



Gingival Depigmentation Using a 980 nm Diode Laser: About a Case Report

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Abstract

The harmony of smile is attributable to the shape, colour, and position of the teeth, but also to the level and color of the gingival tissues. Gingival pigmentation occurs in all races of man and it varies from one race to another. It results from melanin granules which are produced by melanoblasts. An excessive gingival pigmentation frequently poses an aesthetic problem, especially in patients with gummy smiles. Various procedures have been proposed for removal of the gingival pigmentation and to restore esthetics. These techniques include gingivectomy, free gingival autografts, surgical depigmentation, electrosurgery, cryotherapy, use of rotary instruments, chemical agents and lasers. The objective of this article is to report a case of the gingival depigmentation technique using a 980 nm diode laser in a young patient treated in the oral surgery department of the dental consultation and treatment center of Casablanca and to shed light on the effectiveness of this technique which has produced good results and led to patient satisfaction.

Subject Areas

Dentistry

Keywords

Depigmentation, 980 nm Diode Laser, Gingiva, Melanin

1. Introduction

The colour of oral mucosa varies between individuals and groups. It has no gender predilection and may be observed in all races and at all ages.

The gingival color is determined by several factors. These factors include, among others the dimension of blood vessels, thickness and degree of epithelial

keratinization, and pigments.

Melanin, a nonhemoglobin-derived brown pigment, is the most common of the endogenous pigments involved in gum pigmentation [1].

The accumulation of melanin can be physiological and called “racial or ethnic pigmentation” or caused by several endogenous and exogenous factors, including tobacco [1].

Gingival hyperpigmentation may cause esthetic problems and embarrassment, especially in patients with a gummy smile.

Several procedures have been proposed for gingival depigmentation. These techniques include gingivectomy, free gingival autografts, surgical depigmentation, electrosurgery, cryotherapy, use of rotary instruments, chemical agents like phenol and alcohol.

These last years, laser dentistry has replaced many traditional dental procedures and has been recognized as the most effective technique in gingival depigmentation making it more precise and less painful.

The purpose of this work is to report a case of an effective and minimally invasive gingival depigmentation technique using a 980 nm diode laser in a young patient treated in the oral surgery department of the dental consultation and treatment center of Casablanca and to highlight through a literature review the efficacy of this technique that has produced good results.

2. Case Report

A 27 years-old non-smoking patient was referred to the department of oral surgery complaining of darkened gum that aesthetically affects her smile and thus her social life. (Figure 1)

The patient was healthy, without any history of smoking, nor systemic condition, nor taking drugs.

In clinical examination, periodontal tissues were healthy, but bilateral melanin pigmentation was deeply present in both maxillary and mandibular arches (Figure 2).



Figure 1. Extraoral examination.



Figure 2. Intraoral examination showing hyperpigmentation in both maxillary and mandibular arches.

A final diagnosis of ethnic gingival hyperpigmentation was established.

Following the patient's request, a laser depigmentation procedure was planned after obtaining the patient's consent.

Under local anesthesia, depigmentation procedure was applied by using a 980 nm wavelength diode laser. All the safety measures related to lasers were followed by wearing special eye glasses by the patient and the medical staff.

Depigmentation for the upper arch was conducted in the first visit, while the depigmentation of the lower arch was carried out in the second visit.

A little amount of anesthesia was administered to the patient. The laser was activated. It was set at 2 Watt in a continuous mode. The melanin-pigmented gum was resected by circular movement of the fiber with a slight contact with the tissue. During the ablation, sterile gauze soaked in saline solution was used to remove epithelial remnant and to confirm no pigmented areas were left out.

(Figure 3)

A mouthwash was prescribed, analgesics were advised to the patient only if pain occurs. Postoperative instructions were given to the patient, such as avoid eating hot, acidic or spicy food.

She was called back for follow-up and observation. At the first week, gingiva showed a rapid but still immature epithelialization (**Figure 4**). The healing was satisfactory and the patient did not complain about post-operative pain, bleeding, swelling or other complications.

