



Gingival Depigmentation Using Lasers: A Literature Review

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Authors' contributions

This work was carried out in collaboration between all authors. Author FK designed the study, wrote the protocol and wrote the first draft of the manuscript. Author ZN managed the literature searches, analyses of studies gathered in literature review and author NJ participated in the design of the study and edited and finalized the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background: Gingival hyperpigmentation usually occurs due to the abnormal accumulation of melanin in the gingival tissue and confers a dark appearance to the gingiva. Gingival hyperpigmentation often compromises smile esthetics and can occur due to several physiological disorders. Several treatment options are available for this condition; however, laser seems to be the most reliable and satisfactory treatment modality in this regard.

Aim: This study reviews the outcome of laser treatment of gingival hyperpigmentation in terms of response to treatment and recurrence.

Study Design: Review.

Place and Duration of Study: Department of periodontics, Shahid Beheshti University of Medical Sciences, Dental School, between March 2015 and July 2015.

Methodology: An electronic search of the literature was carried out in PubMed, MEDLINE and Google Scholar databases for relevant articles published from January 2000 to June 2015 using the key words "gingiva", "pigmentation", "hyperpigmentation", "repigmentation", "therapy", "depigmentation", "melanin pigmentation", "diode laser", "Er:YAG", "Nd:YAG" and "laser therapy". A

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total of 11 articles met the criteria and their full texts were thoroughly reviewed.

Results: Studies showed no pain, bleeding or sign of impaired wound healing following laser treatment. The results were satisfactory in all studies and recurrence during the follow up period was not reported.

Conclusion: Laser therapy has optimal efficacy for treatment of gingival hyperpigmentation with low recurrence rate.

Keywords: Gingival hyperpigmentation; laser therapy; depigmentation; pigmentation; review.

1. INTRODUCTION

Smile esthetics is determined by the shape, color shade and position of the teeth in the dental arch as well as the gingiva. Gingival tissue is the most pigmented tissue in the oral cavity and gingival color is determined by several factors such as thickness of the epithelium, the keratinization quality of the gingiva, the volume of pigments in the tissue (melanin, melanoid, oxy-hemoglobin and carotene) and the size and number of gingival blood vessels.

Gingival hyperpigmentation manifests as disseminated dark purple pigments or irregular brown or light brown spots. These patterns are variable in different age groups and races [1-5]. Light skinned individuals are expected to have non-pigmented gingiva and dark skinned individuals are more likely to have pigmented gingival tissue. Melanin is a non-hemoglobin brownish pigment and is the most common endogenous pigment synthesized by the melanocytes in the basal layer of the epithelium. Gingival hyperpigmentation occurs due to excessive accumulation of melanin in the basal and supra-basal layers of the epithelium. Although melanin hyperpigmentation of gingiva is completely benign and does not cause any problem clinically, patients especially the gummy smile individuals often complain of compromised esthetics. Therefore, there is a high demand for esthetic procedures to treat gingival hyperpigmentation.

Gingival depigmentation is performed by different methods. Selection of the method depends on the expertise and experience of the clinician as well as the patient's preference. The following methods are used for gingival depigmentation:

1. Chemical methods including the use of acoustic agents
2. Gingivectomy with a surgical scalpel and free gingival autograft
3. Acellular dermal allograft
4. Electrosurgery

5. Cryosurgery
6. Abrasion with a diamond bur
7. Laser therapy with different lasers such as Nd:YAG, Er:YAG and CO₂ lasers

This review aimed to assess the outcome of gingival depigmentation with laser in terms of response to treatment and recurrence in previous studies.

2. REVIEW OF THE LITERATURE

All three reviewers (K.F., N. Z., J. N.) participated in the search and review process. An electronic search was carried out in PubMed, MEDLINE, and Google Scholar databases for relevant articles published from January 2000 to June 2015 using the keywords "gingiva" AND "pigmentation" AND "hyperpigmentation" AND "repigmentation" AND "therapy" AND "depigmentation" AND "melanin pigmentation" AND "diode laser" AND "Er:YAG", "Nd:YAG" AND "laser therapy".

