



Case Report

Simultaneous gingival depigmentation and crown lengthening in esthetic periodontal prosthodontic rehabilitation

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ABSTRACT

Evolution in esthetic dentistry have reshaped the demand for having a perfect smile into a need. Enormous advancements in armamentarium, surgical techniques and material sciences have raised the aspiration of patients for having the desired esthetic outcomes in minimum dental visits. Ample cases are reported in the literature having excessive gingival display and hyper pigmentation treated with simultaneous gingivectomy and depigmentation. However, evidence for simultaneous depigmentation and crown lengthening with osseous resection are scarce. The patient in this paper had gingival hyper pigmentation and excessive gingival display with high osseous crest levels. Simultaneous depigmentation and crown lengthening with osseous recontouring was performed in a single visit. Prosthetic rehabilitation proceeded following healing to replace functionally and esthetically displeasing anterior crowns, restore hard tissue wasting disease, as well as replace missing posterior teeth.

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1. Introduction

The reward of optimal esthetic results has raised the importance of designing a natural attractive smile. Several factors may coexist contributing to an unsatisfactory smile. A high smile line resulting from a lip line extending more than 2 mm from the gingival margin, contributes to excessive gingival display.¹ This unfavorable display is even more compromised when melanin pigmentation affects the gingiva. After all, the acceptance of the pink color of the gingiva is much higher than the dark-colored one by the people.² The excessively displayed gingiva may also compromise the pleasant crown width/length ratio for maxillary incisors (80-85%) reported in the literature.³ Correcting the melanin pigmentation and excessive display of the gingiva was reported successfully whenever surgical stripping was made simultaneously with gingivectomy.⁴

When violation of the biologic width is expected, surgical crown lengthening comprising flap reflection and osseous crest resection is required.⁵ However, separating between surgical depigmentation and flap surgery for crown lengthening lingers and complicates the treatment plan and may contribute to patients' burnout.⁶ This article is aimed at presenting a case of disproportionate crown width/ length ratio in association with excessive gingival display, and hyperpigmentation where surgical stripping and crown lengthening with osseous resection were performed concurrently before prosthetic rehabilitation.

2. Case Description

A 28 years old female complained of esthetically unpleasant smile with dark color of gums that appears excessively upon smiling. The patient is annoyed from short looking pitted teeth that are associated with several "artificial looking" crowns. Reviewing her detailed history, the patient started noticing having short clinical crowns with gummy smile

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around the age of 20. Hyperpigmentation was witnessed since childhood and the medical history didn't reveal any medications taken or systemic conditions that contribute to hyper pigmentation. The patient had a non contributory family history and the personal history showed that she had never smoked. The collected data implied that the patient had physiological hyper pigmentation. Her psychosocial history revealed that her unpleasant smile had negatively affected her self esteem. Past relevant interventions included bilateral extraction of several upper teeth. Moreover, three crowns were executed 8 years ago following the restoration of three decayed upper teeth.

3. Clinical Findings

Extraoral examination revealed no obvious abnormalities. Reviewing the patient's maximum smile, the patient's esthetic zone showed all of the anterior teeth, premolars, and first molars of the upper and lower jaws. Moreover, a high smile line was evident exposing 3-4 mm of the maxillary gingival tissues.

Intraoral examination revealed an average plaque score of 0.8, 3% bleeding index, and an average gingival index of 1. The free gingival margins were rolled, with uneven distorted zenith points, low non symmetrical scallop, and showed diffuse dark pigmented areas. In regards to the latter, dark brown diffuse pigmented areas in the free and attached gingiva extended from the anterior to the premolar areas of the upper and lower jaws. Consequently, a pigmentation score of 3 was assigned to the case according to Dummett-Gupta Oral Pigmentation Index.⁷ Examination of the teeth showed three old crowns on the maxillary central incisors and left lateral incisor with esthetically inappropriate shapes and dimensions. Overall, teeth shape discrepancies were not only recorded in the width dimension, but also included the width to height proportions. Multiple generalized hypoplastic enamel wasting lesions of the dentition were also recorded.

4. Therapeutic Intervention

The patient main concern were for the surgical phase of the treatment plan to be carried in fewer visits and brief timeframe. In light of her concerns, and possessing a thick gingival phenotype, a simultaneous surgical depigmentation and crown lengthening with osseous resection were suggested to the patient.

Preliminary routine phase I periodontal treatment was executed by the dental hygienist and oral hygiene instructions were provided to the patient to abide by for 1 month during which diagnostic mock up was used to construct Poly Methyl Methacrylate (PMMA) provisional crowns. At the time of the scheduled surgery, local anaesthesia 2% lignocaine (1:100,000 adrenaline) was administered by infiltration technique for the maxillary

teeth. Paramarginal primary incisions were carried out to create a new scalloped gingival margin with correct zenith point location.



