



A RANDOMISED CONTROLLED CLINICAL TRIAL TO EVALUATE AND COMPARE THE EFFICACY OF SCALPEL AND DIODE LASER IN TREATMENT OF GINGIVAL DEPIGMENTATION

Dental Science

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ABSTRACT

Aim of study : Comparing efficacy of gingival depigmentation by laser and scalpel technique.

Method: A Randomized control split mouth study was conducted for 30 patients with gingival pigmentation. Dummet Oral Pigmentation Index (DOPI) for pigmentation and Visual Analogue Scale (VAS) for pain and wound healing index, by Tal et al 2003 for wound healing was evaluated for both segment (laser) and control sites (Scalpel technique) at baseline, after 1 week, 1 month, 3 months and 6 months.

Results: Both the groups showed significant reduction in DOPI score i.e., 0 at baseline and after 1 week interval after treatment. DOPI score increased to 1 for 29/30 sites treated with scalpel technique. At 3 month DOPI increased to 2 for 28/30 sites treated with scalpel and increased to 1 for 29/30 sites treated with laser. DOPI are increased to 7 for 23/30 sites treated with Scalpel and sites treated by Laser increased upto 4 for 26/30 at 6 months ($P=0.0601$). This indicates recurrence rate for pigmentation is higher after scalpel treatment. VAS Score was significantly high for scalpel post operatively and after 1 day then laser group ($P=0.038$) WHI (Wound Healing Index) score when compared in both groups complete epithelisation was seen in all sites treated with Laser ($P=0.313$).

Conclusion: It can be concluded that Laser can be effectively and efficiently used for depigmentation by keeping patients acceptance and comfort in mind and also the long term results and ease of use when compared to scalpel technique.

KEYWORDS

Melanin, Laser application, Laser dentistry

INTRODUCTION

"Esthetics" is the science of beauty, which is the particular detail of an animate or inanimate object that makes it appealing to the eye. The color of the gingiva plays an important role in overall esthetics.¹

The gingival complex plays a distinct role in the overall beauty of the smile and it is the duty of the dental surgeon to create and maintain the gingival state with resultant beauty of the smile.

Pigmentation is the process of deposition of pigments in the tissues. Large variation in time of repigmentation may be related to the technique used and the race of the patient. Repigmentation may also be attributed to the melanocytes which are left during surgery as these may become active and start synthesizing melanin.²

Data regarding on depigmentation and Repigmentation following surgical removal of pigmented Gingiva in human is extremely limited. In order to find a better approach for gingival depigmentation, a comparative evaluation of two surgical techniques using conventional scalpel method and 810 nm wavelength (zolar photon®) semiconductor diode laser was undertaken in this study.

MATERIAL AND METHOD

Study subject and location

30 patients within an age range of 15-35 years reporting to the outpatient of Department of Periodontics, Shree Bankey Bihari Dental College & Research Centre, Ghaziabad having gingival melanin hyperpigmentation were selected. Depigmentation procedure were carried out in the maxillary anterior sextant which was divided into two segments, right segment and left segment. So in total 60 segments were used for gingival depigmentation.

Inclusion Criteria

1. Age group between 15- 35 years.
2. Patients with moderate to severe physiologic gingival melanin hyperpigmentation (as given by Dummett Gupta in 1964)
3. Systemically and Periodontally healthy subjects.
4. Subjects having maxillary melanin pigmentation in the anterior regions.
5. Patients with high and medium lip line.
6. Patients with esthetic concern

Exclusion Criteria

1. Patient with systemic disease associated with pathological hyperpigmentation or improper wound healing (uncontrolled diabetes, autoimmune disease etc)
2. Non treated periodontal disease.
3. Non compliant patients.
4. Smokers.
5. Low lip line.
6. Thin gingival biotype.
7. Pregnant and lactating women.

Study procedure:

All subject participating in the study signed a consent form to participate in the study. Appropriate medical and dental history concerning the absolute and relative contraindications and having gingival melanin hyperpigmentation and seeking its removal, were selected on the basis of Dummett – Gupta Oral Pigmentation Index (1964).

Procedure were carried out in the maxillary anterior sextant (divided into two segments)

Segment 1 - Right anterior segment

Segment 2 - Left anterior segment

Scalpel procedure was carried out in segment 1 and Laser procedure in segment 2

Surgical Scalpel technique (Group I)

Local anesthesia was obtained with infiltration in relation to surgical site (for segment 1). The gingival epithelium was excised with Bard Parker blade no 15 or 11. The entire epithelium was removed in one piece. Bleeding was controlled by pressure pack and once homeostasis was achieved, the site was covered by periodontal dressing for a minimum of 1 week.

