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RESEARCH ARTICLE

ESTHETIC MANAGEMENT OF HYPERPIGMENTED GINGIVA BY CO₂ LASER

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ABSTRACT

Gingival hyperpigmentation is a very common feature these days. The important pigment in gingiva is melanin, which is chiefly present in basal and supra basal layers of epithelium. Sometimes, these pigments spoil the dento-facial esthetics of the individual. .

The present study was conducted on 12 volunteers, 8 males and 4 females in the age group of 16-26 years, having dark pigmentation on the anterior segment of gingiva, either in maxillary or mandibular area. A newly designed index was used for the systematic recording of gingival pigmentation.

Pretreatment score of melanin pigmentation was compared with the post-treatment score at different time intervals. As compared to pretreatment melanin score there was a marked reduction in the mean gingival pigmentation score.

The results of the present study suggest that CO₂ laser irradiation is an effective modality for the treatment of local gingival hyper pigmentation.

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INTRODUCTION

Gingival pigmentation is a very common feature. These pigments are of various types but most common pigment is melanin. This oral pigmentation is not limited to any particular racial group, although it does appear to be a common characteristic in dark people¹.

It is synthesized in the rough endoplasmic reticulum of melanocytes. The golgi apparatus takes a vital role in this pathway². Sunshine and X-rays stimulate the formation of pigment by destroying the inhibitory sulfhydryl group³. Melanocyte stimulating hormone secreted by pituitary gland stimulates the synthesis of melanin⁴.

Chemically melanin is a high molecular weight dye that is insoluble in water and most of the organic solvents. Melanin has a protective function against the ultra violet light⁵.

But the hyperpigmentation spoils the dento-facial esthetics of the individual. A lot of methods have been tried to remove melanin pigments from the gingiva like 90% phenol and 95% alcohol in combination⁶, bleaching by strong oxidizing agents, such as H₂O₂, acid chlorate and KMnO₄⁷. Due to harmful effect of these chemicals to oral soft tissues, surgical methods were attempted to overcome this problem such as gingivectomy⁸. Scraping technique by surgical burs to remove heavy continuous band of gingival pigmentation⁹ but these all were

associated with alveolar bone loss and early recurrence of the same. Recent laser technology thought to be tried for the management of hyperpigmentation of the gingiva.

Various types of lasers are used in dentistry. Now a days Argon, Nd:Yag, CO₂ laser are commonly used for hard and soft tissue procedures. In CO₂ laser, the excited CO₂ molecule spontaneously decays and emits infrared photons at a wavelength of 10,600 nm, which is near a major spectroscopic absorption peak for water. All body tissues contain water, and CO₂ laser has an affinity towards water molecule, so it interacts with all soft tissues¹⁰. The CO₂ laser has achieved a good result in eliminating the melanin pigment from the gingiva and the repigmentation has not been reported¹¹. A very few such type of studies has been conducted till now, it is therefore the present study was undertaken to assess the depigmenting potential of CO₂ laser on the melanin pigmented gingival epithelium.

MATERIALS AND METHODS

The present study was conducted on 12 volunteers, 8 males and 4 females in the age group of 16-25 years, having dark pigmentation on the anterior segment of the gingiva either in maxillary or mandibular area who were conscious of their pigmentation and wanted its removal. These patients were selected from the Department of Periodontology, Faculty of Dental Sciences, King George's Medical University, Lucknow.

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A newly designed index was used for the systematic recording of gingival pigmentation. Pigmentation was noted according to the scale. Gingival unit: One gingival unit consist of single interdental papilla adjoining attached gingiva and mucous epithelium between the two teeth.

Score

1. No gingival pigment present.
2. Small fleck of pigment present in gingival unit.
3. More than one flecks of pigment of less than 1 mm diameter present in gingival unit.
4. A band of gingival pigment with 1 mm width present in gingival unit.
5. A band of gingival pigment with more than 1 mm width present in gingival unit.
6. A continuous band of gingival pigment of two gingival units with less than 1 mm width.
7. A continuous band of gingival pigment unite with one or two gingival units with more than 1 mm width.

