

Treatment of gingival hyperpigmentation with laser and scalpel techniques: Case Report

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Abstract

The need and demand for esthetics requires the removal of unsightly pigmented gingival areas to create a pleasant and confident smile, which altogether may alter the personality of an individual. Depigmentation procedures such as scalpel surgery, free gingival autografting, electrosurgery, cryosurgery, diode laser have been used for removal of melanin hyper pigmentation. The application of diode laser appears to be a safe and effective alternative procedure for the treatment of gingival melanin pigmentation. Its benefits include ease of usage, effectiveness in the treatment of superficial benign pigmented lesions, convenience in dental clinics, and decreased trauma for the patient.

Keywords: Gingival depigmentation, laser, scalpel.

Introduction

Gingival hyperpigmentation makes Unesthetic appearances. Melanin is a non –hemoglobin derived brown pigment, responsible for normal pigmentation of the skin, gingival and oral mucous membrane is the most

common of the endogenous pigments and is produced by melanocytes present in the basal and supra basal cell layers of the epithelium. Melanin pigmentation appears as early as 3 hours after birth in the oral tissues and in some cases is the only sign of pigmentation on the body. In 1959, dummet discussed first time various clinico–pathological aspect of melanin pigmentation.¹

Dummet proposed the Dummet Oral Pigmentation Index (DOPI) assessment: 1964.^{2,3}

- Score 0: Pink tissue (No clinical pigmentation)
- Score 1: Mild light brown color (Mild clinical pigmentation)
- Score 2: Medium brown or blue- black tissue (Heavy clinical pigmentation)
- Score 3: Deep brown or blue- black tissue (Heavy clinical pigmentation)

Causes

The gingiva is considered the most frequently pigmented tissue in the oral cavity. Gingival pigmentation is a discoloration of the gingiva due to a variety of lesions and

conditions associated with several endogenous and exogenous etiologic features. It may range from physiologic reasons (e.g. racial pigmentation) to manifestations of systemic illnesses (e.g. Addison's disease) to malignant neoplasms (e.g. melanoma and Kaposi's sarcoma). It is essential to understand the cause of a mucosal pigmentation before planning the treatment of such lesion. Broadly, gingival pigmentation may be classified as physiologic or pathologic.^{4,5}

The process of pigmentation consists of three phases (Lerner et al 1950)⁶

- I) The activation phase occurs when the melanocytes are stimulated by factors like stress hormones, sunlight etc. leading to production of chemical messengers like melanocyte stimulating hormone.
- II) In synthesis phase, melanocytes make granules called melanosomes. This process occurs when the enzyme tyrosinase converts amino acid tyrosine into a molecule called dehydroxyphenylalanine (DOPA). Tyrosinase then converts DOPA into secondary chemical dopaquinone. After a series of reactions, dopaquinone is converted into either dark melanin (eumelanin) or light melanin (pheo-melanin).
- III) In expression phase, melanosomes are transferred from the melanocytes to the keratinocytes which are the skin cells located above melanocytes in the epidermis. After this, melanin color eventually becomes visible on the surface of skin.

Physiology of melanin pigmentation :

The gingival color depends primarily upon

- ♣ The number and size of vasculature
- ♣ Epithelial thickness
- ♣ Degree of keratinization
- ♣ Pigments within the gingival epithelium

Gingival depigmentation can be considered a periodontal plastic procedure whereby the gingival hyperpigmentation is removed by various techniques and the technique selection should primarily be based on clinical experiences and individual preferences with primary indication of demand for improved esthetics.

Different techniques for depigmentation include:

1. Scalpel technique
2. Cryosurgery
3. Electrosurgery
4. Lasers - Nd: YAG laser, Er: YAG laser, CO2 laser
5. Chemical methods including acoustic agents – not used nowadays
6. Method aimed at masking the pigmented gingival from less pigmented gingival areas
 - a. Free gingival graft
 - b. Acellular dermal matrix allograft

The present case series describes two simple and effective surgical depigmentation techniques - The scalpel technique, and a diode laser surgery – for gingival depigmentation, which have produced good results with patient satisfaction.

