

Comparative Evaluation of Scalpel and Bur Abrasion Techniques for Gingival Depigmentation: A 6-Month Case Report on Clinical and Patient-Centered Outcomes

Abstract:

Background: Gingival depigmentation is a cosmetic procedure aimed at improving smile aesthetics by removing excess melanin pigmentation.

Aim: To compare scalpel and bur abrasion techniques for gingival depigmentation in a 22-year-old female over a 6-month period.

Material & Methods: Both procedures targeted the anterior labial gingiva, with outcomes assessed using clinical parameters and the Questionnaire for Patient-Based Outcomes Following Periodontal Therapy (QPBOPT).

Result: Bur abrasion resulted in less bleeding, no postoperative discomfort, and faster healing, but repigmentation began after one month, whereas no repigmentation was observed in scalpel-treated sites until six months. The patient expressed satisfaction with both techniques but preferred bur abrasion.

Conclusion: Factors such as gingival thickness, clinician experience, patient preference, and recurrence rate of pigmentation should be considered when selecting a treatment. QPBOPT proved effective in assessing patient-centered outcomes. Longer-term studies and histopathological evaluations are recommended for better understanding of long-term outcomes and the repigmentation process.

Key-words: Depigmentation, bur abrasion, healing, patient-based outcomes, repigmentation

Introduction:

Dentofacial aesthetics are shaped by the form, alignment, and color of the teeth, as well as the appearance of the gingiva. Healthy gums play a key role in enhancing overall oral aesthetics, as disease-free gingiva contribute to a pleasing smile. Oral melanin pigmentation, present across all racial groups and commonly located in the keratinized mucosa, can range in color from pink to dark brown or black. However, some individuals may find gingival hyperpigmentation aesthetically unappealing. In such cases, cosmetic procedures like gingival depigmentation can be employed to lighten the gingival color and enhance smile aesthetics.

Physiological pigmentation in the oral cavity is primarily determined by an individual's genetic makeup, with the intensity often influenced by physical, chemical, and hormonal factors. Additionally, oral pigmentation can have a pathological origin, stemming from hormonal imbalances,

infections, or inflammation, and may serve as a clinical indicator of systemic diseases or malignant neoplasms.[1]

The management of pigmentation depends on its etiology, extent, and patient expectations, with the most common reason for gingival depigmentation being a patient's desire for improved aesthetics. In 2005, Roshni and Nandkumar

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Received : 20 Oct. 2025, **Published :** 30 Sept., 2025

Access this article online	
Website: www.ujds.in	Quick Response Code 
DOI: https://doi.org/10.21276/ujds.2025.v11.i3.15	

How to cite this article: Budakoti N, Sharma VK, Gupta ND, Yadav PK (2025). Comparative Evaluation of Scalpel and Bur Abrasion Techniques for Gingival Depigmentation: A 6-Month Case Report on Clinical and Patient-Centered Outcomes. UNIVERSITY JOURNAL OF DENTAL SCIENCES, 11(3).

classified various methods for gingival depigmentation, including scalpel surgery, bur abrasion, cryosurgery, lasers, chemical agents, and masking procedures like free gingival grafts.[2]

Extensive literature exists on various depigmentation techniques and their outcomes. However, these studies do not often address the patient's overall well-being. There is limited data regarding patient-reported outcomes, particularly in terms of oral comfort, functionality, aesthetics, and social performance after undergoing depigmentation procedures.

The aim of this case report is to evaluate and compare both clinical and patient-centered outcomes following scalpel and bur abrasion gingival depigmentation procedures, utilizing the QPBOPT questionnaire to assess patient-based outcomes.

Clinical Presentation:

A medically healthy 22-year-old female presented to the Department of Periodontia and Community Dentistry on October 10, 2023, with the chief complaint of bleeding gums during brushing and the appearance of black gingiva. Examination of external features revealed no significant findings, and the patient had a medium-dark skin tone. She reported no history of deleterious habits. Intraoral examination (**Figure 1**) showed fair oral hygiene, with a plaque index score of 1.38 based on the Silness and Loe Index (1964). The bleeding on probing (BOP) score was over 30%, without attachment loss, indicating biofilm-induced generalized gingivitis. The patient was also undergoing endodontic treatment for tooth #11. Depigmentation classification for labial gingiva of anterior teeth are as follows:

Oral pigmentation index (DOPI):[3]

Maxilla: Class 3 [Deep brown or bluish black gingiva (Severe clinical pigmentation)]

Mandible: Class 3 [Deep brown or bluish black gingiva (Severe clinical pigmentation)]

Melanin pigmentation index:[4]

Maxilla: Score 2 (Formation of continuous ribbon extending from neighbouring solitary units) **Mandible:** Score 1 (Solitary unit(s) of pigmentation in papillary gingiva without extension between neighbouring solitary units)

Periodontal diagnosis was Biofilm Induced Generalised Gingivitis with Pigmented Gingiva. The informed consent process was completed, including a thorough explanation of the risks, benefits, and alternative treatment options.

