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Comparative Evaluation of Gingival Depigmentation Techniques: A Split Mouth Case Series

Dr.Norbu[1], Lt Col Nitin Gupta[2],Lt Col B Harshavardhana[3],
Armed Forces Medical College, Punel, Maharashtra
[1]Resident,Division of Periodontology,Armed Forces Medical College, Pune, Maharashtra
[2,3]Faculty,Division of Periodontology,Armed Forces Medical College, Pune,
Corresponding Author: Dr.Norbu(10)

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ABSTRACT: Melanin pigmentation of gingiva is an esthetic concern especially in subjects with high lip line or gummy smile. Gingival depigmentation procedure is a type of perioplastic surgery aimed to lighten the color of the gingiva using different modalities like scalpel,diode,Er:Yag laser and micro needling.This split mouth randomized study was conducted on 5 subjects, exhibiting melanin hyperpigmentation of gingiva. The anterior facial gingiva was divided into 4 quadrants and randomly depigmented using scalpel/diode/Er:Yag laser/micro needing. Tecniques.Parameters such as Dummette Gupta index and VAS scale were assessed and compared between four techniques.Gingival depigmentation procedures with all four technique were effective. However, DOPI showed that micro needling technique was better and VAS score was statistically higher for micro needling technique as compared to other three techniques.The findings of the present study suggest that gingival depigmentation was effective with all four techniques. However, the pain perception was least in laser treated sites and micro needling technique showed the best result out of other three techniques.

KEYWORDS: Gingival depigmentation, Scalpe, Er:Yag, Diode laser Micro-Needling

I. INTRODUCTION

The harmony of smile is determined not only by the shape, the position and the color of the teeth but also by the gingival appearance mainly its color.[1] The color of the gingiva is determined by its blood supply, thickness and degree of keratinization of the epithelium and the pigment containing cells. The color also varies among individuals according to their ethnicities. The color of the healthy gingiva ranges from pale pink and/or coral pink in Caucasians to brown and/or blue-black in Africans or Asians, thus indicating that hyperpigmentation is more frequent in black individuals. [2,3]

The hyperpigmentation of gingiva may be due to physiological conditions, most commonly due to melanin deposits or due to certain pathological conditions such as post inflammatory pigmentation, smoker melanosis, melanotic macule, nevus, melanoma etc. [4]. Hyperpigmentation of gingiva is usually unaesthetic especially in those patients having a “gummy smile”. Therefore, in cases of melanin hyperpigmentation, to improve the esthetic condition of the gums, gingival depigmentation procedures need to be performed.

Gingival depigmentation procedure is a type of perioplastic surgery aimed to lighten the color of the gingiva using different modalities like Scalpel, Electrosurgery, Cryosurgery, Radiosurgery Diode/Er:YAG(Erbium-doped yttrium aluminum garnet) laser and the latest being Micro-Needling technique. Even though gingival depigmentation procedure gives a promising result, there is always a question of recurrence.

Various studies are available showcasing the efficacy of most of the techniques and their superiority over one another. However very few cases are available to evaluate and compare the efficacy of the micro needling technique with other established techniques. This case series is of management of five patients with melanin hyperpigmentation wherein in each patient depigmentation procedures were performed using Scalpel, Er:Yag, Diode laser and Micro needling technique to evaluate which of the above treatment modality was the most effective.

II. CASE SERIES

Four male patients aged between 20-30 years and one female patient aged 26 years visited the Division of Periodontology with the chief complaint of “discoloration of gums” and anesthetic looking gingiva while smiling. All the patients were not on any medication and were systemically healthy.An intraoral clinical examination of all the five patients revealed no signs of any gingival inflammation or loss of periodontal tissues. However, there was presence of generalized diffuse melanin pigmentation of labial gingiva ranging from brown to brownish black in color in both mandible and maxilla. No intraoral hard tissue defects were found. The patients were diagnosed as a case of “Generalized non-dental biofilm induced gingival disease (Gingival pigmentation)” as per 2017 classification of Periodontal and Peri-Implant Diseases and Conditions and were planned to be taken up for gingival depigmentation procedure. [4] The blood investigation reports of all the patients were under normal range. A split mouth surgical depigmentation procedure was planned for all the patients wherein a separate depigmentation procedure would be performed in each quadrant using different modalities. In our study we decided to use either Scalpel, Er:Yag Laser, Diode Laser or Micro needling in each quadrant. Only one depigmentation procedure of one quadrant was to be performed at a time and the next quadrant’s surgery would be done after a gap of 7 days. Gingival Color density was assessed pre-surgically using Dummet Gupta index [5] in all the patients and then they were taken up for depigmentation procedure. Before every depigmentatation procedure, the quadrant was anaesthetized using 2ml of local anesthesia (2 % lignocaine with adrenaline) which was administered as either a nerve block and/or infiltration in the respective quadrant. Then the depigmentation procedure was performed for that quadrant using one of the modalities as follows:

