COMPARATIVE EVALUATION OF GINGIVAL DEPIGMENTATION USING LASER AND ELECTROCAUTERY IN SPLIT MOUTH STUDY: A CASE REPORT

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Abstract

Background: Gingival hyperpigmentation, caused by increased melanin deposition in the gingival epithelium, is a common esthetic concern, especially in patients with a high smile line. Although physiologic in nature, it often necessitates treatment due to patient demand for improved appearance. Various depigmentation techniques such as scalpel surgery, electrocautery, and laser therapy have been employed, each differing in terms of patient comfort, healing, and clinical outcomes. Among these, diode laser and electrocautery are widely used modalities requiring comparative evaluation.

Keywords: Gingival depigmentation, diode laser, electrocautery, melanin pigmentation, esthetics, split-mouth study.

INTRODUCTION

The harmony of an esthetic smile is determined not only by the form, alignment, and color of the teeth but also by the appearance of the surrounding gingival tissues. Healthy gingiva plays a crucial role in overall smile esthetics, and any alteration in its color, such as hyperpigmentation, may compromise patient satisfaction. Gingival pigmentation, although physiologically normal in many individuals, often presents as an esthetic concern—particularly in patients with a high smile line where excessive gingival display becomes prominent.

Oral melanin pigmentation is primarily caused by the deposition of melanin granules produced by melanocytes in the basal and suprabasal layers of the epithelium. This pigmentation is multifactorial in origin and may be influenced by genetic predisposition, racial characteristics, tobacco usage, systemic conditions, and the prolonged use of certain medications such as antimalarial drugs and tricyclic antidepressants. Clinically, gingival color may range from pale pink to deep brown or bluish-black, and its extent can be assessed using indices such as the Dummett–Gupta Oral Pigmentation Index (DOPI), which classifies pigmentation into mild, moderate, and heavy categories.

Although gingival pigmentation does not represent a pathological condition in most cases, the primary indication for depigmentation procedures is patient-

driven demand for improved esthetics. Over the years, various treatment modalities have been employed for gingival depigmentation, including surgical techniques such as gingivectomy with free gingival autografts, use of acellular dermal matrix allografts, mechanical abrasion with diamond burs, cryosurgery, electrosurgery, and laser therapy. Each technique has demonstrated varying degrees of effectiveness, with differences in healing time, patient comfort, intraoperative bleeding, and recurrence rates.

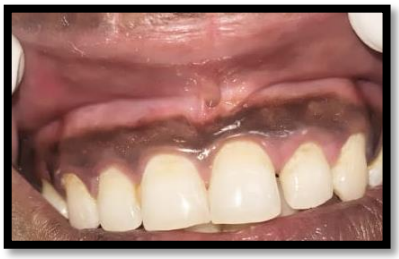
Among these, electrocautery and laser therapy have gained popularity due to their advantages of better hemostasis and precision. However, there remains a need for direct clinical comparison of these modalities under controlled conditions. A split-mouth study design offers a reliable method to minimize inter-individual variability and allows for a direct comparison of outcomes within the same patient.

Therefore, the present case report aims to comparatively evaluate gingival depigmentation using electrocautery and laser therapy in a split-mouth design, assessing clinical outcomes such as intraoperative comfort, healing response, and esthetic results.

CASE REPORT

A 25-year-old male patient, Goutam Kirtania, reported to the Department of Periodontology, Rama Dental College Hospital and Research Centre, Kanpur, with a chief complaint of dark pigmented gums in the maxillary and mandibular anterior regions, causing an esthetic concern. The patient's medical history was non-contributory, and the dental history revealed that the pigmentation had been present since childhood, suggestive of physiological melanin pigmentation. Intraoral examination demonstrated diffuse, symmetrical melanin hyperpigmentation involving the attached gingiva of both arches, which was assessed using the Dummett–Gupta Oral Pigmentation Index (DOPI). Considering the patient's esthetic demand, a split-mouth design was planned, wherein gingival depigmentation using a diode laser was performed in the maxillary anterior region, and electrocautery was used in the mandibular anterior region for comparative evaluation. Prior to the procedure, informed consent was obtained after explaining the risks, benefits, and alternatives, and Phase I therapy (scaling) was completed. The procedure was carried out under standard aseptic conditions with appropriate protective measures, including the use of laser safety goggles, and local anesthesia was administered using 2% lidocaine with adrenaline. For laser depigmentation, a