Case Management:

The treatment began with nonsurgical Phase I therapy, which included patient education and motivation, followed by oral prophylaxis. A re-evaluation was performed four weeks after the scaling procedure, allowing sufficient time for healing and enabling the patient to practice proper oral hygiene techniques to achieve optimal improvement (**Figure 2**). The surgical phase involved a depigmentation procedure on the labial gingiva of the anterior teeth, performed under local anaesthesia using 2% lidocaine with 1:100,000 epinephrine administered via local infiltration. Prior to the procedure, the patient was instructed to rinse with 0.2% chlorhexidine gluconate for one minute to minimize microbial contamination.

Mandible-Scalpel Procedure, Treatment 1(**Figure 3**):

A Bard-Parker blade No. 15 was used to excise the entire pigmented area, extending from the free gingival margin to the mucogingival junction. The blade was positioned nearly parallel to the long axis of the tooth, with careful attention to avoid exposing the underlying bone. An Orban knife was employed to remove the remaining epithelium in the interdental areas. Hemostasis was achieved by applying a pressure pack.

Maxilla-Diamond bur abrasion, Treatment 2 (**Figure 4**):

Initially, a bur abrasion was applied to the predominantly keratinized and thick gingiva, while a 15-number surgical blade was employed on the thin and marginal gingiva as well as overlying bulging roots. The bur abrasion was performed with ample saline irrigation to prevent overheating and tissue dehydration. Hemostasis was achieved using direct digital pressure with moistened gauze pad.

Following hemostasis in both procedures, the site was covered with periodontal dressing for one week. The post-operative instructions comprised taking one acetaminophen tablets every six hours for the initial 24 hours, and subsequently, as needed. Avoidance of hot food during first 24 hours. Avoid citrus fruits or juices and highly spicy food. Refrain from brushing over the periodontal pack.

Clinical Outcomes:

Throughout and post-procedure following criteria were evaluated:

- 1. Pain:** Visual Analog Scale, depicted by a 10-cm horizontal line with its one end denoting no pain (score 0) and the other denoting severe pain (score 10).

Treatment 1: Within the first 24 hours, the score was 10, decreased to 5 on the day following surgery, and ultimately reached 0 by the seventh day.

Treatment 2: In the first day, the score was 2, and it eventually reached 0 after that timeframe.

2. **Bleeding:** measured during surgery, “0 = no bleeding”, “1 = oozing” and “2 = active bleeding”

Treatment 1: Score = 1

Treatment 2: Score = 0

3. **Treatment duration:**

Treatment 1: 30 minutes

Treatment 2: 45 minutes

4. **Wound healing:** (Landry, Turnbull, and Howley Wound Healing Index)⁵

Treatment 1: 1 week after surgery: 3- Good, 25-50% red gingiva

1 month after surgery: 4- Very good, <25% red gingiva

Treatment 2: 1 week after surgery: 4- Very good, <25% red gingiva

1 month after surgery: 5- Excellent, All pink tissue

5. **Gingival pigmentation:**

- **Oral Pigmentation Index (DOPI):**

Treatment 1: 1 week after surgery: No clinical pigmentation,

1 month after surgery: No clinical pigmentation

3 months after surgery: No clinical pigmentation,

6 months after surgery: No clinical pigmentation (pink coloured gingiva).

Treatment 2: 1 week after surgery: No clinical pigmentation,

1 month after surgery: Mild clinical pigmentation,

3 months after surgery: Mild clinical pigmentation,

6 months after surgery: Mild clinical pigmentation (Mild light brown colour).

- **Melanin pigmentation index:**

Treatment 1: 1 week after surgery: Score-0,

1 month after surgery: Score-0,

3 months after surgery: Score-0,

6 months after surgery: Score-0, (no pigmentation).

