

GINGIVAL PIGMENTATION AND ITS TREATMENT MODALITIES

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ABSTRACT

The pigments are not only the most beautiful but some of the most vital substances in the body. Pigmentation is both the normal and abnormal discoloration of oral mucous membrane. Etiology of pigment is multifactorial etiology. Most of the pigmentation is physiologic but sometimes it can be a precursor of severe diseases. Melanin pigment irregularities and color changes of the oral tissues could provide significant diagnostic evidence of both local and systemic disease. Gingival melanin pigmentation occurs in all races of man. The differential diagnosis, clinical, etiology, and treatment of pigmentation are discussed

KEYWORDS: Oral pigmentation, melanin, oral lesions, depigmentation, aesthetic.

INTRODUCTION

Oral pigmentation may be physiological or pathological in nature[1]. It may represent a localized anomaly of limited significance or the presentation of potentially life-threatening multisystem disease[2]. Pigmented lesions are commonly found in the mouth. Such lesions represent a variety of clinical entities, ranging from physiologic changes (e.g., racial pigmentation) to manifestations of systemic illness (e.g., Addison's disease) and malignant neoplasms (e.g., melanoma and Kaposi's sarcoma). "The colour of healthy gingiva is variable ranging from a pale pink to a deep bluish purple hue. [3]. Between these limits of normalcy are a large number of pigmentation mosaics which depend primarily upon the intensity of melanogenesis, depth of epithelial cornification and arrangement of gingival vascularity. More over colour variation may not be uniform and may exist as unilateral, bilateral mottled, macular or blotched and may involve gingival papillae alone or extend throughout the gingiva on to other soft tissues".[4]

Although clinically melanin pigmentation of the gingiva does not present any medical problems it can be an esthetic concern for the patient. Demand for cosmetic therapy is made, especially by fair skinned people with moderate or severe gingival pigmentation. Gingival depigmentation is a periodontal plastic surgical procedure whereby the gingival hyperpigmentation is removed or reduced by various techniques. The first indication for depigmentation is patient demand for improved esthetics.

Various depigmentation techniques have been employed with similar results. Selection of technique should be based on clinical experiences and individual preferences.

EPIDEMIOLOGY :

Oral pigmentation occurs in all races of man.[5,6] There were no significant difference in oral pigmentation between males and females[7]. The intensity and distribution of racial pigmentation of the oral mucosa is variable, not only between races, but also between different individuals of the same race and

within different areas of the same mouth[8]. Physiologic pigmentation is probably genetically determined, but as Dummett suggested, the degree of pigmentation is partially related to mechanical, chemical and physical stimulation[9]. In darker skinned people oral pigmentation increase, but there is no difference in the number of melanocytes between fair skinned and dark skinned individuals. There is some controversy about the relationship between age and oral pigmentation. Steigmann and Amir et al stated all kinds of oral pigmentation appear in young children. Prinz, on the other hand, claimed physiologic pigmentation did not appear in children and was clinically visible only after puberty.[10]

CLINICAL CHARACTERISTICS :

The gingiva are the most frequently pigmented intraoral tissues.[8]

Microscopically, melanoblasts are normally present in the basal layers of the lamina propria[11,12]. The most common location was the attached gingiva(27.5%) followed in decreasing order by the papillary gingiva, the marginal gingiva, and the alveolar mucosa.[13]

The total number of melanophores in the attached gingiva was approximately 16 times greater than in the free gingiva[14]. The prevalence of gingival pigmentation was higher on the labial part of the gingiva than on the palatal / lingual parts of the arches. The shade of pigment was classified as very dark brown to black, brown, light brown yellow. Melanin pigmentation of the oral tissues usually does not present a medical problem, but patients complain of black gums.

Melanin has been intensively studied, because it is the most important pigment of the skin. Chemical, melanin is a high molecular weight which is insoluble in water and most organic solvents. Melanin is formed only in the cytoplasm of melanin forming cells, or the melanocyte. These are dendritic or branched cells found at the epidermal dermal junction of the skin and the mucous membrane, in the leptomeninges of the central nervous system, in the uveal tract and in the retina of the eye. The melanocytes are located in the intercellular epidermal spaces and form intricate patterns by their long processes. The degree of

pigmentation depends on a variety of factors, especially the activity of melanocytes.

