PBM on laser depigmented sites on wound healing which could attribute to PBM was assessed. Similar results were observed by Chawla et al¹⁰ where they conducted a study to evaluate the effect of LLLT on wound healing after depigmentation and they concluded that LLLT promotes wound healing till the 3rd day. Ustaoglu et al¹¹ also found that LLLT enhances wound healing throughout the study period i.e till 21 day in palatal donor site.

This case report comes with a series of limitations. The result of PBM in depigmented wound healing obtained in this case report are encouraging which should be further substantiated by using larger sample size.

5. Conclusion

In this case report, the use of 940 nm diode laser for depigmentation of gingiva along with PBM resulted in complete healing by day 15. It was also shown to be a safe and effective method for acceptable esthetic result and maximum patient comfort. A larger sample size and longer follow-up of the patient and further histological studies to assess the true beneficial nature of PBM.

5.1. Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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7. Conflicts of Interest

There are no conflicts of interest.

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