In this index every gingival unit was checked for pigmentation. A gingival unit consist of single interdental papilla ,adjoining attached gingival and mucous epithelium between two teeth. Scoring criteria was 0-6. In each patients, anterior gingival units were scored according to the newly designed index and selected for laserization.

The present study was divided into two groups

Group-I: Six subjects, with melanin pigmentation on the anterior segment of maxilla.

Group-II: Six subjects, in which management of melanin pigmentation was done on the anterior segment of mandible.

After signing of the consent form, anterior gingival units were taken for the management of melanin by CO₂ laser in both the groups. Under perfectly aseptic conditions and infiltration anesthesia with lignocaine hydrochloride 2% with 1:20,0000 adrenaline in the selected area, laserization was performed.

Laserization

Before starting the laserization of pigmented area, patient's eyes were protected with the help of two cotton packs and the operator used the white lens glasses for protection from the laser exposure. Now the CO₂ laser unit was on and fixed at 5 watts and the pulsed mode of 5 seconds.

The selected area was cleaned and dry with the help of cotton swabs and gingival units of particular jaw was laserized until and unless slough was formed properly. The patients were recalled for checkup and the gingival pigmentation scoring on the next day, 7th day, one month and on the 6th month.

RESULTS

The present investigation has been interpreted under clinical examination, before and after laserization of the hyperpigmented gingival tissue.

Table-I Mean gingival pigmentation score in the patients of Group-I

Subject No.	Pretreatment score	Post treatment score			
		1st day	7th day	One month	Six month
1.	5.714	0.571	0.428	0.428	0.428
2.	4.571	3.000	0.285	0.285	0.285
3.	6.000	1.571	0.128	0.128	0.128
4.	6.000	1.712	0.00	0.00	0.00
5.	6.000	2.000	0.285	0.285	0.285
6.	6.000	0.857	0.712	0.712	0.712

Table-II Analysis of total melanin score in Group-I of 6 subjects

	Pretreatment Score	Post-Tt Score at 1st day	Post-Tt Score at 7th day	Post-Tt Score at one month	Post-Tt Score at six month
Mean	40.00	11.3333	2.1667	2.1667	2.1667
Standard Deviation	4.00	6.0553	1.7224	1.7224	1.7224
Standard Error	1.6329	2.4826	0.7062	0.7062	0.7062

Table-III Comparison of change in score from pretreatment values at different time intervals in Group-I

Comparison	't'	'p'
First day of post-Tt.	7.5955	'p'<0.001
Seventh day of post-Tt.	21.2762	'p'<0.001
One month of post-Tt.	21.2792	'p'<0.001
Six month of post-Tt.	21.2792	'p'<0.001

Table-IV Mean gingival pigmentation score in the patients of Group-II

Subject No.	Pretreatment score	Post treatment score			
		1st day	7th day	One month	Six month
1.	5.000	1.142	0.428	0.428	0.248
2.	5.571	2.285	0.857	0.857	0.857
3.	5.142	1.428	0.857	0.857	0.857
4.	5.714	0.571	0.428	0.428	0.248
5.	4.142	0.857	0.712	0.712	0.712
6.	5.000	1.285	0.428	0.428	0.248

Table-V Analysis of total melanin score in Group-II of 6 subjects

	Pretreatment Score	Post-Tt Score at 1st day	Post-Tt Score at 7th day	Post-Tt Score at one month	Post-Tt Score at six month
Mean	37.0000	9.0000	4.3333	4.1667	4.1667
Standard Deviation	3.0984	4.1473	1.5055	1.7224	1.7224
Standard Error	1.2703	1.7004	0.6173	0.7062	0.7062

Table-VI Comparison of change in score from pretreatment values at different time intervals in Group-II

Comparison	't'	'p'
1st day of post-Tt.	15.1851	'p'<0.001
7th day of post-Tt.	21.4879	'p'<0.001
One month of post-Tt.	21.9978	'p'<0.001
Six month of post-Tt.	21.9978	'p'<0.001

Pretreatment score of melanin pigmentation was compared with the post-treatment score at different time interval. These scores were analyzed from table-I to table-vi. The post treatment mean values were significantly lower than pre treatment values in both the groups at all intervals of recall period.. These values were same at one month and six month after laserization. The comparison of change in score from pretreatment values at different time intervals. The 't' value on

the first day of post-treatment was 7.5955 and the 'p' value was <.001. On seventh day of post-treatment 't' value was 21.2762, at one month, 21.2792 and on the sixth month it was the same as the one month. The changes in melanin score from pretreatment values at different time intervals were significant ($p < 0.001$) and maximum change in score was observed at 7 days.

