



# Ceramic soft tissue trimming bur: A new tool for gingival depigmentation

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## ABSTRACT

**Objective:** Pigmentation of the gingiva plays a negative role in an otherwise acceptable “smile window”. In the present world, people are more concerned about their aesthetics. Several techniques have been employed such as scalpel surgery, electrosurgery, cryosurgery, chemical agents, abrasion and LASER method for the removal of melanin hyper-pigmentation. The present study is aimed at comparing the efficacy of LASER and soft tissue trimmer for gingival depigmentation.

**Methods:** A randomized split-mouth study was conducted for twenty patients with gingival pigmentation. Dummet Oral Pigmentation Index (DOPI), Gingival Pigmentation Index (GPI) for pigmentation, bleeding factor, wound healing factor, gingival colour and visual analogue scale (VAS) score for pain were evaluated for both the groups at baseline, 7th day, 1st month and 6th month.

**Results:** Intra-group comparison between baseline and 6th month showed highly significant difference for both LASER and bur groups. There was no statistically significant difference found between both the groups at 6th month using gingival pigmentation index.

**Conclusion:** It can be concluded that LASER and soft tissue trimmer both are comparable in achieving aesthetic satisfaction. Hence, the soft tissue trimmer could also be used for depigmentation as it is very cost effective, readily available and acceptable by the patients.

## 1. Introduction

Currently the growing aesthetic concerns among the patients require the removal of lackluster pigmented gingival areas to create an aesthetically-pleasant and confident smile.<sup>1</sup> The harmony of the smile is determined not only by the shape, position and colour of the teeth or lips as well as by the by the gingival tissues.<sup>2</sup>

Although, melanin pigmentation of the gingiva is completely benign and does not present a medical problem, but still some patients complain of ‘black gums’.<sup>3</sup> The present study describes two simple and effective surgical depigmentation techniques – the soft tissue trimming bur and diode LASER technique.

## 2. Materials and methods

It was a randomized, split mouth study. A total of 20 patients with age range between 20 and 40 years were selected in the study. Subjects, suffering from uniformly dense bands of bilateral gingival hyperpigmentation, having a primary concern for aesthetics in the anterior region who were periodontally healthy were included in the study. Patients with a history of systemic diseases or acute pain or swelling,

taking medications which could affect the periodontium, pregnant or lactating women and patient with smoking history were excluded from the study. After explanation of the purpose and duration of the study, all the subjects were asked to voluntarily sign an informed consent to be the part of study.

The maxillary arch was divided into two segments:

- Segment I- right first premolar to right central incisors.
- segment II- left first premolar to left central incisors.

These two segments were incorporated into a split-mouth design, wherein one side was used for LASER and the other one for bur, respectively. These two segments will be randomly assigned to one of the two treatment modalities by toss of a coin.

### 2.1. Study protocol

On the first day, the patients were made aware of the procedures and the purpose of the study. Each patient underwent professional scaling, one week before therapy. After 7 days the patient was recalled for the gingival depigmentation procedure, the baseline pigmentation

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Fig. 1. A: Depigmentation done by soft tissue trimming bur, B: Depigmentation done by diode LASER.



Fig. 2. A: Pre-Operative clinical picture. B: Post-operative clinical picture of both the groups after 7th day, C: Post-operative clinical picture of both the groups after 1st month, D: Post-operative picture of both the groups after 6th month.

scores were recorded prior to the surgery. The duration span for the study was 6th month and recordings were taken at baseline, 7th day, 1st month and 6th month. The study commenced in December, 2015 after the approval from the ethical committee was received and it ended in May, 2017.

Materials used for specific treatment included Soft tissue trimming bur [Fig. 1] and Diode LASER [Fig. 2].

The research included the following clinical evaluation parameters:

1. Dummert Oral Pigmentation Index (DOPI) by Dummert and Gupta (1964)<sup>4</sup>: The index is used to score gingival pigmentation and intensity of gingival hyperpigmentation. Scoring criteria are as follows:
  - 0 No clinical pigmentation (pink gingiva)
  - 1 Mild clinical pigmentation (mild brown colour)
  - 2 Moderate clinical pigmentation (medium brown or mixed pink and brown colour)
  - 3 Heavy clinical pigmentation (deep brown or bluish black colour)
2. Gingival Pigmentation Index by Kumar S (2012)<sup>5</sup>: The index is used to score gingival pigmentation and extent of gingival hyperpigmentation. Scoring criteria are as follows:
  - 0 Absence of pigmentation
  - 1 Spots of brown to black colour or pigments
  - 2 Brown to black patch but not diffuse pigmentation
  - 3 Diffuse brown to black pigmentation, marginal, and attached

The purpose of using two indices in the present study was to obtain more precise results as the DOPI is based on the colour intensity and the

gingival pigmentation is based on the location and extent.