Case report

A 27-year-old male patient complaining of heavily pigmented gums visited the Department of Periodontics, Haldia institute of Dental sciences and research. He complained of dark gums and requested for any cosmetic treatment which would eventually enhance the aesthetics on smiling. His medical history was non-contributory. The hyperpigmentation was esthetically displeasing site and laser-assisted depigmentation of the gingiva in the anterior region from 1st premolar to 1st premolar in the maxilla was planned. Topical anesthetic gel was applied to the surgical field. Special eye glasses were worn by the patient and the staff to fulfill with the FDA laser safety rules. The properly initiated tip of the diode laser unit (wavelength

810 nm) angled at an external bevel of 45 degrees and at energy settings of 1.5-2w gated pulse mode (CW) was used with small brush like strokes back and forth with gradual progression deeper along the same initial laser incision to remove the tissue. A 400 µm strippable fiber was used with a power setting of 1.5 watts initially in pulsed wave mode (PW) set at 0.20 ms of pulse duration and 0.10 ms of pulse interval for the de-epithelialization procedure.[Fig.1,2,3]

After removal of the overlying epithelial tissue, power setting was increased to 2 W to attain rapid ablation for removing the pigments present deep at the basement membrane and minimize the hemorrhage from the connective tissue. During the procedure, any tissue tags left out after laser ablation were wiped with sterile gauze soaked in saline every 3-5 min and thorough inspection was done to confirm no pigmented areas were left out. The patient was prescribed analgesics for use when required and was discharged with necessary post-operative instructions. The patient was reviewed at 1 week and the post-operative healing was uneventful. The patient was recalled after 1 month and 3 months for evaluation of any repigmentation .



Fig. 1: Pre-operative



Fig. 2: Immediate post-operative site of laser technique



Fig.3: Post-operative

Scalpel procedure

Local anesthesia was obtained with infiltration (2% Lidocaine with Adrenaline 1:200,000) in relation to the surgical site. Where the gingival epithelium was excised with Bard Parker blade number 15 and 11. The excision involved the entire pigmented area extending from the free gingival margin to the mucogingival junction from the mid line extending up to the first premolar, with the blade placed almost parallel to the long axis of the teeth with care taken not to expose the underlying bone. The entire epithelium was removed in one piece. This was followed by careful examination of the exposed connective tissue surface and any remaining tissue tags were removed by surgical scissors. Bleeding was controlled using a pressure pack and, once hemostasis was achieved, the site was covered by periodontal dressing for 1 week. [Fig.4,5]

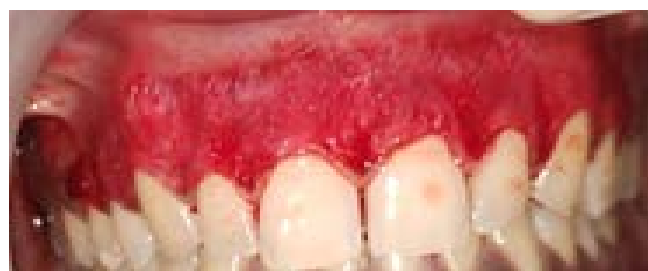


Fig.4: Immediare post-operative site of scalpel technique



Fig.5: Post-operative

Clinical evaluation

Melanin pigmentation index (Takashi et al.2005).⁷The degree of melanin pigmentation was determined by melanin pigmentation index based on the following scoring system:

Score 0: No pigmentation

Score 1: Solitary unit(s) of pigmentation in papillary gingiva without extension between neighboring solitary units

Score 2: Formation of continuous ribbon extending from neighboring solitary units.

Wound healing was evaluated as per the list of clinical observations and patient responses prepared by Sharon et al. (2000) and Tal et al. (2003).⁷

Each parameter was evaluated as:

- Complete epithelization
- Incomplete epithelization
- Ulcer
- Tissue defect or necrosis.

