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Techniques for Gingival Depigmentation: The merits and demerits

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ABSTRACT

A charming smile is determined not only by the alignment and the color of the teeth but also by the gingival health and appearance. The pigmentation of the gingiva is considered to be unaesthetic by many patients, and it may have a psychological impact on them. Pigmentation is contributed by-products of the physiological process and/or pathological diseases, and conditions. Melanin pigmentation results from melanin granules which are produced by melanocyte cells. Furthermore, environmental risk factors such as tobacco smoking contribute to the gingival hyperpigmentation in both active and passive form. Ethnicity and age also influence the color of gingiva and has no sexual predilection.Although a wide array of depigmentation methods are available to manage this condition, there is a shortage of literature which guides clinicians to select the most appropriate technique. Hence, the aim of this review is to emphasis on the advantages and disadvantages of the available depigmentation therapeutic modalities.

Keywords: Pigmentation, gingival depigmentation, techniques, merits, demerits.

1. Introduction

Gingiva is a vital intraoral tissue that contributes in the harmony of smile with its pigmentation playing a critical role. Gingival pigmentation occurs in all races of human and it varies from one race to another. Gingival hyperpigmentation usually occurs due to the excessive abnormal accumulation of melanin in the gingival tissue mainly in the basal and supra-basal cell layers of the epithelium and confers a dark appearance to the gingiva. Gingival hyperpigmentation can be defined as a darker gingival color beyond what is normally expected. Pigmentation of gingiva not only has an effect on esthetics but also creates psychological negativity. This impact is aggravated in patients with excessive gingival display during smiling (Gupta 2011, Alasmari 2018).

2. Causes of gingival hyperpigmentation

Gingival pigmentation is a discoloration of the gingiva due to a diversity of lesions and conditions associated with several endogenous and exogenous etiologic features. It may range from physiologic reasons to manifestations of

systemic illnesses (e.g. Addison's disease) to malignant neoplasms (e.g. melanoma and Kaposi's sarcoma). It is necessary to understand the cause of mucosal pigmentation before planning the treatment of such lesion (Abdel Moneim, El Deeb, et al. 2017).

3. Definition of gingival depigmentation

Gingival depigmentation is "a periodontal plastic surgical procedure whereby the gingival hyperpigmentation is removed or reduced by various techniques." (Ponnaiyan, Gomathy et al. 2013).

4. Gingival depigmentation techniques

There are several different techniques for gingival depigmentation. Removal of hyperpigmentation can be done by surgical and chemical methods. Surgical methods include the conventional method which usually refers to scalpel blade techniques or bur abrasion or using advanced electrosurgery, cryosurgery, lasers and radiosurgery techniques. The non-surgical method generally refers to chemical cauterization and herbal. The methods that mask the gingival pigments include gingival grafting procedures and the use of acellular dermal matrix allograft (Mahesh, Harish et al. 2012, Mostafa and Alotaibi 2022).

4.1. Chemical peeling of gingiva

Chemical agents such as 95% alcohol in combination with 90% phenol have been found to be somewhat harmful to soft oral tissues leading to tissue necrosis and pain. This mixture was found to burn out the pigmented gingiva by destroying tissue down to and slightly below the basal layer of the mucous membranes (Abdelmagyd, Al-Ahmari et al. 2019).

4.2. Scalpel surgical technique

Pigmented gingival epithelium is removed along with a layer of underlying connective tissue using surgical blade and allow it to heal by secondary intention. This technique is economically reasonable and does not require any extensive instruments. In the opposite side, it causes more bleeding during and after surgery, Periodontal dressing required and re-pigmentation can happen by migration of active melanocytes from adjacent untreated area. It is contraindicated with thin gingival biotype and narrow papillary areas (Chethana and Pradeep 2016).

4.3. Gingival Abrasion

Gingival Abrasion involves the denuding of pigmented gingival epithelium by superficial abrasion using football shaped diamond burs. Extra caution should be taken to control the speed and pressure of handpiece, to avoid causing unwanted abrasions or pitting of the tissue. It is a fairly a non-invasive and cost-effective technique and does not require any specific armamentarium. However, it is associated with different drawbacks such as technique sensitivity, increased duration of the procedure, post-treatment pain, and high recurrence rate. Exposure of underlying alveolar bone can occur with high speed and or increased pressure (Kumar, Bhat et al. 2013).

4.4. Electro-surgery

Electro-surgery is the use of high frequency electrical energy in the radio transmission frequency band, which is applied directly to tissue to induce histological effects. As the current passes, the impedance to the passage of current though the tissue generates heat, that boils the tissue water, creating steam, resulting in either cutting or coagulation of tissue. It was found that this technique controls hemorrhage, permits precise contouring of tissues, causes less discomfort to patient, less scar formation and lesser chair time. It requires more expertise than scalpel surgery. Prolonged or repeated application of current to tissue induces heat accumulation and undesired tissue damage. Contact with periosteum or alveolar bone and vital teeth must be avoided (Yadav, Kumar et al. 2022).

4.5. Cryosurgery

Cryosurgery involves freezing of gingiva with the application of various materials, i.e. cryogen such as liquid nitrogen at very low temperatures. The impact of ultralow temperature of cryogen on gingival tissue causes the epithelium to undergo cryonecrosis, which helps to eliminate gingival pigmentation.It is a cheap method with long-term greater esthetic results, rapid healing, and low recurrence rate. Lack of bleeding, pain and scar formation, application without regional anesthesia, sutures or drugs, ease of application of cryogen at papillary areas and need of no complex instruments, and prioritizes the cryosurgery over other depigmentation techniques Post-operative swelling and difficulty in controlling the penetration depth constitute the disadvantages of this method (Jokar, Bayani et al. 2019).