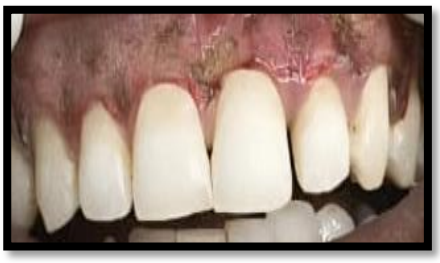
diode laser with a wavelength of 800–980 nm was used at a power setting of 1–1.2 W in continuous contact mode, and the pigmented gingiva was ablated using a brushing motion from the attached gingiva toward the free gingival margin, taking care to avoid excessive heat generation and damage to adjacent tissues. The treated area was subsequently cleaned with saline-soaked gauze, and no periodontal dressing was required due to effective hemostasis. In the mandibular anterior region, depigmentation was performed using electrocautery by carefully ablating the pigmented epithelial layer in a controlled manner, followed by placement of a periodontal dressing. Postoperatively, analgesics were prescribed for 5 days, and oral hygiene instructions were provided. Pain and discomfort were assessed using a Visual Analog Scale (VAS) at 2 hours, 24 hours, and 1 week following the procedure. Minimal intraoperative pain and bleeding were observed with both techniques; however, the patient reported significantly less postoperative discomfort in the laser-treated site, with no need for analgesics beyond the third day, whereas mild to moderate pain persisted up to one week in the electrocautery-treated site. The patient was recalled after 24 hours and again after 7 days, at which time the periodontal dressing was removed, and healing was found to be satisfactory in both areas. Clinically, faster healing was observed in the laser-treated site, with re-epithelialization evident within 1 week and complete epithelialization achieved by 4 weeks, whereas comparatively slower healing was noted in the electrocautery site. The gingiva in both regions appeared healthy and free of pigmentation at the end of the healing period, and no recurrence was observed during the 3–6 months follow-up. Overall, although both techniques were effective in removing gingival pigmentation, laser therapy demonstrated superior outcomes in terms of reduced postoperative pain, enhanced patient comfort, and faster healing compared to electrocautery.



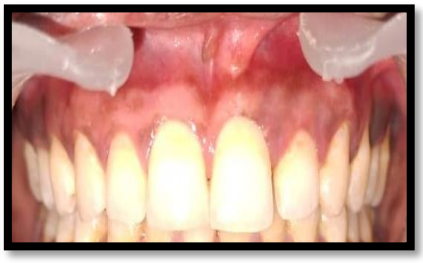
Gingival pigmentation in maxillary arch (Pre-operative)

Intra operative

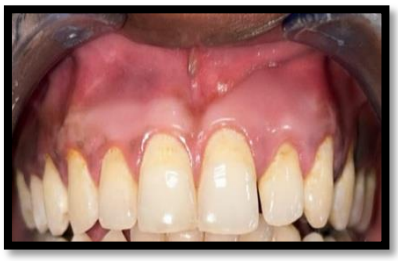
Immediate post operative



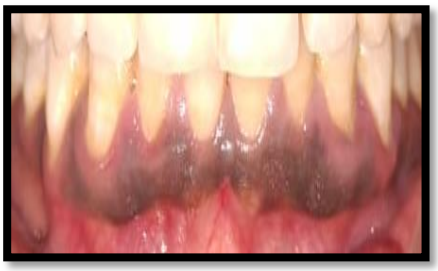
1 week postoperative



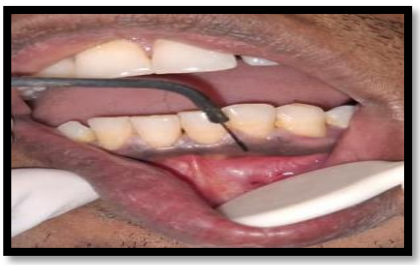
1 month follow up



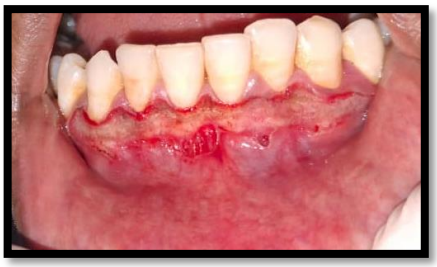
3 month follow up



Gingival pigmentation in mandibular arch

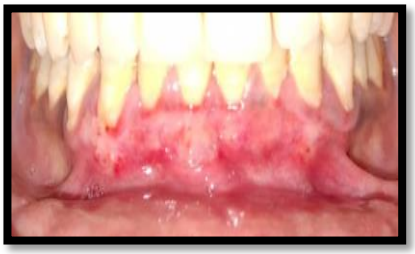


Intraoperative

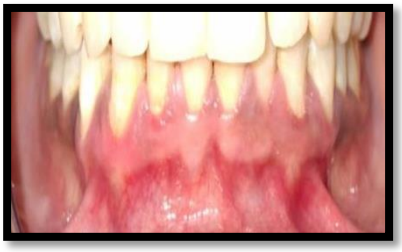


Immediate postop

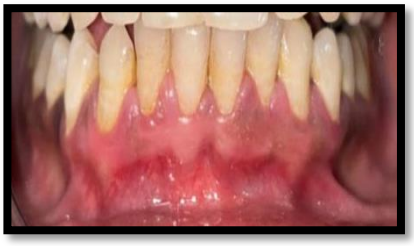
(Pre-operative)



