

Comparative Evaluation of Effectiveness of LASER with Electrosurgery for the Management of Gingival Hyperpigmentation

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ABSTRACT

Objectives: The aim of the present study was to determine the pain levels, area, and intensity of repigmentation after the gingival depigmentation procedure using Electrosurgery and LASER. **Study design:** A total of 36 patients in the age group 17-30 years, 20 males, and 16 females were selected. Patients were randomly selected and divided into two groups of 18 patients each: Those undergoing depigmentation with electrosurgery (Group I) and those by diode LASER (Group II). The intensity of pigmentation was assessed with DOPI and surface area was measured by cellophane sheet on graph paper both pre and post surgery. Postoperative pain was evaluated by (Visual Analogue Scale) VAS score at 24 hours and 1 week. **Results:** The intensity and surface area for repigmentation was significantly more for Electrosurgery group compared to LASER group. VAS score was significantly high for the Electrosurgery group than LASER group. **Conclusion:** LASER and electrosurgery have found to be effective treatment technique for gingival Depigmentation. LASER has found to be better in terms of repigmentation and postoperative pain.

KEYWORDS: LASER, Electrosurgery, Hyperpigmentation

INTRODUCTION

The harmony of the smile is determined not only by the shape & color of the teeth but also by the gingival scaffold. Gingival health and appearance are essential components of an attractive smile. The color of gingiva varies, from pale pink to deep bluish purple. Between these limits of normalcy, a large number of colour variations are observed, which depends primarily upon the vascular supply, the thickness of the epithelium, the degree of keratinization, and the presence of pigments within the epithelium. Frequently gingival hyperpigmentation is caused by excessive melanin deposition by melanocytes which reside in basal and suprabasal layer of epithelium and is transferred to basal cells where it is stored in the form of melanosomes.⁽¹⁾ The prevalence of melanin pigmentation in different population has been reported to vary between 0% to 89% with regards to ethnic factors and smoking habits.⁽²⁾ Individuals may become more conscious of such black or dark patches of pigmentation on gingiva, particularly if the hyperpigmentation is on the labial aspect of gingiva and visible during smile and speech.⁽³⁾ Therefore, such individual visits the dental clinic for its removal.

Gingival depigmentation is a part of periodontal therapy whereby the gingival hyperpigmentation is removed by

various techniques such as cryosurgery, gingivectomy, free gingival autograft, electrosurgery, chemical agents such as 90% phenol and 95% alcohol, abrasion with diamond bur and LASER each technique has its own advantages and disadvantages.⁽⁴⁾ Repigmentation after gingival depigmentation is an important point of which clinician should be aware.⁽⁵⁾ Reports of repigmentation are quite limited in literature. Patient discomfort and post-operative pain are common clinical events associated with many periodontal procedures. There has been less evidence in the literature comparing the levels of pain and discomfort.

The aim of this study was to determine the pain levels, area, and intensity of repigmentation during the gingival depigmentation procedure using electrosurgery and LASER

MATERIALS AND METHODS

This study was conducted at the Department of Periodontology and Oral Implantology, Sharad Pawar Dental College Sawangi (Meghe) Maharashtra (India), from June 2015 to April 2016. Inclusion criteria were: Wide, dense band of pigmentation, Esthetic conscious and systemically healthy patients. Exclusion criteria were: Acute periodontal abscesses, endodontic lesion, patients on relevant drugs, smokers, pregnant and lactating females, and systemic diseases associated with

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healing disturbances, e.g., diabetes and autoimmune diseases. All the patients were informed about the protocol and those who agreed to participate in the study were made to sign an informed consent. 36 patients in the age group 17-30 years, 20 males and 16 females were selected. Patients were randomly selected and divided into two groups of 18 patients each: Those undergoing depigmentation with Electrosurgery (Group I) and those by diode LASER (Group II).

Clinical parameters recording:

Assessment of intensity of Gingival pigmentation: Pre-operative and post-operative observations about the intensity of gingival pigmentation was made according to Dummett-Gupta Oral Pigmentation Index.

- 0 - No clinical pigmentation (pink gingiva)
- 1 - Mild clinical pigmentation (mild light brown color)
- 2 - Moderate clinical pigmentation (medium brown or mixed pink and brown color)
- 3 - Heavy clinical pigmentation (deep brown or bluish black color).

