



GINGIVAL DEPIGMENTATION USING ASCORBIC ACID IN CONJUGATION WITH MINIMALLY INVASIVE MICRO-NEEDLING TECHNIQUE VERSUS CONVENTIONAL SURGICAL SCALPEL SCRAPING TECHNIQUE – A PILOT STUDY

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ABSTRACT **Background**- When it comes to depigmentation techniques, patient's acceptance plays a major role owing to it being a primarily aesthetic procedure with variable incidences of recurrence seen in individuals. A number of techniques have been applied till date to evaluate the effectiveness and patient acceptance. **Objective** – To evaluate and compare aesthetic correction of gingival hyperpigmentation and patient response to minimally invasive micro-needling technique with ascorbic acid and conventional surgical scalpel scraping technique. **Materials And Methods** – A total of 10 patients were selected for the study to be conducted in split mouth fashion. Subjects with either maxillary or mandibular anterior sextants were randomly allocated into two groups viz. group A (Micro-needling group) and group B (scalpel). The gingival pigmentation index was recorded at baseline and one month post intervention. VAS scores for pain and itching were recorded for both the groups for five consecutive days. Consumption of analgesics was noted for five days post-operatively. Patient satisfaction analysis was performed at the end of one month post intervention. **Results** – There was no statistically significant difference between group A and B post-treatment at one month follow up period. The VAS scores and analgesic intake was significantly lower with the micro-needling group. There was no statistically significant difference in terms of patient satisfaction between both groups. **Conclusion** – Topical application of vitamin C post micro-needling can be an effective gingival depigmentation technique.

KEYWORDS : Depigmentation, Micro-needling, Ascorbic acid, Scalpel.

INTRODUCTION

A pleasing smile amplifies an individual's poise and is usually consonant with the position and colour of the gingival tissue in conjugation with the teeth. Gingival Pigmentation though not enumerated as a pathological condition presents as one of the chief dental aesthetic concerns, the situation is further antagonizing in individuals with "gummy smile".¹ It has been estimated that gingival pigmentation in Asian population is 34.9% and with progressing age the hyperpigmentation becomes more evident in the interdental papillae and attached gingiva. However, in the younger age group it was more evident in the interdental papilla, marginal or attached gingiva or both depending on an individual's skin complexion.² Pigmentations of the oral cavity are associated with intensified production of melanin, enhanced count of melanocytes or accretion of adventitiously incorporated exogenous materials.³

Gingival pigmentation can be an outcome of exogenous or endogenous factors. Mostly, the endogenous gingival pigmentation is attributed to melanin, a brownish pigment manufactured by melanosomes of melanocytes housed in basal and supra-basal layers of epithelium.⁴

Various treatment modalities have been channelled for gingival depigmentation and restoration of the gingival aesthetics in order to enhance an individual's smile profile. These techniques include modalities like scraping, bur abrasion, cryotherapy, partial thickness flap, lasers, electrosurgery,⁵ and the novel Vitamin C therapy.⁶

Surgical scalpel scraping technique has traditionally been in use to manage hyper-pigmented gingiva and is considered the "Gold Standard".⁷ The procedure primarily entails scrapping of gingival epithelial layer along with a layer of subjacent connective tissue, enabling the healing of bare tissue by phenomena of secondary intention, the fresh epithelium that emerges is bereft of melanin pigmentation.¹

On the other hand Vitamin C (Ascorbic acid) is implicated in depigmentation procedures of skin via topical, transdermal or intravenous approaches.⁸ The antioxidant, Vitamin C is an essential nutrient also associated with the reduction in production of melanin.⁹ Melanin is the major pool for reactive oxygen species(ROS), copper and calcium in tissue cells.¹⁰ Once vitamin C is inducted at target site, it

effectively binds to melanin due to ROS, calcium and copper content leading to their intra-cellular deficit thereby rendering the cells incompetent of melanin production. Calcium deficit incapacitates melanocytes inhibiting cellular adhesion to keratinocytes as calcium is vital to form cadherins.¹¹ The binding to keratinocytes is a prominent stimulator to melanocytes for melanin production, to format dendrites and transfer the produced melanin to neighbouring cells.¹² Scarcity of inter-cellular copper curtails the production of tyrosine, tyrosinase enzyme and peroxidase enzyme inevitably limiting the melanin production.¹³

The micro-needling technique has been successfully employed in the field of dermatology to form micro-conduits enhancing skin permeability and facilitating penetration of topical medicaments, this property can thus be efficiently employed for the penetration of water-soluble Vitamin C to the deeper layers of gingival epithelium.¹⁴

The study aims to evaluate and compare aesthetic correction of gingival hyperpigmentation and patient acceptance towards minimally invasive micro-needling technique with ascorbic acid versus conventional surgical scalpel scraping technique.

MATERIALS AND METHODS

The systemically healthy subjects in the age group of 18-30 years with the presence of gingival hyperpigmentation in relation to aesthetic region were included in the study. Subjects with systemic diseases, pregnant or lactating females and smokers were excluded.

