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Case Report **Dentistry**

Assessing Platelet-Rich-Plasma in Gingival Depigmentation: A Split-Mouth Two Case Report Comparing Laser and Bur Ablation

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Abstract

A coral-pink gingiva reflects the normal health of blood vessels and the proper width of keratinized tissues, both of which are essential for dental and facial aesthetics. Gingival pigmentation is caused by melanin granules and manifesting as uneven brown, light brown, or deep purplish discoloration and may necessitate cosmetic therapy. Among the various treatment modalities, diode laser and bur ablation are commonly used for gingival depigmentation. Moreover, platelet-rich plasma (PRP), which delivers a supra-physiological dose of growth factors, has emerged as a promising adjunct to accelerate wound healing in periodontal aesthetic procedures. This article presents two case reports of two female patients with gingival pigmentation, who were treated at King Abdullah Medical City Specialist Hospital using a split-mouth approach. In one patient, diode laser ablation was performed on the lower anterior gingiva and bur ablation on the upper anterior region; in the other, laser and bur ablation were applied in different quadrants. Immediately after ablation, injectable PRP was administered into the depigmented areas. Healing was evaluated using the Healing Index on days one, three, seven, 14, and 30, and pigmentation was assessed preoperatively and on day 30 with the Dummett-Gupta Oral Pigmentation Index. The results of the two case reports suggest that adjunctive PRP may enhance wound healing following gingival depigmentation, necessitating further clinical trials with standardized protocols and larger sample sizes.

Keywords: Gingival Depigmentation, Platelet-Rich Plasma, Laser Therapy, Bur Ablation, Gingivitis, and Dentistry.

INTRODUCTION

A coral pink gingiva reflects the normal health of blood vessels in terms of their number and size, as well as the normal width of keratinized tissues [1]. Healthy gingiva is an essential aspect of both dental and facial aesthetics [2]. Gingival pigmentation is caused by melanin granules, appearing as unevenly formed brown, light brown, or black patches, striae, strands, or a broad, deep purplish discoloration [3]. Since gingival pigmentation is painless, it is often a common aesthetic concern, particularly when smiling, and may require cosmetic therapy [4]. Moreover, when comparing normal gingiva to pigmented gingiva, laypeople often perceive pigmented gingiva as unaesthetic [5]. The causes of gingival pigmentation are attributed to physiological disturbances in the activation, synthesis, or expression of melanin in the human body throughout life [3]. Pathological causes have also been identified, including endocrine disorders, heavy metal ingestion, Kaposi's sarcoma, and smoking-associated gingival pigmentation [3-6].

Treatment modalities for managing gingival pigmentation include the use of a scalpel, bur, laser ablation, cryosurgery, and electrosurgery, with laser techniques, particularly diode lasers, being considered the most effective, comfortable, and reliable while also having a low recurrence rate of pigmentation [7]. A recent systematic review published in 2024 concluded that gingival depigmentation using diode lasers is superior to conventional methods in terms of faster healing, less pain and bleeding, better aesthetics, higher patient satisfaction and preference, as well as long-term stability of the depigmentation [8]. However, Hendiani

et al., (2024) concluded that in terms of healing period, diode lasers were inferior to conventional techniques [9].

Various approaches have been used to promote healing and reduce the recurrence rate of gingival pigmentation and improve patient satisfaction, such as the incorporation of low-level laser therapy, hyaluronic acid gel, ozonated oils, and platelet-rich fibrin (PRF) membrane [10, 11]. PRF is effective in protecting open wounds and promoting faster healing as it facilitates the migration of epithelial cells to its surface and supports the formation of microvascular networks serving as a natural fibrin-based material [12]. Platelet-rich plasma (PRP) is a promising approach in periodontal aesthetic surgery, as it accelerates wound healing and facilitates the migration and maturation of soft tissue cells by delivering a supra-physiological dose of growth factors [13, 14]. To prepare platelet-rich plasma injection (i-PRP), blood was first centrifuged at 2000 rpm for two minutes, separating red blood cells from plasma, white blood cells, and the platelet-rich buffy coat. This buffy coat, along with the plasma, was then centrifuged again at 4000 rpm for eight minutes to concentrate the plasma [15].