3. Clinical parameters such as bleeding and gingival colour were recorded according to classification the given by Ladvice et al. (2009).<sup>6</sup>

Parameters	A	B	C	D
<b>Bleeding</b>	None	Slight	Moderate	Severe
<b>Gingival colour</b>	Improvement	Slight improvement	No change	Deterioration

4. Wound healing assessment: The healing was evaluated visually at 7th day and 1st month. The area to be evaluated was dried and 3% H<sub>2</sub>O<sub>2</sub> was applied to the healing wound. The negative peroxide test indicated complete healing. Wound healing assessment criteria as given by Marucha PT (1998)<sup>7</sup> was as follows:
  - Negative (-): No bubble formation (complete epithelization)
  - Positive (+): Bubble formation (incomplete epithelization)
5. Visual analogue scale (VAS) for pain: The VAS was used to measure the intensity of pain experienced during and after treatment. The VAS consists of a horizontal line 100 mm long, anchored at the left end by the descriptor “no pain” and at the right end by “unbearable pain”. The patient placed a mark to coincide with the level of pain.<sup>8</sup> The VAS score was recorded during intraoperative treatment phase, and all the patients were recalled after 1st day and at 7th day for pain assessment.

Depigmentation with precision soft tissue trimmer (DFS Precicut®): Soft tissue trimmer was used in the high-speed rpm without water coolant spray to excise and contour soft gingival tissue. The heat produced by the bur due to friction results in an immediate tissue coagulation and minimal bleeding, therefore, the use of coolant (water) was avoided. After removing the entire pigmented epithelium with precision soft tissue trimmer, the exposed surface was irrigated with saline [Fig. 1 A]. Care was taken to see that all remnants of the pigmented layer were removed. The surgical area was then covered with a Coe-Pak™ (GC America).<sup>9</sup>

Depigmentation with diode LASER: Topical anesthetic spray was applied to the surgical field. Local infiltration with anesthetic solution Lignox® (2% lignocaine with 1:200,000 adrenaline) was given only when discomfort was experienced by the patient. Special eye glasses were worn by the patient and the staff to fulfil with the LASER safety rules. The properly initiated tip of the diode LASER unit (Picasso, AMD LASER technologies, USA; wavelength 810 nm) angled at an external bevel of 45° and at energy settings of 0.5–1.5 W continuous wave (CW) was used with small brush like strokes back and forth with gradual progression deeper along the same initial LASER incision to remove the tissue. A 400 µm strippable fibre was used with a power setting of 1.5 W initially in pulsed wave mode (PW) set at 0.20 m s of pulse duration and 0.10 m s of pulse interval for the de-epithelialization procedure.<sup>3</sup> After removal of the overlying epithelial tissue, power setting was increased to 2 W to attain rapid ablation for removing the pigments present deep beneath the basement membrane and minimize the hemorrhage from the connective tissue [Fig. 1 B].

## 2.2. Observations and results

Dummet Oral Pigmentation index (DOPI) values for LASER and bur were  $2.33 \pm 0.37$  and  $2.45 \pm 0.31$  at baseline,  $0.01 \pm 0.04$  and  $0.01 \pm 0.04$  at 7th day,  $0.11 \pm 0.21$  and  $0.12 \pm 0.25$  at 1st month and  $0.56 \pm 0.38$  and  $0.72 \pm 0.52$  at the 6th month. The scores were not statistically significantly different at baseline, 7th day, and 1st month [Table 1].

The gingival pigmentation index values for LASER and bur were  $2.50 \pm 0.35$  and  $2.59 \pm 0.31$  at baseline,  $0.02 \pm 0.09$  and  $0.01 \pm 0.04$  at 7th day,  $0.15 \pm 0.30$  and  $0.15 \pm 0.32$  at 1st month and  $0.80 \pm 0.61$  and  $0.99 \pm 0.72$  at the 6th month. There was no statistically significant difference found between both the groups at 6th month ( $p = 0.093$ ) [Table 2].

Intra-operatively moderate bleeding was seen in 70% of the patients with bur while only 20% of the patients showed bleeding with LASER. At 7th day 80% patients showed no bleeding with bur while 100% patients of LASER groups presented with no bleeding. At 1st month and 6th month no bleeding was observed in 100% of the patients.

Complete wound healing was seen in more patients at 7th day on the bur treated sites when compared to LASER treated sites. At 1st month all sites treated with LASER and bur showed complete healing.

**Table 1**

Depicts inter group comparison of Dummet Oral Pigmentation Index (DOPI) between soft tissue trimming bur and diode LASER at all-time intervals.

