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Original Research Article

Evaluation of Diode Laser and Cryosurgery Technique for the Treatment of Gingival Hyperpigmentation

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Conflict of interest: Nil

Abstract:

Background and Objectives: Gingival health and color has an important role in the maintenance of the harmony of a smile. The objective was to compare the efficacy of cryosurgery with 1,1,1,2 Tetrafluroethane and Diode Laser for the treatment of gingival pigmentation.

Materials and Methods: The study was conducted for 20 patients with gingival pigmentation, wherein 10 patients were treated with using diode laser (980nm at 1W) (Group A) and other 10 patients were treated with the TFE cooled swab (Group B). Pre and post treatment photographs, VAS pain scores, were evaluated by the clinician at 1 week, 1month and 3 months.

Results: Clinically significant results were seen in both the groups. Mild erythema was seen immediately after the application of cryogen following which a whitish slough could be separated from the underlying connective tissue at fourth day. In group B, a white fibrin slough was seen 24hrs after the procedure. The healing was uneventful and complete epithelialization takes place in 3-4 weeks in both the groups. Though, the patient acceptance was good for both the procedures, mild pain and discomfort was experienced by the patient in group B.

Conclusion: Depigmentation of gingival melanin hyperpigmentation by cryosurgery using TFE and diode laser were found to be an effective procedures, however the patient compliance and acceptance was greater in Tetrafluoroethane cryosurgery when compared to the Diode laser.

Keywords: Cryosurgery, Laser, Depigmentation, Tetrafluroethane, Hyperpigmentation.

Introduction

Beauty and smile is like power and sword. A good smile is like facelift and mood enhancer. Number and size of blood vessels, keratinization, pigmentation and epithelium thickness determines the color of gingiva. The color of oral mucosa may be achieved by the pigments such as melanin (present in the basal and suprabasal layers of the gingival epithelium), carotene, reduced hemoglobin and oxyhaemoglobin [1,2,3].

Tyrosine enzyme synthesizes the active melanocytes in golgi body for the formation of pre-melanosomes [4]. This enzyme leads to oxidation of tyrosine via a number of intermediate products, including dihydroxyphenylalanine, resulting in the formation of dense pigment melanin, which forms homogeneous, opaque melanosomes [5,6]. Inoculation is the process by which premelanosomes are transferred by melanocytes to keratinocytes that plays an active phagocytic role [5,7,8]. In human gingival epithelium melanocyte: basal keratinocyte ratio (1:15) have been observed [9]. Melanin hyperpigmentation may be removed by Gingival depigmentation that include mechanical, surgical, electrosurgical, cryosurgical, free gingival grafts and lasers treatment modality. The commonly used lasers for gingival depigmentation are the diode (810 nm), CO2 lasers (10,600 nm), neodymium-doped yttrium aluminum garnet (YAG) lasers (1,064 nm) [10,11,12].

Gingival depigmentation using lasers requires melanocytes to lie within its range of penetration and to contain melanin to absorb and convert light energy into heat by photothermolysis [13]. Gingival repigmentation refers to the reappearance of

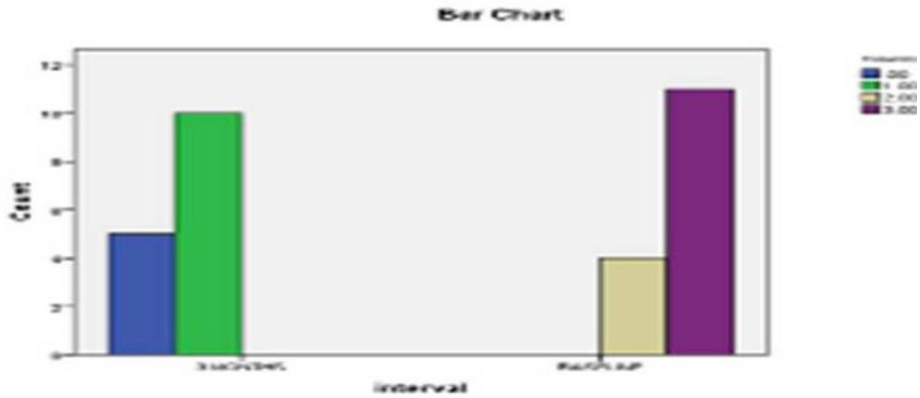
melanin pigmentation following a period during which clinically pigmented tissues were depigmented. It is a common concern in the treatment of gingival hyperpigmentation and starts with the migration of melanocytes from the adjacent gingiva. The extent and time interval of recurrence varies with regard to the treatment. Modalities used and the duration of follow-up. Repigmentation can be assessed clinically as well as histologically [14].

