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CASE REPORT

Esthetic Management of Melanin Hyperpigmentation using Diode Laser: A Report of Four Cases

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ABSTRACT

Gingival hyperpigmentation occurs as triangular/linear/diffuse patches of dark brown to black or light brown to yellow color. Pigmentation may be seen at any age irrespective of sex, although it varies among different races and population. Melanin pigmentation is caused by melanin granules in gingival tissue, which are produced in melanosomes of melanocytes. The ever-increasing demand for esthetics has made individuals conscious of any dark patches of pigmentation, especially on the facial aspects of the anterior gingiva. Melanin hyperpigmentation although medically insignificant is an esthetic concern that is aggravated in individuals with excessive gingival display. Among the plethora of treatment modalities used for depigmentation, lasers have yielded promising results. This case series highlights the effectiveness of diode laser in the management of gingival melanin pigmentation.

Keywords: Depigmentation, Diode laser, Melanin hyperpigmentation.

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INTRODUCTION

Gingival hyperpigmentation is increased pigmentation beyond the normally expected degree of the oral mucosa.[1] Brown or dark pigmentations and discolorations of the gingival tissues, whether physiological or pathological, can be caused by a variety of local and/or systemic factors.[2] Most of the pigmentation is caused by five primary pigments: Melanin, melanoid, oxyhemoglobin, reduced hemoglobin, and carotene. Other cases are caused by bilirubin and iron.[3] However, the most common cause is physiologic or ethnic as a result of excessive melanin deposition by melanocytes, which in turn depends on the activity of enzyme tyrosinase.[1]

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High levels of oral melanin pigmentation are normally observed in individuals of African, East Asian, or Hispanic ethnicity. In general, individuals with fair skin will not demonstrate overt tissue pigmentation, although comparable numbers of melanocytes are present within their gingival epithelium.[4] Moreover, oral pigmentation is due to the activity of melanocytes rather than the number of melanocytes in the tissue. The color 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.[5] Melanin hyperpigmentation usually does not present as a medical problem, but is aggravated in patients with a "gummy smile."[6] However, the growing demand for esthetics has made individuals more aware of their gingival pigmentation, which may be apparent during smiling and speech.[7]

Gingival depigmentation is the treatment modality used to remove melanin hyperpigmentation for esthetic concerns.[8] To date, several different techniques have been used for gingival depigmentation, including the scalpel technique, cryosurgery, electrosurgery, chemical methods, masking the pigmented gingiva with less pigmented gingival areas (free gingival graft, acellular dermal matrix allograft), and lasers (Table 1).[9] Different lasers, such as carbon dioxide (CO_2) laser, neodymium-doped yttrium aluminum garnet laser, semiconductor diode laser, argon laser, erbium-doped yttrium aluminum garnet (Er:YAG) laser, and erbium, chromium: yttrium-scandium-gallium-garnet (Er,Cr:YSGG) have

Table 1: Different techniques employed for gingival depigmentation

I	*Methods aimed at eliminating pigmentation*		
	A	Surgical methods	
		1	Bur abrasion
		2	Scalpel surgical technique
		3	Electrosurgery
		4	Cryosurgery (gas expansion cryoprobe using nitrous oxide, liquid nitrogen, tetrafluoroethane)
		5	Laser (argon, potassium titanyl phosphate, diode, Nd:YAG, holmium:YAG, Er:YAG, Er,Cr:YSGG, CO_2)
	B	Chemical methods (currently not used)	
		1	90% Phenol
		2	95% Alcohol
II	*Methods aimed at masking pigmentation*		
	A	Free gingival graft	
	B	Acellular dermal matrix allograft	

been used for the treatment of gingival pigmentation.[10] Use of lasers for gingival depigmentation is based on their ablative property that targets the melanin in melanocytes present in the suprabasal and basal layers of the epithelium, which absorbs and converts light energy into heat by photothermolysis.[8]

This article discusses four cases of gingival depigmentation accomplished successfully using a diode laser.

CASE REPORTS

The cases of melanin hyperpigmentation were managed by diode laser ablation. All the laser safety precautions were strictly adhered to and depigmentation was performed only after the procedure was verbally explained to the patient and written consent obtained.

