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## Gingival Tissue Depigmentation Using Diode Laser: A Case Report

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### ABSTRACT

The gingival pigment is one of the common aesthetic demands of the patient who attend the periodontal clinic for management. Gingival depigmentation is one of the procedures that are handled to establish a pleasant gingival display. Multiple depigmentation techniques are prescribed in the literature. Non-surgical techniques include chemical peeling and cryosurgery, while surgical techniques include (Abrasion with Bur or Scalpel blade, free gingival graft, acellular dermal matrix allograft, electrosurgery, and laser). Different types of lasers are utilized for depigmentation (carbon dioxide, neodymium-doped: yttrium aluminum garnet, semiconductor diode, and Erbium). Three patients received gingival pigments treatment with diode laser at the periodontics clinic in King Saud Medical City. Their follow-up range was between three to five years to evaluate the changes and chances of re-pigmentation of gingival tissues utilizing the gingival pigmentation index to compare pre-surgical and follow-up outcomes. All three patients presented with re-pigmentation of gingival tissues, but their scores were not as the baseline.

### 1. Introduction

The gingival tissue is a significant element of dentofacial esthetics along with the face, lip, and teeth.<sup>[1]</sup> Gingiva contributes to the smile's beauty and plays an essential role as a major component of a beautiful smile. One crucial aspect of healthy, intact gingiva is a natural pigment. The normal physiologic color of gingiva is coral pink or salmon pink, with physiological variations of melanin pigmentation.<sup>[2]</sup> However, the color of the gingiva varies from person to person and is hypothesized to be linked to cutaneous pigmentation. It ranges in color from light brown to dark brown or black. Different races and locations have different skin tones, textures, and colors.<sup>[2]</sup> Gingival hyperpigmentation is a darker gingival color beyond what is normally expected. Pigmentation is contributed to by-products of the physiological process such as melanin, melanoid, carotene, oxyhemoglobin, reduced hemoglobin, bilirubin, and iron and pathological diseases and conditions.<sup>[3]</sup> Melanin pigmentation results from melanin granules produced by melanoblasts.<sup>[2]</sup> Furthermore, environmental risk factors such as tobacco smoking contribute to gingival hyperpigmentation in both active and passive forms.<sup>[4]</sup> Several patients believe that pigmentation of the gingival tissue is unaesthetic. This negative perception might go beyond that point and cause a decrease in self-esteem, self-image, and many other negative psychological effects, especially in patients with a high smile line,<sup>[1]</sup> otherwise called a gummy smile.<sup>[2]</sup> Patients seek solutions to treat or eliminate

hyperpigmentation, and usually, the dentist would recommend gingival depigmentation as a go-to solution, which has established remarkable results.<sup>[2]</sup> Gingival depigmentation refers to a plastic surgical procedure that focuses on removing gingival hyperpigmentation through the application of various techniques.<sup>[4]</sup> Amongst the popular techniques reported for depigmentation are: chemical peeling, cryosurgery, surgical abrasion, free gingival graft, acellular dermal matrix allograft, electrosurgery, and lasers.<sup>[2]</sup> The selection criteria of the appropriate mode of treatment are subjected to many factors. The patient's preference is an important factor in choosing the best technique and treatment plan. However, many other factors should be considered, such as the lip line, esthetic concern, the magnitude of gingival pigmentation, and the patient's skin color.<sup>[4]</sup>

Moreover, the procedure of choice must be effortless, affordable, safe, and pleasant for the healthcare practitioner and patient.<sup>[5]</sup> Cryosurgery and lasers have been reported to be superior techniques, having excellent esthetic outcomes and a low recurrence rate.<sup>[2]</sup> However, when compared, numerous studies recognized that the laser technique is more restful, resulting in reduced operative pain compared to cryosurgery.<sup>[6]</sup> In addition to the previous benefits, Lasers promote hemostatic activity, good visibility intra-operatively, and fewer postoperative complications such as bleeding, edema, infection, and impaired wound healing.<sup>[2]</sup> Various types of lasers were known to be used for

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gingival depigmentation; carbon dioxide (10.600 nm), diode (810 nm), Neodymium: Yttrium Aluminium Garnet (1.064 nm), and Erbium: YAG (2.940 nm) lasers.<sup>[4]</sup> The diode laser is a favorable and authentic appliance for dental utilization. The semiconductor diode laser delivers constant wave mode. It primarily works in contact mode utilizing a flexible fiber-optic handpiece. 810 nm wavelength, the laser light is greatly hemoglobin absorption and other pigments.<sup>[7]</sup> The following cases described an easy, direct, and efficient surgical gingival depigmentation technique using a diode laser. Its follow-ups after two to five years to evaluate the chances for re-pigmentation of gingival tissues utilizing the gingival pigmentation index by Peeran et al. 2014.<sup>[8]</sup> Peeran et al. suggested gingival melanin pigmentation and pigmented lesions index as follows:

Score 0: Coral pink-colored, non-pigmented.

