ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

*International Journal of Dental Science and Innovative Research (IJDSIR)*

*IJDSIR : Dental Publication Service*

*Available Online at: www.ijdsir.com*

*Volume – 4, Issue – 4, July - 2021, Page No. : 89 - 96*

# Gingival ceramic trimmer-a wonder device to eliminate gingival hyperpigmentation (for gingival depigmentation) in comparison to laser

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**Citation of this Article:** Goldar Kabyik, Agarwal Swati, Bharali Jharna, Agarwal Tanya, "Gingival ceramic trimmer-a wonder device to eliminate gingival hyperpigmentation (for gingival depigmentation) in comparison to laser", IJDSIR- July - 2021, Vol. – 4, Issue - 4, P. No. 89 – 96.



**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

## Abstract

**Background:** Cosmetic desires have improved with time and currently aesthetics have become the major concern. Hyper pigmented gingiva imparts a pessimistic role within the smile corridor. Several techniques such as scalpel, electro surgery, cryosurgery, chemical agents, abrasion, and Laser were used in the past for depigmentation.

**Aim:** To evaluate and compare the efficacy of diode Laser and Ceramic Trimmer for gingival depigmentation.

**Methods:** 15 subjects who satisfied the eligibility criteria were recruited and a preformed proforma was used for recording the details and written consent was obtained. Clinical intervention was done as per the group and the outcome was evaluated as follows- Pain Index at- 1st, 3rd, 7th and 15th day. Healing Index at- $7^{th}$, $15^{th}$ and $30^{th}$ day. Pigmentation index at- $6^{th}$ month and 1 year.

**Results:** Both the treatment modalities responded well in terms of pain and healing index and there was no statistically significant difference between the two groups. However, there were statistically significant intra-group scores, which states that both the procedures provided good result compared to their respective baseline scores. On follow-up, it was seen that Ceramic Trimmer groups showed early pigmentation at $6^{th}$ month, however at $1^{st}$ year it was on the upper edge.

**Conclusion:** The result of this study as well as from patient's acceptance, it can be concluded that Ceramic Trimmer offered consistent and superior results as compared to Laser and can be considered as an alternatively to the expensive device Laser for gingival depigmentation.

**Keywords:** Pigmentation, Gingival Ceramic Trimmer, Laser, Pain and healing index

**Introduction**

Smile is the mirror of our emotions. Currently, in the modern world not only in the young age group but also amongst adults there is always a demand for an assertive smile. The shape, position and colour of the teeth not only amplify an esthetic smile but also the gingival tissues.[1] Gingiva may present with blackish discolouration due to increased melanin content. Within the basal and supra-basal cell layers of the epithelium, the melanocytes secrete the melanin. They form a direct union with 30 to 40 keratinocytes via their dendrites through which melanin is transferred into the keratinocytes.[2] The degree of pigmentation depends on the activity of melanocytes as well as on other factors such as genetics, systemic conditions (Albright's syndrome, Malignant melanoma, Peutz-Jeghers syndrome etc.), heavy metals, medications, endocrine secretions, smoking etc.[3] Although, hyper-pigmented gingiva is not a pathological condition, but still some patients complain of 'black unesthetic gums'.[4]

Amidst the oral tissues, gingiva is found commonly affected by pigmentation. Literature reveals that most common pigmented site is attached gingiva (27.5%) followed by the papillary gingiva, marginal gingiva and the alveolar mucosa. Approximately, about 16 times more melanophores are found in attached gingiva than in free gingiva.[5]

Enlisted within periodontal plastic surgical procedure (perio-esthetics), depigmentation is performed to remove hyperpigmentated gingiva by various techniques.[6] Many treatment modalities such as gingivectomy, electro surgery, cryosurgery, usage of chemical agents, abrasion with diamond burs, Lasers and lately Ceramic Trimmer have been used for this purpose.[7]

Initially, Ceramic Trimming burs were introduced in dentistry for gingivoplasty but recently, it is used for gingival depigmentation as well. These trimmers are made up of mixed ceramic composed of Zircon-dioxide partly stabilized by Yttrium and Aluminium ceramic. It provides a nice and gentle cut while the heat developed creates a good haemostasis, minimal bleeding and the risk of necrosis is virtually eliminated.[8]

Gingival depigmentation by Laser has been recognized as one of the most effective, pleasant and reliable technique. Diode Laser, a solid state semiconductor, uses a combination of Gallium (Ga), Arsenide (Ar) and other elements such as Aluminium (Al) to change electrical energy into light energy. Diode Lasers ablate and destroys the melanin containing cells by generating a wavelength that is specifically absorbed by them without damaging other non-pigmented cells.