Laser gingival depigmentation (Group II)

Procedure started with the application of topical anesthesia (lidocaine topical aerosol – LOX™ 10% Spray) in segment 2. The fiber optic laser tip was kept in contact with the pigmented area and laser was emitted in gated pulsed mode and operated between the wavelength of 800-980nm. Depigmentation was performed with sort light paint brush strokes in a horizontal direction to remove the epithelial lining. Following the procedure, no periodontal pack was given and no antibiotics administered.

Evaluation of clinical parameters

Preoperative: patients were evaluated for melanin pigmentation index (DOPI)

Baseline Immediately after surgery: patients were evaluated immediately after surgery for melanin pigmentation index (DOPI) and pain using Visual Analog Scale (VAS)

One day after surgery: patients were evaluated for pain using Visual Analog Scale (VAS) and Wound Healing Index (WHI by Tal et al).

One week after surgery: patients were evaluated after one week of surgery for healing of wound by (WHI by Tal et al) melanin pigmentation index (DOPI) and pain using Visual Analog Scale (VAS).

One month after surgery: patients were evaluated after 1 month of surgery for healing of wound (WHI by Tal et al), melanin pigmentation index (DOPI) for recurrence of pigmentation.

Three month after surgery: patients were evaluated after 3 months of surgery for melanin pigmentation index (DOPI) for recurrence of pigmentation.

Six months after surgery: patients were evaluated after 6 months of surgery for melanin pigmentation index (DOPI) for recurrence of pigmentation.



Fig.1: Diode Laser Unit With Handpiece And Protective Eyewear for Operator And Patient (zolar Photon Plus™)



Fig. 2: Preoperative



Fig.3: Depigmentation With Scalpel



Fig. 4 : Depigmentation Completed



Fig. 5: Segment 1 Tissue Removed



Fig. 6 : Depigmentation With Laser (group I)



Fig. 7: Immediate Post-operative



Fig.8: 1 Day Post Operative



Fig 9 : 1 Week Post Operative



Fig.10: Postoperative 1 months



Fig.11: Postoperative 3 Months



Fig.12 : Post Operative 6 Months

Statistical Analysis

The data obtained were analyzed using SPSS (Statistical Package for the Social Sciences), version 25.0 and Medcalc Software. Mean and standard deviations were calculated for the clinical parameter (pain). Unpaired or independent t test is used for comparison of mean value between 2 groups when the data follows normal distribution. The Chi square test was employed to determine the difference between wound healing and melanin pigmentation. The p value was taken significant when less than 0.05 ($p < 0.05$).

RESULTS

The final results were statistically analyzed and significance evaluated. Difference in pain was assessed using VAS scores in both the groups after 1 day and 1 week. No statistically significant difference was found between the groups. (P value = 0.001) [Table 1].

No statistically significant difference was found when WHI scores compared between both the groups at 1 week interval and after 1 month (P value = 0.313) [Table 2, 3 and Graph 1, 2 respectively].

On comparison within the laser group and scalpel group a statistically significant difference was found between melanin repigmentation between 1 month and 3 months and 6 months (P value = 0.001).

On comparison of melanin reappearance at 1 month, 3 month and 6 months between the scalpel and the laser groups, no statistically significant difference was found ($P = 0.601$) [Table 4, 5, 6 and Graph 3, 4, 5 respectively]. Results of other parameters could not be evaluated statistically because one of the parameters was constant in either group.

Table 1: Difference in mean pain at baseline post operatively, 1 day and after 1 week in Group I (Scalpel).

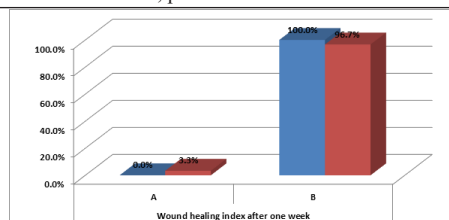
Group I (Scalpel)	Time	VAS Score			
		N	Mean	SD	p-value
	Baseline	30	0.37	0.61	
	After one day	30	0.03	0.18	12.429
	After one week	30	0.00	0.00	0.001*

Table 2: Difference in wound healing after 1 week in individuals treated with scalpel and Laser.