PATIENTS AND OBSERVATIONS

Two patients, both of Black African ethnicity, a 50-year-old woman (first patient) and a 32-year-old woman (second patient), complained about their discolored gums and were referred to the Periodontal Department at King Abdullah Medical City Specialist Hospital, Makkah, Saudi Arabia, for cosmetic management of gingival pigmentation. A detailed review of their medical histories revealed no significant systemic or chronic diseases, or medical conditions that would contraindicate the cosmetic procedures, and no use of medication was reported.

On clinical examination, both patients had good oral hygiene and were free of local factors that limit the cosmetic procedure. The first patient had pigmentation in her upper and lower anterior area, while the second patient had pigmentation in her lower anterior gingiva. Hedin Melanin Index (HMI) was used to assess a baseline extension of gingival pigmentation [16] (Table 1). The first patient scored 4 HMI – one long continuous ribbon covering the intercanine area (Image 1), while the second patient scored 3 HMI – one or more short continuous ribbons (Image 2).

Table 1: Hedin's Classification

Degree	Extent of Pigmentation
0	No pigmentation
1	Isolated (only one or two pigmented interdental papillae)
2	Numerous (more than two) pigmented interdental papillae
3	One or more short continuous ribbons
4	One long continuous ribbon covering the intercanine area

Image 1: Clinical picture of the first patient on different follow up periods. A: Pre-operatively, B: Immediately after intervention, C: Day 3, D: Day 7, E: Day 14, F: Day 30

Image 2: Clinical picture of the second patient on different follow up periods. A: Pre-operatively, B: Immediately after intervention, C: Day 3, D: Day 7, E: Day 14, F: Day 30

0.9 milliliters (mL) of blood were taken from the patient and placed in the tube containing separator gel and sodium citrate solution. Sodium citrate acts as an anticoagulant, preventing blood clotting by binding calcium and ensuring proper PRP preparation. The tube was then centrifuged at 3200 rpm for five minutes. After centrifugation, the blood separated into layers, with the red blood cells at the bottom, a middle layer containing a buffy coat, and a clear plasma layer on top. Using a 27-gauge syringe, the clear plasma layer just above the middle was carefully extracted without disturbing the other layers, and it was prepared for use (Image 3). Local infiltration anesthesia was administered using 2% lidocaine with 1:100,000 epinephrine (1.8 mL, one carpule) for each patient.

In the first patient, a diode laser (Epic10, Biolase, Inc., USA) with a wavelength of 940 nm, a power output of 1 W, 300 µm uninitiated fibers, continuous radiation mode, and an energy level of 80 J/s [17], was applied to the pigmented gingiva in the lower anterior region, while bur ablation was performed on the pigmented gingiva in the upper anterior region using a round diamond bur (Microcopy, USA) connected to a high-speed headpiece. In the second patient, the diode laser was used on the pigmented gingiva in the lower right quadrant. Bur ablation was performed on the pigmented gingiva in the lower left quadrant.

After ablation, i-PRP was injected immediately into the depigmented areas at both the laser and bur-treated sites. The injections were placed 1 mm across the ablated regions, with a 2 mm distance between injection points, and a volume of 0.1 mL was administered per injection [18] (Image 4).

The Healing Index (HI) by Landry *et al*., [19], was evaluated on days one, three, seven, 14, and 30 to observe the healing pattern over different time periods (Table 2). The Dummett-Gupta Oral Pigmentation Index (DOPI) was assessed preoperatively and on day 30 to evaluate pigmentation intensity, providing an objective measure of treatment outcomes using the following scale: 0: No pigmentation (pink gingiva), 1: Mild pigmentation (light brown gingiva), 2: Moderate pigmentation (medium brown or mixed pink and brown gingiva), 3: Heavy pigmentation (deep brown or blue-black gingiva) [20] (Table 3).

