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CASE REPORT  
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## NOVI PRISTUP DEPIGMENTACIJI GINGIVE: VITAMINI C I E ZA POBOLJŠANO ZARASTANJE I SMANJENJE REPIGMENTACIJE

### A NOVEL APPROACH TO GINGIVAL DEPIGMENTATION: VITAMINS C AND E FOR ENHANCED HEALING AND REDUCED RE-PIGMENTATION

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#### Sažetak

**Uvod:** Gingivalna hiperpigmentacija, premda benigna, često predstavlja značajan estetski problem za pacijente, posebno u slučajevima izraženog prikazivanja gingive prilikom osmehivanja. Dostupne su različite tehnike depigmentacije, uključujući i hirurške i hemijske pristupe, koji se primenjuju u velikoj meri. Vitamini C i E, poznati po svojim antioksidativnim i depigmentacionim svojstvima, mogu imati pomoćnu ulogu u poboljšanju zarastanja rane i smanjivanju sinteze melanina.

**Materijal i metode:** Pacijent muškog pola, star devetnaest godina, sistemski zdrav, javio se zbog „crne gingive“ koja je zahvatala anteriornu maksilarnu gingivu. Na kliničkom pregledu uočena je difuzna pigmentacija melanina od desnog do levog prvog premolara. Sprovedena je kombinovana procedura depigmentacije skalpelom i dijamantskim borom u lokalnoj anesteziji, s lokalnom aplikacijom vitamina E i C. Propisana je analgetska vodica za ispiranje usta. Vitamin C je primenjen zbog svog potencijalnog inhibitornog dejstva na melanogenezu.

**Rezultati:** Zarastanje je proteklo bez komplikacija; pritom, ostvaren je odličan estetski rezultat. Na kontroli obavljenoj nedelju dana nakon operacije nisu uočene nikakve komplikacije.

**Zaključak:** Lokalna i sistemska primena vitamina C i E posle gingivalne depigmentacije može doprineti unapređenju zarastanja i smanjenju postoperativne hiperpigmentacije. Ovaj prikaz slučaja ukazuje na uspešan estetski rezultat koji se može postići kombinacijom hirurškog i hemijskog pristupa u tretmanu gingivalne pigmentacije melanina.

**Ključne reči:** zubni karijes, studenti, oralno zdravlje, stavovi

#### Abstract

**Introduction:** Gingival hyperpigmentation, although benign, often presents a significant aesthetic concern for patients, particularly in cases with excessive gingival display. Among the various available depigmentation techniques, both surgical and chemical approaches are widely used. Vitamins C and E, known for their antioxidant and depigmentation properties, may offer adjunctive benefits in enhancing wound healing and reducing melanin synthesis.

**Materials and Methods:** A 19-year-old systemically healthy male presented with a complaint of “black gums” affecting the anterior maxillary gingiva. Clinical examination revealed diffuse melanin pigmentation from the right to the left first premolar. A combined depigmentation procedure using a scalpel and diamond bur was carried out under local anesthesia, with topical application of vitamins E and C. Analgesic mouthwash was prescribed. Vitamin C was incorporated for its melanin-inhibiting potential.

**Results:** Healing was uneventful, with excellent aesthetic improvement and no complications observed at the 1-week follow-up.

**Conclusion:** The adjunctive use of vitamins C and E following gingival depigmentation may enhance healing and reduce postoperative hyperpigmentation. This case highlights a successful aesthetic outcome achieved through a combination of surgical and chemical approaches for managing gingival melanin pigmentation.

**Key words:** aesthetics, ascorbic acid, vitamin E, antioxidants, melanin

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## Introduction

Gingival health and aesthetics are crucial key factors for a pleasing and harmonious smile, with pigmentation playing a vital role. The hyperpigmentation of the gingiva is esthetically not very pleasing and may have a psychological influence on individuals possessing it. This consequence is further exacerbated in patients with a “gummy smile” or overexposed gingiva. A typical macroanatomical characteristic of healthy gingiva is its pink color which varies in shade and is influenced by the degree of vascularization, gingival epithelial thickness, stratum layer keratinization, and level of melanin pigmentation present in the epithelium. Gingival pigmentation manifests as diffuse, dark, purplish discoloration or unevenly shaped brown and light brown or black patches, striae or strands<sup>1</sup>.

Melanin, carotene, reduced hemoglobin and oxyhemoglobin, bilirubin, iron, and/or pathological diseases and conditions contribute to the pigmentation of the gingiva; however, gingival hyperpigmentation occurs because of the pronounced production of melanin pigments by the hyperactivity of melanocytes in the gingival epithelium. The cascade of pigmentation consists of three phases: the activation of melanocytes, the synthesis of melanin, and the expression of melanin. Furthermore, it can be influenced by exogenous causes such as drugs, tobacco smoking, amalgam tattoos, or heavy metal deposition, or may be endogenous because of endocrine disorders, syndromes, chronic irritation, or neoplasia<sup>2</sup>.