4.6. Lasers

Different lasers have been used for gingival depigmentation. Laser photon energy is absorbed by tissue elements named chromophores. Chromophores in oral tissue are composed of melanin, hemoglobin, allied pigmented proteins, hydroxyapatite, and water. Lasers have an electromagnetic spectrum of wavelengths and chromophores can absorb specific laser wavelengths (Suragimath, Lohana et al. 2016).

Laser ablation of gingival depigmentation has been known as one of the effective, pleasant and reliable methods. It is usually sufficient to eliminate the pigmented areas and do not need any periodontal dressing. It also causes less pain and discomfort due to formation of protein coagulum. Also, it allows clean and dry operating field and stable outcomes. Laser light may also seal free nerve endings. But it also has its own drawbacks of delayed wound healing, thermal damage, deep penetration and the comparably expensive cost of the procedure. Lasers for gingival depigmentation including carbon dioxide (10.600 nm), diode (810 nm) Neodymium: Yttrium Aluminium garnet (1.064 nm) and Erbium: YAG (2.940 nm) lasers (Muruppel, Pai et al. 2020).

Diode laser has been presented in dentistry few years back. It is a solid-state semiconductor laser which typically uses a combination of elements to change electrical energy into light energy. It also can be delivered through a flexible quartz fiber optic hand piece. This energy level is absorbed by pigmentation in the soft tissues and makes the diode laser an excellent hemostatic agent. It also allows good visibility at the surgical site. The post-operative patient comfort is better at the surgical sites treated with diode laser than surgical scrapping method .The CO2laser

lead to minimal damage to the periosteum and bone under the gingiva being treated, and it has the distinctive characteristic of being able to remove a thin layer of epithelium cleanly. YAG laser has demonstrated the best application of laser use, leaving the least thermal damage (Moeintaghavi, Ahrari et al. 2022) .

4.7. Radiosurgery

It is a novel therapeutic modality for the gingival depigmentation that utilizes radiofrequency. Electrically generated thermal energy from the radiofrequency apparatus affects the molecular disintegration of melanin cells exist on the basal and suprabasal layers of gingival epithelium. The latent heat of radiosurgery retards the development and migration of melanocytes, which makes it a more effective method of depigmentation than the conventional techniques. Radiosurgery produces coagulation, thereby decreases the bleeding but it requires at least two sessions of treatment. Papillary areas can be easily depigmented with radiosurgery. Multiple sittings, technique sensitivity, and more expense are the limitations of this novel modality (Sherman, Gürkan et al. 2009).

4.8. Ascorbic Acid

Ascorbic acid/Vitamin C has potential in the treatment of gingival melanin pigmentation.It inhibits the melanin formation by suppressing the tyrosine activity that is essential for melanin biosynthesis. Additionally, ascorbic acid directly downregulates dopaquinone formation, a precursor in melanin synthesis, thus inhibiting the melanin formation. It has been successfully used intradermally, intramucosally, as well as topically .Ascorbic acid aids in the postoperative healing of tissues by helping in collagen synthesis, differentiation, and maturation of fibroblasts. A study by Sheel et al. have reported the delay in regimentation of gingiva with the local application of ascorbic acid following the depigmentation procedure(Yussif, Abdel Rahman et al. 2019).

Although it is minimally invasive, has certain limitations, and precautions have to be taken to avoid complications. It is a weak acid and if given in excess may cause necrosis of the underlying gingival tissues. Furthermore, there are certain critical areas which should be taken care off while using vitamin C injections, such as the interproximal gingiva, the mucogingival junction, and areas of thin gingival phenotype (Chaudhary, Parwani et al. 2023).

4.9. Free gingival graft

Free gingival graft is used after depigmentation procedure for better esthetic outcome. It showed no evidence of regimentation even after 4.5 years. Advantages of this technique include no reoccurrence and esthetically appreciated while its drawbacks including the need for second surgical site, more discomfort to patients, extensive procedure, poor color matching of tissue , slow healing and painful and limited donor area available (Ripoll, Fernández de Velasco-Tarilonte et al. 2021).

4.10. Acellular dermal matrix allograft

Surgical blade no. 15 is used for two vertical incision on the non-pigmented tissue both mesial and distal to the pigmented area. In the pigmented area, partial thickness flap is reflected and excised by a horizontal sulcular

incision. The graft is then trimmed according to the treated area and secured with sutures. This method yields better result compared to gingival abrasion technique. It needs to less time compared to free gingival graft, less post-operative discomfort and less post-operative complications. It required clinical expertise, expensive technique and contraction of graft may happen (Novaes, Pontes et al. 2002).

5. Benefits of melanin

Melanin which causes the oral pigmentation is produced by melanocytes. Melanin provides protection from environmental stress such as ultraviolet radiation and reactive oxygen species. Melanocytes function as stress-factors, modulating inflammatory, immune and antibacterial responses so it is not necessary to remove the pigmented gingiva for the patient who does not have problem with it (Gasque and Jaffar-Bandjee ,2015, Chen et al., 2022) .

Conclusion

Melanin pigmentation does not possess a medical problem, it is mostly associated with persons with gummy smile. Gingival biotype, clinician's expertise, patient preferences, cost and recurrence rate, impressively determine the choice of a technique. Each modality has its own advantages and disadvantages. Although a wide range of techniques have been employed, cryosurgery followed by lasers has been reported to be superior methods with better esthetic outcomes and low recurrence rate.

Disclosure

The author reports no conflicts of interest in this work.

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