Score 1: Mild, isolated/scatters, pigment affecting anterior areas; it may or may not affect posterior areas.

Score 2: Moderate to severe, isolated or scatters, pigment it may or may not affect posterior areas.

Score 3: Only posterior areas are affected by pigment.

Score 4: Tobacco-associated pigment: Smoker's melanosis, smokeless tobacco.

Score 5: Exogenous pigments: Amalgam tattoos arsenic, bismuth, chewing betel nut, cultural gingival tattooing, drinks, food colors, lead-burtonian line, mercury, silver, topical medications, idiopathic.

Score 6: Endogenous pigments: Bilirubin, blood breakdown products, ecchymosis, hemochromatosis, hemosiderin, petechiae.

Score 7: medication-associated pigment: Antimalarial drugs, minocycline, oral contraceptives.

Score 8: Pigment associated with Addison's disease, Albright's syndrome, basilar melanosis with incontinence, hereditary hemorrhagic telangiectasia, HIV patients, lichen planus, neurofibromatosis, Peutz-Jeghers syndrome, pyogenic granuloma/granulomatous epulis.

Score 9: Pigment associated with benign lesions: Hemangioma, melanocytic nevus, pigmented macule

Score 10: Pigment associated with malignant lesions: Angiosarcoma, Kaposi's sarcoma, malignant melanoma.

## 2. Case Presentation

### Case 1

A Saudi female patient aged 28 years old visited the Department of Periodontics, Dental hospital at King Saud Medical City, Riyadh. With a chief complaint of darkened gum that aesthetically affects her smile. No remarkable medical illnesses were found. At the oral examination, she scored 2 (Fig. 1). Depigmentation for upper arch only (one visit), Using (BIOLASE, EPIC 10™, WaveLength  $940 \pm 10\text{nm}$ ). The maxillary anterior region from right first premolar to left first premolar was infiltrated by local anesthesia (Lidocaine 2% with epinephrine 1:100000). A 400-micron tip was required for the initiation of the fiber tip. The gingival epithelium and part of connective tissues were exfoliated using 1.0 Watt pulse mood, pulse length, and pulse intervals for 40 microseconds. The tip was provoked using brush strokes to prevent tissue injury. The areas were irrigated with saline, and hemostasis was achieved (Fig. 2). Analgesic and mouthwash were prescribed, and postoperative instructions were delivered to the patient. She was called back after for follow-up and observation (Fig. 3). Between two visits, the patient was reassured and asked about postoperative pain and discomfort; she did not undergo bleeding or post-surgical pain, did not take an analgesic, and only used mouthwash as instructed. After five years, she had been called for follow-up. Their medical history was reviewed and stated no changes; she did

not take any medication that may aggravate gingival pigments; clinical oral examination revealed that gingival tissues showed a re-pigmentation, score 1 while non-operated site lower arch remained score 2 (Fig. 4).



**Fig. 1. Pre-operative photo (baseline).**



**Fig. 2. Upper arch depigmentation.**



**Fig. 3. Follow-up of upper arch depigmentation.**



**Fig. 4. Five years follow-up.**

### Case 2

A 30-years-old Saudi female patient complaining of darkened gum was seen in the Department of Periodontics, Dental hospital at King Saud Medical City, Riyadh. There was no significant medical and dental history or any harmful oral habits. Upon oral examination, spread out of melanin hyperpigmentation was scored 2 for both arches (Fig. 5). Following the same protocol before surgery as in case 1, a procedure managed under infiltration of local anesthesia for the upper arch while lower arch without upon patient request. Same as case 1 (Fig. 6), analgesics and mouthwash were prescribed, and postoperative instructions were delivered to the patient. The patient was recalled after observation; the patient was reassured and asked about postoperative pain and discomfort; she did not experience bleeding or post-surgical pain.

