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CASE REPORT

CLINICAL APPLICATION OF DIODE LASER IN GINGIVAL HYPERPIGMENTATION TO ENHANCE AESTHETICS

[*,1]Dr. Brijesh Byrappa, [2]Dr. Zainab Abubaker, [3]Dr. Swathi Mani, [4]Dr. Narahari Ranganatha and [5]Dr. Mohammed Yunus

[1]Dental Surgeon and Implantologist, Dental Experts – A Super Speciality Dental Clinic, (No. 71, Dr Rajkumar road, Prakash Nagar Bangalore 560021)

[2]Cosmetologist, Dental Experts – A Super Speciality Dental Clinic, (No. 71, Dr Rajkumar road, Prakash Nagar, Bangalore 560021)

[3]Oral Medicine and Radiologist, Dental Experts – A Super Speciality Dental Clinic, (No. 71, Dr Rajkumar road, Prakash Nagar, Bangalore 560021)

[4]Oral and Maxillofacial Surgeon, Senior Lecturer, Dept. of Oral and Maxillofacial Surgery, Rajarajeswari Dental College and Hospital, (No. 14,RAMOHALLI Cross, Mysore Road, Kumbalgodu, Bangalore -560074)

[5]Dental Surgeon & Implantologist, Dental Experts – A Super Speciality Dental Clinic, (No. 71, Dr Rajkumar road, Prakash Nagar, Bangalore 560021)

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ABSTRACT

Patients are highly inclined towards aesthetic outlook in the recent years. More number of patients visit dental offices with the complaint of greyish-black gums. The core reason for this pigmentation of the gingiva is due to the melanoblastic activity. There are wide range of treatment options for depigmentation of the gingiva. They include scalpel gingivectomy, free gingival graft, bur abrasion, use of chemicals, electrosurgery, cryosurgery and lasers. Among the various techniques, lasers provide promising therapeutic option as they are simple, painless, effective and a reliable tool. Here, we report gingival depigmentation of a patient using diode laser technique.

INTRODUCTION

Gingival melanin pigmentation is one of the factors which determine the smile of an individual. The colour of gingiva depends on several factors, such as number, size of blood vessels, thickness of the epithelium, level of keratinization, quantity of pigments (Kashyap, 2015). Oral pigmentation can have other etiological factorsthat may range from simple iatrogenic mechanisms, such as implantation of dental amalgam, to complex medical disorders (Peutz-Jeghers syndrome). Local irritants, such as smoking, may also result in melanosis of varying degrees. Other causes such as, drugs, heavy metals, genetics, endocrine disturbance and inflammation are also suggested. Oral pigmented lesions result from cellular hyperplasia that can range from benign nevi to fatal oral melanoma (Ahmed, 2015 and Kashyap, 2015).

[*]*Corresponding author:* **Dr. Brijesh Byrappa,**
Dental Surgeon and Implantologist, Dental Experts – A Super Speciality Dental Clinic, (No. 71, Dr Rajkumar road, Prakash Nagar Bangalore 560021).

Melanin is a brown pigment and is the most common cause of endogenous pigmentation of gingiva and is the most predominant pigmentation of mucosa. Melanin pigmentation is caused by melanin granules in gingival tissue, which are produced in melanosomes of melanocytes. Melanocytes are primarily positioned in the basal and suprabasal cell layers of the epithelium. Although physiologic melanin pigmentation is not a medical problem, patients may complain of unaesthetic gums (Kashyap, 2015). Numerous procedures have been developed for depigmentation of the gingiva, such as scalpel method, bur abrasion, free gingival graft, gingivectomy, cryosurgery and laser surgery.

Laser surgery has more benefits over other methods such as, homeostasis, sterilization effects and excellent coagulation (Kishore, 2014 and Kashyap, 2015). This case report presents a simplified and effective technique of depigmentation with laser which has been successfully used to enhance periodontal esthetics.

Case report

A 30-year-old male patient visited our dental office with a chief complaint of greyish-black gums visible in upper and lower front region of jaws while smiling. There was no significant medical or dental history or any oral destructive habit. On clinical evaluation, diffused melanin hyperpigmentation was found on the labial surface of both the maxillary and mandibular arches (Fig. 1). The colour of the gingiva was diffuse grey-black and the *Melanin pigmentation index* score was 2. An informed consent was obtained from patient after explaining the laser procedure. Topical anesthetic was used before starting the procedure to reduce any discomfort. The maxillary anterior gingiva from 14 to 24 and the mandibular anterior gingiva from 34 to 44 was depigmented using by Diode laser (Fig. 2).

Figure 1. Preopertative photograph showing diffuse melanin pigmentation of anterior gingival region

Figure 2. Post opertative photograph with good aesthetic outcome of anterior gingival region

IMDS Diode laser of 10 watt, wavelength of 980 nm and frequency of 20KHz, was used for the depigmentation. This diode laseris emitted in pulsed mode and is operated under contact method using an attached flexible fiber optic handpiece. The epithelium and part of the connective tissue of the gingiva would contact the emitted laser. The tip was used in small brush strokes to prevent heating of the tissue. The wound looked fresh with no bleeding. The area was irrigated using saline and wascovered with periodontal dressing after the procedure. Patient was instructed to avoid eating hot and spicy food for a day. A periodontal pack was placed for a week to reduce the postoperative discomfort. Vitamin E capsules (EVION 200MG) was adviced to be used topically thrice daily for a week. After one week, the healing was uneventful. There was no sign of repigmentation of any part of gingiva treated and the healing was good with a considerable improvement in aesthetics at three months of follow up.