At 1 month follow up, the re-epithelialization was complete (**Figure 5**). Gingiva appeared pale pink which was satisfactory for both patient and operator. Our patient is still on follow-up visits after almost 6 months. No further repigmentation was seen.

3. Discussion

Nowadays, social media and community influence can have a major effect on people's perception of beauty, which has a big impact on the person's self-confidence and could affect their social interaction and careers.

A lot of people generally associate a good dental appearance with success in



Figure 3. Intraoperative photographs.



Figure 4. A good healing but still immature epithelialization observed after 1 week.



Figure 5. A complete re-epithelialization after 1 month.

many areas of life.

An aesthetic smile has a number of components. Gingival health and appearance are essential components for an attractive smile.

The gingiva is an important integral tissue, which, when affected, particularly by pigmentation is mainly responsible for the unpleasant appearance. The pigmentation of gingiva occurs in all races and it varies from one race to another. It may be seen at any age and without gender predilection.

It is determined by the number and size of blood vessels, the thickness of the epithelium, the degree of keratinization and the melanin pigments found in the basal and supra-basal layer of epithelium which are produced by melanocytes [1].

Gingival pigmentation is affected by a number of exogenous and endogenous factors.

They include drugs, heavy metals, genetics, endocrine disturbances, syndromes as Albright's syndrome, Peutz Jegher's syndrome, and also in inflammation.

Adverse habits such as smoking can also stimulate melanin pigmentation, and the intensity of pigmentation is related to the duration of smoking and number of cigarettes consumed.

The color could range from pale pink to coral pink, to deep red, and even violet depending on the pigmentation of the gingiva by five primary pigments. These include melanin, melanoid, oxyhemoglobin, reduced hemoglobin and carotene, of which melanin pigmentation is the most common [2].

Although gingival hyperpigmentation does not represent a pathological problem, patients with a gummy smile or excessive gingival display usually complain of a "black gum" and request cosmetic therapy [3].

Our patient was complaining of unpleasant smile caused by hyperpigmented gums affecting both maxillary and mandibular arches.

Several therapeutic modalities have been used to remove the melanin pigmentation with different outcomes. These techniques include gingivectomy, free

gingival autografts, surgical depigmentation (scalpel surgical scraping), electro-surgery, cryotherapy, use of rotary instruments, chemical agents like phenol and alcohol [4].

However, patient comfort, minimal invasiveness and postoperative care were the goals in finding a better technique in order to overcome all the drawbacks related to the traditional methods (the risk to damage the periosteum and underlying bone, bleeding during surgery, postoperative pain and swelling...) [5].

Recently, various types of lasers have been introduced for gingival depigmentation according to their wavelength such as Nd-YAG laser (Neodymium: Yttrium Aluminium Garnet), Er-YAG laser (Erbium-doped Yttrium Aluminum-Garnet), CO₂ laser, and diode lasers [6].

The use of lasers for depigmentation present several advantages comparatively to other techniques, such as good hemostasis, better visibility in the surgical field, short treatment time, short healing period, no or very slight operative and postoperative pain, decontamination and sterilization effects and low rate of recurrence compared to other depigmentation procedures [7] [8].

In the case reported above, we used a 980 nm diode laser to remove melanin pigmentation in both maxillary and mandibular arches.

According to many authors, diode laser has the highest affinity to penetrate into melanin pigments, which makes it the preferred laser type for depigmentation of gingiva.

A study conducted by Agha and Polenik in 2020 revealed that melanin shows a strong absorption of the diode wavelengths compared to the erbium laser. This results in a faster peeling of melanin and a shorter treatment procedure with the diode [9].

The diode laser is a solid-state semiconductor that is emitted in continuous-wave and gated-pulsed modes and contact mode preferably. It is characterized by wavelengths of 800 - 980 nm which target especially soft tissues and it does not interact over hardened dental tissues. It exhibits thermal effects using the "hot-tip" effect caused by heat accumulation at the end of the fiber and produces a relatively thick coagulation layer on the treated surface [6] [10] [11].