Case 1

A 30-year-old male patient with a wheatish complexion reported with a chief complaint of black gums. The medical and dental history was not significant. Clinical examination revealed a healthy periodontium but with unesthetic melanin hyperpigmentation in the anterior region of the maxillary and mandibular gingiva. Hence, laser depigmentation was planned under local anesthesia. A diode laser unit (SIROLaser Xtend, Sirona Dental Systems, Germany, wavelength 970 nm, power 2.5 to 3 W) was used for depigmentation of the maxillary and mandibular anterior gingiva up to the distal aspect of the first premolar on both the sides (Figs 1A to C).

Case 2

A 37-year-old fair-skinned female patient reported with a complaint of black and dark gums in her lower teeth. She requested for any cosmetic therapy that would enhance her smile and esthetics. Both medical and dental histories were insignificant. On clinical examination, no abnormalities were detected except for pigmented gingiva on the labial aspect of the mandibular arch. Thus, it was decided to perform depigmentation using diode laser (ZOLAR Photon, Zolar Technology & Manufacturing Co. Inc, Canada, wavelength 810 nm, power 1 to 1.2 W) for the mandibular arch extending up to the distal of the premolars on either side (Figs 2A to C).

Case 3

A 23-year-old systemically healthy, fair-skinned female patient reported with a complaint of black and unsightly gums, seeking correction of the same. Dental history was not significant. Clinical examination revealed heavy melanin pigmentation in both the arches. Diode laser depigmentation of the gingiva was done (Zolar Photon, Zolar Technology & Manufacturing Co. Inc, Canada, wavelength 810 nm, power 1 to 1.2 W) in two sessions at an interval of 1 week up to the distal aspect of the premolar bilaterally (Figs 3A to C).

Figs 1A to C: Patient 1. (A) Preoperative view of gingival melanin pigmentation with Dummett Oral Pigmentation Index (DOPI) score of 1 in maxilla & 3 in the mandible; (B) Maxillary gingiva one month after treatment; and (C) Mandibular gingiva one month after treatment. Note the significant improvement in esthetics without recurrence or any deformity. DOPI scores were 0 for both arches postoperatively.

Figs 2A to C: Patient 2: (A) Preoperative appearance of gingival melanin pigmentation in the mandible (DOPI score 1); (B) Mandibular gingiva immediately after laser ablation; and (C) Mandibular gingiva one month after treatment. Note the excellent reduction in pigmentation resulting in a more pleasing appearance (DOPI score 0).

Figs 3A to C: Patient 3: (A) Preoperative appearance of gingival melanin pigmentation with DOPI score of 3 in both arches; (B) Gingiva immediately after laser ablation; and (C) 1 month postoperative appearance of maxillary and mandibular gingiva (DOPI score 0)

Case 4

A 29-year-old fair-skinned individual reported seeking cosmetic correction of his black gums. Medical and dental histories were not significant. Clinical examination revealed unesthetic melanin hyperpigmentation in the maxillary and mandibular gingiva. Therefore, laser depigmentation was planned under local anesthesia. A diode laser (SIROLaser Xtend, Sirona Dental Systems, Germany, wavelength 970 nm, power 2.5 to 3 W) was used for depigmentation of the maxillary and mandibular anterior gingiva up to the distal aspect of canines on both the sides (Figs 4A and B).