The present study was planned to evaluate and compare the effectiveness of Gingival Depigmentation using Ceramic Trimmer & Laser.

**Materials and Methods**

The present study was undertaken to evaluate and compare the efficacy of Laser and gingival Ceramic Trimmer on gingival depigmentation. A randomized controlled clinical study was planned and after approval from the ethical committee on Human and Animal studies, Kothiwal Dental College and Research Centre, Moradabad, the study was begun.

(**KDCRC/IERB/10/2018/24**)

Sample size of 15 patients each group (aged from 18-30 years) was calculated based on the results of pilot study.

They were selected from the outpatient department of Department of Periodontology, Kothiwal Dental College and Research Centre, Moradabad, with chief complaint of 'Black Gingiva' on the facial aspect of anterior tooth region with uniformly dense bands of bilateral gingival hyperpigmentation, score->1 (according to Takashi et al Pigmentation Index 2005)[9] were included for the study. The subjects were included or eliminated from the study on the basis of following inclusion and exclusion criteria and informed consent was taken from them. Clinical intervention was then done and the outcomes were evaluated as-

1 Pain Index at- 1st, 3rd, 7th and 15th day (Visual Analogue Scale 1990)[10]
2 Healing Index at- 7th, 15th, and 30th day (Landry, Turnbull and Howley, 1988)[11]
3 Pigmentation index at- 6th month and 1 year (Takashi et al, 2005)[9]

**Procedures**

**Depigmentation by Diode Laser**

After giving local anesthesia melanin pigmentation was ablated by Gallium- Aluminium- Arsenide (GaAlAs) diode Laser device (Fona$^{TM}$, Sirona Dental System, Germany) with a continuous wavelength of 970nm and output power of 1W in contact mode (Fig1). From the mucogingival junction Laser ablation was started and moved towards the marginal gingival, including papilla in contact mode with light brushing stokes in the cervico apical direction. Remnants of the ablated tissues were removed using sterile gauze moistened with saline solution. This procedure was repeated until the pigmented epithelium was completely removed.

**Depigmentation by using Gingival Ceramic Trimmer**

The Ceramic Trimmer (Fig 2) was used on the pigmented gingiva using high speed rotary instrument (operated at 3, 00,000- 4,50,000 rpm, gently in intermittent mode). After adequate local anesthesia, it was used without coolant so that the heat generated during rotation would lead to thermal coagulation. Therefore, the procedure was carried out with minimum bleeding. Pressure was minimum with feather light brushing strokes without holding the bur in one place for too long to avoid pitting of the gingival surface or to remove too many tissues. Care was taken to remove all the remnants of melanin pigmentation as thorough as possible.

In both the cases, following surgery, the surgical site was covered with Periodontal Pak (Coe-Pak$^{TM}$, GC America INC., ALSIP, IL 60803 U.S.A). Post-surgery, mechanical oral hygiene maintenance was avoided for 1 week at the surgical site. Oral hygiene was maintained by using 0.2% Chlorhexidine mouthwash.

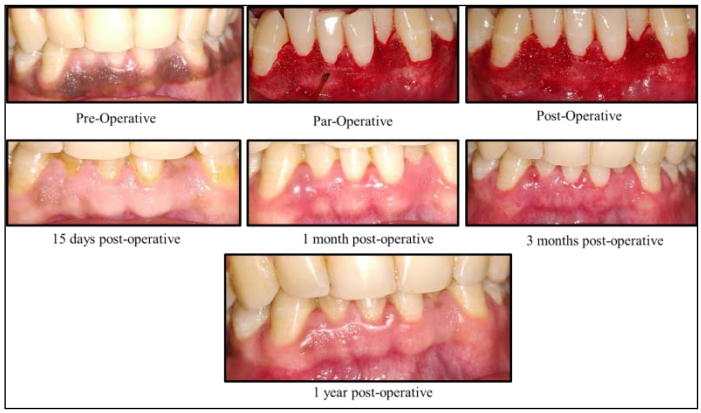



Figure 1: Depigmentation by Diode Laser

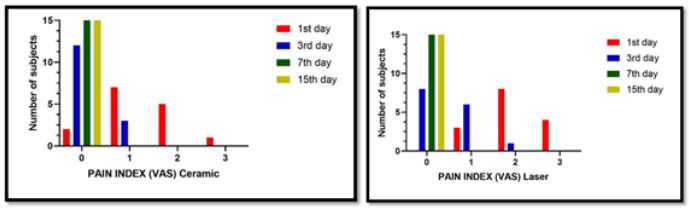

Figure 2: Depigmentation by Ceramic Trimmer

**Result**

After completion of the study, statistical evaluation was done by Chi-squared test and Fisher's exact test for