Based on this background, the aim of this study was to evaluate and compare the effects of the cryosurgery and diode laser techniques for gingival depigmentation.

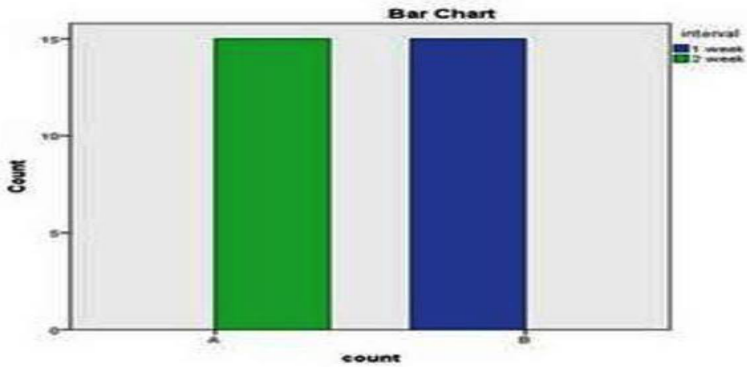
Materials and Methods

All patients were selected from the out-patient Government Dental College & Hospital, Paithna, Rahui, Nalanda, Bihar, India one year before. Patients who were concerned about their esthetics and with uniformly dense bands of bilateral physiologic with moderate to severe melanin hyperpigmentation of the gingiva as given by Dummett [3] were included in this study. Pregnant and lactating women, chronic smokers with systemic disease were excluded from the study.

After taking the written informed consent from the patients fulfilling the inclusion criteria, depigmentation procedure was performed using diode laser in maxillary anterior sextant and cryosurgery with TFE in mandibular anterior sextant. Both the surgical procedures were performed by single operator. The visual analogue score (VAS)for pain was recorded immediately and recorded regularly up to seven days post-operatively by asking the patient to mark on a line having scores 0 – 10.Change in color of pigmentation was recorded after one month and three months respectively (Graph 1), wound healing following for both the procedures was recorded using the wound healing index by one week and 2 weeks after the both procedure(Graph 2).



Graph 1:



Graph 2:

Group A (Diode Laser)

The pigmented area (Figure 1) to be treated was anaesthetized by the topical application of 2% lignocaine hydrochloride. The diode laser of wavelength 980nm was operated at 1W for the procedure. The fibre optic tip was kept in a continuous contact mode with the pigmented area and was moved in a light brushing stroke starting from the mucogingival junction working towards the free gingival margin, including the papillae.

The ablated tissue remnants were removed by the gauze soaked in saline. The procedure was repeated till the desired result had been achieved. The periodontal dressing was placed, and the antibiotics were not prescribed. The patient was prescribed Paracetamol tablet SOS .The patients were then examined at 3 subsequent visits, i.e., after 7 days, 1 month and 3 months (Figure 2).

Figure 1: Clinical view of Mucogingival junction

Figure 2: Clinical view of hyperpigmentation

Group B (Cryosurgery using 1,1,1,2 tetrafluroethane): Topical anesthesia with 2% lignocaine spray was applied following which the pigmented area (Figure 3) to be treated was isolated and air dried. The cotton swab of appropriate size was sprayed with 1.1.1.2 Tetrafluoroethane and was immediately rolled gently over the pigmented area maintaining a freezing zone continuously in each area for about 30-40s. The patients were examined at 7th day, 1 month and 3 months post-operatively for healing and recurrence of pigmentation (Figure 4).

