

A Comparative Study Between Co2 Laser And Mechanical Rotary System Abrasion Of Hyperpigmentation Of The Gingiva

دراسة مقارنة بين استخدام ليزر ثاني اوكسيد الكربون والقشط الميكانيكي بواسطة آلة الحفر السريعة لرفع تصبغ اللثة

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Abstract

Gingival pigmentation is one of most difficult cosmetic problems to treat through conventional ways. Although physiological and ethnic melanin pigmentation is not a medical problem. The black pigmentation was removed with Er-YAG laser and Nd-YAG laser. CO2 laser is revealed an easy, safe, short operation time, and not discomfort to the patient post operatively. This way of removing unwanted pigmentation relieved a good result clinically. Eighty patients were submitted in comparative study between CO2 and mechanical bur abrasion. CO2 laser is revealed an easy, safe, short operation time, and not discomfort to the patient post operatively. The results were evaluated in histological lab in al-sadar teaching hospital.

Keywords: CO2 Laser ,Depigmentation ,gum, Mahdi A.S.AL-Faraaon

الخلاصة:-

تعتبر تصبغات اللثة واحدة من اصعب مشاكل التجميل معالجة بالطرق التقليدية . ان صبغة الميلانين فسلجية وعرقية وهي ليست مشكلة طبية . حيث ان التصبغات الغامقة ممكن ازالها بواسطة ليزر ER:YAG وليزر ND:YAG , إلا أن علاجها بليزر CO2 أكثر سهولة وأسرع وأمن جدا والعملية تستغرق وقت أقصر , ولا يتعرض المريض للإزعاج ويكون مرتاح بعد العملية . أن هذه الطريقة لإزالة التصبغات الغير مرغوب فيها نتائجها السريرية مضمونة وجيدة جدا . تم معالجة ثمانون مريضا اربعون منهم بالطريقة الميكانيكية واربعون الباقين بهذه الطريقة الجديدة للعلاج في العراق . كانت النتائج مشجعة باتجاه العلاج بالليزر وذلك لسهولة العملية وسرعة الشفاء وقلت المعانات وتم تقييم النتائج سريريا واخذت بعض العينات لمختبر الانسجة في مستشفى الصدر التعليمي لتقييم الشفاء النسبي

Introduction

The color of the gingiva is determined by several factors, namely number and size of the blood vessels, epithelial thickness, quantity of keratinization and pigments within the gingival epithelium. Melanin, carotene, reduced hemoglobin and oxyhemoglobin are the main pigments contributing to the normal color of the oral mucosa [1]. Melanin, a brown pigment, is the most common natural pigment contributing to endogenous pigmentation of the gingiva. Physiological pigmentation of the oral mucosa (mostly gingiva), is clinically manifested as multifocal or diffuse melanin pigmentation with variable amounts in different ethnic groups worldwide [2,3] and it occurs in all races [2,4]. Melanin is deposited by melanocytes, mainly located intertwined between the basal and the suprabasal cell layers of epithelium, [5,6] often observed to a greater degree at the incisors [7]. In Caucasians, most melanocytes have striated granules that are incompletely melanized and vary in size from 0.1 to 0.3 μ m. But, the amount is insufficient to cause pigmentation (less than 10% demonstrate pigmentation). A high amount of melanin granules is found in individuals of African and East Asian ethnicity [8]. In them, the granules are more completely melanized and form larger complexes of size about 1–3 μ m; hence, clinical pigmentation is evident. Therefore, the size and degree of melanization of these granules is directly proportional to the degree of pigmentation [7].

Also, there appears to be a positive correlation between gingival pigmentation and degree of dermal pigmentation [8]. However, melanin pigmentation of the gingiva is symmetric and does not alter the normal gingival architecture [2]. The presence of associated skin hyperpigmentation, the presence of systemic signs and symptoms (e.g., malaise, fatigue, weight loss), use of prescription and nonprescription medications, and smoking habits should be noted and differentiated from normal melanine pigmentaion. Pigmented lesions on the face, perioral skin and lips should be noted. The number, distribution, size, shape and color of intraoral pigmented lesions should be assessed. In general, benign pigmented lesions show regular borders and are small, symmetric and uniform in color. They may be either flat or slightly elevated. In contrast, irregular borders, color variation, and surface ulceration suggest malignancy[9].

