

Cyanoacrylate Vs Vitamin E Application after Laser Depigmentation: A Clinical Study.

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Abstract

Aim: To evaluate the clinical efficacy of Cyanoacrylate and Vitamin E application on healing after laser depigmentation procedure.

Materials And Methods: Subjects having gingival melanin hyperpigmentation in maxillary and/or mandibular arches were selected as a part of split mouth study. Depigmentation procedure was performed using diode laser. Cyanoacrylate was applied on right side of the arches and vitamin E was applied on left side of the arches. Subjects were instructed to apply Vitamin E capsule on left side of the operated site thrice daily for three days. Subjects were recalled 1 week and 2 weeks post-operatively and Healing Index and Visual Analog Scale for pain and discomfort were recorded.

Results: There was a statistically significant reduction in VAS scores for pain and discomfort and improvement in healing in both groups. Subjects in Cyanoacrylate group showed better healing. However, VAS scores were better for vitamin E group.

Conclusion: Subjects having gingival melanin hyperpigmentation would show faster healing with laser depigmentation followed by use of Cyanoacrylate application. However, further long term studies with larger sample size are required to reach a definitive conclusion.

Keywords: Cyanoacrylate, gingival hyperpigmentation, Vitamin E.

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I. Introduction

The individual's ability to exhibit a pleasing smile directly depends upon the quality of the dental and gingival elements that it contains, their conformity to the rules of structural beauty, the relations existing between the teeth and lips during smile and its harmonious integration in the facial composition. Melanin hyper-pigmented gingiva is an esthetic problem in many individuals, particularly if the hyper pigmentation is on the facial aspect of gingiva and visible during speech and mastication especially in patients with gummy smiles. Today's growing esthetic concerns among the patients require the removal of unsightly pigmented gingival areas to create an esthetically-pleasant-smile. A large number of parameters like the patient's skin color, the extent of gingival pigmentation, lip line, upper lip curvature and the esthetic concerns of the patient and his/her expectations from the treatment, play an important role in orchestrating the treatment plan¹. Melanin pigmentation is the result of melanin granules produced by melanoblasts present at the basal layer of gingival epithelium. Gingiva is the most commonly affected site, followed by buccal mucosa, lips, palate, and tongue. Melanin pigmentation of gingiva is generally symmetric and it does not alter normal gingival architecture². (Fig. 1)

II. Classification Of Gingival Pigmentation

Gingival pigmentation can be classified according to melanin index categories³.

Class 0: No pigmentation.

Class 1: Solitary unit(s) of pigmentation in papillary gingiva without extension between neighboring solitary units.

Class 2: Formation of continuous ribbon extending from neighboring solitary units.

Smile line⁴

Analyzed by Liebart's classification:

Class L: Very High Smile Line – >2 Mm Of The Marginal Gingiva Is Visible Or > 2 Mm Apical To The Cej Is Visible.

Class 2: High Smile Line – Between 0 - 2 Mm Of Marginal Gingiva Is Visible Or Between 0 And 2 Mm Apical To The Cej Is Visible.

Class 3: Average Smile Line - Only gingival embrasures are visible.

Class 4: Low Smile Line - Gingival embrasures and CEJ are not visible.

III. Depigmentation Procedures

Roshni & Nandakumar in 2005 classified different gingival⁵ depigmentation methods as:

I. Methods aimed at removing the pigmented gingiva:

A. Surgical methods:

1. Scalpel surgical technique,
2. Bur abrasion method,
3. Electrosurgery,
4. Cryosurgery,
5. Lasers,
6. Radiosurgery.

B. Chemical methods.

II. Methods aimed at masking the pigmented gingiva:

1. Free gingival graft.
2. Acellular dermal matrix allograft.

IV. Scalpel Surgical Technique

This technique was first illustrated by Dummet and Bolden in 1963⁶. In this technique, after achieving adequate local anesthesia, the pigmented gingival epithelium along with a layer of the underlying connective tissue is surgically removed by splitting the epithelium with B.P blade no: 15 & 11. Due care is taken to not to leave any pigmented remnants over the denuded area. After adequate hemostasis, periodontal pack is placed. Healing is generally uneventful and complete epithelial healing is achieved in 7 to 14 days. Scalpel surgical technique is highly recommended in consideration of the equipment constrains in developing countries. It is simple, easy to perform, cost effective and above all with minimum discomfort and esthetically acceptable to patient. This technique is contraindicated in thin gingival areas, as removal of pigmented gingival epithelium may lead to gingival recession.