Figure 3: post-operative appearance of the gingiva treated with the diode laser

Figure 4: Post-Operative appearance of the gingival treated with cryosurgery

Statistical Analysis: The results were statistically evaluated using SPSS Inc., (Released 2009 PASW Statistics for Windows, and Version 18.0. Chicago). The power of the study was 90%, and a $P < 0.05$ was considered statistically significant.

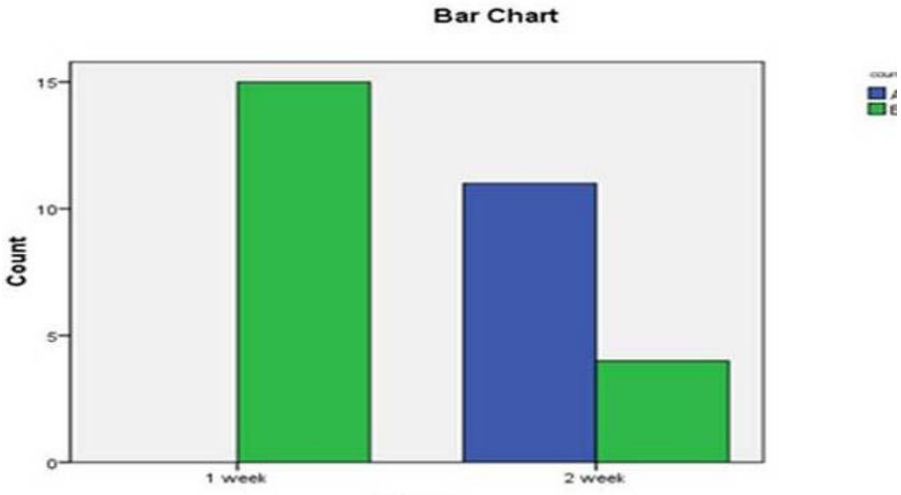
Results

Clinically significant results were seen in both the groups (A and B). Both TFE and 980nm diode laser effectively ablated the epithelial tissue exhibiting melanin pigmentation. Immediately after the procedure slight bleeding points were observed in Group A and mild erythema was seen in Group B. The mean VAS score for pain in both the groups A and B showed statistically significant findings. Patient experienced mild pain and discomfort in group A. There was no sign of recurrence on recall intervals (Figure 2 and Figure 4). On 7th day, the area treated with diode laser appeared to be inflamed with some patients complaining of mild pain. In Group B, a whitish slough following superficial necrosis was apparent. The mean VAS score for pain in group A and in the group B at 7th day postoperatively showed statistically significant result (P= 0.025) with patient experiencing more pain following treatment with laser.

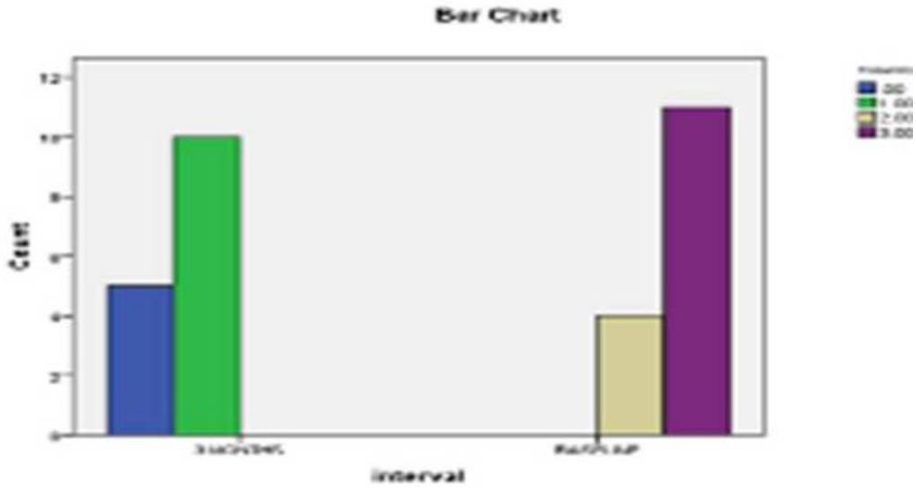
However none of the patients complained of major discomfort during the procedure in both the groups. After one week the gingiva irradiated with laser appeared reddish in color whereas the gingiva appeared normal within 1 week in Group B. After one month, complete healing was observed in both the cases with gingiva exhibiting normal appearance (Figure 4).

