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Laser vs. Scalpel: A split-arch case report on gingival depigmentation

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Abstract
Gingival hyperpigmentation, though physiologic, often causes esthetic concerns, especially in patients with a high smile line. Various techniques have been used for depigmentation, with the scalpel method and diode laser being the most common. This case report compares these two approaches in the same patient. A 25-year-old female presented with generalized dark gingiva. Gingival depigmentation was performed using a diode laser (810 nm, 1.5 W) in the lower arch and a scalpel (No. 15 blade) in the upper arch. Postoperative care included oral hygiene maintenance and chlorhexidine mouth rinse. Both techniques achieved excellent esthetic results with uniform pink gingiva. The laser-treated area showed minimal bleeding, less discomfort, and faster healing, while the scalpel-treated area exhibited mild postoperative pain and slower epithelialization. Within one month, no repigmentation was observed. The diode laser proved to be a more comfortable and efficient technique for gingival depigmentation compared to the conventional scalpel method.

Keywords: Gingiva, hyperpigmentation, melanins, lasers, esthetics

Introduction

Gingival pigmentation is a common physiological occurrence caused by the deposition of melanin granules produced by melanocytes located in the basal and suprabasal layers of the epithelium. Although this pigmentation does not indicate any pathology, it often presents an esthetic concern, particularly among individuals with a high smile line or fair complexion where the pigmented gingiva is visible during speech or smiling [1]. The color of the gingiva varies among individuals and races, influenced by the degree of keratinization, epithelial thickness, vascularity, and most importantly, melanin pigmentation [2]. Excessive melanin pigmentation of the gingiva can create a dark or blotchy appearance that compromises an otherwise pleasant smile, leading many patients to seek esthetic correction.

Several techniques have been proposed to remove or reduce gingival pigmentation. The most conventional and widely practiced method is surgical scraping with a scalpel, which involves removing the pigmented epithelial layer along with a thin portion of the underlying connective tissue [3]. Although this technique is simple, cost-effective, and requires no specialized equipment, it is associated with intraoperative bleeding, postoperative pain, and a longer healing period [4]. To overcome these drawbacks, various alternative approaches have been introduced, including electrosurgery, cryosurgery, chemical cauterization, abrasion with a diamond bur, and more recently, laser-assisted depigmentation [5, 6].

Lasers, such as diode, Er: YAG, CO_2, and Nd: YAG lasers, have been successfully used for gingival depigmentation owing to their precision, hemostatic effect, and minimal postoperative discomfort [7]. The diode laser, in particular, has gained popularity due to its affinity for melanin and hemoglobin, allowing effective ablation of pigmented tissue with excellent hemostasis and reduced patient discomfort [8]. Moreover, laser treatment provides a clean surgical field, minimal damage to adjacent tissues, faster healing, and a lower risk of infection compared to conventional methods [9].

Despite the increasing use of lasers in esthetic gingival procedures, the conventional scalpel technique continues to be widely practiced due to its simplicity and cost-effectiveness. However, few clinical reports directly compare the outcomes of both methods performed within the same patient. This case report presents a comparative evaluation of gingival depigmentation performed using a diode laser in the lower arch and a scalpel technique in the upper arch. The clinical healing pattern, patient comfort, and esthetic results were observed and compared to highlight the advantages and limitations of each technique.

Case Report: A 25-year-old female patient reported to the Department of Periodontics with a chief complaint of "dark gums," which she felt affected the esthetics of her smile. On clinical examination, the pigmentation was found to be generalized and brownish-black in color (Fig.-A). The gingiva appeared firm and healthy with no signs of inflammation. The patient was systemically healthy, with no relevant medical or dental history, and maintained satisfactory oral hygiene. After explaining the etiology of gingival pigmentation, gingival depigmentation was planned using two different approaches within the same patient to allow direct comparison of healing and esthetic outcomes. Laser depigmentation was performed in the lower arch, while the scalpel technique was chosen for the upper arch.

For the scalpel depigmentation procedure in the upper arch, topical anesthesia was applied followed by infiltration anesthesia for patient comfort. Using a #15 Bard-Parker blade, the pigmented epithelial layer along with a thin layer of underlying connective tissue was carefully scraped off with light, controlled strokes (Fig.-B). Hemostasis was achieved by gentle pressure with saline-soaked gauze. The area was thoroughly irrigated with sterile saline to remove debris, and a periodontal dressing was placed to protect the wound surface and promote uneventful healing.