It also appears that the degree of gingival pigmentation of the gingiva and skin is reciprocally related. Fair skinned individuals are very likely to have non pigmented gingiva, but, in darker skinned persons, the chance of having pigmented gingiva is extremely high. The highest rate of gingival pigmentation has been observed in the area of the incisors. The rate decreases considerably in the posterior areas.

Etiological factors[15,16]

- 1. Endogenous 2. Exogenous

Most pigmentation is caused by 5 primary pigments.[7]

- a. Melanin b. Melanoid c. Oxyhemoglobin d. Reduced hemoglobin e. Carotene

Others include :

- 1. Bilirubin 2. Iron

Color of the gingiva is determined by several factors ;

- 1. Number and size of blood vessels 2. Epithelial thickness 3. Quality of keratinization 4. Pigments within the epithelium

Mechanism of Melanin [7]

Melanocytic Stimulating Hormone (MSH) increases the skin pigmentation by stimulating the dispersion of melanin granules in melanocytes, thus causing darkening of the skin. Secretion of this hormone is stimulated by MSH stimulating factor. Glucocorticoids have an inhibiting effect on MSH, when there is adrenal insufficiency, there is reduced glucocorticoids secretion increase in MSH increase melanin pigmentation

Classification and Differential Diagnosis of Oral Pigmentation :[17,18]

A. Localized pigmentation - Amalgam tattoo - Graphite or other tattoos - Nevus - Melanotic macules - Melanoacanthoma - Malignant melanoma - Kaposi's sarcoma - Epitheloid oligomatosis - Verruciform xanthoma

B. Multiple or generalized pigmentations

- 1. Genetics Idiopathic melanin pigmentation (racial or physiologic) - Peutz-Jegher's syndrome - Complex of Myxomas - Carney syndrome - Leopard syndrome etc
- 2. Drugs – Smoking, betal - Anti-malarial - Anti microbial (minocycline) - Cloropromazine - ACTH - Zidovudine - Ketoconazole - Methyldopa - Heavy metals (Gold, Silver, Bismuth, Mercury, Lead, Copper) - Balulphan - Menthol
- 3. Endocrine - Addison's disease - Albright's syndrome - Acanthosis Nigrecans - Pregnancy - Hyperthyroidism
- 4. Post-inflammatory - Periodontal disease - Postsurgical gingival repigmentation
- 5. Others - Hemochromatosis - Generalized neurofibromatosis - Goucher's disease - HIV - Thalassaemia - Nutritional deficiencies

Gingival Depigmentation :

Melanin hyperpigmentation usually does not present as a medical problem, but patients may complain their black gums are unaesthetic. This problem is aggravated in patients with a gummy smile or excessive gingival display depigmentation is a periodontal plastic surgical procedure whereby the gingival hyperpigmentation is removed or reduced by various techniques. Various techniques have been employed with similar results. The selection of a technique should be based on clinical experience and individual preference.

Different Technique Employed :-

I. Methods aimed at removing the pigment layer

A. Surgical methods of depigmentation

- 1. Scalpel surgical technique a. Slicing, or partial thickness flap technique b. Bone denudation c. Abrasion d. Scraping e. Gingivectomy
- 2. Cryosurgery
- 3. Electrosurgery
- 4. Lasers

- 1. Nd:YAG 2. Er:YAG 3. CO2 lasers

B. Chemical method of depigmentation using caustic chemicals. Eg. 90% phenol

II. Methods aimed at masking the pigmented gingiva with grafts from less pigmented areas.

- 1. Free gingival grafts (FGG)
- 2. Acellular dermal matrix allografts

1) Slicing Technique :[19]

Under Local anesthetic infiltration, two incisions are placed extending from the gingival margin to the vestibular area, a little beyond the limits of the pigmented band. These vertical incisions demarcate the surgical

area.

