

## Management of Gingival Hyperpigmentation Using Surgical Blade and Diode Laser Therapy: A Case Report

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### ABSTRACT

Gingival hyperpigmentation has been a major concern for a large number of patients visiting the dentist. Clinicians are challenged for attending to and correcting this biologic, esthetic and functional problem. Melanin, a non-hemoglobin derived brown pigment, is often abnormally deposited in the basal and suprabasal cell layers of gingival epithelium due to which the gums appear black particularly in patients having a high smile line. Several depigmentation procedures like scalpel surgery, gingivectomy with free gingival autograft, electrosurgery, cryosurgery, laser therapy using Nd:YAG, diode or CO<sub>2</sub>, abrasion with diamond bur, chemical agents like 90% phenol and 95% alcohol have been employed for removal of melanin pigmentation.

The present case report describes two distinct surgical depigmentation procedures: scalpel blade surgery and semiconductor diode laser for complete removal of gingival pigmentation, tissue healing following the surgery and fulfillment of patient centered outcomes like satisfaction, pain intensity assessment and adverse events. Diode is a solid state semiconductor laser that combines Gallium (Ga), Arsenide (Ar) and other elements like aluminum (Al) and Indium (In), converting electric energy into light energy. In this report both the surgical techniques have shown excellent results, however scalpel blade surgery showed marginally better results in terms of tissue healing and esthetics.

**Keywords:** Gingival depigmentation, Scalpel, Diode laser.

### INTRODUCTION

In today's world of dentistry where esthetics has taken a front seat, delivering a perfect and an attractive smile to the patient has become a dentist's moral responsibility. The harmony of a smile is not only determined by the shape, position and color of the teeth, but also by the gingival tissues. Gingival appearance and health are important components of an attractive smile.

Melanin pigmentation of the gingiva occurs in all races and is completely benign, but complaints of black gums are common.<sup>1</sup> This hyperpigmentation is seen as a genetic trait in some populations and is more appropriately termed

physiological or racial gingival pigmentation.<sup>2,3</sup> The prevalence of melanin pigmentation in different populations has been reported to vary between 0%-89% with respect to ethnic factors and smoking habits. This problem is aggravated in patients with a gummy smile. Gingival depigmentation is a periodontal plastic surgical procedure whereby the gingival hyperpigmentation is removed or reduced by several modalities like surgery,<sup>4,5</sup> laser,<sup>2,6</sup> bur abrasion<sup>7</sup> or cryosurgery.<sup>8</sup> Although easy and simple techniques are available that give the desired results, there is not much information in the literature about effective depigmentation of gingiva.

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Lasers have been used in dentistry since the beginning of the 1980s. Semiconductor diode laser has been used for gingivectomy, frenectomy, incisional and excisional biopsy, operculum removal, coagulation of graft donor site and exposure of soft tissue covering osseointegrated implants.

The present case report describes two surgical depigmentation techniques: Scalpel surgery and semiconductor diode laser and their effectiveness in fulfilling the patient's needs.

### CASE DESCRIPTION

A 18-year old female patient reported to the Department of Periodontics, K.M. Shah dental college and hospital, Vadodara, India, with the demand for cosmetic correction of "black gums" and "gummy smile". (Figure 1). The pigmentation was esthetically displeasing and hence depigmentation was planned. The patient was informed about the possible outcomes of the treatment including possible recurrence. Informed consent was obtained.

Patient received complete oral hygiene instructions and underwent scaling. The patient was recalled after a week and melanin pigmentation index (MPI) (Takashi et al<sup>9</sup>) was taken. Gingival depigmentation was planned from canine of first quadrant to canine of second quadrant with scalpel blade (no. 15) using the slicing method (Figure 2) and from canine of third quadrant to canine of fourth quadrant with a semiconductor diode laser unit (Figure 3) (Picasso, AMD lasers LLC, Dentsply®, wavelength-980nm). The laser tip was held slightly away from the tissue and the laser beam was directed to the target tissue with a fast motion until blister formation occurred. The blistered gingiva was then scraped with wet cotton to remove the epithelium containing the melanin pigmentation. Coe-pak dressing was placed on the operated site and analgesic was prescribed. The patient was prescribed chlorhexidine mouthrinse (0.2%) for 2 weeks.

Clinical parameters were recorded: pain was evaluated at day 1 and week 1 (Table 1), Landry healing index<sup>10</sup> was evaluated at 1, 2 and 3 weeks postoperatively (Table 2).

To comply with laser safety protocol, safety glasses were used by the operator, patient and assistant. Highly reflective instruments or instruments with mirrored surface were avoided as there could be reflection of the laser beam.

### CLINICAL EVALUATION AND INDICES

#### Melanin pigmentation index (Takashi et al<sup>9</sup>)

The degree of melanin pigmentation was determined based on the following scoring system: Score 0: no pigmentation, Score 1: solitary unit(s) of pigmentation in papillary gingiva without extension between neighboring solitary units, Score 2: Formation of continuous ribbon extending from neighboring solitary units.

#### Visual Analog Scale (VAS)

VAS was used to evaluate the subjective pain level experienced by the patient. VAS consisted of a horizontal line of 10cm long, anchored at the left end by the descriptor "no pain" and at the right end by "unbearable pain". The patient was asked to mark the severity of pain. The distance of this point, in cms, from left end of the scale was recorded and used as the VAS score 0= no pain, 1-3= slight pain, 3.1-6= moderate pain, 6.1-10= severe pain.