Assessment of area gingival pigmentation:

1. **Measuring the area of pigmentation:** It is done by using cellophane sheet & graph paper. Piece of cellophane sheet was kept on the facial aspect of gingiva and the pigmented area was drawn with the marker pen. Pigmented area was counted by keeping the marked cellophane sheet over the graph paper.(fig 1)(fig 2)



Fig 1: Marking the area of pigmentation on cellophane sheet

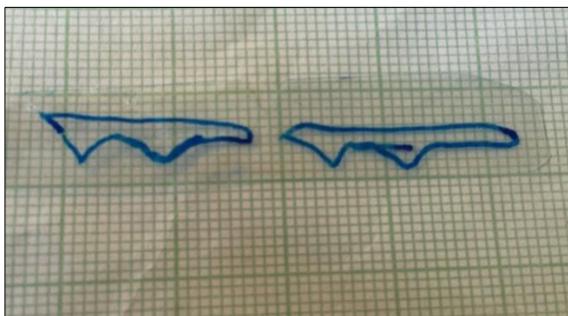


Fig 2: Measuring the area of pigmentation on graph paper

2. **Measuring percentage of repigmentation:**

- $A = \frac{n \times 100}{N}$

Where,

- A=Percentage area of repigmentation.
- N=area in number of squares preoperatively.
- n= Area in number of squares postoperatively

Assessment of pain:

Visual Analogue Scale: Was used to quantify pain levels and patient's discomfort. The VAS consisted of a horizontal line of 10 cm (100 mm) with two end-points representing 'no pain' and 'worst pain imaginable'. Patients are asked to rate their pain by placing a mark on the line corresponding to their current level of pain. The distance along the line from the 'no pain' marker is then measured with a ruler giving a pain score out of 10.

- 0: No pain
- 0.1-3: Slight pain
- 3.1-6: Moderate pain
- 6.1-10: Severe pain.

Group I consisted of electrosurgery procedure, in which 7 males and 11 females participated. Topical lignocaine hydrochloride anesthesia was applied in the surgical area. Loop and needle electrode with light brushing motion were used with moving the tip continuously.(fig 3) Prolonged application of the electrode was avoided as it cause undesired tissue destruction and care has been taken to not to involve periosteum or vital teeth. No periodontal dressing was placed. All the post operative instructions were given to the patient. No analgesics was prescribed.



Fig 3: De-epithelization by Laser

Group II consisted of LASER procedure, in which 13 males and 5 females participated. Topical lignocaine hydrochloride anesthesia was applied in the surgical area. Before starting the procedure patient and clinician were protected by LASER light by wearing protector spectacles. Reflective mirrored instruments were avoided as there could be a reflection of the LASER beam. A semiconductor diode LASER unit of wavelength 980 nm, in gated pulsed mode, was used. The tip was moved using interrupted brushing motion to prevent overheating of tissue.(fig 4) The saline soaked gauze was used to remove the epithelial remnants.No periodontal dressing was placed. All the post operative instructions were given to the patient. No analgesics was prescribed.



Fig 4: De-epithelization by Electrocautery

Patients were asked to define the level of pain by using the Visual analog scale (VAS). Subjects were asked to place a mark on 10 cm line at the location between no pain and severe pain. Pain level was evaluated after 24 hours and 1 week. Each patient provided single assessment sheet both the time so that patient could not refer to the previous VAS markings.

RESULTS

Mean Intensity of pigmentation preoperative by Dummetts oral pigmentation index for LASER group was 2.64 ± 0.49 and for Electrosurgery group 2.41 ± 0.61 . postoperatively it was 0.29 ± 0.19 for LASER group and 0.64 ± 0.41 (Table 1). Area of repigmentation for LASER group was $2.70 \pm 1.82 \text{ mm}^2$ and for Electrosurgery group it was $29.05 \pm 17.39 \text{ mm}^2$. Mean VAS score at 24 hours was 0.81 ± 0.24 for LASER group and for Electrosurgery it was 1.64 ± 0.57 . Mean VAS score at 1 week was 0.04 ± 0.09 for LASER group and 0.49 ± 0.35 for Electrosurgery group. The intensity and surface area for repigmentation was significantly more for Electrosurgery group compared to LASER group. VAS score was significantly high for the Electrosurgery group than LASER group.

