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Treatment of Gingival Hyperpigmentation Using CO_2 Laser: A Case Report

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Abstract: The gingival complex plays a vital role in the overall esthetics of a smile. Melanin, a brown pigment, is the most common natural pigment contributing to endogenous pigmentation of the gingiva. For depigmentation of gingiva different treatment modalities have been reported like bur abrasion, scraping, partial thickness flap, cryotherapy, electrosurgery and laser but repigmentation of the melanin pigment after surgical procedure is noted and considered in a high percentage. The present article describes and discusses one case of gingival melanin pigmentation, a 23-year-old female, who is medically fit and free of any systemic condition, complaining of dark pigmented gingivae. The CO_2 laser device (OpusDuo Aqualite EC Lumens group of companies Germany) was used for treatment delivered in the present case. The clinical view 6 months after the treatment shows healthy gingival color. Conclusion: Treatment of hyperpigmentation by CO_2 laser radiation in a defocused mode was found to be a safe, effective procedure and easy to perform. Postoperative patient satisfaction in term of esthetics and pain was excellent. The gingivae healed uneventfully and completely regenerated with no infection or scarring. No repigmentation occurred after 6 months period. Based on these observations, CO_2 laser is a good treatment choice for gingival depigmentation.

Keywords: Melanin, Gingiva, Pigmentation, CO_2 Laser, Depigmentation

1. Introduction

The color of the attached and marginal gingivae is generally described as pink. This is determined by several factors, including the number and size of blood vessels, epithelial thickness, quantity of keratinisation and pigment within the epithelium.(1)

Oral pigmentation is a relatively common condition that may involve any portion of the oral cavity. Multiple causes are known, and they may range from simple iatrogenic mechanisms, such as implantation of dental amalgam, to complex medical disorders, such as Peutz-Jeghers syndrome. Local irritants, such as smoking, may also result in melanosis of varying degrees. Oral pigmented lesions result from cellular hyperplasia that can range from benign nevi to fatal oral melanoma. (2)

Gingival pigmentation is presented as a diffuse deep purplish discoloration or as irregularly shaped brown and light brown patches. Gingival pigmentation results from melanin granules. Melanin, a non-hemoglobin–derived brown pigment, is the most common of the endogenous pigments and is produced by melanocytes present in the basal and suprabasal cell layers of the epithelium. (3)

Brown or dark pigmentation and discoloration of gingival tissues also can be caused by a variety of systemic conditions, such as endocrine disturbance, Albright's syndrome, malignant melanoma, antimalarial therapy, Peutz-Jeghers syndrome, trauma, hemochromatosis, chronic pulmonary disease, and racial pigmentation. (4,5)

The distribution of oral pigmentation in black individuals is 60% gingival, 61% hard palate, 22% mucous membranes, and 15% tongue. (6)

A smile expresses a feeling of joy, success, sensuality, affection, courtesy which reveals self-confidence and kindness. The harmony of the smile is determined not only by the shape, position and the color of teeth, but also by the gingival tissues. Gingival tissues form an important part of what we can consider to be a pleasing smile. Often, patients complain about dark gums being unsightly. (7)

Melanin hyperpigmented gingivae is an esthetic problem

in many individuals. Particularly if the hyperpigmentation is on the facial aspect of gingivae and visible during smile and speech, especially in patients with gummy smiles.

Gingival depigmentation has been carried out using a variety of methods aimed at removing the pigmented layer (8) Such methods includes surgical techniques, like cryosurgery, (9) which is followed by considerable swelling and it is also accompanied by increased soft tissue destruction, (10) scalpel surgical techniques, (11) electrosugery, which has its own limitations in that its repeated and prolonged use induces heat accumulation and undesired tissue destruction, (12,13) abrasion with diamond bur, (14) and lasers. (15) Examples of lasers used for gingival depigmentation include neodymium doped Yttrium - aluminum- -Garnet (Nd-YAG) lasers, Erbium (Er: YAG) lasers, Carbon dioxide (CO_2) lasers and diode lasers.

In the past, there were chemical methods for depigmentation using caustic chemicals such as 90% phenol and 95% alcohol. (16) These chemicals are currently not recommended. In addition to these methods for pigmentation removal, there are methods aiming at masking the pigmented gingivae with grafts from less pigmented areas, such as free gingival grafts (17) and a cellular dermal matrix allograft. (18)

Melanin pigmentation is located at the basal layer of the epithelium. The CO_2 laser's indications are ablation and vaporization of soft tissue. The laser would allow ablation of the tissue with minimal invasion, which generates less postoperative pain than conventional modalities. The depth of abrasion can be well controlled with the CO_2 laser and the shrinkage of the surface of the tissue can be minimized with a water spray during irradiation. The procedure was done in a non contact mode. Furthermore, the CO_2 laser ablates only at the surface of the tissue, giving the operator good control of the removal rate and facilitating viewing while operating. There were no contraindications for the CO_2 laser treatment. The laser energy can easily interact with the hard tissues of the tooth surface, therefore care must be taken to direct the radiation toward the soft tissue to avoid damage to the tooth. (19)

2. Case Presentation

The present case report describes an effective laser depigmentation technique with modern equipment, which yields aesthetically excellent results. The procedures involved the selective removal of melanin pigmentation affecting the anterior labial gingivae, using a CO_2 laser.