Study Design

A total of 10 patients were selected for the study to be conducted in split-mouth fashion. Subjects with either maxillary or mandibular anterior sextants were randomly allocated into two groups viz. group A and group B using chit system. A session of gingival depigmentation using Vitamin C/ Ascorbic acid slurry post micro-needling with derma-pen and surgical scalpel scraping technique were performed on each individual by the same operator. The gingival pigmentation index (Kumar et al 2013) was recorded at baseline and one month post intervention. VAS scores (Reich et al, 2012) for pain and itching were recorded for both the groups for five consecutive days. Consumption of analgesics was noted for five days post-operatively. Patient satisfaction analysis (Huh et al, 2003) was performed at the end of one month post intervention.

Surgical Procedure

For Group A, Local anaesthesia was administered, the micro-needling of the gingiva was done using a derma-pen device with disposable cartridge having 12 microneedles arranged in rows, adjusted to 1.5 mm depth at speed of 700 cycles per min. The derma-pen was used intermittently on the sextant gingival area for 30 seconds per tooth till bleeding pinpoints were evident on all areas presenting pigmentation, further irrigation with normal saline solution was advocated and sterile gauze was used to dry the area followed by topical application of ascorbic acid slurry. The slurry was prepared using ascorbic acid powder in concentration of 1000 mg per ml of normal saline mixed in a small glass dish. The slurry was topically applied to the gingival mucosa for a period of 10 minutes. The treated area was left without periodontal dressing. For Group B, following administration of Local anaesthesia depigmentation procedure was done using a bard parker handle with no. 15 blade with scraping technique to remove the pigmented layer. The pressure was applied with sterile gauze to control haemorrhage during procedure. The epithelium in entirety along with a partial layer of connective tissue was scraped. Once the bleeding was in control a periodontal dressing was given. All subjects received post-operative instructions to avoid drinking acidic or hot beverages for 24 hours and to not brush the treated area for one day post micro-needling and one week post scalpel scraping technique to evade any mechanical trauma to the gingiva. In case of pain patient was advised to consume and record the prescribed analgesics as per intake.



Figure 1 a. Armamentarium for Micro-needling technique
b. Armamentarium for Scalpel Scraping technique



Figure 2- a)Pre-operative image b)Micro-needling to prepare conduits c)Bleeding points post micro-needling d)Application of ascorbic acid slurry (Mandibular sextant) e)Gingival scraping with scalpel(Maxillary sextant) f)Post-operative image(1-month)

Statistical Analysis

The statistical software SPSS 16.0 was used for analysis of data. The normality of data was tested by Shapiro Wilks test. In total of 10 patients with 20 pigmented sextants were taken into consideration for the split-mouth study.

RESULTS

The mean values for pigmentation index values at baseline were statistically non-significant when compared using un-paired t-test. At follow up of one month the mean values for pigmentation index for group A and B revealed a statistically significant decline for both groups A and B. However, there was no statistically significant difference between group A and B post-treatment at one month follow up period (Table 1).

Table-1 Intergroup And Intragroup Comparison Of Pigmentation Index Values Of Group A And Group B

PI	Group	Mean	Std. Deviation	t-test value	p-value (Inter-group)
Pre-treatment	Group A	2.90	0.32	-1.000	0.331
	Group B	3.00	0.00		
Post-treatment (1-month)	Group A	1.10	0.57	2.060	0.054
	Group B	0.60	0.52		

Pre-treatment vs Post-treatment (Intra-group)	Group A			13.500	0.001*
	Group B			14.697	0.001*

The mean VAS scores for pain at day 1, 2, 3, 4 and 5 were compared between Group A and Group B using the unpaired t-test. The mean VAS scores for Pain at day 1, 2 and 3 were significantly more among Group B as compared to Group A (Chart 1).

The mean VAS scores for itch at day 1,2,3,4 and 5 were also compared using similar test. However, no significant difference was obtained between group A and B with respect to mean VAS scores for itch (Chart 1).

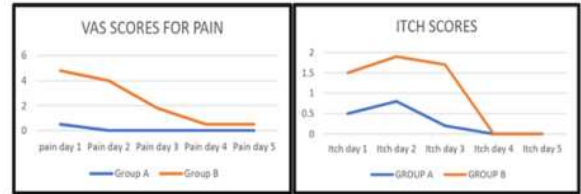


Chart-1 Intergroup comparison of VAS scores for pain and itch for Group A and B

The analgesic intake as reported by the patient were recorded and mean values were calculated and subjected to comparison for group A and B using the unpaired t-test. The mean drug (analgesic) intake at day 1, 2 and 3 was significantly more in group B as compared to group A (Chart 2).