Un wanted pigmentation carried out using non-surgical and surgical procedures. Although physiologic and ethnic melanin pigmentation is not a medical problem, complaints about "black gums" are common. case series presents a split mouth de-epithelization procedure using popular surgical techniques such as scalpel, bur abrasion or electrosurgery. These techniques were successfully used to treat gingival hyperpigmentation. Although we found that electrosurgery increased the efficacy of our work, giving a cleaner and neater work field, it required a lot of precision. In contrast, scalpel de-epithelization was easy and technique-friendly, giving excellent results and patient satisfaction[10].

Comparative Evaluation of Gingival Depigmentation using Tetrafluoroethane Cryosurgery and Gingival Abrasion Technique is new study to same target. The use of cryogen Tetrafluoroethane is easy, practical and inexpensive as compared to gingival abrasion, due to its high rate of recurrence.

Hence, it is more acceptable to the patients and the operator[11].

A comparison of different gingival depigmentation techniques: ablation by erbium:yttrium-aluminum-garnet laser and abrasion by rotary instruments recently study was done by Lee *et al*[12]. The results of these cases suggest that ablation of the gingiva by an Er:YAG laser and abrasion with a rotary round bur is good enough to achieve esthetic satisfaction and fair wound healing without infection or severe pain. Prudent care about the gingival condition, such as the gingival thickness and degree of pigmentation along with appropriate assessment is needed in ablation by the Er:YAG laser procedure.

Gingival depigmentation by Er-YAG laser has been recognized as a most effective, pleasant and reliable technique[1].

CO₂ laser is reacted with the water in any where as a chromophorce [13].The oral mucosa cell texture is mainly H₂O[14]. According to that and laser tissue interaction principle, as shown in figure 1,[15].The CO₂ laser photon energy will be absorbed from water of the cell. When the temperature of the cells water reach to the boiling degree , cells will be explosion left charring materials in site of operation[16].

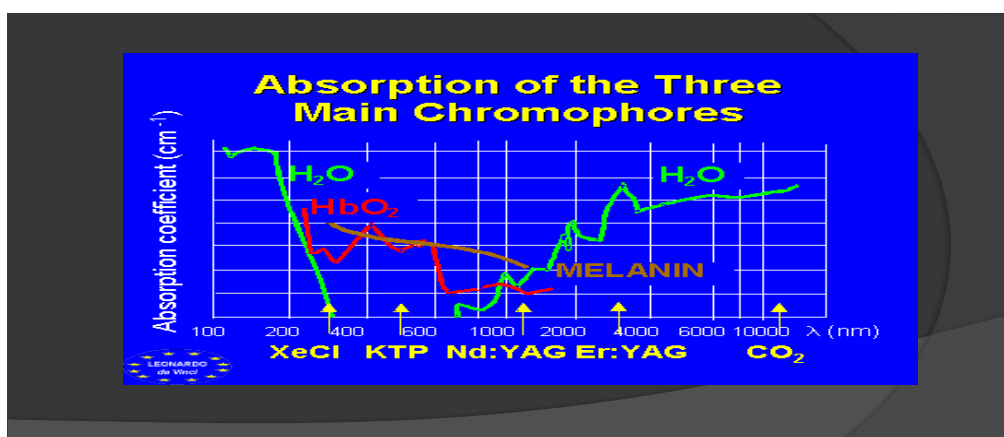


Figure- 1 Deferent wavelength related with absorption coefficient[15]

Materials and Methods

The study had been done in laser dental research unit Dentistry college, Kufa University. The study included 80 patients males and females who requested cosmetic therapy for gingival melanin pigmented. Extraoral and intraoral examinations was done after taking history. The history was included the onset and duration of the pigment. All abnormal dark pigmentation were avoided from this study except the physiological hyper pigmentation.

NO. OF PATIENTS	MALE	FEMEAL
80	40	40
%	50%	50%

Table 1 Number and Percentage Of Treatment Patients

The patient ages range between 16-35 years old. Treatment was carried out using CO2 laser and high speed Burr for mechanical abrasion. The laser beam was set at 5W in pulse mode. The beam was defocused to produce a 3 mm diameter circle, thus reducing the beam penetration depth while increasing the treated surface area. The power density was 0,07W/Cm². The "brush" technique was applied by wet gauze until the gingival surface appeared clinically free of pigmentation. Some of deep black spot applied the laser beam twice. Some deep spots not disappeared were left, to avoid the overheated that may be effected the sub lining bone.

