

Gingival Depigmentation Using Diode Laser with the Conjunctive Application of Vitamin C: A Case Series

Gingival
Depigmentation
Using Diode
Laser with
Conjunctive

Dhafer Alasmari

ABSTRACT

Gingival hyperpigmentation can pose an esthetic concern for certain patients, especially when it manifests on the anterior labial gingiva, primarily in individuals with a prominent smile line. The patients presented to Dental Clinics of College of Dentistry, Qassim University between August 2018 to September 2022.

This pigmentation typically presents as a brown or dark discoloration resulting from the excessive deposition of melanin by melanocytes in the basal and supra-basal cell layers of the epithelium. Various techniques have been employed to address gingival hyperpigmentation, including scalpel excision, abrasion, cryosurgery, radiosurgery, electrocautery, chemical agents, LASER therapy, and gingival grafts. In this case series, we aim to assess the effectiveness of a combination of Vitamin C (Ascorbic acid) and a Diode LASER emitting light at 445 nm for treating gingival hyperpigmentation while also evaluating its ability to reduce repigmentation over a one-year follow-up period.

Key Words: Gingival Depigmentation, Laser, Vitamin C, Pigmentation

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INTRODUCTION

Gingival hyperpigmentation can be a cosmetic concern, especially when it affects the anterior labial gingiva in individuals with a prominent smile line. This condition is characterised by the presence of brown or dark discoloration due to the excessive deposition of melanin by melanocytes in the basal and supra-basal cell layers of the epithelium.¹ The underlying causes of gingival pigmentation can be categorized as either physiologic or pathologic. Physiologic pigmentation is hereditary and can be observed in some populations, regardless of age or gender. In contrast, pathologic pigmentation can result from exogenous factors like medications, smoking, heavy metal exposure, or amalgam tattoos, or from endogenous factors related to various medical conditions.²

Several methods have been employed to address gingival hyperpigmentation, including the removal of the pigmented layer and the masking of pigmented gingiva.

Pigmented layer removal techniques encompass the use of a scalpel, abrasion with a diamond bur, cryosurgery with liquid nitrogen, electrosurgery, and laser therapy utilizing different types of lasers, such as semiconductor diode, Nd:YAG, CO₂, and argon lasers.³ Chemical treatments with substances like 90% phenol, 95% alcohol, and vitamin C have also been employed. Alternatively, the pigmented gingiva can be masked using techniques like free gingival grafts (FGGs) or acellular dermal matrix allografts (ADMA).⁴

Among these approaches, laser ablation has gained recognition as an effective and comfortable method for gingival depigmentation. The diode laser, a solid-state semiconductor laser, has emerged as a popular choice due to its precision in targeting soft tissues, minimal need for local anesthesia, and limited thermal impact on deeper tissues.⁵ It also exhibits a high affinity for hemoglobin and melanin, making it particularly well-suited for addressing deeper soft tissue concerns.⁶ Moreover, the diode laser is characterized by its high electrical to optical efficiency, portability, and quiet operation. The introduction of the 445 nm blue wavelength in 2015 has further expanded the utility of diode lasers in dental procedures.⁷

The combination of the 445 nm blue diode laser and vitamin C (ascorbic acid) has shown promise in non-ablative depigmentation of oral mucosa, offering immediate aesthetic improvements with minimal procedure time. Vitamin C, renowned for its role in scurvy prevention, also possesses cancer prevention, anti-viral, and antioxidant properties. In dermatology, vitamin C is well-known for its skin-strengthening, photo-protective, collagen biosynthesis, and melanogenesis-inhibiting effects, making it a popular

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choice for depigmentation and anti-aging treatments.⁸ In practice, the local application of vitamin C, in conjunction with the scalpel technique for gingival depigmentation, has yielded satisfactory aesthetic results with minimal discomfort and a low risk of recurrence.