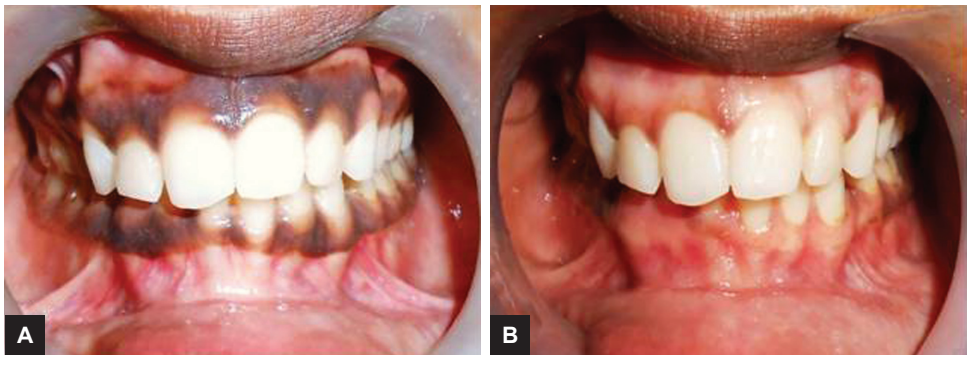
Surgical Protocol

Prior to the procedure, a detailed history was recorded and relevant investigations done to rule out any contraindications for the surgery. Routine oral prophylaxis was carried out. Following infiltration anesthesia, laser energy was delivered in a contact, continuous wave mode using a 400 µm fiber. Laser ablation was started from the mucogingival junction toward the free gingival margin, including papillae. Ablation was carried out using the "brush technique" in a continuous movement while taking care to avoid injury to tooth surfaces or adjacent tissues. During the procedure, the laser ablated the gingival epithelial surface little by little to reach the pigments without causing any bleeding, which aided in clear visualization. This produced a melanin pigment-free surface without any carbonization. No periodontal dressing was given.

The patients were discharged from the operatory with instructions to continue performing their normal daily routine and to avoid consuming hot or spicy food. Analgesics were prescribed postoperatively so that the patients could take it should the need arise. The patients were reviewed after 1 week. Healing was uneventful in all the cases without any postsurgical complications. At the 1 month follow-up visit, the gingiva appeared healthy, pink, and firm with the patients expressing satisfaction over the significantly improved esthetic appearance.

DISCUSSION

Gingival hyperpigmentation presents an esthetic challenge.[8] Owing to the increasing demand for depigmentation, various methods are available that exhibit different degrees of success.[2] Surgical stripping has been a gold standard for gingival depigmentation. However, in the past decade, dental lasers have also gained prominence for these procedures.[1] Lasers have been reported to be an effective, pleasant, and reliable method for depigmentation with minimal postoperative discomfort and faster wound healing.[10]



Figs 4A and B: Patient 4: (A) Preoperative view of melanin hyperpigmentation with DOPI score of 3 in maxillary and mandibular arches; and (B) 1 month postoperative view of both arches (DOPI score of 1 in maxilla and 0 in mandible)

The diode laser is a solid-state semiconductor laser that typically uses a combination of gallium (Ga), arsenide (Ar), and other elements, such as aluminum (Al) and indium (In), to convert electrical energy into light energy. This laser has energy and wavelength characteristics that specially target the soft tissues. As it has affinity for hemoglobin and melanin, it is more efficient and better equipped to address deeper soft tissue problems.[10] Moritz et al in their study demonstrated the high bactericidal effect of the diode laser and its ability to seal blood vessels in the surrounding tissue that accounted for its distinct advantage of hemostasis, thereby ensuring a clear and dry operating field.[11] Further benefits of diode lasers are that they are smaller sized units and of lower financial costs.[10]

Kaya et al[12] compared diode and Er:YAG lasers in treating gingival melanin pigmentation in terms of gingival depigmentation, local anesthesia requirements, postoperative pain/discomfort, depigmentation effectiveness, and total treatment duration. The authors concluded that both the lasers resulted in satisfactory depigmentation, with the diode laser demonstrating an advantage of significantly shorter treatment time. In another study, Singh et al[13] evaluated depigmentation achieved using diode laser and cryosurgery in 20 patients over a 18-month follow-up period. The depigmentations obtained using both techniques were equivalent and satisfactory. However, absence of pain intraoperatively and postoperatively with faster healing times were the key advantages of the laser technique.

The success of depigmentation may be weighed by the extent of depigmentation achieved and by the time taken for the reappearance of pigments.[14] Gingival repigmentation refers to the reappearance of melanin pigmentation after a period during which clinically pigmented tissues were depigmented.[1] The mechanism of repigmentation is not clearly understood, but according to the migration theory, active melanocytes from the adjacent pigmented tissues migrate to the treated areas, causing failure.[14] The extent and time interval of recurrence varies with regards to the treatment modalities used and the duration of follow-up.[1]

Lin et al[15] in their systematic review have stated that repigmentation was reported with nearly all the depigmentation methods. However, as per their analysis, lasers were more reliable for treating gingival melanin pigmentation as demonstrated by their low recurrence rates when compared with bur abrasion, scalpel surgery, and some other methods. Further, the diode laser exhibited the least pigmentation recurrence rates when compared with other lasers analyzed using random-effects Poisson regression.

Based on our findings and those in the literature, it can be concluded that the diode laser is extremely proficient in treating gingival melanin pigmentation. Moreover, the patients were pleased with the treatment outcome, which is the ultimate endeavor of any therapy.

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