categorical data. 'p' value less than 0.05 was considered as statistically significant. Statistical analysis was performed by using GraphPad Prism Software version 8.0e.

1. In terms of pain index (VAS, 1990)[10] which was done at 1st, 3rd, 7th and 15th day post-operatively, there were significant statistical difference (p value= <0.0001) in the intra group comparison (both in Group A and B) (Chart 1). But there were no statistically significant inter-group comparison (p value insignificant). But from table 1 of pain index evaluation it can said that, although there is no statistically significant difference between the 2 groups, but still the pain threshold experienced by the participating subjects were more in case of Laser than that of Ceramic Trimmer on 1st & 3rd day post-operatively. No statistical evaluation can be made to assess the pain index on 7th and 15th day as the values are identical in both the groups.



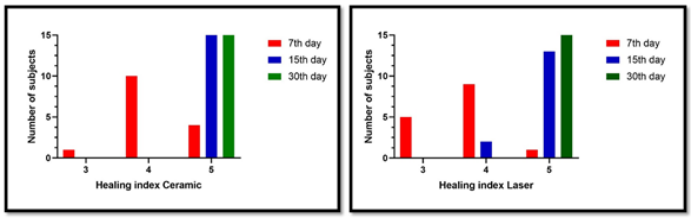

Graph 1: Intra-group comparison of pain index on 1st, 3rd, 7th and 15th day for both group A & B

| Groups | | Nos of subjects with score 0 | Nos of subjects with score 1 | Nos of subjects with score 2 | Nos of subjects with score 3 | p value |
|---|---|---|---|---|---|---|
| Group A | 1st day | 2 | 7 | 5 | 1 | 0.1072* (1st day) |
| | 3rd day | 12 | 3 | 0 | 12 | |
| Group B | 1st day | 0 | 3 | 8 | 4 | 0.2466* (3rd day) |
| | 3rd day | 8 | 6 | 1 | 8 | |

*p= insignificant

Table 1: Inter-group comparison of pain index on 1st and 3rd day for both group A & B

2. In terms of healing index (Landry, Turnbull and Howley Healing Index, 1988)[11] which was done at 7th, 15th and 30th day post-operatively, there were significant statistical difference (p value= <0.0001) in the intra group comparison (both in Group A and B) (Chart 2). But from table 2 (mentioned below) of the healing index it can be said that there were no statistically significant inter-group comparison (p value insignificant). But from both previously mentioned tables and graphs of healing index evaluation we can say that, although there is no statistically significant difference between the 2 groups, but still the healing score in the participating subjects were better in case of Ceramic Trimmer than laser at 7th & 15th day respectively. No statistical evaluation can be made to assess the healing index on 30th day as the values are identical in both the groups.




Graph 2: Intra-group comparison of healing index on 7th, 15th and 30th day for both group A & B

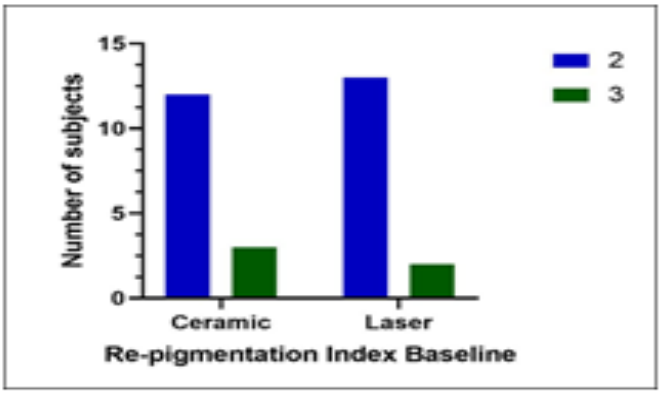
| Groups | | Nos of subjects with score 0 | Nos of subjects with score 1 | Nos of subjects with score 2 | Nos of subjects with score 3 | p value |
|---|---|---|---|---|---|---|
| Group A | 1st day | 2 | 7 | 5 | 1 | 0.1072* (1st day) |
| | 3rd day | 12 | 3 | 0 | 12 | |
| Group B | 1st day | 0 | 3 | 8 | 4 | 0.2466* (3rd day) |
| | 3rd day | 8 | 6 | 1 | 8 | |