Fig. 1: Full smile photograph showing the excessively displayed pigmented gingiva an esthetically unpleasant clinical crowns.



Fig. 2: Following gingival stippling for the right side.

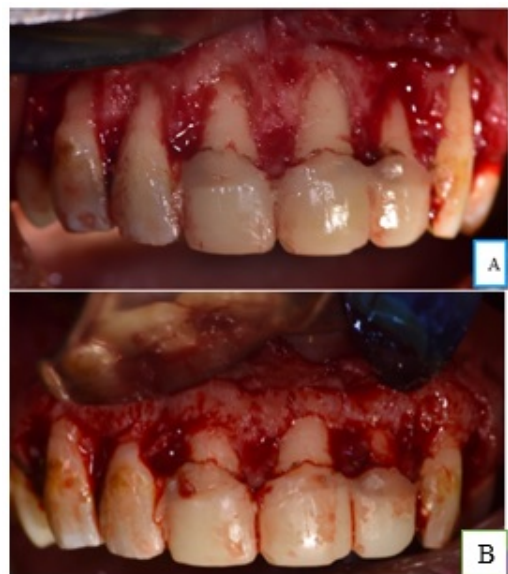


Fig. 3: A: B: Following a full thickness flap, osseous crest resection was performed.



Fig. 4: Following flap replacement and suturing.



Fig. 5: Full smile following cementation of definitive crowns.

The surgical blade was then used nearly parallel to the surface of the attached gingiva peeling the epithelial and superficial connective tissue layers. A bare connective tissue surface had to be free of remaining melanin pigments and the gingival margins were left intact to avoid any subsequent recession (Figure 2).

A mucoperiosteal flap was then elevated for all the area between the maxillary first molars. Planning to transfer the biological width to a more apical position, the osseous crest was reduced by 4 mm using an electric high speed hand piece and copious saline irrigation (Figure 3) Out of the 4 mm, the apical 2 mm would be occupied by supracrestal attachment while the coronal 2 mm was for the future sulcus depth.

The flap was repositioned and vertical internal matters suture design was utilized with polypropylene monofilament sutures (Figure 4) Ibuprofen 600 mg was prescribed for one week while asking the patient to monitor for any gastrointestinal risks. Regular post surgical instructions were provided to the patient ensuring her abstinence from teeth brushing of the upper jaw for two weeks.

5. Clinical follow up and outcomes

To compensate for the lack of home care for the operative site, the patient was asked to attend every other day for professional elimination of the accumulated plaque with a low speed contra angle hand piece with a mounted polishing brush and polishing paste. After two weeks, sutures were removed and healing was found uneventful. The patient declared that moderate pain lasted for the first week while post operative edema regressed from the fourth day post operative. One week following suture removal, provisional restoration was planned. After 3 months, new temporary restoration was constructed to follow the new gingival contours. At the 6th month following surgery, final impressions were obtained for the definitive all ceramic (E-max) fixed prosthetics.

The outcomes recorded at the 3rd month following surgery reported spot areas of mild repigmentation on the right side but the overall result was very satisfactory for the patient. At the 6th month and following the delivery of definitive prosthetics, the Oral Pigmentation Index was calculated. The sum of assigned estimates for every tooth were divided by 32 unit spaces as described by Dummett-Gupta. The resultant value ($=0.56$) was described as score one Dummet Oral Pigmentation Index.

The width to length ratio was calculated for every tooth in the esthetic zone following definitive restorations. The recorded ratios ranged between 70 to 82 %. With a fully retracted smile, only the interproximal papillae were visible with total resolution of the gummy smile. Overall, the final outcomes successfully eliminated the gummy smile, reduced the gingival hyperpigmentation and corrected the width to height ratios of teeth. Such outcomes were excellent from the patient perspective (Figure 5).

6. Discussion

With the rising need of the people for obtaining the most pleasing and attractive smile in minimal chair time, surgeons face the obstacle of achieving the desired esthetic outcomes. This is true whenever multiple surgical interventions are indicated. Examples include the patient in this case report who was diagnosed with physiologic pigmentation and gummy smile that affected the teeth width to height percentage. It would seem convenient to perform the crown lengthening flap and osseous resection following a sufficient healing time of the depigmentation surgery. However, in the current clinical scenario, the thick gingival phenotype with generous gingival thickness raised the suggestion to perform both procedures contemporaneously.