Treatment 2: 1 week after surgery: Score-0 (no pigmentation),

1 month after surgery: Score-2,

3 months after surgery: Score-2

6 months after surgery: Score-2 (formation of continuous ribbon extending from neighbouring solitary units).

6. Questionnaire assessing patient-based outcomes following periodontal therapy (QPBOPT)[6] 1 month after surgery (**Table 1 & 2**).

Mandible-scalpel procedure (Treatment 1):

During the procedure, there was oozing of blood from certain sites, and the entire process took approximately 30 minutes. After one week, the gingivae showed satisfactory healing with some erythema still present. By one month from the baseline, the gingiva was fully healed and well-contoured, with no clinical repigmentation observed by the end of 6 months (figure 5).

According to the patient, the scalpel procedure lasted approximately 45 minutes. The patient reported mild pain and discomfort while chewing 24 hours post-procedure, which reduced by the second day and completely subsided by the seventh day. She took ibuprofen 400 mg three times daily for an additional two days. Overall, the patient was satisfied with the result.

Figure 5: A) 1 week, B) 1 month, C) 3 months, D) 6 months follow up.

Maxilla: Diamond bur Abrasion (Treatment 2):

The procedure, which lasted almost 45 minutes, involved little to no bleeding. After one week, healing was very good with minimal erythema. By one month, the gingiva showed excellent healing and well-defined contours. However, mild clinical repigmentation was observed by the end of the month which intensified in 6 months.

The patient noted that the procedure took approximately 1 hour and 15 minutes, which was relatively longer. She reported experiencing less discomfort compared to the scalpel procedure and did not require any analgesics 24 hours post-procedure. Overall, she was satisfied with the results.

Figure 6: A) 1 week, B) 1 month, C) 3 months, D) 6 months follow up

Discussion :

Oral pigmentation is observed in individuals of all races, at any age, and without gender predilection, with the gingiva being the most common site. Although physiological pigmentation does not cause medical issues, depigmentation is often sought for aesthetic reasons. Various techniques have been used, including scalpel surgery, bur abrasion, cryosurgery, lasers, chemical agents, and masking procedures such as free gingival grafts.

In this study, two depigmentation procedures—scalpel and bur abrasion—were performed on the same patient, targeting the maxillary and mandibular anterior labial gingiva. Outcomes were evaluated using both clinical and patient-centered parameters over a 6-month period.

Scalpel surgical depigmentation, a pioneering technique first described by Dummett and Bolden in 1963,[7] involves the removal of the epithelium along with a layer of underlying connective tissue. This approach allows the exposed connective tissue to heal by secondary intention, resulting in the formation of new epithelium devoid of melanin pigmentation. During the scalpel procedure, the blade is held parallel to the long axis of the teeth with minimal and gentle pressure. The technique is precise, well-controlled, simple, easy to perform, and cost-effective. However, it may cause bleeding and requires the application of a periodontal dressing for 7–10 days to protect the site and aid in healing.

The bur abrasion method, first documented by Ginwalla et al. in 1966,[8] involves the removal of tissue through abrasion with a high-speed rotating bur. This technique utilizes a medium-grit, football-shaped diamond bur at high speed with ample saline irrigation to denude the epithelium. A medium-sized round bur is preferred to avoid creating small pits and to ensure even surface abrasion. The procedure involves minimal pressure and feather-light brushing strokes, without holding the bur in one place. It is relatively simple, safe, and non-aggressive, and can be easily repeated. Additionally, it is economical, does not require sophisticated instruments, and causes less discomfort for the patient. However, the process takes more time, and controlling the depth of de-epithelialization can be challenging. It must be performed with caution, protecting adjacent teeth to avoid gingival recession, injury to the underlying periosteum and bone, delayed wound healing, or enamel loss. Extra care is essential for patients with thin gingival biotypes and prominent root convexities.

Postoperative pain is a complex experience influenced by psychological, environmental, and physical factors. In this case, pain was assessed using the Visual Analog Scale (VAS). The patient reported less pain and a faster recovery with the bur abrasion method. This reduced pain experience may be attributed to the fact that bur abrasion removes only the outer epithelial layer, preserving the underlying lamina propria, which contains nerve endings.[9]

No bleeding was observed with bur abrasion, which improves the visibility of the site. These results are in agreement with those reported by Faten F. Mikhail et al (2023).[9] Bur abrasion took relatively more time as it requires repeated brushing strokes to remove the superficial layer. Healing for both procedures occurs by secondary intention. However, the bur abrasion site exhibited faster healing.