*p= insignificant

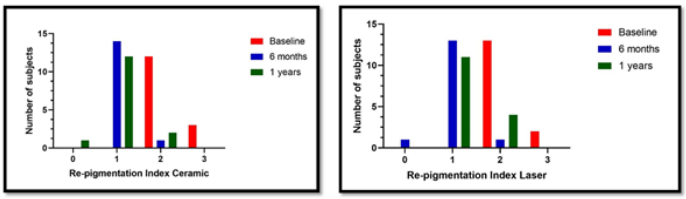
Table 2: Inter-group comparison of healing index on 7th and 15th day for both group A & B

3. The pigmentation score was assessed at the baseline using Takashi et al pigmentation index, 2005[9] and the p value states that there is no statistically significant difference between the 2 groups (p value= 0.6242) (Graph 3). This value reflects that the inclusion of subjects for the study was not biased. Intra-group comparison shows that there was a statistically significant difference (p value **<0.0001**) in both the groups from baseline to 6th month, baseline to 1st year and between 6th month and 1 year respectively (Graph 4). However inter-group comparison states that there are no statistically significant difference in

between the 2 groups at 6th month or at 1st year. Though there is no significant difference between the 2 groups but still from the data it can be said that the Re-pigmentation score in the participating subjects were better in case of Laser than that of Ceramic Trimmer at 6th month while better in Ceramic Trimmer at 1st year.




Graph 3: Inter-group comparison of healing index at baseline




Graph 4: Intra-group comparison of pigmentation index at 6th month and 1st year

| Groups | | Nos of subjects with score 0 | Nos of subjects with score 1 | Nos of subjects with score 2 | p value |
|---|---|---|---|---|---|
| Group A | 6th month | 0 | 14 | 1 | 0.5954* (6th month) |
| | 1st year | 1 | 12 | 2 | |
| Group B | 6th month | 1 | 13 | 1 | 0.4253* (1st year) |
| | 1st year | 0 | 11 | 4 | |

*p= insignificant

Table 3: Inter-group comparison of pigmentation index at 6th month and 1st year

**Discussion**

All human beings, irrespective of races, age and gender are presented with various levels of pigmentation and the gingiva is the most frequently pigmented intra-oral site. Oral melanin pigmentation may be physiologic or pathological.[12] Lerner and Fitzparick[13], in a review described the mechanism of conversion of tyrosine to melanin in melanocytes and also stated that areas which are at a higher temperature (such as axilla, groin, skin folds and oral cavity) than other regions tend to be hyperpigmented. This can be explained by the fact that increased temperature (>30°) may accelerate the rate of enzymatic conversion of tyrosine to melanin.

Since 1960s, various treatment modalities have been used to treat gingival hyperpigmentation such as chemical cauterization, gingivectomy, abrasion of gingiva, cryotherapy, free gingival graft, connective tissue graft, electrocautery and Laser therapy. Literature speaks highly about Laser as one of the best treatment modality for depigmentation procedure and according to Azeeh et al[14] the advantages of Laser use are sterilization of surgical site, little mechanical trauma, a relatively bloodless surgical field with minimal post-operative swelling and scarring and high patient acceptance. Recently, ceramic trimmer which is mentioned in the literature for gingivoplasty, has been used in the treatment of depigmentation as well.

Hence, the present study was undertaken to evaluate and compare the efficacy of diode laser and ceramic trimmer in the treatment of gingival hyper-pigmentation in terms of pain felt by the participating subjects, rate of wound healing and the rate of re-pigmentation observed in both the groups.