Depigmentation procedure using Surgical Scalpel

After achieving profound local anesthesia, the pigmented area was de-epithelized using a #15 Bard- Parker blade in a scrapping method in which only the superficial layer of epithelium was scrapped off thus surgically removing all pigmented gingival. The procedure was started from the distal aspect of canine up to the mesial part of the central incisor ensuring not to cross the midline. Bleeding was controlled using sterile gauze as a pressure pack. [Fig 1(a)(b)(c)]

Depigmentation procedure using Micro needling with ascorbic acid

After local anesthesia was achieved in the concerned quadrant, the micro needlingtechnique for removal of pigmented gingiva was performed using a Dermapen device equipped with 24 microneedles. The device was set to a depth of 1.25 mm. Each site of the gingiva was needled for 30-40 seconds in a circular manner until pin-pointed bleeding spots were observed. Then the gingiva was irrigatedwith 0.9% saline. Ascorbicacidpowder (1000 mg/ml) was mixed with saline to form a paste which was then applied topically on to the micro-needled gingiva for 10 minutes. [Fig2(a) b) (c)(d)]

Depigmentation procedure using Er:Yag laser

After achieving local anesthesia of the quadrant,Er:YAG laser of 2940 nm wavelength was used for the depigmentation procedure. The pigmented area was de-epithelized with the laser beam at 200 mJ, 2.5 W, 15 Hz, in a non-contact pulsed mode at a distance of 1 mm from the tissue. A surgical aspirator was used to cool the operative site. Sterile gauze soaked in saline was used to remove the char formed over the surface of the depigmented area. Extreme care was taken to ensure the removal of all pigmented areas. [Fig3(a)(b)(c)]

Depigmentation procedure using Diode laser

Post obtaining local anesthesia, a Diode laser of 980 nm wavelength was used for depigmentation procedure. The fiber-optic handpiece which had a 400μ tip wire was initiated using a 2.5-watt power. The laser was applied in a continuous-wave and in contact mode in a coronoapical direction movement of the pigmented areas. A surgical aspirator was used to cool the operative site. Sterile gauze soaked in saline was used to remove the char formed over the surface of the surgical areas. Extreme care was taken to ensure the removal of all epithelial pigmented areas. [Fig4(a)(b)(c)]

After the digpigmentation procedure in each quadrant, postoperative instructions were given. The patients were prescribed analgesics for 3 days & 0.2% chlorhexidine digluconate rinses twice daily for 2 weeks. They were also instructed to avoid alcohol and spicy food and not to traumatize the surgical area for next 07 days. The patients were recalled after 24 hrs post procedure and VAS score were recorded for all of them [6]. The patients were then examined every month. 03 months post operatively, the Dummet index was recorded and compared with the preoperative index readings to evaluate the outcome of the procedures. [Table 1]

III. RESULTS

All the four techniques were successful in achieving gingival depigmentation. Pre-surgically, DOPI scoring for all the patients ranged from 2 to 3 with a mean score of 2.8. The mean DOPI score after 3 months for scalpel, Er:Yag, Diode laser and micro-needing techniques were 0.4, 0.8, 0.8 and 0.2 [Table 2] respectively thus establishing that depigmentation was best achieved by micro-needling followed by scalpel technique. However, with regards to pain perception, the post-surgical mean VAS score for scalpel, Er:Yag, Diode laser and micro-needing techniques were 3.2, 5.2, 0.2 and 0.6 [Table 3]respectively. This shows that patients had least amount of discomfort with laser procedure followed by the use of scalpel. However, pain perception was reported maximum in the micro-needling technique. In the present study, as the sample size was small, statistical analysis could not be performed.