Gingival depigmentation (GD) is a plastic periodontal modality that eliminates or minimizes heightened melanosis. There are various techniques available for gingival depigmentation that involve removing the pigmented layer surgically or chemically. The surgical method consists of partial thickness excision/surgical excision with a scalpel, electrocautery, laser therapy, gingival abrasion/surgical stripping, and cryotherapy. In addition, chemical agents or nonsurgical methods include gingival peeling procedures, which employ ascorbic acid (vitamin C), phenolic compounds, salicylic acid, glycolic acid, trichloroacetic acid, and alcohol. It can also be reduced by masking the pigmented gingiva with grafts from minimally pigmented areas as free gingival autografts or by using acellular dermal matrix allografts<sup>3</sup>.

Among chemical depigmentation agents, ascorbic acid (vitamin C) has been recognized as a hydrophilic antioxidant and a vital nutrient for collagen biosynthesis. It contributes to the elimination of hyperpigmentation by chelating copper ions at the tyrosinase active site, which suppresses the enzymatic activity of tyrosinase, thereby decreasing melanin production<sup>4</sup>. It can downregulate the formation of dopaquinone, a progenitor involved in melanin biosynthesis, thus suppressing melanin formation<sup>5</sup>. Furthermore, vitamin E ( $\alpha$ -tocopherol,  $\alpha$ -Toc) is a lipophilic antioxidant that influences skin pigmentation by interfering with lipid peroxidation of melanocyte membranes, increasing the intracellular glutathione content, and inhibiting tyrosinase activity. Additionally,  $\alpha$ -tocopherol has been reported to upregulate the expression of basic fibroblast growth factor and stimulate the formation of type I collagen, which is crucial for periodontal wound repair and tissue regeneration processes<sup>5</sup>.

However, studies on the depigmentation effect of vitamin E on gingival hyperpigmentation are scarce. Therefore, in this case report, the depigmentation effects of topical application of vitamin C and vitamin E after a surgical depigmentation procedure were evaluated and compared. This case report also compared the gingival stripping depigmentation procedures performed with a blade bur and a diamond bur.

## Materials and Methods

A 19-year-old male patient, who was systemically healthy, attended the Department of Periodontology with a chief complaint of blackish discoloration of gums with a Dummett oral pigmentation index (DOPI) score of 4 and was deeply pigmented, as shown in Figure 1. His gums showed marked pigmentation bilaterally up to the first premolar region during the intraoral examination. The patient had a history of excessive pigmentation since childhood. The patient also had maxillary and mandibular anterior crowding and desired to undergo orthodontic treatment, but wanted the elimination of excessive pigmentation prior to the placement of orthodontic braces. Extraoral examinations revealed a fair skin complexion. An intraoral examination revealed a healthy periodontium with mild gingival inflammation around the marginal and papillary gingiva.

To eliminate gingival inflammation and return the gingiva to a healthy state, phase 1 therapy was carried out 15 days prior to

scheduling the surgical procedure. During this period, the patient was advised to maintain optimal levels of oral hygiene.

### Surgical Procedure

To perform GD, a scalpel/blade technique and a gingival abrasion technique using a bur were planned along with the topical application of vitamins C and E. Informed written consent was obtained from the patient following a thorough explanation of the surgical procedure. Laboratory investigations, familial predispositions, and detailed systemic examinations were carried out to identify potential limitations to surgery.

A split-mouth surgical design was planned for the study. The maxillary and mandibular arches were each divided into right and left halves to allow comparative evaluation of the two depigmentation techniques. In the maxillary arch, one half was allocated for gingival depigmentation using the scalpel technique, whereas the contralateral half was assigned for depigmentation using the bur technique. Following completion of the

surgical procedure, topical vitamin E was applied over the depigmented maxillary sites. Similarly, in the mandibular arch, one half was designated for depigmentation using the scalpel technique, and the other half for depigmentation using the bur technique. After the completion of depigmentation, topical vitamin C was applied to the treated mandibular sites.

Local anesthesia (lignocaine with adrenaline 1:100000) was administered in the maxillary anterior area from the premolar to the premolar. The phenotype of the gingiva was assessed via a periodontal probe. The phenotype was recorded to be 1 mm (Figure 2).

Using a No. 15 blade with a Bard-Parker grip, the pigmented epithelial layer of the gingiva was removed along with a thin layer of connective tissue while ensuring that the orientation of the blade was parallel to the long axis of the teeth. The minimum level of pressure and force was applied to prevent gingival pitting after surgery (Figure 3).



