International Journal of Dentistry and Oral Science (IJDOS)
ISSN: 2377-8075

Gingival Depigmentation Techniques: A Review

Review Article

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Abstract

Pigmentation of gingiva has a major impact on esthetics and also creates psychological negativity. Although a wide range of depigmentation techniques are available to manage this condition, there is a scarcity of literature that guides clinicians to choose the most appropriate technique. Hence, the aim of this review is to evaluate the available depigmentation treatment modalities with their pros and cons. Cryosurgery followed by lasers has been reported to be the superior techniques with better esthetic results and low rate of recurrence. However, further randomized controlled longitudinal studies are warranted to elaborate the efficiency and effectiveness of available techniques.

Keywords: Depigmentation; Gingival Pigmentation; Periodontal Surgery; Cryosurgery.

Introduction

A beautiful smile highly depends on the level of appearance of the teeth and gingiva. The shape, position and color of the teeth, and level and color of the gingival tissue play an important role in smile harmony.[1]

Gingival hyperpigmentation can be defined as a darker gingival color beyond what is normally expected. Pigmentation is contributed by-products of the physiological process such as melanin, melanoid, carotene, oxyhemoglobin, reduced hemoglobin, bilirubin and iron and/or pathological diseases, and conditions.[2] Melanin pigmentation results from melanin granules which are produced by melanoblasts. 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.[3]

Gingival pigmentation is caused by both exogenous or endogenous factors.[4] Physiologic gingival pigmentation (PGP) is the most common type, resulting in excessive melanin deposition leading to hyperpigmentation.[5] Although pathological disorders are also implicated in the pathogenesis of oral pigmentation, most cases are physiologic. Irrespective of its origin, many local and/or systemic factors including genetics, tobacco use, antimalarial agents and tricyclic antidepressants may cause gingival pigmentation. [6] Although PGP is a normal condition, complaints of "black gums" are common among adolescents. Patients are often concerned about gingival hyperpigmentation and color variations of their gingiva and many of them with moderate or severe gingival pigmentation especially those with a high smile line (gummy smile) may consider aesthetic treatments. [7] Our research experience has prompted us in pursuing this study [8-17].

Endocrine Diseases

Several endocrine diseases responsible for gingival hyperpigmentation are Addison's Disease,Acromegaly, Albright Syndrome, Nelson's syndrome.[18]

Drugs

Several drugs responsible for gingival hyperpigmentation are Quinine, chloroquine,Zidon1dine,Bleomycin, Minocycline, Kern

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Received: May 28, 2021
Accepted: June 16, 2021
Published: July 01, 2021

Citation: Edala Venkata Gana Karthik, Kaarthikeyan G, Dhanraj Ganapathy. Gingival Depigmentation Techniques: A Review. *Int J Dentistry Oral Sci.* 2021;8(7):2946-2949. doi: doi: http://dx.doi.org/10.19070/2377-8075-21000598

Conazole, Cyclophosphamide, Chlorpromazine.[18, 19].

Heavy Metals

Heavy metals responsible for gingival hyperpigmentation are Lead, Arsenic, Bismuth, Mercury, Silver. [19]

Malignant Neoplasm

Malignant neoplasms responsible for gingival hyperpigmentation are Kaposi Sarcoma,Melanoma.[18]

Mucosal Conditions

Mucosal conditions responsible for gingival hyperpigmentation are Lichen planus,Oralmelanoacanthoma, Hemochromatosis, Blue nevus, Nevocellular nevus, Hemangiomas, HIV oralmelanosis, Inflammatory mucosal lesions. [20, 21]

Miscellaneous

Smokers melanosis, Amalgam tattoo, Graphite tattoo, Gingival tattoo, Carney Syndrome, Puetz-Jeghers Syndrome, Leopard Syndrome and Complex of myxomas have known to cause gingival hyperpigmentation.[20]

Gingival Depigmentation

Gingival depigmentation can be defined as a periodontal plastic surgical procedure whereby the gingival hyperpigmentation is removed or reduced by various techniques.Depigmentation is not a clinical indication but a treatment of choice where esthetics is a concern and is desired by the patients.[22]

Melanin pigmentation can be treated by various methods that include chemical methods using phenol, alcohol, ascorbic acid, and surgical methods of depigmentation such as chemical peeling, ascorbic acid application, gingival abrasion technique, split-thickness epithelial excision, combination technique (gingival abrasion and split-thickness epithelial excision, free gingival grafting, and recent methodologies in gingival depigmentation lasers, cryosurgery, and radiosurgery. [23, 24]

Criteria For Technique Selection

Patient's skin color, extent of gingival pigmentation, lip line, upper lip curvature, esthetic concern and expectation from the treatment, influence the orchestration of treatment plan, and selection of technique.