IV. DISCUSSION

Gingival hyperpigmentation refers to the darkening of the gum tissue due to an increase in melanin production. The pigmentation is often more noticeable in individuals with darker skin tones, but it can occur in people of all backgrounds [2]. There is no significant difference in the oral pigmentation between males and females which also holds true in our study where no difference in the degree of pigmentation could be found among both the sexes. The hyperpigmentation of gingiva may be due to physiological conditions, most commonly due to melanin deposits or due to certain pathological conditions such as post inflammatory pigmentation, smoker melanosis, melanotic macule, nevus, melanoma etc. [4].

Pigmentation can also be due to exogenous causes such as long-standing amalgam restoration, heavy metal exposure or due to certain drugs. However, in our cases, since all the patients were systemically healthy without any history of exposure to heavy metal poisoning or amalgam restoration, they were all diagnosed as cases of melanin hyper pigmentation.

Melanin pigmentation is generally managed for esthetic reasons. Various methods have been used for depigmentation such as Scalpel, Electrosurgery, Cryosurgery, Radiosurgery, Laser and the latest being Micro-Needling technique. Various studies are available comparing Scalpel with Er:Yag and Diode laser and also with micro-needling.(7,8,9)But, there is no study which compares Scalpel, Er:Yag ,Diode laser and Micro-needling techniques that too in the same patient.

To our knowledge, this is the first study where micro needling has been proved to give better results than other techniques. During the procedure, it was necessary to generate precise bleeding pinpoints by micro-needling to achieve optimal results [10]. These microholes allow the therapeutic medication to penetrate easily into the connective tissues, stimulating new collagen production and affecting melanocytes [11]. Then, we used topical ascorbic acid as a therapeutic medication that was reported to be effective in reducing melanogenesis directly and thus promoting depigmentation.

However, pain perception was maximum in this technique. This could be attributed to the microholes created for depigmentation. The scalpel technique gave average results in respect to both DOPI & VAS scores which is similar to the results in the studies by Lin et al [12]. The Laser technique had the least pain but the amount of depigmentation achieved was not the best. This could be attributed to the penetration depth of the Lasers in order to remove melanin form the deeper layers of epithelium. In our study, mild repigmentation was observed after 3 months in all the techniques.

V. CONCLUSION

Clinical experience, affordability, and personal preferences should be considered when selecting a technique for treating gingival hyperpigmentation. Micro needling technique of using Dermapen and topical ascorbic acid showed promising results, which gives new perspectives for its application. Although the technique is a simple and safe gingival depigmentation method, it should be performed cautiously. However, our study was limited to only five patients. Therefore, RCTs with larger sample sizes would further help in strengthening our findings.

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Fig 1(a)Pigmentation on mandibular gingival

Fig 1(c)Immediate postoperative site of scalpel technique

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Fig 2(a)Pigmentation on mandibular gingival

Fig 2(b) Removal of pigmented layer using Derma pen

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Fig 2(c) Immediate postoperative site of micro-needling

Fig 2(d)Application of Ascorbic acid powder

Fig 3(a)Pigmentation on maxillary gingival

Fig 3(b)Er:YAG laser

Fig 3(c) Immediate postoperative site

Fig 4(a)Pigmentation on maxillary gingival

Fig 4(b)Diode laser

Fig 4(c) Immediate postoperative site

PATIENT	AGE	SEX	BASELINE DOPI	THREE MONTH DOPI (SCALPEL)	VAS SCORE (SCALPEL)	THREE MONTH DOPI (MICRO-NEEDLING)	VAS SCORE (MICRO-NEEDLING)	THREE MONTH DOPI (ER:YAG)	VAS SCORE (ER:YAG)	THREE MONTH DOPI (DIODE)	VAS SCORE (DIODE)
PT1	29	M	3	0	3	0	6	1	1	0	1
PT2	26	M	3	0	3	0	4	1	0	1	1
PT3	28	M	3	0	4	1	5	0	0	1	0
PT4	30	F	2	1	3	0	6	1	0	1	0
PT5	24	M	3	1	3	0	5	1	0	1	1

Table 1

Technique	Mean DOPI
Scalpel	0.4
Micro-Needling	0.2
Er:YAG	0.8
Diode	0.8

Table 2: Mean DOPI score after 3 months

Technique	Mean VAS
Scalpel	3.2
Micro-Needling	5.2
Er:YAG	0.2
Diode	0.6

Table 3: Mean VAS score