For the laser depigmentation procedure in the lower arch, a diode laser (wavelength 810 nm) was used in contact mode with a power output of 1.5 W in continuous mode. The fiber tip was initiated and applied in light, sweeping strokes over the pigmented areas. Care was taken to avoid excessive heat generation by keeping the laser handpiece in constant motion and using intermittent wiping with saline-moistened gauze to remove the coagulated epithelial layer (Fig.-C). The procedure resulted in immediate hemostasis, a clear surgical field, and minimal patient discomfort. No periodontal dressing was required as the area remained clean and bloodless.

Postoperatively, the patient was instructed to avoid hot, spicy, and hard foods for one week to prevent irritation of the treated sites. She was advised to maintain meticulous oral hygiene using a soft-bristled toothbrush and to rinse twice daily with 0.12% chlorhexidine mouthwash for one week. Analgesics were prescribed for pain management if required. The patient was recalled after one week for follow-up and evaluation of healing.

At one week, healing was uneventful in both arches (Fig.-D). The laser-treated site showed faster epithelialization, minimal discomfort, and no bleeding. The scalpel-treated area demonstrated mild postoperative pain and slight bleeding during the first 24 hours. At one month, both arches exhibited uniform pink gingiva with no repigmentation (Fig.-E).

Figure: A) Pre-operative photo, B) Scalpel depigmentation, C) Laser depigmentation, D) 1week Post-op, E) 1-month post-op.

Discussion: The esthetic appearance of gingiva plays a crucial role in the overall harmony of a smile. Excessive gingival melanin pigmentation, although physiologic, can be a source of cosmetic concern, particularly among patients with a high smile line. Various surgical and nonsurgical depigmentation procedures have been employed to eliminate such pigmentation, each with distinct advantages and limitations [10].

In the present case, two different depigmentation techniques—diode laser and scalpel—were performed in the same patient to compare their clinical outcomes and patient experience. The results demonstrated that both methods effectively removed the pigmented epithelium and achieved a uniform pink appearance post-healing. However, differences were noted in intraoperative comfort, hemostasis, and postoperative healing.

The scalpel technique has long been considered the gold standard for gingival depigmentation because it is simple, cost-effective, and requires no advanced equipment [11]. However, it often results in considerable intraoperative bleeding, postoperative discomfort, and the need for periodontal dressing to protect the denuded surface [12]. In this case, mild postoperative pain and transient bleeding were observed in the upper arch, consistent with earlier findings by Pontes *et al* [13], who reported that mechanical methods, though effective, are associated with delayed epithelialization and greater patient discomfort compared to laser methods.

The laser technique, in contrast, provides several clinical advantages. The diode laser used in this case offered precise ablation with excellent hemostasis due to its affinity for pigmented tissues and hemoglobin. The patient reported minimal pain, and the site exhibited faster epithelialization and minimal inflammation. These findings are in agreement with the studies by Kathariya *et al*. [14] and Gokhale and Kalra [15], who demonstrated that diode lasers yield superior patient comfort, minimal bleeding, and faster wound healing compared to conventional methods. Furthermore, laser therapy sterilizes the surgical field and promotes biostimulation, which accelerates healing and reduces postoperative infection risk [16].

Another important aspect of depigmentation procedure is the potential for repigmentation. Repigmentation is believed to occur due to the migration of active melanocytes from adjacent pigmented areas into the treated site [17]. While some studies have reported recurrence of pigmentation as early as three months post-surgery [18], the present case showed no visible repigmentation at one month of follow-up. Long-term observation, however, is required to determine the stability of results, as the rate and extent of repigmentation vary depending on individual melanocyte activity and technique used [19].

Conclusion: The findings of this case suggest that while both scalpel and laser depigmentation methods effectively achieve esthetic improvement, the diode laser provides additional benefits such as minimal intraoperative bleeding, faster healing, and greater patient satisfaction. Nevertheless, factors such as equipment availability, operator expertise, and cost considerations may influence the selection of technique in clinical practice.

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Conflict of Interest

The authors declare no conflicts of interest related to this study.

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