DISCUSSION

Hyper pigmentation of melanin spoils the dento-facial esthetics of the individual. Many procedures have been employed to remove melanin pigment from the gingiva in order to give a pleasant and acceptable esthetics.

Many surgical procedures like gingivectomy slicing, bone denudation, scraping procedure and surgical bur procedure were tried to remove the hyperpigmentation but most of these surgical procedures were associated with alveolar bone loss and recurrence of the pigmentation even in short duration.

Cryosurgery¹² is a good alternative but there can be difficulty in judging the final volume of tissue necrosis and its probe is very big in size, which can not be used in the interdental papilla area because this also cover the tooth surface. Inadequate destruction of the lesion requires repeated cryosurgical procedure.

To overcome these problems, laser was tried to remove the melanin pigmentation. *Phimon et al*¹³ used the Nd: YAG laser to remove the hyperpigmentation but he found gingival fenestrations in some cases. This complication may be caused due to repeated ablation of the gingiva. This may be because of poor Nd:YAG laser absorption¹⁴. Repeated exposure of Nd:YAG laser also produces profound thermal damage of tissue, and the injury is approximately 40 to 50 times greater than that for CO₂ laser¹⁵. Nd: YAG laser did not produce immediate visible change in the surrounding tissue, the zone of vaporization, it is therefore difficult to estimate the actual extension of thermal necrosis.

*Absten*¹⁶ demonstrated that the depth of CO₂ laser was 39 to 90 μ m, as compared to Nd:YAG, which has a depth of 4-6 mm in water absorption model. This difference in the water absorption model predicts, events occurring in soft tissue, and shows less injury with CO₂ laser.

The current study deals with the ablation of superficial physiologic pigmentation by the CO₂ laser. It is a very sophisticated surgical tool with limited penetration power in soft tissues, thus making it eminently suitable for depigmentation procedure.

Group-I of this study showed that the pretreatment gingival pigmentation mean value was 40.00 and after one day of laserization this value was 11.33. After 7 days this mean value came to 2.16 and remained same at one month and six month post laserization. So the best results were achieved at the 7th day. (Table-III)

These findings can be matched with those of *Phimon et al.* who found that the ablated wound was healed almost completely in one week and the color of ablated gingiva was pink. *Sharon et al*¹⁷ reported that after laserization complete healing occurred in two weeks with no evidence of pigmentation.

In this study no repigmentation was found upto the six months of follow up. However, in other earlier studies, they reported repigmentation occur in due course of time after the depigmentation procedure. *Hirschfeld and Hirschfeld* tried 90% Phenol and 95% alcohol for depigmentation in 20 patients but found repigmentation in short period of time. Similarly *Dummet et al*⁸ reported the recurrence of gingival hyperpigmentation after gingivectomy in 6 out of 8 patients in a follow-up period of 33 to 120 days. *Manchandia*¹⁸ also found repigmentation in the form of spotted pigmentation in 42% of subjects within a short period. *Ginwalla et al*¹⁹ observed repigmentation within 24 to 56 days. *Pal et al*²⁰ observed repigmentation in 5 cases out of 27 cases in 3 months of follow-up. *Phimon et al* did not found any recurrence in his total of 4 cases but found gingival fenestration in one case. The clinical results of the present study showed that there was no recurrence of pigmentation upto the six months of follow up.

CONCLUSION

The results of the present study suggest that CO₂ laser irradiation is an effective modality for the treatment of local gingival pigmentation. However, further studies must be performed with longer observational periods to clearly establish the effect of CO₂ laser irradiation on gingival melanin.

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