V. Laser

The diode laser, with a wavelength of 655nm and 980nm, does not interact with dental hard tissues. It is used for cutting and coagulating soft tissue, and has been proposed for sulcular debridement and curettage. Recent studies reported short-term microbiological effects with the use of diode laser therapy, as well as its acceptance by patients and overall safety. Depigmentation was performed with short light paint brush strokes in non-contact mode in horizontal direction to remove epithelial lining. The surgical site was wiped with gauze soaked in saline solution and the procedure was repeated till no pigments remained. Following the procedure, cyanoacrylate and vitamin E was applied on left and right side of arches respectively.

VI. Electrosurgery

Electro-surgery is the use of high frequency (50 kHz) electrical energy in the radio transmission frequency band, which is applied directly to tissue to induce histological effects. The first documented case report using electrosurgery for de-pigmentation was by Ginwalla et al in 1966⁷. The radio waves created by the device travel from the electrode tip to the patient and are returned to the device via an indifferent plate antenna placed under the patient's body in the vicinity of the surgical site. As the current passes, the impedance to the passage of current through the tissue generates heat, which boils the tissue water, creating steam, resulting in either cutting or coagulation of tissue.

Three patterns of current flow are produced, which are:

1. Fully rectified, filtered, used mainly for incision (90% cut and 10% coagulate).
2. Fully rectified, used mainly for the excision of epidermal growths (50% cut and 50% coagulate).
3. Partially rectified, used mainly for hemostasis or coagulating vascular lesions (90% coagulate and 10% cut).

After achieving local anesthesia, the desired diamond loop electrode is fixed to the hand-piece. The hand-piece is held in a pen-like fashion and the tip of the electrode is swiftly moved over the pigmented tissue to be excised. Electrode is used in a light brushing stroke and the tip is kept in motion all the time. The contact time of the tip of the electrode with the tissue should be very brief. Always keep the tip moving, as keeping the tip in one place could lead to excessive heat build up (lateral-heat accumulation) and destruction of the tissues.

After each use, the tip of the electrode is wiped on the rough surface of the saline-soaked gauze to remove all debris. Electro-surgery requires more expertise than scalpel surgery. Prolonged or repeated application of current to tissue induces heat accumulation and undesired tissue destruction. Contact with periosteum or alveolar bone and vital teeth should be avoided⁸. This technique is uncomfortable to patients due to foul odor and the use of high-speed suction is mandatory. Contraindications to this technique include patients with cardiac pacemakers, and history of recent active episode of herpes simplex infection.

VII. Cyanoacrylate

1. Cyanoacrylates are tissue-adhesive materials that were synthesized in 1959 by Coover et al.
2. Properties of cyanoacrylate:-
3. Tissue healing
4. Less post-operative pain
5. Hemostasis
6. Workable polymerization time
7. Wound healing
8. Elimination of dead space
9. Biodegradability
10. Strong bonding

Vitamin E refers to a group of compounds that includes both tocopherols and tocotrienols.

Properties of vitamin E :-

1. Antioxidant
2. Prevents oxidation of poly unsaturated fatty acids
3. Protects lipids
4. Inhibition of platelet coagulation
5. Neurological functions
6. Gene expression
7. Enzymatic activities
8. Good healing capacity

Literature documents use of lasers for treatment of hyperpigmented gingiva. Studies have shown good post-operative healing on application of vitamin E and cyanoacrylate dressing individually on oral tissues. However, till date, to the best of authors' knowledge, this is the first study that has directly compared healing by cyanoacrylate dressing and vitamin E application after laser depigmentation techniques.

VIII. Aim of The Study

To evaluate the clinical efficacy of cyanoacrylate and vitamin E application on healing after laser depigmentation procedure.

IX. Objectives

1. To assess the healing and the degree of post-operative pain and discomfort experienced by individuals on cyanoacrylate application after laser depigmentation procedure.
2. To assess the healing and the degree of post-operative pain and discomfort experienced by individuals on vitamin E application after laser depigmentation procedure.
3. To compare the healing and the degree of post-operative pain and discomfort experienced by individuals on cyanoacrylate and vitamin E application after laser depigmentation procedure.

X. Materials And Methods

Subjects for the study were selected from the Out Patient Department, Department of Periodontology. Subjects of 20-50 years of either sex, subjects having gingival melanin hyperpigmentation in maxillary and/or mandibular arches, systemically healthy and cooperative subjects were included in the study. Smokers and tobacco chewers, pregnant or lactating women or women taking oral contraceptives, subjects undergoing orthodontic therapy, subjects with a history of use of medications or nutritional supplements in the past six months, subjects with known allergy to the components of the bio-adhesive material being used were excluded from the study. (Fig. 2, 3,4)Thirteen contralateral sites with gingival melanin hyperpigmentation were selected for the study. A signed informed consent form was obtained from all the participants. A detailed case history was recorded. Laser depigmentation was performed under local anaesthesia (using a diode laser of 810nm wavelength).