Reviewing the literature, different techniques were used to correct gingival hyperpigmentation including surgical and non-surgical techniques. Scalpel technique was still considered by several authors as the gold standard for depigmentation compared to electrosurgery and bur

abrasion due to its simplicity.⁸ The use of LASER, especially diode, demonstrated promising clinical efficiency in the literature. However, the advantage of using the conventional scalpel in the presented case outweighs the use of LASER diode for several reasons. First, recent systematic reviews and meta-analysis point out to the higher rates of repigmentation for the LASER groups at 6 months follow up periods with the recommendation for execution of good quality randomized clinical trials.⁹ Additionally, controlling the thickness and depth of penetration of the blade is more precise in comparison to the LASER light. This facilitates adequate control over the remaining intact gingival thickness for a mucoperiosteal flap with sufficient thickness to be elevated.

Scalpel procedure also provide the advantage of cost effectiveness and the healing outcomes start to be witnessed between 7- 10 days unlike the LASER results which appear between 1-2 weeks. The latter, however, offer the privilege of being easy and faster modality that provides efficient hemostasis and decontamination effects.¹⁰ Other than LASER, using cryosurgery would have been inconvenient due to the lack of control over the duration and depth of freezing as well as the reported complication of postoperative swelling.¹¹ Electrosurgery, as well, have the disadvantage of unfavorable excessive tissue destruction, as well as more inflammatory response of the tissues compared to scalpel wounds.¹²

In the presented case, the depigmentation step succeeded to reduce the pigmentation score from 3 to 1 according to the Dummett-Gupta Oral Pigmentation Index. This was consistent with several clinical trials reporting the favorable clinical outcomes with the surgical stripping technique.¹³ Corresponding with Patil et al.,¹¹ The distribution of repigmentation in the presented case was patchy but did not affect the overall satisfaction level of the patient. The occurrence of re-pigmentation was noticed at the third month following the surgical intervention. This coincides with Gul et al. who reported higher recurrence of the surgical stripping technique in comparison with LASER after 3 months follow up period.¹⁴

Two mechanisms have been described in the literature that justify the process of re-pigmentation. One is the migration theory which claims that active melanocytes in the adjacent pigmented tissues migrate to the treated zones causing re-pigmentation.¹⁵ Ginwalla et al., on the other hand, reported re-pigmentation in 50% of his treated cases between 24 and 55 days. The phenomenon was attributed to residual melanocytes left at the time of surgery which later became activated to synthesize melanin.¹⁶

Lengthening the clinical crowns in the presented cases was aimed for the following objectives: 1- to reduce the volume of displayed gingiva; 2- to modify the square shaped anterior teeth by changing the width to length ratio; 3- to establish new zenith point location for a higher

and esthetically pleasing gingival scalloping. When the procedure is anticipated to violate the biologic width, flap reflection is indicated to shift the alveolar crest margin into a more apical position.¹⁷ The scenario in the presented case included a prosthetic rehabilitation phase. In the presented case, disturbance of soft tissue healing by teeth preparation had to be avoided thus, an early tooth preparation and provisional relining approach after 3 weeks from surgery was chosen as suggested by Zucchelli et al. and a sufficient healing period of 6 months was allowed before the delivery of definitive prosthetics.¹⁸

Adding a second surgical procedure aiming for depigmentation through stripping, might have lengthened the overall treatment plan timeline and, therefore, the patient acceptance for the recommended interventions. Fortunately, evaluation of the gingival phenotype of the presented case revealed a thickness > 3mm. Surgical depigmentation by elimination of approximately 1 mm from the surface of attached gingiva, would leave 2 mm thickness which is the optimal flap thickness for flap reflection as suggested by Floyd et al.¹⁹ From the perspective of the patient's agenda, combining both surgeries in one session sounded convenient and serves as an esthetically predictable protocol with patient centered outcomes but only in patients with gingival thickness > 3 mm.

7. Conclusion

Whenever realistic, operators should put in consideration the patients' expectations while constructing a systematic treatment plan. Our surgical protocol of concurrent depigmentation and surgical crown lengthening with osseous resection can be performed successfully in thick gingival phenotypes with excellent esthetic outcomes while considerably decreasing the overall treatment duration. On the other hand, operators and patients should be aware that the reduction in treatment plan time gained will be at the expense of lingering the chair time of the original crown lengthening procedure. Performing future clinical trials to compare the current protocol with the two step surgery is highly recommended. In addition, performing the same procedure with digital design and execution would be a valuable suggestion to improve the accuracy of the outcomes.

8. Data Availability

The clinical data used to support the findings of this study are available from the corresponding author upon reasonable request.

9. Source of Funding

None.

10. Conflict of Interest

None.

11. Acknowledgment

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