A No.11 or 15 BP blade is held parallel to the gingival surface, the epithelium and a portion of the C.T. is gently dissected out from one end of the vertical incision.

Care is taken not to tear the tissue or leave any pigmented posts behind or expose the bone.

Periodontal dressing applied for 1 week.



Pre operative view



two vertical and one horizontal incision given



partial thickness flap raised in max.arch



Immediately after surgery in maxillary arch



Recall after 1 month

2) Scrapping Technique [19]

After infiltrating the area with local anesthesia No.15 or 11 B.P. blade with handle is used to scrape the epithelium with underlying pigmented layer carefully.

The raw surface is irrigated, cleaned and dressing is given for 1 week.



Pre operative view



Immediately after surgery of Maxillary region



Recall after one month

3) Abrasion Technique : [20]

It involves removing the epithelium of the pigmented areas with a high speed hand piece. After adequate local anesthesia a high speed handpiece with a diamond bur (straight No.8) with copious water lavage is selected.

It is recommended to use larger size diamond bur because smaller burs do not smoothen the surface easily and has a tendency to make small pits in the area to be corrected.

Feather, light brushing strokes should be used to remove the pigmented areas without holding the bur in one place.



Pre- operative view



carbide bur



Immediately after surgery of the mandibular anterior region



Recall after 1 month

4) Chemical Cauterization [21]- Using 90% phenol

Disadvantages : Harmful to oral tissues Heavy bands of pigmented gingiva are difficult to remove. Depth of action not controlled.

5) Gingivectomy Technique [2]

This procedure is associated with loss of alveolar bone, prolonged healing by secondary intention and excessive post-operative pain. It also results in non-permanent depigmentation.

6) Bone denudation Technique [22]

Under local anesthesia, two vertical incisions are placed, each extending from the gingival margin to the vestibular area, a little beyond the limits

of the pigmented band.

The papillae were splint into labial and lingual halves with B.P. blades.

A horizontal incision was then made into the vestibule, apical to the pigmented band, connecting the two vertical incisions.

With a periosteal elevator, the tissue along with the periosteum was gently separated from the underlying alveolar bone and was removed en-mass entirely exposing the subjacent alveolar bone. Periodontal pack was placed at weekly intervals.

7) Cryosurgical treatment of melanin-pigmented gingiva [23]

The method used for treatment was direct application of liquid nitrogen (-196°C) with a cotton swab on the pigmented gingiva.

Topical anesthesia with 45 xylocaine spray was used to minimize discomfort for 1 to 2 minutes before treatment.

The swab, 5 mm in diameter, was gently rolled forward and backward across 1 cm of the affected area.

Freezing was continuously maintained for 20 to 30 seconds in each area.

All pigmented gingiva in both jaws were treated during a single appointment.

A second course of cryosurgical treatment was usually needed after 1 week to remove any residual pigmentation.

Patients were examined at 2 and 7 days and 2 and 4 weeks and again at the 3rd and 6th months after treatment. They were subsequently recalled once every year.

Slight erythema of gingiva developed immediately after the cryosurgery. During the next 2 to 3 days, superficial necrosis became apparent and a whitish slough could be separated from the underlying tissue, leaving a clean pink surface.

The gingiva appeared normal within 1 to 2 weeks, and keratinization was completed in 3 to 4 weeks after the treatment.

No post operative pain, hemorrhage, infection, or scarring occurred in any of the patients.

Healing was uneventful, patient acceptance of the procedure was good, and the results were excellent. A follow-up period that spanned 3 months to 2 years showed no repigmentation

8) Treatment of gingival hyperpigmentation for esthetic purposes by Nd:YAG LASER [23]

The Nd:YAG laser produces invisible, near infrared light with a wavelength of 1064 nm. This type of laser is used to eliminate various types of hyperpigmented lesion in dermatological surgery, as well as to produce depigmentation in skin.

Because the Nd:YAG laser has a particular affinity for melanin or other dark pigments, it works more efficiently when the entry is applied in the presence of pigment.