**Figure 1.** Dummett oral pigmentation index score of 4 pigments in the maxilla and mandible



**Figure 2.** William's periodontal probe used to assess the gingival thickness

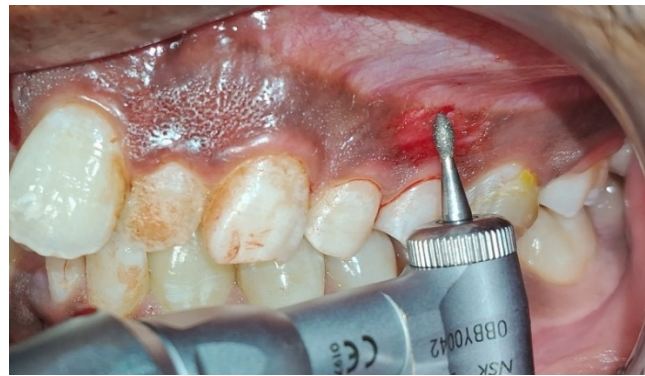


**Figure 3.** The No. 15 blades were used to excise the epithelium and a layer of connective tissue

The gingival tissue was mechanically stripped or abraded via a diamond bur, and similar tissues were excised using the scalpel technique (Figure 4). After the tissue was removed, vitamin E (400 mg of capsule extraction containing tocopheryl acetate) was applied to the surface of the maxilla<sup>5</sup> (Figure 5), and vitamin C (topical ascorbic acid powder (1000 mg/ml) mixed with saline to form a mixed slurry paste for 10 minutes) was applied to the surface of the mandible (Figure 6)<sup>4</sup>. The bur was maneuvered with minimal pressure possible, employing feather-light sweeping strokes and ensuring that prolonged contact with the bur at one site was avoided.

All possible precautions were taken to eliminate the residual pigmented layers. A periodontal dressing was placed over the surgical area, as displayed in Figure 7.

After surgery, the patient was instructed to rinse with chlorhexidine mouthwash every 12 hours. The surgical site was reviewed after the periodontal pack was removed. Different indices were used to assess pain, itching, and tissue healing, as well as repigmentation (Tables 1, 2 and 3). Pigmentation was evaluated after 15 days, 1 month, 3 months, and 6 months (Figures 8, 9 and 10).



**Figure 4.** Diamond bur used for de-epithelization



**Figure 5.** Topical application of vitamin E



**Figure 6.** Topical application of vitamin C



**Figure 7.** Periodontal pack



**Figure 8.** Fifteen-day follow-up



**Figure 9.** Three-month follow-up



Figure 10. Six-month follow-up

**Table 1.** Visual analog scale (VAS) score for pain after 24 hours, 7 days, 15 days, and 1 month<sup>6</sup>

| Points | Assessment                |
|--------|---------------------------|
| 0      | Pain is absent            |
| 1–3    | Presence of mild pain     |
| 4–6    | Presence of moderate pain |
| 7–10   | Presence of severe pain   |

**Table 2.** Verbal scales for the itching of wounds after 24 hours, 7 days, 15 days, and 1 month<sup>3</sup>

| Points | Assessment                       |
|--------|----------------------------------|
| 0      | No itching                       |
| 1      | Mild itching present             |
| 2      | Moderate itching present         |
| 3      | Severe itching present           |
| 4      | Extremely severe itching present |

**Table 3.** Wound Healing Index (WHI) of Huang et al. (2005) after 15 days, 1 month, 3 months, and 6 months<sup>7</sup>

| Points | Assessment                                                                                                                   |
|--------|------------------------------------------------------------------------------------------------------------------------------|
| 1      | Uneventful healing with absence of gingival edema, erythema, suppuration, patient discomfort, or flap dehiscence             |
| 2      | Uneventful healing with slight gingival edema, erythema, patient discomfort, or flap dehiscence observed, but no suppuration |
| 3      | Poor wound healing with marked gingival edema, erythema, patient discomfort, flap dehiscence, or any suppuration             |

## Results

The patient reported no pain, with a score of 0, in either arch at any of the follow-up intervals. No itching was reported in any of the regions. Additionally, in both arches, healing occurred uneventfully, with mild erythema observed in the maxillary arch only on the 15th day of follow-up on the side of the scalpel technique. Furthermore, no erythema was noted during the later follow-up periods. No suppuration, dehiscence, or patient

discomfort was reported. Pigmentation started appearing in both arches at 6 months after the procedure, more prominently in the maxillary arch, where vitamin E topical application was carried out. The results indicated that both vitamin C and vitamin E applications were efficient at managing gingival hyperpigmentation, with no postoperative complications and adequate maintenance of patient esthetics and comfort.