2.1. Pretreatment

The patient, a 23-year-old female, who is medically fit and free of any systemic diseases, presented to our clinic complaining of dark pigmented gingivae. On clinical examination, we found gingival pigmentation related to the buccal surfaces of the gingivae of the teeth number 14# – 24# and 44# – 34# (Figure 1). A periodontal examination revealed normal gingival contour with no pocketing, and with normal sulcus depth of 1-2 mm. There was no mobility and no bleeding on probing. All teeth related to the pigmentation area were tested for vitality, clinically; there is no obvious decay of these teeth. Using the VITAPAN (Vita Zahnfabrik, Germany) shade guide, the color of the involved teeth was recorded as A3.

Figure 1. *The preoperative view of the gingival pigmentation.*

A radiographic examination, using panoramic radiograph was done. There was no impacted teeth, carious lesions, or associated pathology and the bone level around the teeth appeared normal (Figure 2).

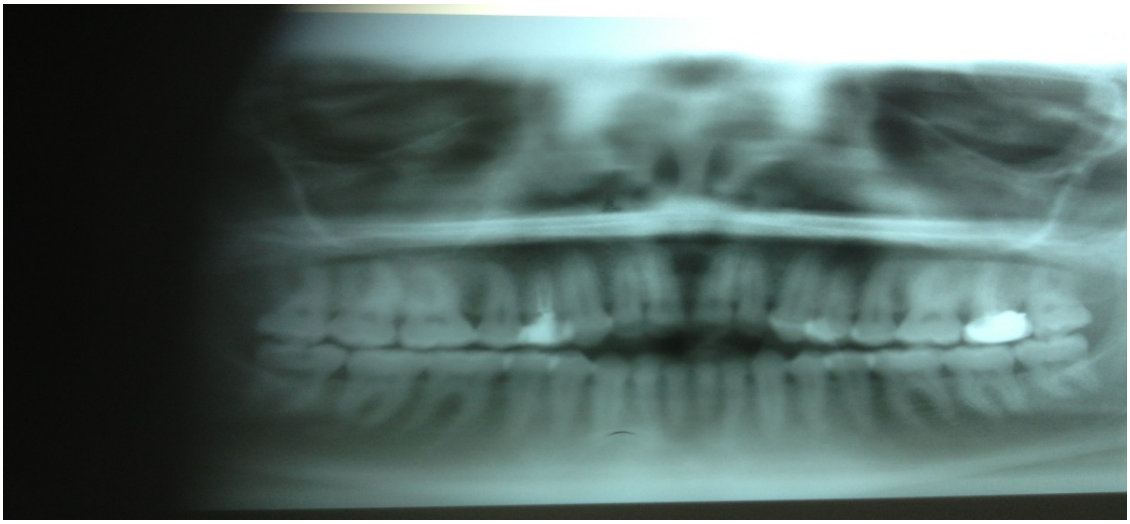

Figure 2. *Baseline Panoramic view of the patient.*

2.2. Diagnosis and Treatment Plan

The condition of the patient was diagnosed as melanin pigmentation on attached gingivae on teeth number 14# – 24# and 44# – 34#. The treatment plan involved removal of all the melanin pigmentation of this gingival tissue using a CO_2 laser, one quadrant each visit.

2.3. Treatment

Informed Consent

The patient gave verbal informed consent which was recorded in the treatment chart

A. Objective

Removal of melanin pigmentation of the tissue to enhance the esthetic appearance.

B. Laser Operating Parameters:

The CO_2 laser device (OpusDuo Aqualite EC Lumens group of companies Germany) was used for treatment delivered in the present case (Figure 4).The device comes with: wavelength; 10600 nm, laser mode; superpulsed, continuous emission mode, average power; 3 W, repetition rate; 20 Hz, and beam diameter of 0.8 mm.

Figure 3. *CO_2 laser (OpusDuo Aqualite EC Lumens group of companies Germany).*

C. Treatment Delivery Sequence:

The treatment objectives and procedures were discussed with the patient and consent was verified. Laser safety protocol was established and monitored. Safety goggles were put on for everyone in the surgical room.

The device was checked before the treatment to ensure its prefect operational conditions. Intra- and extra oral high-volume suction was used during the laser irradiation. The procedure was performed with local anesthesia (2% lidocaine with 1:100,000 epinephrine 3.6 mL).

Test-fire of the laser was conducted. The hand-piece was used in non- contact position, held approximately perpendicular to the tissue, and was applied to the site and slowly moved in a sweeping motion on the tissue surface.

All the discolored gingival surfaces around teeth were ablated with the CO_2 laser. The immediate postoperative view is shown in Figure 4 and Figure 5.