#### Wound healing

Wound healing was evaluated by Landry healing index<sup>10</sup> based on the following criteria: Tissue color, Response to palpation, Incision margins and Suppuration (Table 2).

### RESULTS

Since the patient was under anesthesia, evaluation of pain was not done immediately post operatively. It was done 1 day and 1 week post operatively. Compared to scalpel blade surgery, diode laser technique showed better results for pain intensity scale (VAS). At the scalpel operated sites moderate pain was recorded at 1 day post operatively compared to slight pain at laser operated sites. However, the pain had reduced considerably 1 week after surgery. It came down to no pain at 1 week post operatively for both the technique (Table 1). The MPI score showed that there was no recurrence of pigmentation at 1 month post operatively (Table 1). However, better results



**Figure 1:** Pre-operative view of pigmented gingiva

in terms of reduction of pigmentation were seen with the scalpel technique (Figures 2b, 3b). Compared to scalpel surgery, diode laser showed delayed healing (Table 2). No adverse events were noted at 1 week and 1 month post operatively with either of the techniques.

## DISCUSSION

Pigmented gingival tissue often forces patients to seek cosmetic treatment. Several treatment options have been suggested in the literature, ranging from a simple slicing method to free gingival grafts but each technique has its own advantages as well as shortcomings. The semiconductor diode laser is emitted in continuous-wave or gated-pulsed mode and is usually operated in a contact method using a flexible fiber optic delivery system. The diode laser used in the present case was on a gated pulsed mode with a wavelength of 980 nm. Laser light is poorly absorbed in water, but highly absorbed in hemoglobin and other pigments.<sup>11</sup> Since the diode basically does not interact with dental hard tissues, it is indicated for cutting and coagulating gingival and oral mucosa, and for soft tissue curettage or sulcular debridement. The diode laser 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. It causes minimal damage to the periosteum and bone under the gingiva being treated and it has the unique property of being able to remove a thin layer of epithelium cleanly. Diode laser did not produce any deleterious effect on the root surface. Although healing of laser wounds is slower than healing of scalpel wounds, the laser wound is sterile and has no inflammatory reaction.<sup>12</sup> Blood vessels in the surrounding tissue upto a diameter of 0.5mm are sealed by the laser,

thus the primary advantage is hemostasis and a relatively dry field. Tissue penetration with diode laser is less than that of the Nd:YAG laser, while the rate of heat generation is higher. The advantages of diode over Nd:YAG is the lower financial costs. Scalpel surgery causes unpleasant bleeding during and after the surgery, and it is necessary to cover the exposed lamina propria with a periodontal dressing for 7-10 days. The healing period of scalpel is shorter than the diode laser because of the absence of coagulated and charred tissue as in laser surgery. The other advantages of scalpel surgery over laser are cost effectiveness, reduced surgical time and surgical control by the operator. Scalpel does not have any untoward effects on the underlying bone and the periosteum. The operator can control the depth and extent of the incision using a scalpel unlike that in a laser, hence chances of tissue damage are minimal with the scalpel technique. The usual mechanism of diode laser that leads to ablation or decomposition of biological materials is photochemical, thermal or plasma mediated. Thermal ablation means that the energy delivered by the laser interacts with irradiated material by an absorption process, yielding a temperature rise there. As the temperature increases at the surgical site, the soft tissues are subjected to warming (37-60°C), protein denaturation, coagulation (>60 °C), welding (70-90 °C), vaporization (100-150 °C) and carbonization (>200 °C). The rapid rise in intracellular temperature and pressure leads to a cellular rupture, as well as release of vapor and cellular debris, termed as laser plume.<sup>13</sup> Few advantages of laser over other techniques are: bloodless operative field, sterilization of wound site, less post-operative pain and little mechanical trauma. However it has some disadvantages, the main one being its higher cost, delayed healing time, increased operative time and the offensive odor emitted while cutting the tissue.

## CONCLUSION

Growing esthetic concerns require the removal of unsightly pigmented gingival areas to create a pleasant and confident smile, which altogether may alter the personality of an individual. This could be attained by any of the techniques described in the present report. Both techniques have their own advantages and disadvantages. However, scalpel blade surgery

offers several benefits to the patients and has shown marginally better results than diode laser in terms of tissue healing and esthetics within the period of available follow up. The patient however

was satisfied with the outcomes of both the surgical techniques, which is the ultimate goal of any therapy.



**Figure 2:** Postoperative View (Blade) **Figure 2a:** Postoperative view after 1 week. **Figure 2b:** Postoperative view after 4 weeks



**Figure 3:** Postoperative View (Diode Laser) **Figure 3a:** Postoperative view after 1 week. **Figure 3b:** Postoperative view after 4 weeks

**Table 1:** Clinical evaluation of pain by Visual Analog Scale (VAS) and melanin pigmentation index (MPI)

Method	VAS		MPI		
	1 day post-op	1 week post-op	Pre-op	1 week post-op	1 month post-op
Scalpel	3.3	0.5	2	1	0
Laser	2	0	2	0	0

**Table 2:** Landry healing Index

	Tissue color		Response to palpation		Incision margin		Suppuration		Total	
	scalpel	laser	scalpel	laser	scalpel	laser	scalpel	laser	scalpel	laser
1 week	4	3	4	5	4	3	5	5	17	16
2 week	5	4	4	5	4	4	5	5	18	18
3 week	5	4	5	5	5	5	5	5	20	19

#### CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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