

A comparative evaluation of depigmentation techniques with electro-cautery and diode laser: A clinical comparative study

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Abstract

Introduction: There are several factors that determine the beauty of an individual’s smile. One of the most imperative but often overlooked factor is gingival aesthetics that could significantly enhance the smile and confidence of an individual. Gingival aesthetics is a decisive factor in smile design. Beauty of a smile mainly revolves around gingival zenith, but the colour of the gingiva can significantly influence the outcome of a smile design especially in individuals with high lip line and gummy smile. Since an array of treatment modalities are available for treating gingival

pigmentation here a comparative evaluation with two of the most widely used treatment option used currently are used in the current study: diode laser and electro-cautery. **Aim and objective:** To evaluate and compare the efficacy of two different treatment modalities of gingival depigmentation with laser and electro-cautery. To compare the change in gingival hyperpigmentation pre-operatively and post-operatively using comparative clinical photographs following treatment with laser and electro-cautery. To evaluate the clinical parameters with Dummett Oral Pigmentation (DOP) index, the patients comfort and experience following the gingival

depigmentation procedure with laser and electro-cautery in terms of pain perception using Visual analogue scale.

Material and method: Total number of 20 patients (10 patients each) diagnosed with gingival pigmentation, were randomized using the coin toss method into group A (DIODE laser) and group B (Electro-cautery). The clinical parameters- DOPI Index, Healing Response and subjective parameter- VAS scale were measured at baseline, 7th day, 6 months.

Results: Results showed that for gingival depigmentation using diode laser and electro-cautery results were statistically significant at baseline, 7days between group. For group A (Diode Laser) result was statistically significant at 6 months between group and insignificant for group B (Electro-cautery) at 6 months.

Conclusion-Lasers can be used as a safer and effective treatment modality to provide optimal aesthetics and enhanced comfort with lesser pain to the patients during the treatment for gingival hyperpigmentation. Further studies with a larger study samples and follow up period would be desirable with special concern on multiple laser sessions to reach a solid evidence based conclusion regarding which technique is better keeping in mind the effect of repigmentation.

Keywords: Gingival Hyperpigmentation, Hispanic ethnicity, Etiologic Factors.

Introduction

Smile expresses a feeling of joy, success, affection, courtesy and also reflects self- confidence. The harmony of a smile is not only determined by the shape, position and colour of the teeth, but also by the gingival tissue. Gingival health and appearance are essential components of an attractive smile.

An aesthetic smile does not only create an impact on the viewers but it also enhances the personality and self-

confidence of the individual. Various factors such as shape, colour, position of teeth and gingiva contribute to the composition of an aesthetic smile¹. Of these, the colour of gingiva plays an important role in the overall smile aesthetics. The gingival colour of normal healthy person is typically coral pink. The colour of gingiva is affected by some factors including the degree of keratinization, the thickness of epithelium, size of blood vessels and colour pigments within the epithelium. Melanin, carotene, reduced haemoglobin, oxyhemoglobin are the main pigments contributing to the normal colour of the oral mucosa. Normal colour of the gingiva is mainly due to the pigment called melanin produced by melanocytes which are present in the basal and supra-basal layer of the epithelium, and excessive melanocytic activity leads to hyperpigmentation. Gingival colour is not uniform and varies from person to person and it has been observed that hyperpigmentation is normally found in individuals of African, East Asian, or Hispanic ethnicity. Positive correlation of state that the pigmentation was more in the attached gingiva and interdental papilla. Oral pigmentation has been associated with a variety of endogenous and exogenous etiologic factors. Gingival hyperpigmentation can be physiological or pathological.

Demand for cosmetic therapy is made, especially by fair-skinned people with moderate or severe gingival pigmentation. Gingival depigmentation is a periodontal plastic surgical procedure whereby the gingival hyperpigmentation is removed or reduced by various techniques. The first and foremost indication for depigmentation is patient demand for improved aesthetics. Selection of the technique should be based on clinical experiences and individual preferences.

Different treatment modalities are available for the management of gingival hyperpigmentation that can be broadly classified into two categories: methods that remove pigments and methods that mask the pigment⁴. Removal of the pigments can be done by surgical and nonsurgical or chemical methods. Surgical methods mainly include conventional scalpel surgery. Nonsurgical method refers to chemical cauterization, laser ablation, electro-cautery, cryosurgery, radiosurgery. The methods that mask the gingival pigments include gingival grafting procedures and use of a cellular dermal matrix allograft etc. All these treatment modalities have their own advantages and disadvantages. Since an array of treatment modalities are available for treating gingival pigmentation here a comparative evaluation with two of the most widely used treatment option used currently are used in the current study: diode laser and electro-cautery.