Figure 4. *Ablated area opposite teeth #23 and #24.*

Figure 5. *Ablated area opposite teeth #32 – #35.*

D. Management of Complications

The debris generated during the CO_2 laser irradiation was efficiently removed with the high-volume evacuation. There was no complication during the surgery. The patient remained comfortable under the local anesthesia.

E. Prognosis

All of the melanin pigmentation was removed with minimal penetration into the tissue. There was no area of bleeding. There was no irradiation on any of the tooth surfaces. The prognosis at the surgery site was good.

F. Treatment Records

A notation was inserted in the patient treatment record to describe the ablation of melanin pigmentation on the attached gingiva of teeth number 14# – 24# and 44# – 34#. using a CO_2 laser with 3 watt, 90-degree.

G. Management

The patient was very comfortable and tolerated the procedure very well with no complications. Excellent hemostasis was achieved after pressing the area with sterilized gauze for five minutes. Over-the-counter analgesics were suggested in case of postoperative pain. The patient was given the Office's contact instructions in the event of complications.

H. Postoperative Instructions

The patient was advised to avoid spicy food or other strong seasonings for several days. The patient was also advised not to traumatize the area during the healing period (1 week after the treatment).

2.4. Follow-Up Care

A. Side effects and complications:

No side effect or complications were reported. The one-week postoperative view depicts complete healing (Figure 6 and Figure 7).

Figure 6. *Complete healing.*

Figure 7. *Complete healing.*

B. Assessment of Treatment:

The clinical view 1 week after treatment shows healthy gingival color and almost all the ablated areas were covered with new epithelium, with no inflammation.

The clinical view 6 months after the treatment (Figure 8) shows healthy gingival color. There was no pocketing, with a normal sulcus depth of 1-2 mm. There was no bleeding on probing and no mobility on the teeth. The patient's oral hygiene was excellent

Figure 8. *6 months after treatment shows healthy gingival color.*

3. Discussion

Melanin pigmentation is frequently caused by melanin deposition by active melanocytes located mainly in the basal layer of the oral epithelium. (20) Oral pigmentation occurs in all human races. The intensity and distribution of pigmentation of the oral mucosa is variable, not only between races, but also between different individuals of the same race and within different areas of the same mouth. However, there is no significant difference in oral pigmentation between males and females of the same race. Physiologic pigmentation is probably genetically determined, but as Dummet (19) has indicated the degree of pigmentation is partially related to mechanical, chemical, and physical stimulations.

Individuals with melanin pigmentations may request their removal for esthetic reasons. Numerous authors have reported on the use of lasers for soft tissues removal. They include procedures common to oral surgery, oral pathology, restorative dentistry and periodontics.(21,22) There is abundant evidence confirming markedly less bleeding particularly of highly vascular oral tissues, with laser surgery compared to other surgical techniques. Anecdotal reports that incising oral soft tissues with laser is less painful than using a scalpel.(23)

Different treatment modalities have been used for depigmentation. The selection of a technique for depigmentation of the gingiva should be based on clinical experience, patient's affordability and individual preferences. (24) Electrosurgery requires more expertise than conventional scalpel surgery. Prolonged or repeated application of electrical current to soft tissues induces heat accumulation and undesired tissue destruction. Contact with periosteal or alveolar bone and vital teeth should be avoided.(25) Cryosurgery is followed by a considerable swelling, and it is also accompanied by increased soft tissue destruction. In addition, depth control in cryosurgery is difficult, and optimal duration of freezing is not known, but prolonged freezing increases tissue destruction (11)

A free gingival graft can also be used to eliminate the pigmented areas. However, it requires an additional surgical site (donor site) and color matching in these treatment modalities, however, are not widely accepted or popularly used (26)

Scalpel surgical technique is highly recommended in consideration of the equipment constraints that may not be frequently available in clinics It is known that the healing period for scalpel wounds are faster than other techniques. However, scalpel surgery may cause unpleasant bleeding during and after the operation, and it is necessary to cover the exposed lamina propria with periodontal dressing for 7 to 10 days (11)

Using lasers a one step laser treatment is available usually sufficient to eliminate the pigmented areas and do not require any periodontal dressing. This has the advantages of easy handling, short treatment time, hemostasis and decontamination and sterilization effects. But this approach needs expensive and sophisticated equipment that is not available commonly at all places and makes the treatment very expensive. (27)

In our report about depigmentation with CO_2 laser, re-epithelization was completed after one week and the gingiva was similar to the normal untreated gingiva.

In the present study, repigmentation was not observed during a short follow up period (6 months). However long-

term observation is required to determine the sustainability of the effect of CO_2 laser in depigmentation.

4. Conclusion

Treatment of hyperpigmentation by CO_2 laser radiation in a defocused mode was found to be a safe, effective procedure and easy to perform. Postoperative patient satisfaction in term of esthetics and pain was excellent. The gingivae healed uneventfully and completely regenerated with no infection or scarring. No repigmentation occurred after 6 months period. Based on these observations, CO_2 laser is a good treatment choice for gingival depigmentation.

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