Article Selection and data extraction:

Titles and abstracts of the articles yielded from the search were evaluated and full texts of the articles that met the criteria for further assessment were obtained and thoroughly reviewed. The inclusion criteria were case reports and clinical studies that met the followings:

- Assessment of physiologic gingival hyperpigmentation: the pigmentation is a physiologic finding in a normal patient and not due to any systemic condition.
- Known follow up period: the study refers to a determined time period for follow ups.
- Precise recording of the results of depigmentation: the exact outcome concerning the gingival color is present in the study.

- Reporting information regarding recurrence: the study reports any recurrence of the pigmentation.

The exclusion criteria were:

- Patients with systemic diseases: The hyperpigmentation is the secondary result of an systemic condition such as Albright syndrome.
- Patients with gingival hyperpigmentation due to the use of medications: Hyperpigmentation secondary to the drugs such as metronidazole.
- Animal studies

3. RESULTS

The search of the literature yielded 25 articles; based on the above-mentioned criteria, 14 were excluded and 11 remained in the study for thorough review of their full texts. Fig. 1 shows the selection process of the articles.

Table 1 shows the results of assessments. Only studies focusing on the therapeutic effects of laser were evaluated in our study and the efficacy of laser for treatment of gingival hyperpigmentation was evaluated. Moreover, patient comfort during and after laser treatment

was assessed. The follow up period of each study was also taken into account and the rate of recurrence of hyperpigmentation was investigated as well.

4. DISCUSSION

Based on Table 1, it is concluded that most previous studies have evaluated the efficacy of laser in gingival depigmentation and some have compared the treatment outcome of laser and other treatment options. Satisfactory results showing reduction in gingival pigmentation or normal gingival color were reported in all studies and were almost present in all cases to the last follow up [6-14]. Three of the studies [8,9,14] reported on the patient satisfaction which is a worthy objective outcome. It is suggested that future studies assess more standard outcomes such as health related quality of life.

In general, studies on the efficacy of laser in gingival depigmentation have high heterogeneity and small sample size and mostly limited to case reports. For instance laser type, wavelengths, maximum laser power and duration of irradiation are variable in different studies. The duration of assessment has also been variable and in some studies too short to draw a conclusion.