Wound healing index after one week	Group I	Group II	Total

A	0	1	1
	0.0%	3.3%	1.7%
B	30	29	59
	100.0%	96.7%	98.3%
Total	30	30	60
	100.0%	100.0%	100.0%

Chi-square value = 1.017, p-value = 0.313



Graph 1 : Difference in wound healing after 1 week in between Group I (Scalpel) and Group II (Laser).

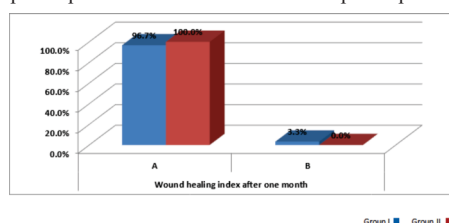
Table 3 : Difference in wound healing after 1 month in individuals treated with scalpel and Laser.

Wound healing index after one month	Group I	Group II	Total
A	29	30	59
	96.7%	100.0%	98.3%
B	1	0	1
	3.3%	0.0%	1.7%
Total	30	30	60
	100.0%	100.0%	100.0%

Chi-square value = 1.017, p-value = 0.313

A= Complete Epithelisation

B= Incomplete Epithelisation

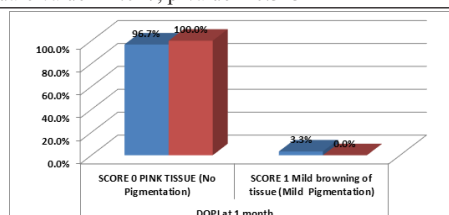


Graph 2: Difference in wound healing after 1 month in between Group I (Scalpel) and Group II (Laser).

Table 4: Difference of melanin reappearance at the end of 1 month in Group I and Group II

DOPI at 1 month	Group I	Group II	Total
SCORE 0 PINK TISSUE (No Pigmentation)	29	30	59
	96.7%	100.0%	98.3%
SCORE 1 Mild Browning of tissue (Mild Pigmentation)	1	0	1
	3.3%	0.0%	1.7%
Total	30	30	60
	100.0%	100.0%	100.0%

Chi-square value = 1.017, p-value = 0.313



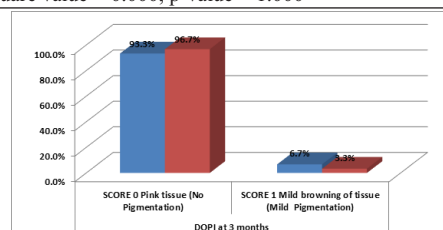
Graph 3: Difference in melanin reappearance at the end of 1 months in Group I (Scalpel) and Group II (Laser).

Table 5: Difference of melanin reappearance at the end of 3 month in Group I and Group II

DOPI at 3 months	Group I	Group II	Total
SCORE 0 Pink tissue (No Pigmentation)	28	29	57
	93.3%	96.7%	95.0%

SCORE 1 MILD BROWNING OF TISSUE (Mild Pigmentation)	2	1	3
	6.7%	3.3%	5.0%
Total	30	30	60
	100.0%	100.0%	100.0%

Chi-square value = 0.000, p-value = 1.000

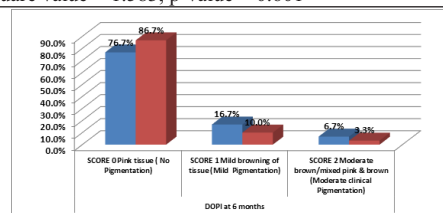


Graph 4: Difference in melanin reappearance after 3 months in Group I(Scalpel) and Group II (Laser)

Table 6: Difference in melanin reappearance at the end of 6 months in Group I (Scalpel) and Group II (Laser).

DOPI at 6 months	Group I	Group II	Total
SCORE 0 PINK TISSUE (No Pigmentation)	23	26	49
	76.7%	86.7%	81.7%
SCORE 1 MILD BROWNING OF TISSUE (Mild Pigmentation)	5	3	8
	16.7%	10.0%	13.3%
SCORE 2 Moderate brown/mixed pink & brown (Moderate clinical Pigmentation)	2	1	3
	6.7%	3.3%	5.0%
Total	30	30	60
	100.0%	100.0%	100.0%

Chi-square value = 1.583, p-value = 0.601



Graph 5: Difference in melanin reappearance at the end of 6 months in Group I (Scalpel) and Group II (Laser).