Table 2: Healing Index (Landry, Turnbull, and Howley)

Healing Index	Criteria
Very Poor 1	Tissue color: more than 50% of gingivae red Response to palpation: bleeding Granulation tissue: present Incision margin: not epithelialized, with loss of epithelium beyond margins Suppuration: present
Poor 2	Tissue color: more than 50% of gingivae red Response to palpation: bleeding Granulation tissue: present Incision margin: not epithelialized with connective tissue exposed.
Good 3	Tissue color: less than 50% of gingivae red Response to palpation: no bleeding Granulation tissue: none Incision margin: no connective tissue exposed
Very Good 4	Tissue color: less than 25% of gingivae red Response to palpation: no bleeding Granulation tissue: none Incision margin: no connective tissue exposed
Excellent 5	Tissue color: all gingivae pink Response to palpation: no bleeding Granulation tissue: none Incision margin: no connective tissue exposed

Table 3: Dummett-Gupta Oral Pigmentation Index (DOPI)

Score	Intensity of Pigmentation
0	No pigmentation (pink gingiva)
1	Mild pigmentation (light brown gingiva)
2	Moderate pigmentation (medium brown/mixed pink and brown gingiva)
3	Heavy pigmentation (deep brown / blue-black gingiva)

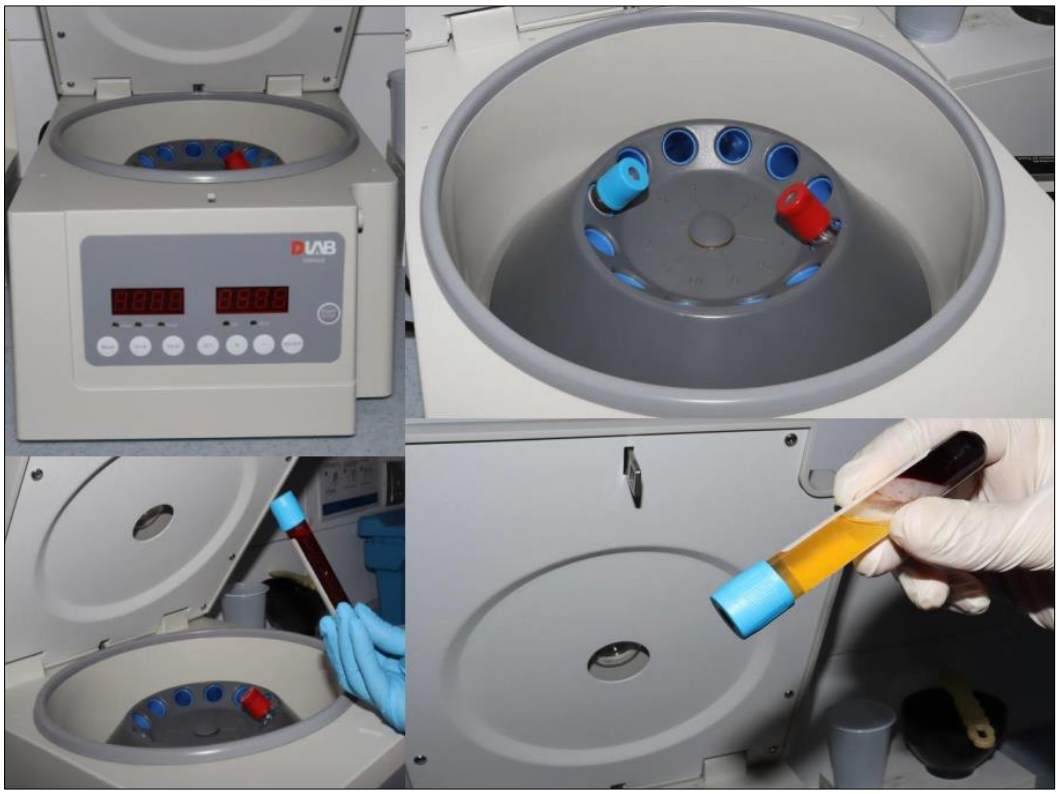

Image 3: PRP preparation in centrifuge

Image 4: Platelet-Rich-Plasma administration

The laser-treated site in the first patient (L1) and the laser-treated site in the second patient (L2) exhibited complete ulceration immediately after the intervention, with both sites scoring HI 2.