Group A : Cynoacrylate dressing was applied (left side of arches)

Group B: Vitamin E was applied (right side of arches).

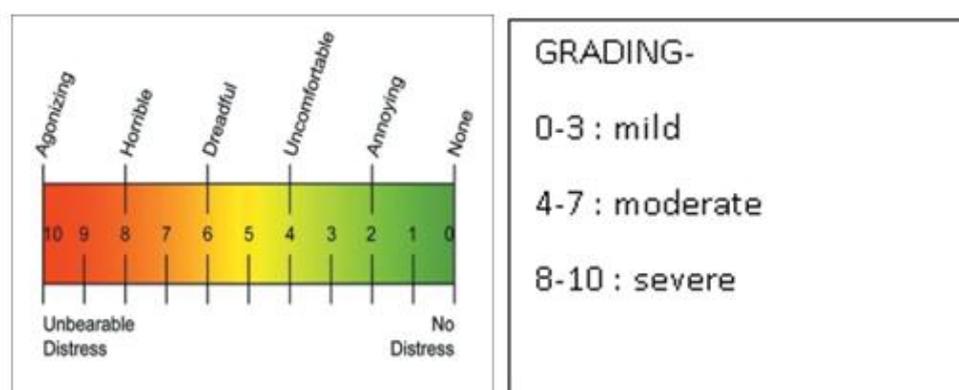
The subjects were asked to separately rate the degree of post-operative pain and discomfort on a 10-cm horizontal visual analogue scale (VAS) on post-operative 1 week and 2 weeks.

Assessment Of Clinical Parameters (at post-operative 1 week and 2 weeks)

1. Visual analog scale (VAS) ratings for pain
2. Visual analog scale (VAS) ratings for discomfort
3. Healing index (Landry, Turnbull and Howley, 1988).

XI. Method Of Scoring

The subjects were asked to separately rate the degree of pain and postoperative functional complications (discomfort during chewing and speech), on a 10-cm horizontal **Visual analogue scale (VAS)** on postoperative- 1 week and 2 weeks.



Healing Index (Landry, Turnbull And Howley, 1988)

Healing Index 1 - Very Poor:

Has 2 or more of the following:

- (1) tissue color: $\geq 50\%$ of gingiva red
- (2) response to palpation: bleeding
- (3) granulation tissue: present
- (4) incision margin: not epithelialized, with loss of epithelium beyond incision margin
- (5) suppuration present

Healing Index 2 – Poor:

- (1) tissue color: $\geq 50\%$ of gingiva red
- (2) response to palpation: bleeding
- (3) granulation tissue: present
- (4) incision margin: not epithelialized, with connective tissue exposed

Healing Index 3 – Good:

- (1) tissue color: $\geq 25\%$ and $< 50\%$ of gingiva red
- (2) response to palpation: no bleeding
- (3) granulation tissue: none
- (4) incision margin: no connective tissue exposed

Healing Index 4 - Very Good:

- (1) tissue color: $< 25\%$ of gingiva red
- (2) response to palpation: no bleeding
- (3) granulation tissue: none
- (4) incision margin: no connective tissue exposed

Healing Index 5 – Excellent:

- (1) tissue color: all tissues pink
- (2) response to palpation: no bleeding
- (3) granulation tissue: none
- (4) incision margin: no connective tissue exposed

XII. Statistical Analysis

Descriptive statistics were expressed as means and standard deviations for each group. Within group comparison for the parametric study variables was analyzed using Paired t test. Between group comparisons for the parametric study variables were analyzed using One way ANOVA test. Post hoc comparison was done using Bonferroni correction. The non-parametric variables were analyzed using Kruskal Wallis ANOVA and Mann-Whitney U test. In the above tests, p value less than or equal to 0.05 ($p \leq 0.05$) was taken as statistically significant. All analyses were performed using SPSS software version 17.

XIII. Results

There was a statistical significant reduction in Visual Analog Scale scores for pain and discomfort and improvement in healing in both the groups. Subjects in Cyanoacrylate group showed better healing as compared to subjects in vitamin E group. However, the VAS scores were better for vitamin E group.