The lack of bleeding after diode laser treatment can be attributed to its property to coagulate blood vessels. The laser is absorbed by pigments in the soft tissue, thus making it an excellent hemostatic agent and thereby help in providing a relatively dry surgical field [12].

The use of water during the procedure enhances the visualization of the operative field and minimize heat generation by cooling the irradiated area and absorbing excessive laser energy [13].

Furthermore, photomodulation effects of diode laser were shown to help in stimulating the fibroblasts, angiogenesis and accelerating the lymphatic flow, which improves repair and regeneration [7]. Newly formed re-epithelization occurs after 1 - 2 weeks and is completed by the end of 4 weeks.

Moreover, the diode laser has been recognized as one of the most effective and

comfortable techniques for gingival depigmentation because the treated area required no painful injections and patients experienced no intra or post-operative pain after being dismissed.

Similar results were reported by other studies who stated that diode laser presented advantages in terms of less discomfort/pain during and post-therapy period as well as a reduction of treatment chair time.

A study conducted by Jnaid Harb ZK in 2021 has compared the effectiveness of diode laser (980 nm) and erbium-YAG laser (2940 nm) for gum depigmentation.

One of the parameters analyzed was post-operative pain. The study concluded that the patients experienced slightly more pain at the Er:YAG laser-treated sites compared to the diode laser-treated sites. This result could be attributed to the shallow surface interaction of the Er:YAG laser beam that requires more time to remove the pigments causing damage to the gingival tissues and subsequent postoperative pain [14].

Chandna *et al.* in 2015 showed through their study comparing pain levels between electrosurgery and diode lasers that at all intervals (24 h, 1 week) the patients in the diode lasers group experienced significantly less pain levels as evaluated by the Visual Analog Scale (VAS) [15].

Another advantage of diode laser is that it has smaller equipment as well as, the lower cost compared to other types of lasers. The only disadvantage of laser therapy is the relatively high cost of the equipment compared to traditional methods [7].

Keeping all these benefits in mind, the use of a diode laser is highly recommended for the treatment of gingival hyperpigmentation. It was shown to be a safe and effective treatment modality to provide optimal aesthetics with reduced discomfort to the patients.

However, there is a critical concern in the management of hyperpigmented gingiva which is a relapse or gingival repigmentation.

This occurs due to the migration of active melanocytes from adjacent pigmented tissues to the surgically treated areas. The duration of relapse remains controversial. It depends on the technique chosen and the follow-up period.

The patient's ethnicity and tobacco consumption are two factors highly mentioned in the literature that could promote pigmentation recurrence [16].

According to Perlmutter & Tal, gingival tissue treated by traditional surgical intervention shows evidence of re-pigmentation in some areas after 32 months and after 7 - 8 years completely pigmented [17].

The majority of the available literature has shown lower recurrence rate for cryosurgery and lasers compared to other techniques, but more research is needed that include longer follow-up periods and histologic evaluations to further understand the pathophysiology of repigmentation and to monitor its occurrence.

In our case, gingival depigmentation performed was carried out using a 980 nm diode laser at 2 W power in continuous mode. During the procedure, there was no bleeding. Postoperatively, the patient was satisfied with her new smile.

She did not report any infection, swelling, or other complications. She did not even necessitate the use of any form of analgesics. She was recalled regularly for follow up. The healing was good.

No sign of repigmentation was observed after almost 6 months, but a longer follow-up is necessary to monitor the occurrence of a relapse.

4. Conclusions

Gingival health and appearance play a major role in building a patient's smile.

Over the years, the esthetic expectations of patients have grown, which has led to the era of dentistry that optimizes the search for ideal solutions.

To serve this purpose, several techniques have been proposed to treat gingival hyperpigmentation. The use of a diode laser seems to be a safe and effective treatment modality that provides optimal aesthetic results with reduced discomfort to the patients during the treatment.

Conflicts of Interest

The authors declare no conflicts of interest.

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