The wound healing was statistically significant (Graph 3, 4) in both the groups with gingiva showing normal pink color.

There were no signs of scar formation, hemorrhage, or infection in both the cases. Patient acceptance was good for both the procedures.



Graph 3:



Graph 4:

Discussion

The factors determining the color of gingiva include the depth of epithelization, intensity of melanogenesis, degree of epithelial cornification and the gingival vasculature. Various depigmentation techniques have been documented like cryosurgery, bur abrasion, scalpel, laser therapy, electrosurgery and free gingival auto grafts. The technique should be selected carefully based on clinical experience and individual preferences. Laser [16] and Cryosurgery are the recent advances being used for the various periodontal plastic procedures.

Though Laser ablation of the gingival pigmentation has been recognized as an effective, pleasant and reliable procedure, certain drawbacks of laser therapy includes thermal damage, delayed wound healing, deep penetration and the comparably high costs of the procedure. Studies by authors in which diode lasers were employed with a wavelength of 980nm, power of 2-4W, pulse intervals varying from 20 and 50 milliseconds no repigmentation was observed after 15 months and 1 year follow-ups. A wide range of oral and maxillofacial lesions has been treated with use of cryosurgery [17]. The use of extremely cold solutions was first reported by Dr. James Arnott (1851) who has been considered as the pioneer of cryosurgery. He had used a mixture of sodium chloride and ice to treat tumors. He had noticed that cold temperatures have beneficial anti-inflammatory and analgesic effects [18].

Cryosurgery with Tetrafluroethane has an edge over conventional scalpel technique and laser in terms of depth control (making use of time factor of maintaining the cryogen for 30-40 sec at the site) [19, 20]. In the healing phase, immediately after the cryosurgery procedure slight erythema develops. A whitish slough following the superficial necrosis could be separated from underlying connective tissue after 34 days leaving behind a pink clean ulcer bed. Within 1 week, the gingiva appears normal. The healing was uneventful with epithelialization being completed within 3-4 weeks. Immediately after removal of gingival pigmentation by laser, slight bleeding points were observed on the exposed gingival connective tissue.

Twenty four hours after the procedure, a white fibrin slough was seen. The epithelialization of epithelium starts at about 1 week showing immature healing. Complete healing with tissue maturation was observed at 1 month, wherein the gingiva appears normal. In the present study, comparable clinical results were found between both the groups. Patients experienced minimal pain following cryosurgery with TFE as compared to the laser. Hence, patient compliance was better following cryosurgery. In the study conducted by Singh et al. (2012) comparing the efficacy of TFE and diode laser, it was found that cryosurgical approach by TFE was less painful, caused less discomfort and hence was more acceptable as compared to laser [21].

In a case series done by Kumar S et al in 2013 with ten patients, comparing the efficacy of TFE and gingival abrasion technique for the treatment of gingival pigmentation, they found that the there were no signs of repigmentation with TFE [22]. Kumar et al in 2013 carried out a study (case series) with 5 patients.

They study the effectiveness of the TFE for gingival depigmenation. It was concluded that TFE can be used safely and efficiently for depigmentation procedures. It was found that TFE can destroy gingival epithelium effectively without causing any damage to the underlying connective tissue. Clinically, the results in respect to color, healing and longevity were more satisfactory [23, 24]. In the study conducted by Narayankar SD et al (2017) comparing the efficacy of TFE and surgical scalpel

technique, it was found that cryosurgical approach by TFE was less painful, caused less discomfort and hence was more acceptable as compared to surgical scalpel technique [21].

Conclusion

Depigmentation of gingival melanin hyperpigmentation by cryosurgery using TFE and diode laser were found to be an effective procedures, however the patient compliance and acceptance was greater in Tetrafluoroethane cryosurgery when compared to the Diode laser.

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