	Laser		Bur		Significance (Wilcoxon Signed Rank Test)
	Mean	SD	Mean	SD	
BASELINE	2.33	0.37	2.45	0.31	0.069
7 <sup>th</sup> DAY	0.01	0.04	0.01	0.04	1.00
1 <sup>st</sup> MONTH	0.11	0.21	0.12	0.25	0.655
6 <sup>th</sup> MONTH	0.56	0.38	0.72	0.52	0.041*

The scores were not statistically significantly different at baseline, 7th day, and 1st month. The pigmentation score was significantly higher for the bur side at 6th month.

**Table 2**

Inter group comparison of Gingival Pigmentation Index (GPI) between soft tissue trimming bur and diode LASER at all-time intervals.

	Laser		Bur		Significance (Wilcoxon Signed Rank Test)
	Mean	SD	Mean	SD	
BASELINE	2.50	0.35	2.59	0.31	0.086
7 <sup>th</sup> DAY	0.02	0.09	0.01	0.04	0.317
1 <sup>st</sup> MONTH	0.15	0.30	0.15	0.32	1.000
6 <sup>th</sup> MONTH	0.80	0.61	0.99	0.72	0.093

The scores were not statistically significantly different at baseline, 7th day, 1st month and 6th month.

The VAS (pain) score for the LASER group the intraoperative pain was scored at around  $1.15 \pm 0.81$ , that reduced to  $0.50 \pm 0.51$  at 1st day. In both groups no pain was experienced at 7th day.

Significant improvement in gingival colour was seen at 7th day, 1st month and 6th month in 100% patients of both the groups.

## 3. Discussion

We know that physiologic gingival melanin pigmentation is not a medical problem, but patients may complain of unaesthetic “black gums”. The patient's smile window is directly hampered. Ginwalla et al. (1966)<sup>10</sup> described the broad black zone of pigmentation on the gingiva as “unsightly” and suggested its removal. A questionnaire survey by Dummet et al. (1969)<sup>11</sup> to explore personal attitude towards gingival pigmentation showed that “pink gum” is the ideal one. Twenty patients were included in the study who were aesthetically conscious of their dark gums. Among total subjects, 9 were male and 11 were females in the age group 16–32 years. This was done in accordance with the studies conducted by Grover H et al. (2014)<sup>12</sup> and Nagati R et al. (2016).<sup>13</sup>

Dummet Oral Pigmentation index (DOPI) value for LASER and bur to be  $2.33 \pm 0.37$  and  $2.45 \pm 0.31$  at baseline,  $0.01 \pm 0.04$  and  $0.01 \pm 0.04$  at 7th day,  $0.11 \pm 0.21$  and  $0.12 \pm 0.25$  at 1st month and  $0.56 \pm 0.38$  and  $0.72 \pm 0.52$  at the 6th month. Similar results have been shown by the studies of Rao PVN et al. (2014)<sup>14</sup> and Kaur H et al. (2010).<sup>15</sup> The DOPI scores were significantly reduced from baseline. This was in accordance with the studies conducted by Abdullah BA et al. (2014)<sup>16</sup> and Kumar S et al. (2013).<sup>17</sup>

The gingival pigmentation index value for LASER and bur to be  $2.50 \pm 0.35$  and  $2.59 \pm 0.31$  at baseline,  $0.02 \pm 0.09$  and  $0.01 \pm 0.04$  at 7th day,  $0.15 \pm 0.30$  and  $0.15 \pm 0.32$  at 1st month and  $0.80 \pm 0.61$  and  $0.99 \pm 0.72$  at the 6th month. The change in clinical parameters from baseline to 6th month in both the groups has been clearly depicted in [Fig. 2 A, B, C, D] respectively. Similar results have been shown in the study conducted by Kumar S et al. (2013).<sup>17</sup> There was no statistically significant difference found between both the groups at 6th month ( $p = 0.093$ ).

In the present study, bleeding during surgery was assessed between both techniques. LASER treated areas showed relatively less bleeding than soft tissue trimming bur treated area. This may be because, initiation of tip provides a hot tip effect, which helps in concentrating energy at the tip. This helps in removing the superficial layer of epithelium without bleeding or trauma to mucosa. Furthermore, the blood vessels surrounding tissue up to a diameter of 0.5 mm were found to be sealed by LASER, thus providing haemostasis which aids the operator with a relatively clean and dry field. Similar results have been shown by the study conducted by Shenawy H M et al. (2015).<sup>18</sup> In the present study only 4 patients recorded with slight bleeding during carrying out of the procedure using LASER as shown in which might be due to LASER beam penetrating deeper than required, which is comparable with the study conducted by Kishore A et al. (2014)<sup>19</sup> who observed that the bleeding was directly correlated with the depth of the ablation.