## Discussion

Gingival depigmentation is governed by certain factors such as patient needs, patient acceptance, and aesthetic outcomes. Furthermore, the choice of techniques is also dependent on the gingival biotype and severity of pigmentation<sup>8</sup>. One frequent approach to manage gingival hyperpigmentation is the conventional scalpel surgical technique. This therapeutic approach requires resection of the gingival epithelium along with some connective tissue, followed by healing of the surgical site through secondary intention<sup>5</sup>. The scalpel method is a widely used, affordable approach associated with mild to moderate postoperative discomfort. An evaluation of the scalpel method versus bur abrasion revealed equally favorable outcomes, with no significant differences in tissue healing, gingival repigmentation, or severity. Mild bleeding or discomfort was associated with both procedures. Both scalpels and microabrasions have been proven to be effective in reestablishing the original shade of the gingiva<sup>8</sup>.

In this case report, both the scalpel technique and bur abrasion resulted in satisfactory outcomes, with no postoperative complications or discomfort. Healing was adequate for both techniques; mild erythema was observed on the 15th day of treatment in the maxillary arch on the side of the scalpel technique, which later healed with no further complications during the other follow-up periods.

Furthermore, vitamin C functions as a powerful antioxidant and minimally invasive depigmenting modality agent that has been effectively utilized<sup>3</sup>. Vitamin C binds to copper ions at the catalytic site of tyrosinase and blocks its ability to convert tyrosine into dopaquinone, resulting in diminished melanin formation. Additionally, ascorbic acid aids in postsurgical tissue recovery by enhancing collagen biosynthesis and the differentiation and maturation of fibroblasts. Sheel et al. reported satisfactory aesthetic results after gingival depigmentation with a scalpel along with local applications of ascorbic acid, resulting in lower pain scores and no repigmentation areas at the nine-month follow-up<sup>9</sup>. In this case report, vitamin C positively contributed as a depigmentation agent, with enhanced healing and no other complications.

Additionally, vitamin E is known for its antioxidant properties, protecting cell membranes from oxidative stress and interfering with the lipid peroxidation of

melanocyte membranes. The depigmentation effect can further be triggered by an increase in the level of intracellular glutathione and the attenuation of tyrosinase<sup>10</sup>. Vitamin E can also exert its antinociceptive effects by interacting with nitric oxide (a free radical that is employed in central pain processing) because of its antioxidant properties and ability to promote wound healing<sup>5,11</sup>.

A split-mouth clinical comparative study evaluating the therapeutic effectiveness of topical application of vitamins E and C for enhancing healing following gingival depigmentation suggested that the use of vitamin E and vitamin C topically yields beneficial effects; nonetheless, the application of vitamin E leads to accelerated wound repair and less postoperative discomfort. In this case report, vitamin E had beneficial effects on hyperpigmented gingiva, with no pain or discomfort and adequate wound healing<sup>5</sup>.

Moreover, gingival repigmentation is recognized as a clinical recurrence of melanin pigmentation following a phase of therapeutic depigmentation therapy<sup>12</sup>. Gingival repigmentation is thought to occur because of the movement of nearby melanocytes into the surgical site<sup>13</sup>. Relapse can be influenced by the periodontal phenotype, nicotine use, ultraviolet exposure, genetic makeup of the skin, and employed procedure<sup>3</sup>. In this case, the application of vitamins C and E along with the scalpel technique and bur abrasion resulted in the initiation of repigmentation after 6 months. Hence, these interventions are effective and well-tolerated for managing gingival hyperpigmentation.

## Limitations

The present case report has certain limitations that should be acknowledged. Given that this study was conducted on a single patient, the findings cannot be generalized to a larger population. The simultaneous use of two depigmentation techniques along with the topical application of vitamins C and E made it difficult to independently evaluate the exact contribution of each intervention to wound healing and repigmentation control. In addition, a follow-up period of six months may not be adequate to assess the long-term recurrence of gingival pigmentation. Therefore, further randomized controlled clinical studies with larger sample sizes and longer follow-up durations are needed to validate these findings.

## **Conclusion**

The technique for successful management of gingival hyperpigmentation can depend on the gingival biotype, degree of gingival hyperpigmentation, case selection, and patient cooperation. In this case report, satisfactory outcomes were achieved with respect to pain, discomfort, and wound healing following the application of both vitamins C and E. The results were esthetically acceptable to patients with no further complications. Like vitamin C, vitamin E can also be used as a depigmentation agent, which provides new perspectives and alternatives for managing gingival hyperpigmentation. However, these findings can be further supported by upcoming randomized clinical studies with larger populations and longer observation periods, which may provide better insight into this outcome.

## ***Ethical Approval and Consent to Participate***

The clinical procedure described in this case report was conducted in accordance with institutional ethical standards and the principles of the Declaration of Helsinki. In accordance with the institutional guidelines of the Institutional Ethics Committee, KMC Manipal, ethical approval is waived for case reports and case series involving fewer than ten participants. Written informed consent was

obtained from the participants prior to the procedure, after providing a complete explanation of the treatment and its documentation for publication purposes.

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## ***Data Availability Statement***

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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