DISCUSSION

Gingival depigmentation performed in this study with a blade was precise and under control. With this technique, it was possible to appreciate the depigmented areas immediately and did not leave any room for residual pigments. This technique resulted in hemorrhage and required immense care while excising the epithelium in order not to expose the bone or to create gingival recession and it requires local anesthesia. It was necessary to cover the surgical site with periodontal dressing for 7-10 days to protect the site from food debris, foreign irritants, thermal stimuli and infection. Comparatively, the use of the scalpel technique for depigmentation is the most economical as compared with other techniques.

Recently, laser has been recognized as one of the most effective, comfortable and reliable techniques for gingival depigmentation.⁴ The word laser is an acronym for light amplification by stimulated emission of radiation.

Lasers were first introduced in 1960 by **Maiman**. The use of semiconductor diode laser for depigmentation procedure was introduced by **Yousuf A et al in 2000**⁵. Laser light at 810 nm is poorly absorbed by water but highly absorbed in hemoglobin and other pigments.⁶.

In this study, both the procedures scalpel and laser were efficient for removal of melanin pigmentation.

Difference in pain was assessed using VAS scores in both the groups at baseline, after 1 day and 1 week. No statistically significant difference was found among both the groups.

The depigmentation procedure was performed under local infiltration. As no analgesics was prescribed, no sooner the effect of

infiltration wore off, patient complained of slight discomfort after 1 day, but by the end of 1 week, pain perception was considerably less as healing usually gets completed by **Mani A et al in 2011**⁷, **Lagdive S et al in 2009**⁸, as they all noticed reduced pain at 1 week postoperative with scalpel group.

Healing was assessed by WHI given by **Tal et al in 2003** in this study. WHI used in the study was simple (easy to use), reliable and results can be easy to fill as it was assessed by visualization.

On comparison of wound healing at 1 week, between scalpel and laser group, no statistically significant difference was found. In both the segments wound healing occurred by secondary intentions and due to wound contraction. Although healing was faster in scalpel. Healing on comparison at 1 week was not significant in both the segments. The findings are in accordance with the studies conducted by **Kumar S et al in 2012**², **Khakhar M et al in 2011**¹⁰ where they also concluded no significant difference in healing.

Oral Repigmentation refers to clinical reappearance of melanin pigment after a period of clinical depigmentation of the oral mucosa. In this study the repigmentation assessed by using index DOPI. Pigmentation started to reappear after 1 month and during the 6 month follow up period, the patchy pigmentation could be a result of the ongoing process of Repigmentation. The decreased intensity of pigmentation may be due to less production of pigments.

On comparison in laser group, statistically significant difference was found between melanin repigmentation between 3 month and 6 month. After the epithelisation is complete by the end of 3 month, patchy pigmentation started to appear because of the results of the ongoing process of repigmentation. The intensity may increase with time and may reach to pretreatment levels as depends on racial background of the patient.² The results of our study are in accordance **Doshi Y et al in 2012** as he found mild patchy pigmentation.

On comparison of melanin reappearance at 6 months, between scalpel and laser group, no statistically significant difference was found. Pigmentation recurrence has been documented in literature, following the surgical procedure, within 24 days to 8 years. The results are in accordance with **Doshi Y et al in 2012**, **Mani A et al in 2009**, **Gupta G in 2011**¹¹, **Thangavelu A in 2012**¹² as they found mild patchy pigmentation.

A period of 6 months follow up seems to be inadequate and it is required that these patients are regularly monitored for a longer period of time in order to evaluate the maintenance of treated areas and subsequent repigmentation. Future studies are required at histological and histochemical level to evaluate the activity and behavior of melanocytes following the two procedures.

CONCLUSION

As per the study, no statistical significance was seen in comparison of both the techniques in terms of efficiency and repigmentation. The results of this study indicated that both, scalpel as well laser were efficient for depigmentation of the gingiva. Both the procedures did not result in any postoperative complication and the gingival healed uneventfully.

However, compared to conventional mucosal excision, laser was found to have advantages in terms of simplicity, non-invasiveness, ease of procedure, no requirements of anaesthesia, total lack of hemorrhage, minimal postoperative complications and good acceptability by the patients and less percentage of repigmentation. This enables laser to be employed repeatedly and also safely even in medically compromised patients.