However, the procedure adopted should be simple, cost-effective, and comfortable to the clinician as well as patient with less pain and minimal tissue loss. Caution must be employed to avoid injury to soft tissues and adjacent teeth. Inappropriate technique or inadvertent application can result in a gingival recession, damage to attachment apparatus, underlying bone, as well as enamel.

Chemical Peeling

It is a treatment method used to destroy the overlying gingival epithelium using a chemical peeling agent. A variety of chemical agents are available such as phenols, salicylic acid, glycolic acid, and trichloroacetic acid. The most commonly used are phenols and alcohols. In a study by Hirschfield and Hirschfield in 1951, pigmented gingiva was burnt out by destroying tissue down to and slightly below the basal layer of mucous membranes using a mixture of 90% phenol and 95% alcohol. However, repigmentation and relapse occurred in all cases shortly after the application of either agent. As phenols may induce cardiac arrhythmias, cardiac monitoring is necessary. The inability to control the depth of penetration and amount of destruction are the main drawbacks of this method. Thereby, these methods are no longer in use and are unacceptable to the clinicians as well as patients. [25-27]

Ascorbic Acid

Melanin pigmentation is regulated by the activity of tyrosinase, a rate-limiting enzyme in melanin biosynthesis. Because melanin is derived from the precursor dopaquinone, which is formed by the tyrosinase oxidation of tyrosine, tyrosinase plays an important role in melanin synthesis. Thus, the effect of AS-G (ascorbic acid 2-glucoside) on tyrosinaseactivity.In a study conducted by Shimada et al. the results showed that inhibition of tyrosinase activity directly correlated with the dose of AS-G [28]. In addition, AS-G caused the strong inhibition of melanin formation in B16 melanoma cells, and the rate of inhibition was higher than that of tyrosinase activity. Conversely, Kameyama et alreported that ascorbic acid derivative significantly suppressed melanin formation on purified tyrosinase or cultured cells and inhibited melanin formation without cell growth suppression on cultured human melanoma cells. Taken together, AS-G probably suppresses melanin formation at various oxidative stages [29, 30].

Soft Tissue Trimmer

In a study conducted by Rohini et al. Depigmentation with precision soft tissue trimmer (DFS Precicut®) a Soft tissue trimmer was used in the high-speed rpm without water coolant spray to excise and contour soft gingival tissue. The heat produced by the bur due to friction results in an immediate tissue coagulation and minimal bleeding, therefore, the use of coolant (water) was avoided. After removing the entire pigmented epithelium with precision soft tissue trimmer, the exposed surface was irrigated with saline. Care was taken to see that all remnants of the pigmented layer were removed. The surgical area was then covered with a Coe- PakTM [31].

However, it is associated with various drawbacks such as technique sensitivity, increased treatment duration, post-treatment pain, placement of periodontal dressing, and high recurrence rate. Exposure of underlying alveolar bone can occur with high speed and/or increased pressure [31-33].

Surgical Scalpel Method

This procedure essentially involves surgical removal of gingival epithelium along with a layer of the underlying connective tissue and allowing the denuded connective tissue to heal by secondary intention. Dummett and Bolden (1963)[30] reported in a study that Scalpel surgery can cause unpleasant bleeding during and after the procedure. It is essential to cover the exposed lamina propria with a periodontal pack for 7-10 days. Delicate scarring, exposure of the alveolar bone at areas where the gingiva is thin and repigmentation can be few of the disadvantages of the pro-

cedure. In a study conducted by Suraj. D et al. concluded that in Tetrafluoroethene has shown better results and outcome in all the parameters considered when compared with conventional surgical scalpel technique [7, 31, 32, 34].