To evaluate and compare the efficacy of two different treatment modalities of gingival depigmentation with laser and electro-cautery. To compare the change in gingival hyperpigmentation pre-operatively and post-operatively using comparative clinical photographs following treatment with laser and electro-cautery. To evaluate the clinical parameters with Dummett Oral Pigmentation (DOP) index, the patients comfort and experience following the gingival depigmentation procedure with laser and electro-cautery in terms of pain perception using Visual analogue scale.

Materials and Method

This study was conducted on the patients obtained from the outpatient department of Periodontics and Oral Implantology at Ahmedabad Dental College and Hospital, Ahmedabad, Gujarat. The present study compares the efficacy between diode laser and electro-

cautery for the treatment of gingival depigmentation in patients with complaint of “black gums” or in patients with gummy smile or excessive gingival display in the maxillary anterior region, were selected and followed up after 6 months.

20 patients (10 patients each) diagnosed with gingival pigmentation, were randomized using the coin toss method into group A (DIODE laser) and group B (Electro-cautery). The clinical parameters were measured at baseline, 7th day, 6 months. All the patients participating in the study were explained in detail about the procedures to be performed and written consent were taken from them. All the patients received initial scaling with oral hygiene instructions. Four weeks following the hygiene phase of therapy, patients were undergoing a re-evaluation examination during which time all the baseline scores were recorded. Pre-operative and Post-operative photographs were obtained from each participant following standardized protocol by single operator ensuring consistent lighting condition, camera settings, and patient positioning to accurately capture the clinical photographs. Additionally, all photographs were taken using the same camera model -MWC72KH/A to maintain consistency across the dataset.

Inclusion Criteria

1. Subjects with clinically healthy gingiva.
2. Subjects with score -4 (heavy pigmentation) as given by Dummett Gupta in 1964.
3. Subjects with 16-45 years of age and both sex male and female, with the complaint of “black gums”
4. Patients with gummy smile.
5. Patient with well- maintained oral hygiene and compliant on periodontal recall.

Exclusion Criteria

1. Patient suffering from systemic disease/condition known to cause oral pigmentation like Addison's disease, Albright's syndrome, Neurofibromatosis, Peutz Jeghers.
2. Pregnancy and Lactation
3. Patient who smokes.
4. Drugs like ACTH , Antimalarial drugs , Minocycline, Oral Contraceptives , Phenothiazines , Chemotherapeutic agents like busulfan and doxorubicin , chemicals like Silver , Mercury , Arsenic , Bismuth, Graphite some endogenous pigments like Billirubin , Hemosiderin , Hemochromatosis with potential to cause oral pigmentation.

Group A (Diode Laser)

The procedure was started with the application of topical anesthesia (lignocaine topical aerosol spray) and if required local infiltration was given. The fiber-optic laser tip at 1.8-2.5 Watt power in a continuous wave mode was kept in contact with the pigmented area and laser emitting done between the wavelengths of 810 and 940 nm. Depigmentation was performed with short light paint brush strokes in a horizontal direction to remove the epithelial lining. And lastly, periodontal dressing was given to minimize discomfort.

Group B (Electrocautery)

The procedure was started with the application of topical anesthesia (lignocaine topical aerosol spray) and if required local infiltration was given. The needle tip or loop electrode was used for the gingival depigmentation procedure. To accomplish depigmentation, the sides and tip of the electrode were used. The area was dabbed with gauze soaked in saline solution and the same procedure

was repeated till no pigments remained and periodontal dressing was given to minimize discomfort.

Postoperative Care

Patients will be prescribed suitable analgesics for post-operative pain management. All the patients were instructed to continue with good oral hygiene and avoid trauma around surgical site. Patients were instructed to avoid hot and spicy food for 24 hours. A periodontal dressing (Coe-Pak) was placed on the surgical wound area for patient comfort and to protect it for 1 week and was advised to use 0.12 % chlorhexidine gluconate mouthwash for 2 weeks postoperatively.

Parameters assessed: The Dummett- Gupta Oral Pigmentation Index (DOPI); Dummett CO, 1964 , Healing response/ Wound Healing , Postoperative Pain (Visual Analogue Scale), Wewers et al , 1990.