Tables

Table no.1: Age distribution of the study participants

	Mean	SD
Age (in years)	28.60	6.48

Table no.2: Gender distribution of the study participants

	Number	Percentage
Males	6	60
Females	4	40

Table no.3: Intergroup comparison of the healing index scores among the two groups

Healing index score	At 1 week (mean ± SD)	At 2weeks (mean ± SD)
Cyanoacrylate group	2.80 ± 0.42	3.80 ± 0.42
Vitamin E group	2.50 ± 0.53	3.50 ± 0.53
P value (unpaired t test)	0.177	0.177

Table no.4: Change in VAS scores (for pain) among the two groups

VAS score	Baseline (mean ± SD)	1 week (mean ± SD)	2weeks (mean ± SD)	P value (Repeated measures ANOVA)
Cyanoacrylate group	3.60 ± 1.07	2.40 ± 1.07	1.10 ± 1.10	<0.001*
Vitamin E group	3.20 ± 0.79	1.80 ± 0.92	0.50 ± 0.71	<0.001*

* $p \leq 0.05$ is statistically significant

Table no.5: Intergroup comparison of the change in VAS scores (for pain).

Change in VAS score	Cyanoacrylate group	Vitamin E group	P value (unpaired t test)
At 1 week	1.20 ± 0.42	1.40 ± 0.52	0.355
At 2 weeks	2.50 ± 0.71	2.70 ± 0.48	0.470

Table no.6: Change in VAS scores (for discomfort) among the two groups

VAS score	Baseline (mean ± SD)	1 week (mean ± SD)	2weeks (mean ± SD)	P value (Repeated measures ANOVA)
Cyanoacrylate group	3.90 ± 1.45	2.60 ± 0.97	0.70 ± 0.67	<0.001*
Vitamin E group	3.70 ± 0.82	2.20 ± 0.92	0.50 ± 0.71	<0.001*

* $p \leq 0.05$ is statistically significant

Table no.7: Intergroup comparison of the change in VAS scores (for discomfort).

Change in VAS score	Cyanoacrylate group	Vitamin E group	P value (unpaired t test)
At 1 week	1.30 ± 0.82	1.50 ± 0.71	0.567
At 2 weeks	3.20 ± 1.23	3.20 ± 0.42	1.000

* $p \leq 0.05$ is statistically significant

XIV. Discussion

Cyanoacrylate dressing formed a protective layer over the surgical site which aided in faster healing. Repeated applications of vitamin E also showed significant improvement in healing with better VAS scores. There are studies which have concluded that cyanoacrylate and vitamin E promote wound healing without complications. However, till date, to the best of authors' knowledge, there has been no study that has directly compared healing by cyanoacrylate dressing and vitamin E application after laser depigmentation techniques.

XV. Conclusion

The present study showed that subjects having gingival melanin hyperpigmentation would show faster healing with laser depigmentation followed by the use of Cyanoacrylate dressing as compared to vitamin E application. While, the patient acceptability for vitamin E was better in terms of reduced pain and discomfort. However, there is scope for RCT (Randomized Controlled Trial) to be done.

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Fig. 1

Armamentarium



Diode Laser Unit

Fig. 2

SURGICAL PROCEDURE



Pre-operative view



Administration of local anaesthesia



Depigmentation by laser



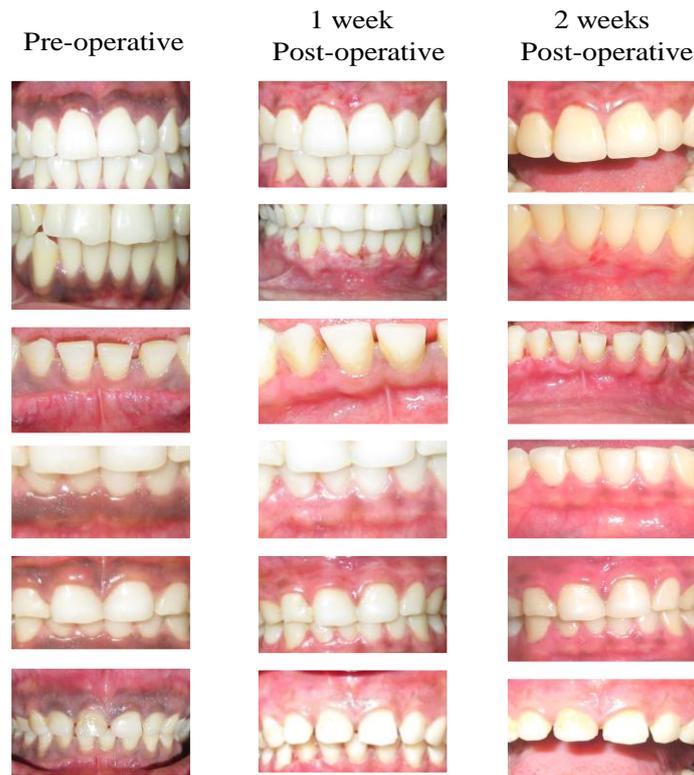
Immediate post-operative view

Fig. 3

LASER DEPIGMENTATION PROCEDURE



Fig. 4



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