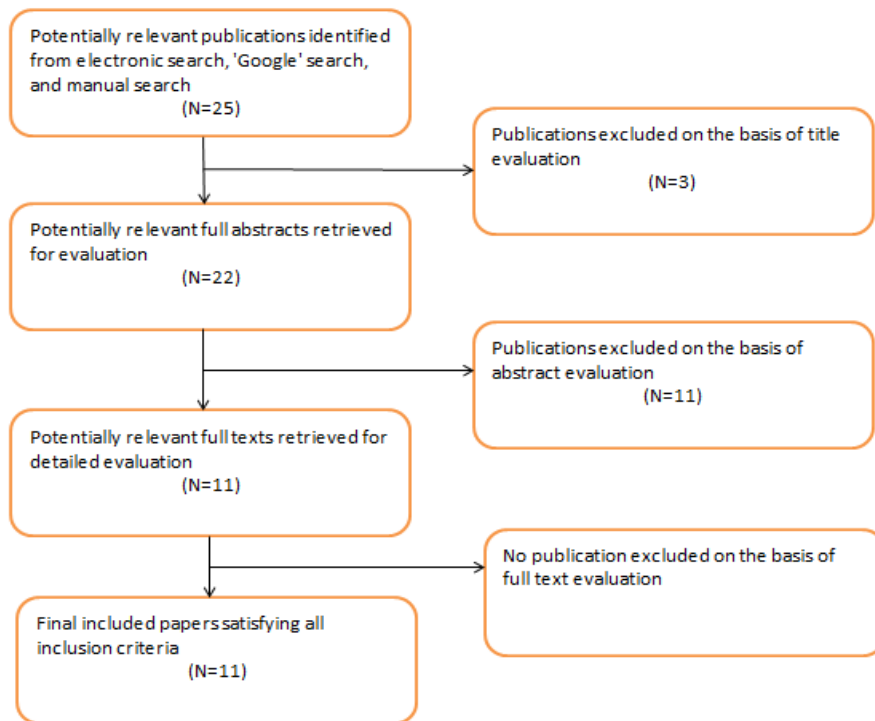


Fig. 1. Literature search flowchart

Table 1. Studies on the application of laser for depigmentation

Author	Type of study	Publication date	Study population	Treatment protocol	Results	Follow up period
Allen et al. [6]	Case report	2011	1	LPM* (980 nm,20 w)	Demonstrated the applicability of a new, minimally invasive and effective method of localized gingival hyperpigmentation removal; less pain and discomfort	2-5 months
Atsawasuwan [7]	Case report	2000	4	Nd:YAG laser (60 mJ/pulse, 100 Hz,6 w)	Gingival color became normal after three weeks. No recurrence was noted.	1 year
Azzeh et al. [8]	Case report	2007	6	Er: YAG laser (250 mJ,15 Hz)	The outcome was good in all patients. No recurrence was noted. No anesthesia was used at the time and no pain was reported.	6-18 months
Lee et al. [9]	Case report	2011	2	Er:YAG laser with rotary instrument (250 mJ,15 Hz) Non-contact method	Both methods showed satisfactory results. However, slight pigmentation remained at the gingival margin. More pain reported in the laser side.	1 month
Geeti Gupta [10]	Case report	2011	1	Semi-conductor diode laser (980 nm,2-4 w)	Satisfactory results were noted in the laser-treated anterior gingiva. No recurrence was noted.	15 months
Fekrazad [11]	Case report	2014	1	Er,Cr:YSGG laser (630 nm,200 mw)	Patient had no post-operative pain and no antibiotic use. Complete healing was achieved after four weeks.	4 weeks
Esen et al. [12]	Case report	2004	10	CO ₂ laser (0.8 nm,20 Hz)	CO ₂ laser efficiently and safely treated gingival	24 months

Author	Type of study	Publication date	Study population	Treatment protocol	Results	Follow up period
					hyperpigmentation. Two patients showed repigmentation at last follow up. No pain was reported.	
Murthy M, et al. [2]	Case report	2012	3	Comparison of rotary abrasion, surgical scalpel and diode laser (0.5-1.5 w,810 nm, 0.2 ms)	Laser showed significantly superior results. Longer recovery time but significantly less pain were reported for the laser treatment.	3 months
Grover et al. [13]	Original article split mouth study design	2014	20	Comparison of surgical scalpel and diode laser (2.5 w,320 μm) melanin pigmentation index was calculated immediately, 1 w.1 m and 3m after. Pain was assessed by VAS index one day after, 1 w, 1 m and 3 m after.	Both methods showed optimal efficacy with no significant difference in depigmentation levels or pain reported. Optimal depigmentation was observed at one and three months.	3 months
Riberio [14]	Original article (double-masked randomized controlled clinical trial)	2012	11	Comparison of Nd: YAG laser and surgical scalpel (6 w, 60 mJ/pulse, 100 Hz)	Both methods had optimal efficacy. The time required for treatment with scalpel was longer and pain and discomfort were less after laser therapy	6 months

* laser – patterned Micro coagulation

Randomized blinded clinical trials with an acceptable methodology and long-term follow ups are required to obtain more reliable results proving the efficacy of laser treatment and a comparison between different laser types and parameters. Most of present evidence is limited to case reports with short term follow ups. Also these studies have employed different outcome measurements to evaluate the efficacy of depigmentation. It is suggested that one standardized outcome measurement be used in the studies so it will be possible to pool the data.

5. CONCLUSION

Based on the reviewed literature, laser therapy seems to be a safe treatment option for gingival depigmentation with low rate of recurrence and pain reported.

Considering the fact that few blinded controlled clinical trials have been issued on the comparative efficacy of laser treatment protocols, future studies with adequate sample size and proper methodology are suggested.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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