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Depigmentation Using Scalpel and Diode Laser: A Split Mouth Case Report

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Abstract

Gingival hyperpigmentation is a hereditary condition that, while not harmful, can affect smile aesthetics and cause psychological distress. Gingival depigmentation is a cosmetic periodontal procedure used to reduce this pigmentation. Techniques include scalpels, lasers, cryosurgery, electrosurgery, and chemical methods, with lasers and cryosurgery showing better results and lower recurrence. Treatment choice depends on factors like skin tone, pigmentation level, lip line, and patient expectations. This case report compares scalpel and diode laser treatments in a 24-year-old female using a split-mouth design. The scalpel side healed well, while the laser side offered a bloodless field and quicker recovery. No pain, scarring, or repigmentation was observed, and the patient was pleased with the outcome.

Keywords: Depigmentation, Scalpel, Diode laser.

Introduction

A pleasant smile is influenced not only by the alignment and color of the teeth but also by the appearance of the surrounding gum tissue. The color of the gingiva is determined by several factors, including the number and size of blood vessels beneath the surface, the thickness and keratinization of the epithelial layer, and the

presence of natural pigments[1]. Common pigments in the oral tissues include melanin, carotene, hemoglobin, and oxyhemoglobin[2]. Gingival pigmentation can show up as dark purplish areas or as uneven brown, black, or light brown patches and streaks. When melanin is excessively produced and accumulates in the lower layers of the epithelium, it leads to a condition called gingival hyperpigmentation. This is often seen as an aesthetic concern, especially when it affects the front gums that are visible while speaking or smiling, particularly in individuals with a gummy smile.

Melanocytes, once activated, begin producing granules rich in melanin called melanosomes. The process starts with the conversion of the amino acid tyrosine into DOPA (dihydroxyphenylalanine), a reaction catalyzed by the enzyme tyrosinase. This enzyme further facilitates the transformation of DOPA into dopaquinone. Dopaquinone then undergoes multiple biochemical steps to eventually form either eumelanin, which is dark in color, or pheomelanin, which is lighter[3]. These melanin pigments are transferred to keratinocytes found in both the skin and the oral lining. To address cosmetic concerns, a procedure known as gingival depigmentation is employed within periodontal plastic surgery. One of the earliest and still commonly used methods involves the surgical scraping of the pigmented gum tissue using a scalpel. The procedure entails the removal of the pigmented epithelial layer along with a thin section of connective tissue beneath it. Healing occurs naturally, and the newly regenerated tissue usually lacks pigmentation. This discussion evaluates and compares the effectiveness of scalpel surgery versus laser therapy in managing gingival pigmentation.

Case Presentation

A 24-year-old female patient presented with the complaint of black gums to the Department of Periodontology at the Panineeya Institute of Dental Sciences, Hyderabad, Telangana state. Since the pigmentation had been evident from childhood, it was likely physiological in origin. On clinical examination, noticeable melanin pigmentation was observed in the gingiva of both the upper and lower jaws. There was no familial background suggesting similar pigmentation. According to the grading system by Takeshi et al., the pigmentation ranged between grades 1 and 2(fig:1).

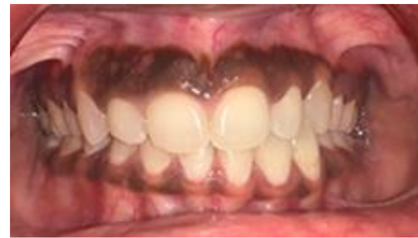

Figure 1: Hyperpigmented gingiva

The patient was medically fit and demonstrated good oral hygiene. They were informed about various treatment modalities and the potential for pigmentation to recur over time. Phase I therapy was completed during the initial visit. A split-mouth technique was selected to compare the effectiveness of scalpel and laser methods for depigmentation.

Procedure

Gingival depigmentation was carried out using two distinct approaches. For teeth 13, 12, and 11, a scalpel method was adopted. After administering local anesthesia, the outer pigmented gingival layer along with a thin portion of underlying tissue was gently scraped using a No. 15 blade(fig:2).

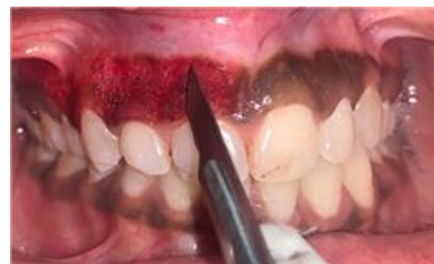

Figure 2: Depigmentation by scalpel method

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Bleeding was managed using sterile gauze pressure (Fig 3), periodontal dressing was placed and healing was allowed to occur naturally over time(fig:4).

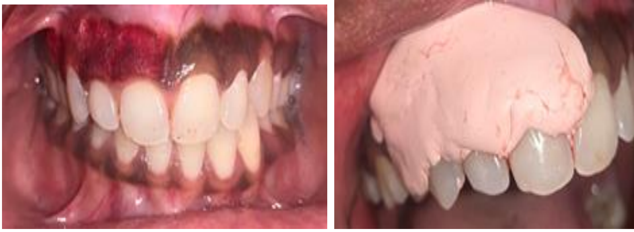

Figure 3 and 4: Immediate post-operative and periodontal dressing was placed

On the other hand, teeth 21, 22, and 23 were treated with a diode laser, operated in contact mode at a power range of 1.5 to 2 watts (fig:5).