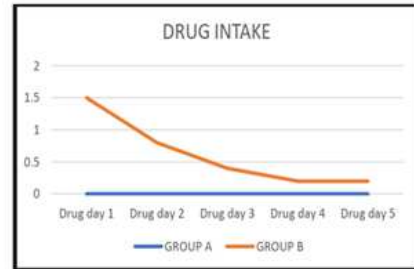


Chart- 2 Intergroup comparison of intake of analgesics for group A and B

The mean Satisfaction scores were compared between Group A and B using the unpaired t-test. There was no significant difference in mean Satisfaction score between Group A and B (Chart 3)



Chart 3 - Intergroup comparison of patient satisfaction

DISCUSSION

Gingival hyperpigmentation presents as chief dental aesthetic concerns and patients frequently seek aesthetic correction for the condition which they rapidly address as "Black gums." Gingival depigmentation is an aesthetic procedure whereby the pigmentation is eliminated by various employable techniques. In a young patient seeking aesthetics the fear of blade and post procedural limitations like the periodontal dressing becomes a major discouraging factor and has a psychological impact hence, in the present study was an attempt to achieve similar aesthetic results as the conventional procedures with the minimally invasive micro-needling technique using ascorbic acid slurry in order to overcome these limiting factors.

In the present study Derma-pen was employed for the purpose of micro-needling owing to its small size and replaceable cartridge head

to limit cross-patient contamination. It is a rechargeable electronic device with various speeds and penetration depth settings thereby limiting operator related ramifications and making it compatible for intra-oral use. Vitamin C has been successfully used intradermally, intra-mucosally as well as topically.⁸

The present study compared preoperative and postoperative pigmentation changes with micro-needling and topical ascorbic acid application and surgical scraping. The gingival pigmentation index documented in 2013 by Kumar et al was used to make intra-group and inter-group comparisons and significant aesthetic outcomes were established in both the groups however, no significant difference was observed between the groups one month post-operatively. Furthermore, the findings were consistent with the results of Shimada et al. where topical application of vitamin C gel to the gingiva inhibited melanin pigmentation.¹⁵

The patient acceptance was evaluated as per the VAS scale devised by Reich et al in the year 2012 as an instrument for assessment of pruritis, this scale was employed to compare postoperative pain and itching between the groups. The post operative pain and itching was significantly higher with surgical scraping which could be attributed to secondary intention healing and constant irritation caused by the placement of periodontal pack over the wound created post scraping. However, with micro-needling the post-operative discomfort in terms of pain and itching were almost negligible. Furthermore, a periodontal dressing is not advocated in the micro-needling group assuming that the formed micro-holes heal quickly without any sort of perfuse bleeding, unlike with invasive scraping technique, where gingival tissues should be inevitably covered by a periodontal dressing since they leave denuded connective tissues that heal via mechanism of secondary intention.¹⁶ As the VAS scores for pain were insignificant with micro-needling the consumption of analgesics was also remarkably lower while it was notably higher with scraping procedure. These results were in agreement with the clinical trial conducted by Yussif et al injecting 1-1.5 ml of the ascorbic acid (200-300 mg) intra epithelially in the gingival mucosa and established a statistically significant reduction in pigmentation accompanied with significantly lower VAS scores with vitamin C mesotherapy over the surgical scalpel technique.¹⁷

Patient satisfaction was assessed between the groups after one month in accordance to the criteria described by Huh et al¹⁸ in trial of Vitamin C iontophoresis in melasma. In terms of patient satisfaction micro-needling with ascorbic acid slurry proved to be as efficient as the conventional surgical scraping method nonetheless, it significantly outmatched the scraping technique with lesser VAS scores for pain and better patient acceptance. With regard to entirety of the procedure in terms of reduction in overall intensity it was an established characteristic of surgical scalpel scraping technique.

Micro-needling with ascorbic acid is a non-expensive procedure with minimal to no complications. Meanwhile lasers how so ever portable, pain free with excellent haemostasis are extremely expensive and might delay healing for upto two weeks.¹⁹ Another alternate that is electrosurgery is associated to immoderate heat accumulation and comorbidities like unintended tissue destruction.²⁰ Cryosurgery on the other hand is linked to swelling and inadvertent soft tissue destruction.²¹

The stability of gingival depigmentation is determined by genetic and ethnic factors and also the treatment modalities employed.²¹ Surgical techniques have shown recurrence after variable intervals ranging from 15 days to 6 months.²²⁻²³ As the recurrence of gingival pigmentation is inevitable the present trial paves the way for a more acceptable, economical and patient friendly alternate to other invasive procedures. As the procedure of micro-needling with ascorbic acid was well tolerated by the patients it can be repeated for re-pigmentation cases owing to better patient acceptance.

Few limitations of the present study, could be the small sample size and short term follow up. Future prospective studies with longer follow up evaluating the effect of multiple sessions of micro-needling with ascorbic acid can be advocated in order to compare it with other treatment modalities for gingival depigmentation.

CONCLUSION

The present study suggests, topical application of vitamin C post

micro-needling to be almost as effective as the conventional surgical scraping technique. Vitamin C outrivald scraping technique with reduction in VAS scores for pain and superior patient approval. However, the overall reduction in intensity in terms of locus and entirety were characteristic features of surgical scalpel scraping technique. With further studies this novel technique can serve as a definite regimen for recurrence of pigmentation that is observed in majority of the cases.

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