DISCUSSION

Aesthetics has become the prime importance in a fast pace and self-conscious society and gingival hyperpigmentation is one of the most demanded periodontal aesthetic treatment. Physiologic pigmentation is probably genetically determined, but as Dummett (1960) suggested, that the degree of pigmentation is partially related to mechanical, chemical, and physical stimulation. Pigmentations can be removed for aesthetic reasons. Different treatment modalities have been used for the same. Clinical evaluation of the patient helps in better treatment planning and execution. The following indices can be used for the same (Luis, 2014).

The degree of melanin pigmentation can be determined by *Melanin pigmentation index* with the scoring given as *(Takashi et al.):*

Score 0: No pigmentation.
Score 1: Solitary unit(s) of pigmentation in papillary gingiva without extension between neighbouring solitary units.
Score 2: Formation of continuous ribbon extending from neighbouring solitary units (Luis, 2015 and Rohini, 2014).

A *classification of oral pigmentation*by *Academic Centre of Dentistry*, Amsterdam and University of California (*Carolineet al*):

Class I: Pigmentation in the attached gingiva only.
Class II: Pigmentation in the attached gingiva and interdental papilla.
Class III: Diffuse pigmentation involving all parts of gingiva.
Class IV: Pigmentation in marginal gingiva only.
Class V: Pigmentation in interdental papilla only.
Class VI: Pigmentation of marginal gingiva and interdental papilla (Rohini, 2014).

The selection of a technique for depigmentation of the gingiva should be based on patient's affordability, clinician's experience and preferences.

The different techniques for depigmentation

- Scalpel technique
- Cryosurgery
- Electrosurgery
- Lasers: Different lasers have been used for gingival depigmentation, including carbon dioxide (CO_2, wavelength 10600 nm), semiconductor diode (wavelength 820 nm), neodymium-doped: yttrium, aluminum, and garnet (Nd: YAG, wavelength 1064 nm), erbium-doped: yttrium, aluminium garnet (Er: YAG, 2940 nm), and erbium, chromium doped: yttrium, scandium, gallium garnet (Er,Cr: YSGG wavelength 2780 nm) lasers.

- Chemical methods including acoustic agents such as 90% phenol, 95% alcohol and ascorbic acid are not used nowadays.
- Methods aimed at masking the pigmented gingiva from less pigmented gingival areas such as free gingival graft and acellular dermal matrix allograft (Suneethi, 2017)

LASER is an acronym for Light Amplification by Stimulated Emission of Radiation, based on theories and principles first put forth by Einstein in the early 1900s. The first actual laser system was introduced by Maiman in 1960. Laser light is a man-made single-photon wavelength. The process of lasing occurs when an excited atom is stimulated to remit a photon before it occurs spontaneously. Stimulated emission of photons generates a very coherent, collimated, monochromatic ray of light (Apeksha, 2015). Clinical lasers are of two types: Soft and hard lasers. Soft lasers are claimed to aid healing, reduce inflammation and pain. Its applications include frenectomies, ablation of lesions, gingivectomies, gingivoplasties, de-epithelization, soft tissue tuberosity reductions, operculum removal, coagulation of graft donor sites, crown lengthening procedures, incisional and excisional biopsies. Hard lasers however, can cut both hard and soft tissues (Apeksha, 2015 and Rizwan, 2015). Lasers designed for surgery deliver concentrated and controllable energy to the tissue. For a laser to have a biological effect the energy must be absorbed by the tissue. Laser energy is absorbed by specific chromophores within the irradiated tissue. Diode laserfalls in the region of near infra-red in the spectrum. Diode laser energy is highly absorbed in pigments like melanin and haemoglobin. Hence they are highly efficient for gingival depigmentation. The most commonly used diode wavelengths are 810, 940 and 980 nm. We have used diode laser of 980 nm (Apeksha, 2015). Diode laser basically does not interact with dental hard tissues, it is an excellent soft tissue surgical laser, indicated for curettage or sulcular debridement, cutting and coagulating oral mucosa. The diode laser exhibits thermal effects using the *hot-tip* effect caused by heat accumulation at the end of the fiber, and produces a relatively thick coagulation layer on the treated surface (Rizwan, 2015). The diode laser causes minimal damage to the periosteum and bone under the gingiva being treated. It has the unique property of being able to remove a thin layer of epithelium cleanly. Although healing of laser wounds is slower than healing of scalpel wounds, a sterile inflammatory reaction occurs after laser use (Rizwan, 2015).

There are many advantages of lasers over surgical procedures. (Wigdor *et al*., 1995), these include:

- Dry and bloodless surgery,
- Instant sterilization of the surgical site,
- Reduced bacteremia,
- Reduced mechanical trauma,
- Minimal postoperative swelling and scarring and
- Minimal postoperative pain (Amit, 2012).

Lasers can be used for patients to reduce anxiety. It provides a 'needle-free' approach or no anesthesia dentistry. Also, laser dentistry requires less chairside time compared with more traditional treatments and hence results in more patient cooperation and more efficient dentalpractice. There is increased coagulation and a necrotic slough that is formed over the surface of soft tissue after treating with lasers. There is no need of sutures and a comfortable healing is seen. Thus, it provides faster and better treatment outcome (Amit, 2012; Ponaganti, 2015).

There are few limitations of laser

- Expensive,
- Technique-sensitive,
- Need for eye protection for doctor, patient and assistant,
- Hyperpigmentation can reappear in 6 months to 1 year time
- Tissue penetration from laser may cause thermal damage to underlying hard tissues (Amit, 2012).

Conclusion

The treatment modality for melanin hyperpigmentation of gingiva by using diode laser was found to be safe and effective. Postoperative patient satisfaction in terms of aesthetics was excellent. The gingiva healed uneventfully within a week and completely regenerated with no infection, pain, swelling, or scarring. No re-pigmentation occurred during the follow up period of three months. Based on these observations, diode laser is a good treatment choice for gingival depigmentation.

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