A high speed handpiece and round carbide bur were used for abrasion on the other side. Abrasion under water spray over an epithelial layer was performed until whitish connective tissue was exposed. A # 2 round bur was used to draw the outline of the pigmented lesion and # 6 round bur was used for abrasion. All the melanin remnants of the epithelium were completely removed to prevent the possibility of recurrence

All mechanical depigmentation covered the operation site with periodontics pack which were removed after 3-4 days. The pack was used to stop the bleeding and avoid tissue contamination.

Each patient filled out a personal evaluation questionnaire for clinical analysis.

Results

Patient no.		Average Operation time/ minutes		Average Healing time /days	
Laser CO ²	Mechanical bur	laser	bur	Laser	Bur
40	40	7	25	7	14

Table 2 Number of patients was treated with CO² laser and burr abrasion, operation time in minutes and healing time in days.

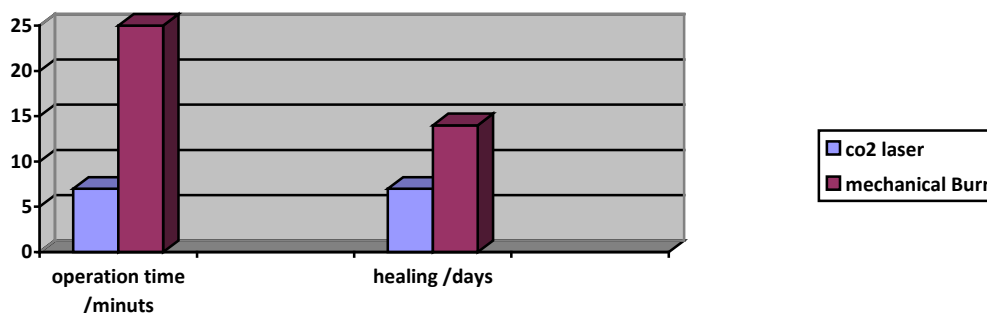


Figure 2 operation time (minutes)and healing time(days) of CO2 laser and Burr abrarsion

Between 5-10 minutes were recorded as total time of treatment for each jaw from canine to canine eminences. While, the time with burr abrasion was between 30 to 20 minutes. The time consuming was depending on the epithelium thickness and pigmentation.

Treatment required local anesthesia for both technics. the mechanical Burr abrasion was bloody and not smooth operation.

Healing was uneventful and required no supportive therapy apposite to mechanical abrasion. None of the patients experienced severe pain during or post-operatively with laser. Mild pain or itching was common during the first week. Treatment was reported as generally pleasant. While the mechanical abrasion Supportive therapy of analgesic and antibiotic to reduce pain development and avoid bacterial contamination was prescribed.

Clinical follow-up during I week, 1month, and 6 months showed no recurrences except one case to both teachings.

Small biopsy 1 to 2 mm² was evaluated in histopathology laboratory in Al-Sadar teaching hospital, the evaluation was to see complete reepithilization of oral mucosa. Clinical picture is the primary evaluation to the see the final healing of operation site.

No. Patient		Not Recurrence		Recurrence	
laser	burr	laser	burr	laser	burr
40	40	39	39	1	1
%	%	97%	97%	3%	3%

Table 3 number and percentage of recurrence and not recurrence of hyperpigmentation to the CO2laser and mechanical (burr) abrasion.

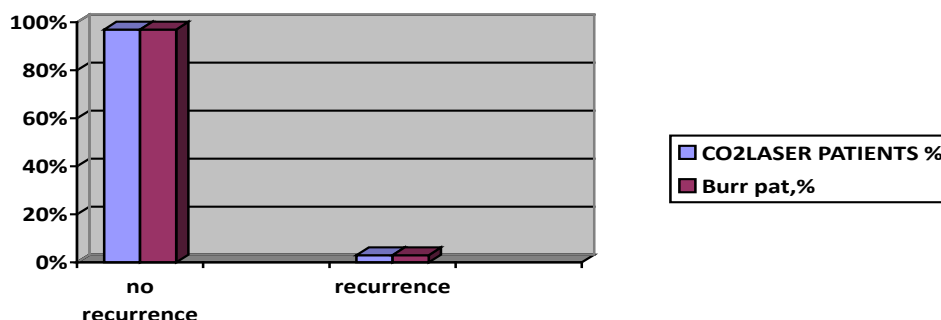


Fig 3 No recurrence and recurrence % of CO2 laser and Burr abrasion.