The visual analog scale(VAS) was used to evaluate the subjective pain level experienced by each patient. It consists of a horizontal line 100 mm (10 cm) long, starting at the left end with the descriptor “no pain” and ending at the right end with “unbearable pain.” Patients were asked to mark the severity of their pain. The distance of this point, in millimeters, from the left end of the scale was recorded and used as the VAS score).

Score 0 was recorded as no pain,

Scores between 1 and 30 were recorded as slight pain,

Scores between 31 and 60 were considered as moderate pain

Scores of 61-100 were recorded as severe pain

Results

Because the patient was under anesthesia, evaluation of pain was done 1 day postoperatively. Healing was uneventful in 1st week with pink color comparable to

nearby non-treated area, resulting in a significant improvement in esthetic appearance. Patient’s acceptance of the procedure was good and results were excellent as perceived by the patient. Compared to scalpel blade, diode laser showed delayed healing. At the VAS evaluation sites operated on with scalpel blade the patient complained of moderate pain, but at the site treated with diode laser, only slight or no pain was recorded. However, the pain had reduced considerably 1 week after the surgery. The Melanin pigmentation index score also showed that there was no recurrence of pigmentation at 3 months.

Discussion

Melanin pigmentation is frequently caused by melanin deposition by active melanocytes located mainly in the basal layer of the oral epithelium. The semiconductor diode laser is emitted in continuous- wave or gated-pulsed modes, and is usually operated in a contact method using a flexible fiber optic delivery system. Laser light at 800 to 980 nm is poorly absorbed in water, but highly absorbed in hemoglobin and other pigments. Since the diode basically does not interact with dental hard tissues, the laser is an excellent soft tissue surgical laser, indicated for cutting and coagulating gingiva and oral mucosa, and for soft tissue curettage or sulcular debridement. 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. The advantages of diode lasers are the smaller size of the units as well as the lower financial costs. Diode laser did not produce any deleterious effect on the root surface. Thus, it is generally considered that diode laser surgery can be performed safely in close proximity to dental hard tissue. The healing period of scalpel wounds is shorter than with diode laser. However, scalpel surgery causes unpleasant bleeding during and after the operation and it is necessary to cover the exposed lamina propria

with a periodontal pack for 7 to 10 days. The diode laser causes minimal damage to the periosteum and bone under the gingiva being treated, and 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.

The post-operative experience of pain is a complex phenomenon, influenced by psychological, environmental and physical factors. VAS is a reliable method to assess pain in clinical settings when compared with the verbal rating scale. The pain perception was less in the laser group as protein coagulum is formed on the wound surface, which serves as a biological wound dressing and seals the ends of the sensory nerves.

Moritz et al.⁶ in an in vitro and in vivo study showed a bactericidal effect of diode laser. They found an extraordinarily high reduction of bacteria. Blood vessels in the surrounding tissue up to a diameter of 0.5 mm are sealed; thus, the primary advantage is hemostasis and a relatively dry operating field. The use of scalpel technique for the depigmentation is the most economical as compared to other techniques, which require more advanced armamentarium. However, scalpel surgery causes unpleasant bleeding during and after the operation, and it is necessary to cover the surgical site with periodontal dressing for 7 to 10 days.

The mechanism of repigmentation is not understood, but according to the migration theory, active melanocytes from the adjacent pigmented tissues migrate to the treated areas, causing failure.

Conclusion

The need and demand for esthetics requires the removal of unsightly pigmented gingival areas to create a pleasant and confident smile, which altogether may alter the personality of an individual. This could be easily attained

by using any of the methods described above. The application of diode laser appears to be a safe and effective alternative procedure for the treatment of gingival melanin pigmentation. Its benefits include ease of usage, effectiveness in the treatment of superficial benign pigmented lesions, convenience in dental clinics, and decreased trauma for the patient.

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