Case Figure

Group A



Fig.1: Pre-Operative



Fig. 2: Laser Application



Fig. 3: Immediate Post-Op



Fig. 4: 7 Days follow up



Fig. 5: 6 Months follow up



Fig. 6: Periodontal Dressing

Group B



Fig. 1: Pre-Operative



Fig. 2: Electro-cautery



Fig. 3: Immediate Post-Op



Fig. 4: 7 Days Follow up



Fig. 5: 6 months follow up



Fig. 6: Periodontal Dressing

Observation & Results

The present study was conducted with the aim to evaluate and compare the efficacy of two different treatment modality for gingival depigmentation with diode laser and electro-cautery. 20 patients with chief complain of aesthetic correction and black gums with 16-45 years of age and both sex male and females were

included in this study. 20 patients diagnosed with gingival pigmentation, were randomized using the coin toss method into group A (DIODE laser) and group B (Electro-cautery). Pigmentation was scored using the Dummett –Gupta oral pigmentation index at baseline, 7th day, 6 months. All the measurements were subjected to statistical analysis with the help of SPSS VERSION 20.0 software. No undesirable effects were noted and the treatment was tolerated by the patients. Statistical tests: Repeated Measure ANOVA, Bonferroni test, Un-paired t test, Chi square test

Table 1: Intergroup distribution between DIODE LASER and ELECTROCAUTERY Group using VAS score

Time period	Groups	Number	VAS score		P Value
			Mean	SD	
Baseline	Diode Laser	10	7.40	0.51	0.196**
	Electrocautery	10	7.70	0.48	
7 Days	Diode Laser	10	5.40	0.51	< 0.001*
	Electrocautery	10	7.10	0.73	
6 Month	Diode Laser	10	0.20	0.42	0.139 **
	Electrocautery	10	0.60	0.69	

Level of Significance $P \leq 0.05$, * Significant, ** Non Significant

Table 2: Intergroup distribution between DIODE LASER and ELECTROCAUTERY Group for Healing Index

Time period	Groups	Number	Healing Index		P Value
			Mean	SD	
Baseline	DIODE LASER	10	2.60	0.51	0.398**
	ELECTROCAUTERY	10	2.40	0.51	
7 Days	DIODE LASER	10	3.60	0.51	< 0.001*
	ELECTROCAUTERY	10	2.40	0.51	
6 Month	DIODE LASER	10	4.70	0.48	< 0.001*
	ELECTROCAUTERY	10	3.20	0.42	

Level of Significance $P \leq 0.05$, * Significant, ** Non Significant

Table 3: DOPI distribution

Time period	DOPI Score	Groups		P Value
		Diode Laser	Electrocautery	
Baseline	0	0	0	0.639**
	1	0	0	
	2	4	3	
	3	6	7	
7 Days	0	10	10	-
	1	0	0	
	2	0	0	
	3	0	0	
6 Month	0	6	4	0.638**
	1	3	5	
	2	1	1	
	3	0	0	
P Value		< 0.001*	< 0.001*	-

Level of Significance $P \leq 0.05$, * Significant, ** Non Significant

Discussion

Facial appearance depends on several oral and extra-oral factors. The gingiva is an important intraoral tissue which when affected particularly by pigmentation is mainly responsible for unpleasant appearance. The need and demand for aesthetics requires the removal of unsightly pigmented gingival areas to create a pleasant and confident smile, which altogether may alter the personality of an individual.

The degree of melanin pigmentation varies from one individual to another, which is mainly due to the melanoblastic activity. Gingival melanin pigmentation is symmetric and persistent which does not alter the normal gingival architecture. Also, gingival melanosis is frequently encountered among dark-skinned ethnic groups, as well as in medical conditions such as Addison's syndrome, Peutz-Jegher's syndrome, and Von Recklinghausen's disease (neurofibromatosis).

Gingival depigmentation is a periodontal plastic surgical procedure whereby the hyperpigmentation is removed or reduced by various techniques. Selection of the technique should be based on clinical experiences and individual preferences.

The present study conducted was a clinical study with the aim of comparing two different techniques of gingival depigmentation, diode laser ablation technique and gingival depigmentation using electro-cautery. All the patients were re-evaluated after 6 months. Gingival depigmentation was carried out in patients who were concerned about the aesthetics regarding appearance of black gums with the age range of 16-45years and both male and female were included in the study. All the patients were satisfied with the results. All 20 patients selected had moderate to heavy gingival pigmentation based on the (Dummett Oral Pigmentation Index).

In the present study 20 patients were selected with gingival pigmentation, and were randomized using the coin toss method into two groups - group A (DIODE laser) and group B (Electro-cautery). In a similar study done by GirishSuragimath, MohiniHemantLohana, and Siddhartha Varma in 2016 which was a split mouth randomized clinical comparative study were in they evaluated the efficacy of gingival depigmentation using scalpel or diode laser and divided the areas randomly by flip coin method. The clinical parameters were measured at baseline, 7 days and 6 months.