The bur treated tissue resulted in an immediate tissue coagulation and minimal bleeding caused by the rotational energy of the DFS PreciCut® precision soft tissue trimmer. But slight bleeding was recorded in 4 patients, 14 patients recorded moderate bleeding and 2 patients recorded for severe bleeding out of total 20 patients.

Wound healing was assessed after 7 days, in case of bur 15 patient showed complete healing and 5 patients showed incomplete wound healing and in case of LASER, 7 showed complete healing whereas, 13 patients showed incomplete wound healing respectively. Bur treated areas healed faster compared to LASER treated areas. The healing that occurred after using bur method is identical to that of scalpel technique. The finding is also consistent with the results of Rossmann et al. (1987)<sup>20</sup> who had reported slower wound healing following use of LASER compared to scalpel technique. In this study, diode LASER was used in contact mode in sweeping motion, and sufficient care was taken not to overexpose the surgical area with LASER radiation to avoid excessive necrosis of the tissue. In an experimental study, Luomanen et al. (1987)<sup>21</sup> explained the reasons of delayed healing with use of LASERs. The results from the study suggested that retarded proliferation of capillaries during healing and slower infiltration of inflammatory cells caused by thermal coagulation and denaturation of some vasculogenic polypeptides by LASER is the cause of delayed wound healing on LASER treated sites.

The pain perception was less in the LASER group as protein coagulum forms on the wound surface. Irradiation might act as a biological wound dressing sealing the ends of sensory nerve endings. The present study results were in accordance with the study conducted by Lagdive et al. (2009)<sup>6</sup> where they compared scalpel and diode LASER group of patients experiencing significantly less pain compared to scalpel group. In the present study, VAS for LASER and bur was highly significant intra-operatively and at day 1. The results showed that most of the LASER treated site showed slight or no pain, whereas, bur treated patients reported slight to moderate pain and only 1 patient complained of severe pain as shown in.

Re-pigmentation is described as spontaneous and has been attributed to the activity and migration of melanocytic cells from surrounding areas. In the present study laser treated site showed recurrence in 16 patients out of 20 patients each, as in accordance with the study done by Kaur H et al. (2010).<sup>22</sup> Re-pigmentation, here does not mean that the whole of the segment or arch was pigmented, but even a small dot or streak in relation to a single tooth was considered as re-pigmentation in that segment and even in that individual case. It appeared at different times in each patient and was of varying intensity, in the form of very small spots, dots and streaks of mild intensity as compared to broad heavy bands seen preoperatively. The mechanism of re-pigmentation is not clear; but according to the theory of migration, active melanocytes from the adjacent pigmented tissues migrate to the already treated areas, causing re-pigmentation. Another explanation for re-pigmentation may be the melanocytes which left during surgery, which may have become activated and started synthesizing melanin. Ginwalla et al. (1966)<sup>10</sup> also attributed the re-pigmentation to left-out melanocytes, in a study where re-pigmentation was reported in 50% of cases between 24 and 55 days. All the patients were explained about the possibility of re-pigmentation, so all were satisfied with the results. Raut et al. (1954)<sup>23</sup> stated that the degree and the incidence of pigmentation of the gingiva increases as the complexion changes to darker shade. This may be applied to above findings even for re-pigmentation in cases with different facial complexions, and the possible reason may be the rate of melanogenesis which is intrinsically maintained and is higher in dark-complexioned patients as compared to fair complexioned patients.<sup>24</sup>

It can be concluded that, both cases showed almost complete depigmentation and similar aesthetic results. Ablation and abrasion techniques were good enough to achieve aesthetic satisfaction and fair wound healing without infection or pain. The use of soft tissue trimmer is easy, inexpensive as compared to diode LASER. Hence it is more

acceptable to the patients and operator. Further long-term studies are needed to assess the effectiveness of the Soft tissue trimmer and diode LASER.

**Conflicts of interest**

Nil.

**Contribution details**

	Dr. Rohini Negi	Dr. Rajan Gupta	Dr. Parveen Dahiya	Dr. Mukesh Kumar	Dr. Vrishti Bansal	Dr. Japnit Kaur Samlok
Concepts		✓	✓			
Designs	✓	✓	✓	✓		
Definition of intellectual content	✓	✓				
Literature search	✓	✓	✓			
Experimental studies		✓	✓		✓	✓
Data acquisition	✓	✓	✓	✓	✓	✓
Data analysis		✓	✓			
Statistical analysis				✓	✓	✓
Manuscript preparation	✓	✓				
Manuscript editing		✓	✓	✓	✓	✓
Manuscript review	✓	✓		✓	✓	✓
Guarantor					✓	

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