The reappearance of melanin pigment after clinical depigmentation is known as repigmentation. Repigmentation may be influenced by the technique used in the depigmentation procedure and the patient's race. The migration theory explains this phenomenon, suggesting that active melanocytes from adjacent pigmented tissues migrate to the treated areas, causing repigmentation.[10] Additionally, repigmentation may be attributed to melanocytes that were left behind during surgery.[11] The purpose of using two indices in the present study was to obtain more precise results as the DOPI is based on the colour intensity and the gingival melanin pigmentation by Takashi et al. is based on the location and extent. By the end of three-month, patchy mild light brown repigmentation was observed at the bur abrasion sites, whereas no repigmentation was reported at the scalpel sites.

The patchy pigmentation could be attributed to the ongoing process of repigmentation. The reduced intensity of pigmentation might be due to decreased pigment production. Over time, the intensity could increase and potentially return to pre-treatment levels, depending on the patient's racial background. A randomized clinical trial reported in their 12-month follow-up study that repigmentation was significantly less in the surgical stripping method compared to the laser ablation method.[12] A study showed that repigmentation occurred in 19% of the cases following gingival depigmentation by surgical bur.[13] Also, repigmentation was more common in the maxillary arch in comparison to the mandibular arch which may be due to more exposure to environmental factors during smiling and speech, factors that are not related to the technique used.[14]

When queried, the patient expressed satisfaction with the outcomes of both procedures and leaned towards favouring bur abrasion methods for depigmentation. The Questionnaire Assessing Patient-Based Outcomes Following Periodontal Therapy (QPBOPT) proved to be an effective tool for evaluating patient-related outcomes in this study. However, no significant differences were noted between the responses for the two procedures. The choice of technique should consider not only clinical experience and the clinician's preferences but also the patient's preferences. Additionally, factors such as the site, gingival biotype, intensity, and extent of pigmentation are crucial considerations when planning a depigmentation procedure.

The results of our study indicated less bleeding, a longer operative duration, no postoperative discomfort, and faster healing with the bur abrasion method compared to the scalpel method. Repigmentation began by the end of one month at

sites treated with bur abrasion, while no repigmentation was observed until three months postoperatively for the scalpel method.

To the best of our knowledge, this study is the first to utilize the QPBOPT questionnaire for assessing patient-centered outcomes in gingival depigmentation. It is a split-mouth study with two treatment arms and a follow-up period of 6 months. This innovative approach offers several strengths, including the use of a comprehensive assessment tool that captures both objective clinical data and subjective patient experiences. The split-mouth design enhances the study's validity by allowing direct comparison of the scalpel and bur abrasion techniques within the same patient, thereby minimizing variability and providing a clear assessment of each method's relative efficacy.

However, there are notable limitations to this study. The 6-month follow-up period may be insufficient for fully assessing long-term outcomes and the stability of results, particularly regarding repigmentation. Additionally, as a case report, the findings are based on the experience of a single patient, which may limit the generalizability of the results. The absence of histopathological assessment further restricts our understanding of the underlying mechanisms of repigmentation and the tissue response to the depigmentation procedures.

Given these limitations, future research should consider extending the follow-up period to better monitor long-term outcomes and repigmentation patterns. Incorporating histopathological evaluations would provide deeper insights into the repigmentation process and tissue changes associated with each technique. Additionally, studies with larger sample sizes would enhance the generalizability of the findings, and exploring the effectiveness of these techniques across diverse patient populations could account for variations in pigmentation and treatment response.

Conclusion :

In conclusion, this study demonstrates that both scalpel and bur abrasion techniques for gingival depigmentation can be effective, each with its distinct advantages and challenges. Bur abrasion was associated with less bleeding, no postoperative discomfort, and faster healing compared to the scalpel method. However, repigmentation occurred earlier with bur abrasion, while scalpel treatment showed no repigmentation until three months postoperatively. The QPBOPT questionnaire proved valuable in assessing patient-centered outcomes, underscoring the importance of integrating clinical efficacy with patient satisfaction.

The selection of the depigmentation technique should also consider several critical factors, including the thickness of the gingiva, the clinician's level of experience, the patient's preference, and the rate at which pigmentation recurs. These factors play a significant role in determining the most suitable treatment approach. Further research with extended follow-up, histopathological assessments, and larger sample sizes is recommended to gain a comprehensive understanding of long-term outcomes and the mechanisms underlying repigmentation.

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