Moreover, she did not take analgesics. Only she used mouthwash as instructed. After five years, she was called to the clinic for follow-up (Fig. 7). Medical history was reviewed, and the patient denied medical problems and did not use any medication. Clinical oral examination shows gingival tissues exhibiting re-pigmentations scored 1 (Fig. 8).



**Fig. 5. Pre-operative photo (baseline).**



**Fig. 6. Immediately after depigmentation.**



**Fig. 7. One-week follow-up.**



**Fig. 8. five years follow-up.**

### Case 3

A Saudi female patient aged 29 years old visited the Department of Periodontics, Dental hospital at King Saud Medical City, Riyadh. Her chief complaint was that darkened gum had a negative aesthetic impact on her smile. No remarkable medical illnesses were found. At that time of oral examination, she scored 2 gingival-pigmentation (Fig. 9). Depigmentation for the upper arch (Fig. 10) was conducted in the first visit, while the depigmentation of the lower arch was carried out in the second visit. (Fig. 12) both were carried out under local anesthesia upon patient request. After each surgical visit, analgesics and mouthwash were prescribed, and postoperative instructions were explained to the patient. The patient was called back for follow-up and observation (Figs. 11 and 13). During all visits, the patient was reassured and asked about postoperative pain and discomfort; The patient stated that she did not suffer bleeding or post-surgical pain. Moreover, they did not take an analgesic and only used mouthwash as instructed. After three years, she had been called for follow-up. Their medical history was reviewed and stated no changes; she did not take any medication that may aggravate gingival pigments; clinical oral examination revealed that gingival tissues had expressed re-pigmentation score 1 (Fig. 14).



**Fig. 9. Pre-operative photo (baseline).**



**Fig. 10. Upper arch depigmentation.**



**Fig. 11. Follow-up of upper arch depigmentation.**



**Fig. 12. Lower arch depigmentation.**



**Fig. 13. Follow-up of lower arch depigmentation.**



**Fig. 14. Three years follow-up.**

### 3. Discussion

As demonstrated in the three cases above, the depigmentation procedures were carried out with minimal pain and discomfort, adding to the laser's curative ability such as cutting, removing, and reshaping gingiva easily, leading to more effective and efficient surgery that leaves the surgical area almost entirely bloodless and visible.<sup>[9]</sup> Another remarkable aspect is the postoperative period which did not necessitate the use of any form of analgesic painkillers. The information stated above aligns with the findings of several studies that documented that utilizing lasers in gingival depigmentation was associated with less postoperative pain and more patient satisfaction.<sup>[10]</sup> The use of anesthesia did not show signs as the whole procedure did not seem to provoke pain if done properly. However, the issue of pigmentation recurrence seems to raise questions about the reliability of the outcome of the procedure.

Moreover, several studies have found that lasers are associated with less postoperative pain and more patient satisfaction.<sup>[10]</sup> Association between laser treatment and recurrence has been widely inspected, and remarkable differences have been emphasized compared to traditional treatments.<sup>[11]</sup> Recurrence of pigmentation is considered one of the common issues.<sup>[12]</sup> Investigators rule out that the recurrence of physiologic pigmented lesions is coordinated with the flow of melanin cells from neighboring tissues. Interestingly, the recurrence ratio can be different with laser type and follow-up periods.<sup>[13]</sup> According to Perlmutter & Tal (1986), gingival tissue treated by surgical intervention shows evidence of re-pigmentation in some areas after 32 months and after 7-8 years completely pigmented.<sup>[14]</sup> When comparing cases treated with diode laser and surgical intervention for depigmentation, studies found that both groups exhibited re-pigmentation after three months; however, there were fewer in the diode laser group. Although, after six and nine months, both groups exhibit the same level of re-pigmentation.<sup>[15]</sup> With all the limitations faced by this particular study, namely the relatively mild score discoloration baseline and not having regular, equal intervals recall visits for the three patients to set as a benchmark to compare the time it took the re-pigmentation recurrence to occur. It is still evident that diode laser depigmentation is the treatment of choice when it comes to mild gingival pigmentation cases, especially from the patient comfort and satisfaction aspects.

### 4. Conclusion

Regarding all presented cases, with limitations, all patients received depigmentation sessions with a diode laser between three and five years back; at their recent examination visits, re-pigmentation of gingival tissues was evident for all of them with variable scores but not to their baseline scores, in which has been correlated with literature findings. With the limitations of this case report, it expresses the need to implement well-structured studies to ensure large samples to validate the present outcome.

### Conflict of Interest

The authors declared that there is no conflict of interest.

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