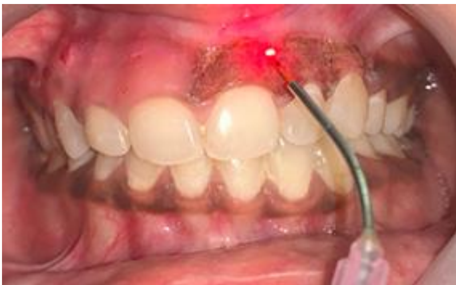

Figure 5: Depigmentation by diode laser

The pigmented areas were gradually removed with controlled, sweeping movements. Periodontal dressing was placed (Fig 6)

After the procedure, the patient received detailed postoperative care instructions. Diclofenac sodium, a nonsteroidal anti-inflammatory medication, was prescribed at a dosage of twice daily for three days to manage pain and inflammation

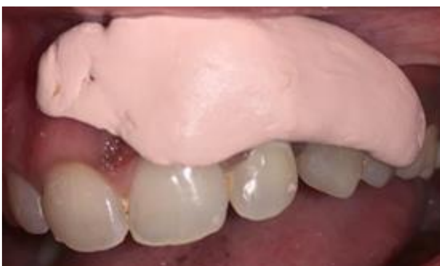

Figure 6: Periodontal dressing was placed

The patient returned for a follow-up visit one week later. At that time, both treated areas showed consistent and satisfactory healing.

The patient noted experiencing mild discomfort in the region where the scalpel technique was used, which lasted for about three days. During the follow-up, the periodontal dressing was removed, and the healing site was assessed. By the three-month mark, healing was smooth, with no complications observed.(Fig 7) The gingiva appeared healthy—pink, firm, and aesthetically improved. The patient expressed contentment with the outcome. Although pigmentation remained in the lower front gum region, it was not a cosmetic concern for the patient.

Figure 7: Post-operative 3 months

Scoring Method

Pain levels were assessed immediately after the procedure and again on the seventh day using a 10 cm horizontal Visual Analog Scale (VAS). Participants indicated their pain by marking a point along the line, with the left end representing "no pain" and the right end representing "unbearable pain." The pain intensity was categorized as follows: 0 = no pain, 1–3 = mild pain, 3.1–6 = moderate pain, and 6.1–10 = intense pain.

Intraoperative and postoperative bleeding were evaluated. The operator also recorded the level of difficulty encountered during the procedure. Wound healing was checked on the seventh day.

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Discussion

Oral pigmentation can be observed across all ethnic groups and shows no significant difference between genders. However, the intensity and spread of pigmentation within the oral epithelium can vary considerably. While environmental factors such as physical, chemical, and mechanical influences may affect pigmentation, it is largely believed that physiological pigmentation is genetically influenced[4].

One of the earliest and most frequently used methods to address gingival pigmentation is the surgical removal of the affected tissue. This procedure, also known as surgical stripping or split-thickness epithelial excision, involves the removal of the pigmented epithelium along with a superficial layer of underlying connective tissue.[6] The exposed connective tissue is then left to heal through secondary intention, and the newly regenerated epithelium typically lacks melanin pigmentation. In the present case, depigmentation was attempted in the maxillary left region using a scalpel. This approach provided satisfactory clinical and aesthetic outcomes. However, scalpel surgery is often accompanied by notable intraoperative and postoperative bleeding, requiring the placement of a periodontal dressing for approximately 7–10 days. In this case, healing was completed within 10 days, and the gingiva regained a healthy and natural appearance.

A study by Murthy et al. compared three different depigmentation techniques—bur abrasion, scalpel excision, and diode laser—in a case series involving three patients[8.] Their findings indicated that the scalpel-treated group exhibited the fastest healing, possibly due to the absence of thermal damage often caused by laser coagulation.[9] However, despite its affordability and relatively low recurrence rates, this method is associated with considerable postoperative discomfort, bleeding, and the need for a periodontal pack. It is also not recommended for patients with thin gingival biotypes or narrow interdental papillae.

Among the available options, laser therapy is considered highly effective for gingival depigmentation. Commonly used lasers include carbon dioxide (CO_2, 10,600 nm), neodymium-doped yttrium aluminum garnet (Nd: YAG, 1,064 nm), and diode lasers (980 nm)[10.] Lasers offer better visibility of the surgical field and reduce postoperative complications such as pain, swelling, bleeding, and infection. They are considered reliable and safe, providing good access to the interdental papilla and showing a low chance of pigment recurrence. While lasers are capable of delivering excellent cosmetic outcomes, the equipment is costly, requires specific training, and takes up significant space. Patients treated with lasers generally report less postoperative pain compared to scalpel-treated patients. This is likely due to the coagulum formed over the wound, which acts as a natural dressing and seals off sensory nerve endings, thereby reducing pain perception.

Conclusion

No recurrence of pigmentation was observed with either treatment method in this case. Both the scalpel and laser approaches demonstrated comparable outcomes in terms of tissue healing. The scalpel technique, however, resulted in an open wound with bleeding that required postoperative attention. In contrast, laser treatment created a coagulated layer that effectively acted as a natural dressing, minimizing bleeding. While lasers offer the advantage of enhanced hemostasis and reduced discomfort, their use requires specific technical expertise and should be approached with care. Additionally, the high cost of laser equipment is an important consideration. Based on the findings of this case, it can

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be concluded that both techniques offer similar long-term clinical results.

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