The pain index, however, was more in trimmer treated cases compared to Laser. This result may be due to the fact that the ceramic trimmer abrades the entire epithelium and irritates the nerve terminals present within the lamina propria while in the Laser treated areas a biological dressing in the form of protein coagulum seals the ends of the sensory nerves causing the pain.[15] But from the present study, it was seen that, although there is no statistically significant difference between the 2 groups,

but still the pain threshold experienced by the participating subjects were more in case of Laser than that of Ceramic Trimmer. However, Negi R et al (2019)[16] stated that the friction of the bur with the epithelial surface generates heat which results in an immediate tissue coagulation and minimal bleeding, therefore, the use of coolant (water) was avoided. The healing that occurred after using trimmer is identical to that of scalpel technique. Moreover, ceramic trimmer treated areas healed faster compared to Laser treated areas. From this present study it was seen that, although there is no statistically significant difference between the 2 groups, but still the healing score in the participating subjects were better in case of Ceramic Trimmer than that of Laser at 7$^{th}$ and 15$^{th}$ day post-operatively.

Currently, gingival hyperpigmentation has become a major esthetic concern which forces the patient to seek treatment on cosmetic grounds. Several techniques (gingivectomy, scalpel surgical technique, electrosurgery, cryosurgery and Laser) have been used in the past to remove this pigmentation and they have produced variable re-pigmentation scores. The re-pigmentation score for Laser is well established in different studies by different authors and it ranges from a period of 6 months upto 5 years.

Re-pigmentation can be explained by the spontaneous and active migration of melanocytes from its vicinity and it doesn't necessarily mean re-pigmentation of the entire arch or sextant, but even a small patch or dot with respect to even a single teeth was considered to be re-pigmented. In the present study, the form (dots, patches, streaks, bands) and rate of re-pigmentation varied among different individuals and although there was statistically significant (p value **<0.0001**) intra group (Group A & B) difference of pigmentation index, but no significant inter-group difference was found at 6$^{th}$ month and 1$^{st}$ year. Although, there is no significant difference between the 2 groups but still from the data it could be stated that the Re-pigmentation score in the participating subjects were better in case of Laser than that of Ceramic Trimmer at 6$^{th}$ month while better in Ceramic Trimmer at 1$^{st}$ year. Still today, there is no clear explanation for the mechanism of re-pigmentation. According to some authors, even after depigmentation procedure, some melanocytes get activated (might be because of heat generated due to friction) and they migrate to the already treated areas, thus causing re-pigmentation while according to the rests, depigmentation procedure cannot completely eliminate all the melanocytes, which might have become activated post-operatively and have started synthesizing melanin. A classical paper by Ginwalla et al. (1966)[17] supports the second theory and it stated that re-pigmentation was seen in 50% of cases and it might be because of the left-out melanocytes during surgery. Another cause of re-pigmentation might be co-related with skin complexion and there is a direct proportion between the rate of gingival re-pigmentation with darker skin complexion.[18,19]

**Comparison between the two devices-**

| **Laser** | **Ceramic Trimmer** |
|---|---|
| 1. Instant sterilization of surgical site | 1. Instant sterilization can be achieved because of its property of heat generation, but yet to be assessed and proved. |
| 2. Minimal post-operative bleeding, scaring and swelling | 2. Due to thermo-coagulation, bleeding is less observed but somewhat more than that of Laser treated group. |

| | |
|---|---|
| 3. Less pain (might be because of protein coagulation acting as a biological wound dressing) | 3. Less pain experienced by the subjects probably because of the same mechanism of that of Laser. |
| 4. Healing was slower compared to the Ceramic Trimmer treated group. | 4. Faster and uneventful healing was observed. |
| 5. It initially (upto 6th month) showed slow repigmentation scores which gradually paced up at one year compared to Ceramic Trimmer. | 5. Long term delayed re-pigmentation score was observed. |
| 6. It takes long time to complete the entire process. | 6. Less time consuming and convenient to use. |
| 7. Very costly product. | 7. Very cheap product compared to Laser and a single Ceramic Trimmer can be used approximately in 15-20 patients. |
| 8. Produces fume which are not well accepted by the patients. | 8. Does not produce any fume. |
| 9. Difficult to achieve a uniform architecture of soft tissue (mainly at the interdental area). | 9. A clean and uniform architecture can be achieved with it. |

Hence it could be concluded that, though Laser provides us with so many advantages but also it has certain demerits specially its cost. While on the other hand, Ceramic Trimmer (1/60th price of a Laser) provides us with all the advantages of Laser and additionally this study also speaks highly in favour of this instrument and thus can be concluded that Ceramic Trimmer can be used as an alternative to Laser in gingival depigmentation procedure. Thus it is a “boon for depigmentation” in the field of Periodontology.

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