According to the table 3 the recurrence of the unwanted pigmentation was 3% Vs 97% not recurrent to the both depigmentation methods.

Conclusions

Depigmentation of gingival melanin by CO2 laser radiation in a defocused mode was a safe and faster method Vs. the rotary bur abrasion. The esthetic results were pleasing and healing was uneventful. Since the CO2 laser is available in the dental office, it seems to be the laser of choice for this procedure.

References

1. Tal H, Oegiesser D, Tal M. Gingival depigmentation by Erbium: YAG laser: Clinical observations and patients responses. *J. Periodontol*;74:1660–7. 2003.
2. Dummett CO. Oral pigmentation: First symposium of oral pigmentation. *J Periodontol*;31:356. 1960.
3. Dummett CO, Barends G. Pigmentation of the oral tissues: A review of literature. *J Periodontol*;38:369–78. 1967.
4. Page LR, Corio RL, Crawford BE, Giansanti JS, Weathers DR. The Oral melanotic maculae. *Oral Surg Oral Med Oral Pathol*;44:219–26,1977.
5. Cicek Y. The normal and pathological pigmentation of oral mucous membrane: A review. *J Contemp Dent Pract*;4:76–86. . 2003.
6. Dummett CO. Overview of normal oral pigmentations. *J Indiana Dent Assoc*;59:13–8. 1980.
7. Perlmutter S, Tal H. Repigmentation of the gingiva following surgical injury. *J Periodontol*;57:48–50. 1986.
8. Fry L, Almeyda JR. The Incidence Of Buccal Pigmentation In Caucasoid and Negroids In Britain. *Br J Dermatol*;80:244–7. 1968.
- 9- •Adel Kauzman, Marisa Pavone, Nick Blanas, Grace Bradley; Pigmented Lesions of the Oral Cavity: Review, Differential Diagnosis, and Case Presentations; *J. Can. Dent. Assoc.* 2004; 70(10):682–3.
- 10-Rahul Kathariya and A. R. Pradeep: Split mouth de-epithelization techniques for gingival depigmentation: A case series and review of literature; *J Indian Soc Periodontol.* 2011 Apr-Jun; 15(2): 161–168
- 11-Santhosh Kumar, G. Subraya Bhat, and K. Mahalinga Bhat; Comparative Evaluation of Gingival Depigmentation using Tetrafluoroethane Cryosurgery and Gingival Abrasion Technique: Two Years Follow Up: *J Clin Diagn Res.* 2013 February; 7(2): 389–394.
- 12-Kwang-Myung Lee, Dong-Yeol Lee,¹ Seung-Il Shin, Young-Hyuk Kwon, Jong-Hyuk Chung, Yeek Herr; A comparison of different gingival depigmentation techniques: ablation by erbium:yttrium-aluminum-garnet laser and abrasion by rotary instruments. *J Periodontal Implant Sci.* 2011 August; 41(4): 201–207.
- 13-G.David Baxter; Therapeutic Laser, theory and practice, Churchill Livingstone, 1994,40-41.
- 14- Lewis Clazman and Paul Kuo. Uses of LASER in dentistry. Thieme, Laser in Maxillofacial Surgery and Dentistry, published by Thieme. 1997, 134
- 15- M. N. Avadhanulu ; An introduction to laser theory and applications; LASER Physics S. Chand company Ltd, 2001,28-37
- 16- Markolf h. Niemez. Laser-Tissue Interaction, Fundamentals and applications Third, Revised Edition, Springer, 2004, printed in Germany, 101-125 ..

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1-Patient Hyperpigmentation



3-laser depigmentation after 1week

4- after 6 mon



Before laser treatment



Immediate after laser treatment



1-hyperpigmentation in orthopatient



2-remove the pigment of upper jaw immediatly after laser application



3-after one month