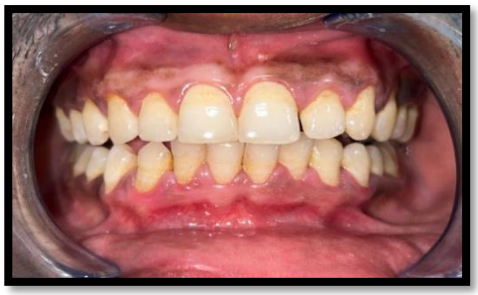
1 week follow up



1 month follow up



3 month follow up



6 month follow up

DISCUSSION

Gingival hyperpigmentation, although physiologic in most individuals, often poses a significant esthetic concern, particularly in patients with a high smile line. The present split-mouth case report compared two commonly used depigmentation techniques—diode laser and electrocautery—to evaluate their clinical effectiveness, patient comfort, and healing outcomes under identical intraoral conditions. Both techniques successfully eliminated gingival pigmentation; however, notable differences were observed in terms of postoperative pain and healing response.

Laser depigmentation has gained considerable popularity due to its advantages of precise tissue ablation, excellent hemostasis, sterilization of the surgical site, and minimal postoperative discomfort. In the present case, the laser-treated site demonstrated faster healing, minimal pain, and no requirement for analgesics beyond the third postoperative day. These findings are consistent with the observations of Azzeh MM, who reported that diode lasers provide effective depigmentation with minimal intraoperative bleeding and enhanced patient comfort due to reduced tissue trauma and protein coagulation at the surgical site. Similarly, Berk G et al. highlighted that laser therapy promotes rapid re-epithelialization and improved patient acceptance owing to its minimally invasive nature.

In contrast, electrocautery, although effective in removing pigmented gingival epithelium, is associated with greater thermal damage to adjacent tissues, which may delay healing and increase postoperative discomfort. In the present case, the electrocautery-treated site showed prolonged pain lasting up to one week and comparatively slower healing. These findings are in agreement with the study by Deepak P et al., who reported that electrosurgery, while economical and

efficient, may result in delayed epithelialization due to lateral heat dissipation and tissue necrosis.

The split-mouth design employed in this case report minimized inter-individual variability and allowed direct comparison of both techniques within the same biological environment, thereby increasing the reliability of the clinical observations. The use of the Dummett–Gupta Oral Pigmentation Index (DOPI) further standardized the assessment of pigmentation levels, enhancing the objectivity of the evaluation. Additionally, pain perception assessed using the Visual Analog Scale (VAS) revealed superior patient comfort with laser therapy, which is in accordance with the findings of Almas K, who concluded that laser techniques are associated with less postoperative morbidity and better patient compliance compared to conventional methods.

Despite the advantages of laser therapy, factors such as cost, availability, and operator expertise must be considered when selecting the appropriate technique. Electrocautery remains a viable alternative in resource-limited settings due to its affordability and ease of use, although it may compromise patient comfort and healing time. Furthermore, long-term follow-up is essential, as recurrence of pigmentation has been reported with all depigmentation techniques due to the migration of melanocytes from adjacent tissues.

Within the limitations of a single case report, the present study suggests that both diode laser and electrocautery are effective modalities for gingival depigmentation; however, laser therapy demonstrates superior clinical outcomes in terms of reduced postoperative pain, faster healing, and improved patient satisfaction. Further controlled clinical trials with larger sample sizes and longer follow-up periods are recommended to validate these findings.

CONCLUSION

Within the limitations of this split-mouth case report, both diode laser and electrocautery techniques were found to be effective in the removal of gingival melanin pigmentation and in improving esthetics. However, diode laser therapy demonstrated superior clinical performance in terms of reduced postoperative pain, enhanced patient comfort, absence of the need for periodontal dressing, and faster healing with early re-epithelialization. In contrast, electrocautery, although economical and efficient, was associated with comparatively greater postoperative discomfort and delayed healing. Therefore,

diode laser may be considered a more patient-friendly and clinically advantageous modality for gingival depigmentation, while electrocautery remains a viable alternative in settings with limited resources.

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