The postoperative follow up of the present study was short. Since the success of the procedure may be weighed only by the extent of depigmentation achieved and by the time taken for reappearance of pigments, prolonged follow up is necessary. It is proposed that further studies to be taken up for a longer period of monitoring along with histopathological assessment to understand the process of repigmentation.

REFERENCES

1. Kaur H, Jain S, Sharma RL. Duration of reappearance of gingival melanin pigmentation after surgical removal a clinical study. *Journal of Indian Society of Periodontology*. 2010; 14(2):101-106.

2. Ginwalla TMS, Gomes BC and Varma BRR. Surgical removal of gingival pigmentation- A preliminary study. *J Indian Dent Asso*. 1966; 38: 147-34.
3. Mani A, Mani S, Shah S, Thorat V. Management of gingival hyperpigmentation using surgical blade, diamond bur and diode laser therapy: A Case Report. *J Cutan Aesthet Surg*. 2011 Sep-Dec; 4(3):208-210.
4. Thibodeau. Durgesh N Bailoor, Nagesh KS. *Fundamentals of Oral Medicine and Radiology*. 1st ed. Jitender P Vij, 2005.
5. Grover HS, Dadlani H, Bhardwaj A. Evaluation of patient response and recurrence of pigmentation using laser and scalpel. *Journal of Indian Society of Periodontology*. 2014; 18(5): 586-592.
6. Orban B. Clinical and histologic study of the surface characteristics of the gingiva. *Oral Surg Oral Med Oral Pathol*. 1948; 1:827-41.
7. Bhatia G, Kumar A, Khatri M, Bansal M, and Saxena S. Assessment of the width of attached gingiva using different methods in various age groups- A clinical study. *J Indian Soc Periodontol*. 2015 Mar-Apr; 19(2): 199-202.
8. Lagdive S, Doshi Y, Marawar PP. Management of gingival hyperpigmentation using surgical blade and diode laser therapy: A comparative study. *J Oral Laser Appl*. 2009; 9:41-47.
9. Kumar S, Bhat SG, Bhat MK. Development in techniques for gingival depigmentation- An update. *Indian J Dent*. 2012; 3:213-21.
10. Thangavelu A, Elavarasu S, Jayapalan P. Pink esthetics in periodontics – Gingival depigmentation: A case series. *J Pharm Bioall Sci*. 2012; 4:186-90.
11. Gupta G. Management of gingival hyperpigmentation by semiconductor diode laser. *Journal of Cutaneous and Aesthetic Surgery*. 2011(4): 208-210.
12. Hirschfeld I & Hirschfeld L. Oral pigmentation and method of removing it. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2004; 98:522-7.
13. Shimada Y, Tai H, Tanaka A et al. effects of ascorbic acid on gingival melanin pigmentation in vitro and in vivo. *J Periodontol*. 2009; 80: 317-323.
14. Farnooosh AA. Treatment of gingival pigmentation and discolouration for esthetic purposes. *Int J periodontics restorative dent*. 1990; 10:313-319.
15. Pal TK, Kapoor KK, Parel CC and Mukherjee K. Gingival Melanin Pigmentation – A study on its removal for esthetics. *Journal of Indian Society Periodontology*. 1994(3) : 52- 54.
16. Jayaprasad K and Vijaykumar C. Case report: Deepithelization (A way to obtain esthetic smile) *J of Indian Society of Periodontology*. 1999; 2:98.
17. Mokeem SA. Management of Gingival Hyperpigmentation by Surgical Abrasion ; Report of 3 cases. *Saudi Dental Journal*. 2006; 18:161-6.
18. Perlmutter S, Tal H. Repigmentation of the gingiva following surgical injury. *J Periodontol*. 1986; 57:48-50.
19. Almas K, Sadig W. Surgical treatment of melanin-pigmented gingiva; an esthetic approach. *Indian J Dent Res*. 2002; 13(2):70-3.
20. Phillips GE, John V. Use of Subepithelial Connective tissue graft to treat an Area pigmented with graphite. *J Periodontol*. 2005; 6:139-47.
21. Bergamaschi O, Kon S, Doine AI, Ruben MP. Melanin repigmentation after gingivectomy. A 5 Year clinical and transmission electron microscopic study in humans. *Int J periodontics Restorative Dent*. 1993; 13:85-92.
22. Tanuja P, Butchi BK, Murali KT. Laser-Assisted Crown Lengthening and Gingival Depigmentation To Enhance Aesthetics- A Case Report. *Annals and Essences of Dentistry*. 2011; 3:56-9.