Parameters	LASER	Electrosurgery	p value
Intensity of pigmentation preoperative by DOPI	2.64 ± 0.49	2.41 ± 0.61	0.26 (NS)
Intensity of pigmentation postoperative by DOPI	0.29 ± 0.19	0.64 ± 0.41	0.009 (S)
Area of pigmentation pre-operatively	178.88 ± 38.79	169.64 ± 42.65	0.42 (NS)
Area of repigmentation post-operatively	$2.70 \pm 1.82 \text{ m}^2$	$29.05 \pm 17.39 \text{ m}^2$	<0.001(S)
Mean VAS score at 24 hrs	0.81 ± 0.24	1.64 ± 0.57	<0.001(S)
Mean VAS score 1 week	0.04 ± 0.09	0.49 ± 0.35	<0.001(S)

Table 1

DISCUSSION

The demands for dental cosmetic treatments are increasing gingival depigmentation is one of the cosmetic demand by the patients. Clinicians have tried to remove melanin hyperpigmentation by various methods. Chemical methods such as 90% phenol and 95% alcohol

have been used in combination however this methods are quite harmful to oral tissues.⁶ Surgical blade has been used for depigmentation; however, this method is associated with alveolar bone loss, delayed healing by secondary intention, and excessive pain.⁷ Cryosurgery depigmentation is another option. But this method requires skillful clinician to manage the complicated technique and instruments.⁸ Free gingival graft surgery is another option to remove the hyperpigmented areas; but, this requires an additional surgical site and colour matching.⁹ Therefore in our method two simplest methods of depigmentation LASER and electrosurgery have compared. In the present study the intensity & area of repigmentation was assessed with DOPI after 1 year. Area of repigmentation was assessed with cellophane sheet. The exact mechanism of repigmentation is unclear but "migration theory" seems to be favored.¹⁰ Repigmentation after depigmentation has been reported following both the techniques. The mechanism of repigmentation is not understood, but according to the migration theory, active melanocytes from the adjacent pigmented tissues migrate to treated areas, causing repigmentation.¹¹ There is significantly more area & intensity of repigmentation following electrosurgery. Also the VAS Score for electrosurgery group was significantly more than LASER at 24 hours & 1 week following surgery.

An electrosurgical unit was used for the procedure, which is used upon the biterminal principle that grounds the patient in the circuit. According to Oringer's "Exploding cell theory," it is predicated that electrical energy leads to the molecular disintegration of melanin cells of the operated and surrounding sites. electrosurgery has a strong influence in retarding migration of melanin cells. Electrosurgery do not offers absorption of specific cells and is unable to control the depth and results in undue necrosis of the treated tissue. These high temperatures causes a depth of necrosis of more than $500 \mu\text{m}$; therefore, it is a significant disadvantage to use of electrosurgical techniques for tissue ablation.¹² Electrosurgery has its own limitation in that its continuous and prolonged use induces heat accumulation and undesired tissue destruction that may be the reason for increased pain in Electrosurgery group. However, the usual mechanism of diode LASER that lead to ablation or decomposition of biological materials are photochemical, thermal or plasma mediated. The temperature at surgical site, the soft tissues are subjected to warming (37 to 60°C) & protein denaturation and coagulation ($>60^\circ\text{C}$), vaporization (100 to 150°C) The rapid rise in intracellular temperature leads to cell rupture, as well as release of vapor and cellular debris termed the LASER plume.⁽²⁾ Moreover LASER group shows significantly less pain postoperatively it has been theorized by the fact that the protein coagulam formed on the wound surface, serves as a biological wound dressing and seals the end sensory nerves.⁽¹³⁾ Moritz et al showed in an in vitro and in vivo study the bactericidal effect of diode LASER.¹³

CONCLUSION

Both LASER and electrosurgery has found to be effective treatment technique for gingival Depigmentation. LASER has found to be better in terms of repigmentation and postoperative pain. Although both the methods required technical expertise and have a advantage of minimal bleeding. Also, high cost of LASER must be taken in to consideration. Thus, with the present study, it can be concluded that both the techniques provides comparable results in the follow up time of 1 year.

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