On the third day, the bur-treated site in the first patient (B1) and the bur-treated site in the second patient (B2) showed faster re-epithelialization. Starting from the first week, both sites in both patients showed similar healing patterns throughout the follow-up period (Table 4). Regarding DOPI, the first patient scored 2 preoperatively and 0 on day 30, while the second patient scored 3 preoperatively and 0 on day 30.

Table 4: Comparison of Healing Index (HI) across Different Sites over the Follow-up Period

Day	L1	L2	B1	B2
Day 1	2	2	2	2
Day 3	2	2	3	3
Day 7	3	3	3	3
Day 14	4	4	4	4
Day 30	5	5	5	5

DISCUSSION

Over the years, ongoing investigations have been conducted to test the effectiveness of different autologous materials for their ability to improve healing outcomes, accelerate healing, reduce pain, and, at the same time, be easily obtained and applied in a clinical setting with minimal equipment and feasibility for healthcare professionals. However, Majewska *et al*., conducted a study to develop a reproducible procedure for the optimal utilization of PRP and PRF in aesthetic treatments and proposed a protocol that includes a commercial kit containing two tubes for PRF and PRP, concluding that PRF and PRP are effective in improving skin thickness and density [21].

The effectiveness of PRP has been studied in vitro to assess the proliferation and migration of periodontal ligament cells, as well as osteoblast activity and growth factor release. PRP stimulates soft tissue wound healing through a ten-day sustained release of a supra-physiological dose of platelet-derived growth factors [14]. Human gingival fibroblasts proliferate and migrate in response to the growth factors within PRP, with peak stimulation lasting three days [22].

A recent systematic review and meta-analysis conducted by Wu *et al*., (2023) evaluated wound healing using various blood derivatives including autologous fibrin gel, autologous platelet gel, growth factors, ozonated oil, PRP, and PRF, finding that PRP demonstrated higher efficacy in wound healing compared to PRF, while also showing a lower pain score, with a total of 42 studies included in the review but only one testing PRP in an oral site [23]. Samani *et al*., compared the healing of the donor site of a free gingival graft in ten patients with another ten patients who underwent the same surgery with the addition of PRP, and reported that PRP can accelerate the healing process [13].

Healing time and outcome of conventional surgical methods are faster and more aesthetic than laser treatments, where carbonization and scarring of soft tissue occur [24-26]. This difference may be attributed to the high laser parameters used that generate heat and cause unintended damage to adjacent tissues. However, lasers are superior to conventional methods in terms of intra and postoperative pain perception [8, 9].

A split-mouth technique comparing a bur and laser may provide insight into the effects of PRP, as both treated sites show similar healing by day seven and almost complete epithelialization by day 14. However, due to the weak design of the study and non-standardized assessment methods, larger clinical trials and long-term studies are needed to evaluate PRP in oral sites. Different types of oral surgeries may also lead to different outcomes, and adding histological assessment could help better understand the healing process.

CONCLUSION

These preliminary findings suggest that the adjunctive use of PRP may enhance wound healing following gingival depigmentation, with a split-mouth approach demonstrating a similar healing pattern across both treatment modalities. However, further clinical trials with standardized protocols and larger sample sizes are needed to confirm the effect of PRP.

Conflict of Interest: The authors have no conflicts of interest to declare.

Protection of Human and Animal Subjects: The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of Data: The authors declare that no patient data appears in this article.

Right to Privacy and Informed Consent: The authors have obtained the written informed consent of the patients or subjects mentioned in the article.

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