Laboratory studies have indicated that ascorbic acid significantly inhibits tyrosinase activity and melanin production, both in B16 mouse melanoma cells and in human skin models.⁹ Intraepithelial injections of vitamin C have been explored for direct delivery to gingival tissues, allowing the assessment of vitamin C's impact on melanin pigmentation.¹⁰ This case series presents an approach involving the topical application of vitamin C in combination with a diode laser to prevent the recurrence of physiologic gingival hyperpigmentation. It also compares this combined approach to the use of the diode laser alone for depigmentation and evaluates its effects on gingival health.

CASE PRESENTATION

Four female patients, ranging in age from 18 to 35 years, sought professional care at the Department of Periodontics, Qassim University, citing a common chief complaint of "dark gums" and no significant medical history. This concern stemmed from their experiences of diminished self-assurance and social discomfort within their peer groups. The initial case involved a 21-year-old female patient with notable gingival hyperpigmentation extending bilaterally from molar-to-molar regions in the upper arch, along with a similar presentation in premolar-to-premolar regions in the lower arch. The clinical assessment of pigmentation was as follows: DOPI (Dummett Oral Pigmentation Index) for the maxillary gingiva was 0.5, and for the mandibular gingiva, it was 0.4, indicating mild pigmentation. The second case concerned an 18-year-old female patient who exhibited moderate pigmentation, as evidenced by a Dummett Oral Pigmentation Index (DOPI) of 1.28 for the maxillary gingiva and 0.81 for the mandibular gingiva. In the third case, a 35-year-old female patient displayed mild pigmentation, with DOPI scores of 0.56 for the maxillary gingiva and 0.62 for the mandibular gingiva. The fourth case pertained to a 26-year-old female patient who presented with mild pigmentation, as indicated by DOPI scores of 0.5 for the maxillary gingiva and 0.4 for the mandibular gingiva.

These diverse cases underscore the significance of addressing gingival hyperpigmentation across a spectrum of age groups. Furthermore, the range in the severity of pigmentation highlights the need for personalised treatment strategies that cater to the unique requirements of each patient. These cases emphasize the critical nature of esthetic concerns associated with

gingival pigmentation and the potential for efficacious interventions to mitigate these concerns.

TREATMENT

In the first case, the approach to address gingival hyperpigmentation involved the use of the SIROLaser Blue, emitting light at 445 nm and operating at 2 W. A 320 µm fiber was employed for the depigmentation procedure, with continuous movement from the mucogingival junction towards the free gingival margin (Figure 1).



Figure No.1: SIROLaser Blue, emitting light at 445 nm and operating at 2 W



Figure No.2: 500 mg (2 ml) of ascorbic acid (Ascorbic acid ampoule, Huons Company)



Figure No.3: Patient 1 - Pre and Post Treatment

Following this, a topical application of 500 mg (2 ml) of ascorbic acid (Ascorbic acid ampoule, Huons Company) was administered (Figure 2). To ensure material stability during the approximately 5-minute application, the area was effectively isolated using a cheek retractor, cotton rolls, and suction. The patient's progress and long-term outcomes were monitored through scheduled follow-up appointments at 1 week, 1-, 3-, 6-, and 12-months post-treatment (Figure 3).

In the second case, the management of gingival hyperpigmentation also utilised the SIROLaser Blue, operating at 445 nm and 2 W. A 320 μ m fiber was employed to perform the depigmentation procedure, moving continuously from the mucogingival junction towards the free gingival margin. Subsequently, a topical application of 500 mg (2 ml) of ascorbic acid (Ascorbic acid ampoule, Huons Company) was administered. Effective isolation of the treated area was achieved using a cheek retractor, cotton rolls, and suction to prevent material dissolution during the approximately 5-minute application (Figure 4).



Figure No.4: Patient 2 - pretreatment and 1 year follow up post treatment

The third case involved the use of the SIRO Laser Blue, operating at 445 nm and delivering 2 W of power for addressing gingival hyperpigmentation. A 320 μ m fiber was employed for the depigmentation procedure, entailing continuous movement from the mucogingival junction towards the free gingival margin. Following the depigmentation procedure, a topical application of 500 mg (2 ml) of ascorbic acid (Ascorbic acid ampoule, Huons Company) was administered, with proper isolation techniques to ensure material stability during the approximately 5-minute application (Figure 5).