With its range of power and fiber-optic delivery, it has been extensively used in minor oral and periodontal surgery. Therefore, it may be another optional treatment for melanin.

A carpule of anesthesia was infiltrated in the operating area.

The patient and staff were protected from the laser by wearing the manufacturer's spectacles.

The Nd:YAG laser was set at 6 watts, 60 millijoules, and 100 pulses per second. The ablation was operated using a handpiece with a fiber optic filament 320 µm in diameter. The procedure was performed in a contact mode with cervico-apical direction in all pigmented areas. The laser was cautiously used to avoid injury to the tooth surface & adjacent tissues during the ablation. This procedure was completed in 15 minutes. After ablating the epithelium with the Nd:YAG laser, the wound was covered with some dried and charred epidermis.

The wound was almost healed completely within 3 weeks. The color of ablated gingiva was dark pink in some areas. The patient did not have any pain or bleeding complications.

Four weeks after the operation, the gingiva was generalized pink in color and healthy in appearance.

The patient was routinely checked every 2 months. After the 11 month follow up, there was no recurrence of gingival hyperpigmentation. Melanin's absorption spectrum ranges from 351 to 1064 nm and therefore lends itself to treatment with a wide variety of lasers. Many laser systems such as Q-switched ruby laser, flash lamp pumped-dye laser, Argon laser, CO2 laser,

The post surgical problems after using the argon and CO₂ laser for skin depigmentation have been reported as scarring, textural changes, and hypopigmentation. The Q-switched ruby laser, flash lamp pumped dye laser, and pulsed Nd:YAG laser were reported as successful devices for pigmented skin depigmentation. Using 6 watts, 60 millijoules, and 100 pulses per second, the Nd:YAG laser demonstrated good result in gingival depigmentation. The procedure were minimally invasive, convenient, fast, and safe. No severe pain was reported during and/or after the procedure. The Nd:YAG laser does not require local anesthesia because it generates pulse energy in a short duration that allows for a long resting time. The Nd:YAG laser could produce effects at tissue depths of 4 to 6 mm into the dermis resulting in a large volume of coagulated issue. If the Nd:YAG laser is used repeatedly, profound thermal damage could be produced unknowingly and tissue damage would occur. II. Treatment of severe physiologic gingival pigmentation with **1.Free Gingival Autograft** [6]

Preparation of the Recipient Site : The surgical procedure was performed after application of local anesthesia in the area of gingival melanin pigmentation.

In each patient, at least two areas were grafted. In one area, the recipient bed was prepared in such a way that the bony surface would remain covered with periosteum and thin connective tissue (partial thickness dissection).

In the second surgical area, the periosteum, connective tissue, and epithelium were completely removed (full-thickness bed preparation). To control bleeding in the surgical area, pressure was applied to the recipient site with wet gauze after injection of lidocaine with epinephrine. **Donor Site :** The autogenous gingival graft was obtained from the unpigmented area of the palate. A No.15 scalpel was used to elevate a split thickness section of a 1 to 2 mm thick graft. The graft was placed in close contact with the recipient site and held in place by simple sutures of 4-0 silk. Sutures were removed after 1 week.

The pigmented gingival tissue was histologically examined by a pathologist. All histologic reports indicated that there was no evidence of malignancy and corroborated the clinical diagnosis of physiologic melanin pigmentation. Patients were examined upto 4.5 years following surgery. Clinical healing of free gingival autograft used to replace areas of gingival pigmentation proceeded uneventfully. All 10 patients were followed for 4.5 years postsurgically. In all 10 areas in which the recipient bed was prepared by full-thickness dissection, no evidence of repigmentation was seen. During the follow up period, only one of 10 grafted areas in which the recipient bed was prepared by partial thickness dissection exhibited repigmentation, after 1 year.

Healing : A clearly incised wound produces an initial inflammatory reaction followed by relatively quick epithelization that takes place over a smooth bed of connective tissue.

The initial response will be hemorrhage followed by the formation of a serofibrinous exudates and blood clot covering the wound area.

Conclusion: The depigmentation procedure was successful and the patient was satisfied with the result of the depigmentation technique.

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