Many individual studies were conducted for gingival depigmentation using diode laser and electro-cautery. Few comparative studies have been done between diode laser and electro-cautery which have been mentioned and is taken as the reference in the present study for evaluating the efficacy between diode laser and electro-cautery for gingival depigmentation. Gingival hyperpigmentation is a major aesthetic concern for many people. Although it is not a medical problem, many people complain of dark gums as unesthetic. In this study the subjects were randomly selected using the coin toss method and had the chief complaint of dark gums. All 20 patients were divided into two groups group A consisted of depigmentation procedure using semiconductor Diode Laser and group B consisted of depigmentation procedure using electro-cautery. The subjective and objective clinical parameters which were considered in this study included DOPI index , smile line , VAS score , healing index and on the basis of this the parameters were recorded at baseline , 1 week , 6 months.

DUMMETT ET AL in 1964 did a study estimating the Epidemiology of Oral Pigmentation and they used the DOPI assessment as a clinical tool in estimating the

quantitative occurrence of pigmentation of gingiva. Studies attest to its usefulness as an epidemiological tool in estimating how widespread is oral pigmentation, and in comparing the amount of pigmentation occurring in the various oral tissues of maxillary and mandibular region. In the current study distribution of gingival pigmentation was based on the Dummett and Gupta classification as: 0- no pigmentation, 1 – mild pigmentation, 2-moderate pigmentation, 4-heavy pigmentation. In present study (Table .9) DOPI distribution shows statistically, significant difference was present in change of DOPI from baseline to 6 month time period in DIODE LASER Group. Statistically, significant difference was present in change of DOPI from baseline to 6 month time period in ELECTROCAUTERY Groups. Statistically, no significant difference was present in DOPI score between DIODE LASER Group and ELECTROCAUTERY Groups at baseline, 7 day and 6 month time period.

The post-operative experience of pain is a complex phenomenon, influenced by psychological, environmental and physical factors. VAS is a reliable method to assess pain in clinical settings when compared with the verbal rating scale. VAS scores are sensitive to treatment effects and data derived can be analysed using parametric statistical techniques. In the present study Visual Analog Scale (VAS) scores were recorded in patients of both groups at baseline, 7 days, 6 months. Mean VAS score was less in DIODE LASER Group (5.40 ± 0.51) than ELECTROCAUTERY Group (7.10 ± 0.73) at 7 day time period. Statistically, significant difference was present in VAS score between DIODE LASER Group and ELECTROCAUTERY Groups at 7 day time period.

Healing was checked using the Wound Healing Index scores of Landry et al, at 1 week and 6 months postoperatively. Gingival swelling, redness, pus, patient pain, granulation and suppuration all were taken into account while calculating the index. Mean Healing Index score was more in DIODE LASER Group (3.60 ± 0.51) than ELECTROCAUTERY Group (2.40 ± 0.51) at 7 day time period. Statistically, significant difference was present in Healing Index score between DIODE LASER Group and ELECTROCAUTERY Groups at 7 day time period. (Table 8). No significant differences were observed in the magnitude of change of healing index after 1 week and 6 month time period between the two treatment modalities and showing the same effectiveness. The only significant difference was present in healing index score between laser and electro-cautery group at 6 month time period. Patients in the laser group had better healing and epithelialization compared to the electro-cautery group. Amongst the total patients selected there were 2 dropouts and 2 patients in the electro-cautery group showed recurrence at 6 months.

Ponnaiyan et al observed that dark skinned individuals had heavy gingival pigmentation compared to the fair skinned individuals. These statements may be employed to the above findings even for repigmentation cases with different facial complexions, and the possible reason may be the rate of melanogenesis, which is genetically maintained and in dark complexioned patients as compared to light complexioned cases.

Conclusion

The growing aesthetic concern requires the removal of unsightly pigmented gingival areas to create a confident smile, which may alter the personality of the individual. Gingival depigmentation is a surgical procedure used to

remove or reduce excessive pigmentation. LASER has become a ray of hope in dentistry. Within the limitations of this study, it can be concluded that lasers can be used as a safer and effective treatment modality to provide optimal aesthetics and enhanced comfort with lesser pain to the patients during the treatment for gingival hyperpigmentation. Further studies with a larger study samples and follow up period would be desirable with special concern on multiple laser sessions to reach a solid evidence based conclusion regarding which technique is better keeping in mind the effect of repigmentation.

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