Free Gingival Grafting

Described by Tamizi, Taheri (1996) for treating severe physiologic melanin pigmentation requires replacement with an unpigmented free gingival autograft. The result of this procedure showed no evidence of repigmentation even after 4.5 years. Of the 10 treated patients only 1 patient showed repigmentation after 1 year. But the disadvantage of this procedure included two surgical sites, ghost-like appearance of the treated site due to hypopigmentation and technique sensitivity.[34, 35]

Acellular Dermal Matrix Allograft

Acellular dermal matrix with partial thickness flap has been used in the elimination of gingival melanin pigmentation. It can be a substitute for gingival autograft.[36, 37].

Electrosurgery

In electrosurgical technique, heat generated by transmission of high-frequency electrical energy to the tissues leads to either cutting or coagulation of tissue. Bleeding control, tissue contouring and less scar tissue formation favor the use of this technique for gingival depigmentation. However, pain and patient discomfort during the initial healing period is more with this technique. Furthermore, it requires more clinical expertise than the scalpel surgical method. Prolonged or repeated application can induce heat accumulation and undesired tissue destruction. Contact of the electrosurgical tip with the teeth, periosteum, or alveolar bone can cause their damage. [38, 39, 5, 6].

Laser Surgery

Melanocytes, located in mostly basal and suprabasal layers of gingival epithelium, should be eliminated for a proper depigmentation. Superior to other techniques, application of a laser results in homogeneous ablation of epithelial and rete pegs as well. Diode laser with 810 nm wavelength is used in soft tissues for coagulation and cutting. Diode laser irradiation also has a bactericidal effect resulting in hemostasis. Having a high affinity to penetrate into hemoglobin and melanin pigments makes it the preferred laser for depigmentation of gingiva. Diode lasers can be used both in pulsed or continuous mode. Application of the laser in pulsed mode prevents overheating of surrounding tissues that may cause necrosis and jeopardize healing. Taking into consideration the previously published studies diode laser was used in continuous mode in this study knowing the fact that it may penetrate deeper and affect connective tissue as well. That's why the evaluations were also made at weeks 4 and 12. The use of lasers has several advantages such as no need to place a periodontal dressing, short healing period, no or very slight pain, no hemorrhage. The only disadvantage may be the high cost of the lasers.Inappropriate application may damage gingiva and underlying alveolar bone which, in turn, can cause gingival recession, gingival fenestrations, and delayed wound healing [1, 39-44].

Cryosurgery

Cryosurgery is the most widely accepted method of gingival depigmentation. It involves freezing of gingiva with the application of different materials, i.e. cryogen such as liquid nitrogen at very low temperatures. The effect of ultralow temperature of cryogen on gingival tissue causes the epithelium to undergo cryonecrosis, which helps to eliminate gingival pigmentation. It is an inexpensive method with long-term superior 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 complicated instruments, and prioritizes the cryosurgery over other depigmentation methods.Post-operative swelling and difficulty in controlling the penetration depth constitute the disadvantages of these techniques [34, 45-47].

Radiosurgery

It is a novel therapeutic modality for the gingival depigmentation that utilizes radiofrequency. Electrically generated thermal energy from the radiofrequency apparatus influences the molecular disintegration of melanin cells present 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 efficient method of depigmentation than the conventional methods.Radiosurgery produces coagulation, thereby reduces 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 technique.[48]

Gingival Repigmentation

A critical concern in the management of hyperpigmented gingiva is a relapse or gingival repigmentation.Repigmentation refers to the clinical appearance of melanin pigment following a period of clinical depigmentation.As it depends on methodology and follow-up period, the duration of repigmentation mentioned in literature remains controversial from one technique to another. Furthermore, factors such as smoking, sun exposure, and genetic determination of skin color, influence the duration of relapse. However, the majority of the available literature has shown lower recurrence rate for cryosurgery and lasers.[1]

Conclusion

Demand for depigmentation therapy is mostly seen in patients with black gums or with high smile line. Gingival biotype, clinician's expertise, patient preferences, and recurrence rate, greatly determine the selection of a technique. Although a wide range of techniques have been employed, cryosurgery being the gold standard followed by lasers has been reported to be superior techniques with better esthetic results and low rate of recurrence. Relapse or repigmentation is a critical concern and depends on the technique employed and follow-up period.

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