Figure No.5: Patient 3- pre and post treatment

In the fourth case, a similar approach was taken for addressing gingival hyperpigmentation, involving the use of the SIROLaser Blue, which operates at 445 nm and delivers 2 W of power. A 320 μ m fiber was utilised for the depigmentation procedure, and the process involved continuous movement from the mucogingival junction towards the free gingival margin. Subsequent to the depigmentation procedure, a topical application of 500 mg (2 ml) of ascorbic acid (Ascorbic acid ampoule, Huons Company) was administered. Adequate isolation of the treated area was achieved using a cheek retractor, cotton rolls, and suction to prevent material dissolution during the approximately 5-minute application. The patient's progress and outcomes were monitored through scheduled follow-up appointments at 1 week, 1-, 3-, 6-, and 12-months post-procedure (Figure 6).



Figure No.6: Patient 4- pre and post treatment

DISCUSSION

The collective approach of using a diode laser in conjunction with vitamin C (ascorbic acid) application for gingival depigmentation has garnered increasing attention in the field of periodontology. This combined technique capitalises on the advantages of both laser surgery and topical ascorbic acid application to address gingival melanin pigmentations effectively. Several authors and studies have explored the merits of this approach, substantiating its efficacy and benefits.

The case series shed light on the manifold advantages of employing a 445 nm laser for gingival depigmentation, with positive outcomes even at lower power settings. This approach not only streamlines the procedure, reducing its duration, but also enhances operational efficiency and minimises the risk of tissue bleeding, making it an appealing choice for patients seeking esthetic improvements in gingival pigmentation. The concomitant use of ascorbic acid, or vitamin C, has proven effective in diminishing the likelihood of pigmentation recurrence over a one-year follow-up period, underlining its utility in promoting sustained esthetic outcomes.

Fornaini et al. (2016) conducted an observational study emphasizing the efficiency of diode lasers, particularly a 445 nm laser, in oral soft tissue surgical procedures. They concluded that diode lasers are highly efficient and safe for such interventions, and their findings align with the favorable outcomes observed in our cases involving the use of the SIROLaser Blue.¹¹ Additionally, in another study conducted by Yussif NM et al., comparing the efficacy of vitamin C as a minimally invasive non-surgical technique with conventional surgical depigmentation, yielded similar results, indicating the potential for vitamin C to offer atraumatic depigmentation procedures in the future.¹² These inferences resonate with the research by Hatayama et al. (2008), who conducted an in vivo study, affirming the utility of the blue laser diode in the ablation and incision of soft tissue, alongside its role in sterilizing periodontal disease-causing bacteria.¹³ These collective findings reinforce the robustness of the approaches employed in these case series and underscore their potential for broader application in the realm of oral health and esthetic dentistry.

While the collective approach of diode laser and ascorbic acid application presents an effective and promising solution for gingival depigmentation, it is essential to consider the potential limitations associated with diode lasers, such as the cost of equipment and the delayed inflammatory response.¹⁴ Future research should aim to address these limitations, focusing on cost-effective alternatives and strategies to mitigate post-operative discomfort. Moreover, conducting comparative studies that evaluate the long-term outcomes of different depigmentation techniques will

contribute to the broader understanding of their predictability and efficacy, ensuring that patients receive the most suitable and cost-efficient treatments. Additionally, continued collaboration and knowledge sharing among dental professionals are crucial to further advance the field of periodontics and enhance patient care.

CONCLUSION

The combined treatment approach using a diode laser and vitamin C application has demonstrated positive results in addressing gingival hyperpigmentation, offering an effective and minimally invasive solution for patients seeking esthetic improvements.

Author's Contribution:

Concept & Design of Study:	Dhafer Alasmari
Drafting:	Dhafer Alasmari
Data Analysis:	Dhafer Alasmari
Revisiting Critically:	Dhafer Alasmari
Final Approval of version:	Dhafer Alasmari

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