

Applications of Laser in Management of Oral Melanin Pigmentation



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Abstract

Oral melanin pigmentation occurs due to melanin deposition in melanocytes located in basal and suprabasal layers of oral epithelium. This condition can occur due to physiologic or pathologic factors and is considered an esthetic problem. There are several treatment modalities available for oral melanin pigmentation including laser therapy. The present article briefly discusses lasers for management of oral melanin pigmentation.

Keywords: Pigmentation; Melanin; Laser

Introduction

Oral melanin pigmentation occurs due to melanin deposition in melanocytes located in basal and suprabasal layers of oral epithelium [1]. Several etiologic factors have been contributed to oral melanin pigmentation, including endocrine disorders [2], medications such as antimalarial drugs [2], Peutz-Jeghers syndrome [2], tobacco use [3], and physiologic pigmentation [4] since the color of the gingiva plays a significant role in overall esthetics, management of oral melanin pigmentation is important. There are several treatment modalities available for oral melanin pigmentation. Both surgical and non-surgical methods are suggested for this purpose [5]. Pharmaceutical agents have shown limited success in treatment of oral melanin pigmentation [6]. Surgical methods include the use of free gingival graft [7], use of acellular dermal matrix allograft [8], gingivectomy [9], de-epithelialization by abrasion with rotary instruments [10], cryosurgery [11], electrosurgery [12] scalpel [13], and laser [10,14-16].

Recurrences may be expected for each treatment modality [6,15,17-19]. The recurrence rate and complications vary with regard to treatment technique and duration of follow-up [14]. Lasers have been introduced to dentistry for more than three decades [20]. Since then different laser modalities have been employed for various purposes, such as caries therapy [21], bleaching [22], wound healing [23], oral and maxillofacial incisions [24], and ablation of pigmented oral mucosa [10,14-

16,25]. This mini-review is an attempt to briefly discuss different modalities, mechanism of action, benefits, and drawbacks of lasers for melanin depigmentation of oral mucosa.

Mechanism of Action and Different Laser Modalities



Figure 1: Preoperative and postoperative photograph of removal of gingival pigmentation using diode laser.

Laser treatment of pigmentation is based on selective photothermolysis principle [26]. Laser beam must have a wavelength that is well absorbed by the particular chromophore being removed. Melanin has an absorption spectrum range of 352-1,064nm [27]. Also laser energy is transformed into ablation energy, resulting in cellular rupture and vaporization with minimal heating of the surrounding tissue [28]. Different laser techniques have been used for treatment of oral melanin pigmentation, including erbium-doped: yttrium aluminum garnet (Er: YAG)

laser [10,14-16,25], neodymium-doped: yttrium aluminum garnet (Nd: YAG) laser [29,30], carbon dioxide (CO₂) laser [14,17], semiconductor diode laser [31,32], chromium and erbium-doped: yttrium scandium gallium garnet (Cr, Er: YSGG) laser [33] (Figure 1). Recommending different modalities requires further studies on the subject because of the paucity of information in this regard.

Advantages and Disadvantages

Advantages of laser treatment of oral melanin pigmentation include less postoperative discomfort and pain, and lower chair-time compared to scalpel technique (conventional treatment) [34]. Moreover, as laser beam produces a bloodless field for surgery and causes minimal damage to the periosteum and underlying bone, it provides the advantages of easy handling, hemostasis, and decontamination and sterilization effects. Also the treated gingiva and mucosa do not need any dressing [30]. Lasers are considered among the treatments with lower repigmentation rate (1.16%) [35]. Laser beam destroys basal cells of epithelium and thus reduces the recurrence rate [29]. Other advantages of laser treatment of oral pigmentation include less swelling and scarring [36], and increased patient satisfaction from esthetic outcome [33]. However, this approach needs expensive and sophisticated equipment, which makes the treatment expensive [30]. Also personnel and patient need protection from laser beam. Moreover, some studies suggest that healing of laser wounds is slower than healing of scalpel wounds [37].

Conclusion

It seems that laser offers a convenient therapy with predictable results for treatment of gingival pigmentation. However, further clinical studies are necessary to determine which laser modalities have the best performance in managing this esthetic problem.

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