A Concise Review of Gingival Depigmentation Techniques and Re-Pigmentation

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Abstract

Gingiva pigmentation has an impact on patient's esthetics and formulates pscyhological negativity. Gingival pigmentation is most predominant and endogenous pigmentation among oral mucosa. The gingival pigmentation can be physiologic and pathologic. It can be a genetic trait in some population. The physiologic melanin pigmentation does not possess a medical problem, it is mainly associated with individuals with high smile line and excessive gingival display. Pigmentation of gingiva is due to deposition of melanin in basal and suprabasal layer of epithelium. The gingival depigmentation is a esthetical correction technique where hyperpigmentation is removed. The treatment depends on patient need and skin complexion. Proper treatment method is required for treating the unesthetic gingival pigmentation. Perio-esthectic is focused on proper equilibrium of both pink and white(teeth) tissue. To overcome this problem wide array of method are put forth which include scalpel method, cryosurgery, gingival ablation method, electrocautery, chemical method, lasers and grafts. Each technique has its own advantages and disadvantages.

Keywords: *Gingival pigmentation, depigmentation, repigmentation, various techniques of gingival depigmentation.*

Introduction

"The science of beauty is nothing but aesthetic" as rightly quoted in the literature, which makes any living or non living object attractive to the eyes.(1) Aristotle correctly said as "Beauty is a greater recommendation than any letter of introduction."(2) A harmonious smile is described by various factors which include shape of the teeth along with the proper positioning. Other factors which should be considered are the color of the tooth as well as how well it goes with the gingiva. The major component of an aesthetic smile is definitely gingiva which is in its healthiest form. Other gingival factors which are responsible for a healthy smile are removal of gingiva which shows pigmentation which is required for a smile which boosts confidence and oozes aesthetics.(3) One of the most commonly tissues which are seen with pigmentation is gingiva which is dependent on several factors like epithelial thickness, amount of keratinization, amount of vascularisation and existence of pigments within the gingival tissues like melanin(4) ''Melas,'' is a Greek word which means black from which the word melanin was derived.(5) One of the most common pigment secreated endogenously, Melanin, is present in the basal and suprabasal layers of the epithelium.(6) Melanin is secreted by Melanocytes which were first isolated by Dr Becker et al in the year 1927 in the oral epithelium(7) After a few years, Melanocytes isolation was carried out from samples tissues of gingiva by Dr Laidlaw et al. ***Dummett***in his study stated that presence of pigmentation oral cavity observed in black race is:

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"gingiva 60%; hard palate, 61%; mucous membrane, 22%; and tongue, 15%".[8] Evidence of first melanin pigmentation occur 3 hours after birth. Pigmentation are mainly caused by five primary pigments:- "Melanin, Oxyhemoglobin, Melanoid, Carotene, Reduced haemoglobin".[9,10]

1. **Pigmentation seen in gingiva due to physiologic factors(ethnicity/race):** Colour variation may be seen on one side, or both the sides, it can beuniform, or have a macular distribution, Mottling or blotching can also be seen. It can be seen on gingival papillae. or the whole in general and into other oral structures. Pigmentation due to normal physiology can be clinically manifested as being multifocal or diffused general. More pigmentation occur in attached gingiva.
2. **Various pathologic causes of gingival pigmentation[12]:**

Endocrine disease	Addison's disease Acromegaly Nelson's disease Albright's disease
Drug-induced	Quinine Zidovudine Chloroquine Minocycline Cyclophosphamide
Heavy metals	Lead Bismuth Arsenic
Mucosal conditions	Lichen planus Blue nevus HIV oral melanosis Hemangiomas Oral melanoacanthoma Inflammatory mucosal lesions
Malignant neoplasms	Melanoma Kaposi's sarcoma
Idiopathic melanin pigmentation	Peutz-Jegher's syndrome Leopard syndrome Carney syndrome
Tobacco associated	Smoker's melanosis
Others	Amalgam tattoo Gingival tattoo

Depigmentation of Gingiva: The definition of gingival depigmentation can be given as "a periodontal plastic surgical procedure whereby the gingival hyperpigmentation is removed or reduced by various techniques."When the patient desires better aesthetics the procedure of depigmentation can be carried out and is not a clinical indication.

Bur abrasion method: The first case of depigmentation with bur was documented by Ginwalla *et al. in 1966.*

Technique: A medium grit football shaped diamond bur is used at high speeds to denude the epithelium. It takes around 45 min to 1 hour to complete.[10]

Advantages:

1. Easy to perform
2. Simple, non-aggressive and safe
3. Less discomfort to patient
4. Good esthetic outcome

Disadvantages:

1. Difficult in controlling the depth of de-epithelialisation
2. Technique sensitive
3. Post operative pain
4. Longer treatment time
5. High recurrence rate
6. Periodontal dressing required

Complications:

1. Harm to underlying periosteum and bone
2. Gingival recession
3. Wound healing is delayed
4. Enamel loss can occur

Scalpel surgical technique:

Synonyms: Surgical stripping and split thickness epithelial excision

Technique- Pigmented gingival epithelium is removed along with a layer of underlying connective tissue with the help of a surgical blade and allow it to heal by secondary intention.[10]

Advantages:

1. Economically feasible
2. Does not require any extensive armamentarium

3. Rapid wound healing

Disadvantages:

1. More bleeding during and after surgery
2. Periodontal dressing required
3. Re-pigmentation can occur by migration of active melanocytes from adjacent untreated area {Dummett and Bolden (1963)}

Contraindication:

1. Thin gingival biotype
2. Narrow papillary areas

Electro-surgery:

Technique: After administration of local anesthesia, the needle electrode is used in a sweeping motion in the operated area. Feather-light brushing strokes with high frequency electrical current in the range of 1.5-7.5 Megahert are used for de-epithelization. The procedure is performed in a cervico-apical direction and operated area is cleaned with the help of sterile gauze soaked in 1% normal saline solution.[13]

Advantages:

1. It controls hemorrhage
2. Permits adequate contouring of tissue
3. Lesser operating time
4. Less scar formation after surgery
5. Less discomfort to patient

Disadvantages:

1. More expertise required
2. More post operative pain
3. Causes undesired tissue destruction
4. Periodontal pack required

Complications:

1. Intense inflammation occured
2. Loss of crestal bone height seen

Cryosurgery: Technique- freezing of gingiva is carried out with variousagents which include liquid nitrogen. Cryoprobe which is cooled to a minimum of -81 °C is the basic necessity used for application in the areas which show pigmentation for a oeriod of about 10 seconds. A little degree of erythema occurrs within a time span of 1 minute. The following method uses the idea of rapidly freezing the water & followed by slowly melting slow .This leads to the deterioted tissue formation . The Dehydration of Cell, denaturation of protein, enzyme inhibition,including the death of cell which occurs due to the shock due to thermal activity are few of the many effects which occur due to the process of cryotherapy .Cryotherapy leads to changes in the vascular supply and also affects the immunity of the individual leading to cell death.[14]

Advantages:

1. Easy and rapid to apply
2. Done in less time
3. No anesthesia required
4. No suturing needed
5. No bleeding encountered
6. No scar formation seen

Disadvantages:

1. Post operative swelling
2. Increased soft tissue destruction
3. Difficult to control depth of penetration

The Procedure of Cryosurgery: Tissue type, size and depth of the lesion are used to decide the dose and delivery method. Additionaly underlying structures, thickness of the epidermis, local blood flow and the water content of the skin can be considered.[10]

1. Dipstick method
2. Spray technique
3. Cryoprobe technique

Spray technique using spray tip: This is also known as Open-spray technique. The hand held or table top cryosurgical unit filled with liquid nitrogen is used, Select a spray tip that sprays within the border of the lesion. For single short freeze, no local anesthesia is required . But if the lesion is large and requires more freeze time, then 1% lignocaine is given . The spray should be done 1 cm away from the area and is administered at the centre of the lesion. The lesion is allowed to thaw slowly i.e. come back to room temperature. Thaw time is usually double of freeze time .

Cryoprobe technique: In this method, liquid nitrogen is circulated to cool the tip of cryoprobe. Hence,

freezing occurs by conduction. This technique is slower than spray technique.[10]

Disadvantages:

1. Excessive tissue damage
2. Depth of penetration difficult to control
3. Burning sensation or pain
4. Stinging sensation

Lasers: Lasers are introduced by Maiman in 1960, since than it is used widely in medical field. This method has been conceded as one of the pleasant, reliable and effective method.

Types	Wavelength
Carbon dioxide (CO2)	(10,600 nm)
Neodymium-doped: Yttrium, Aluminum, and Garnet (Nd:YAG)	(1064 nm)
Diode	(820 nm)
Erbium (Er)-doped:YAG	(2940 nm)
Erbium- and chromium-doped: yttrium, scandium, gallium, garnet (Er,Cr: YSGG)	(2780 nm)

Advantages:

1. No periodontal dressing required
2. Minimalpost operative pain and swelling
3. Less discomfort (protein coagulum formation)
4. Blood less field (sealing nerve endings)

Disadvantages-

1. Thermal damage
2. Delayed wound healing
3. Expensive treatment
4. Bone exposure and gingival fenestration can occur[15]

Diode laser: This laser is a solid-state semiconductor that utilizes light energy from electric energy. Flexible quartz fiber optic hand piece can be used. Wavelength spectrum of 800 to 980 nm is used to absorbed by water, soft tissue and chromophores, such as oxyhemoglobin and melanin.

Advantages:

1. Good visibility
2. Excellent hemostatic agent
3. Better patient comfort
4. Less damage to periosteum and underlying bone
5. Shorter operating time

Disadvanatges:

1. Slight discomfort
2. Dry and itchy feeling during procedure

Er: YAG laser: It is manufactured with a wavelength of 2940 nm, which is ideal for absorptionby water and hydroxyapatite.

Advantages:

1. Less thermal damange
2. Less pain
3. Rapid wound healing

Disadvantages:

1. Wavelength of this laser cannot absorb melanin

Nd: YAG laser: This laser is set at 60 mJ per pulse, 6 W and 100 pulses per second. A 320 micron diameter fiber optic is used in the pigmented area with a contact mode.[10]

Advantages:

1. No complications
2. No bleeding
3. No pain

Radiosurgery: It is the most advanced form of electrosurgery. It is used for removal of soft tissue with the aid of radio frequency energy.“Frequencies of 3.0 MHz (MHz) to 4.0 MHz is being used where 4.0 MHz being the optimal frequency”.(10)

Advantages:

1. Produce coagulation in the treated site
2. Less thermal damage
3. Faster healing (4MHz wave technology)
4. Self sterilising method
5. Little or no scar formation seen
6. Better visibility due to bloodless field

Disadvantages:

1. Atleast two appointment required

2. Cannot be used in pacemaker patients
3. Uncomfortable to patients due to foul smell

Chemical method: Chemical agents like 90% phenol along with 95% alcohol is used.

Disadvantages:

1. Tissue necrosis
2. Pain
3. Burn the gingiva

Free gingival graft: Free Gingival Grafts are used extensively in root coverage procedure and to increase the width of attached gingiva. According to *Tamizi, Taheri (1996), Kumar et al., 2012 and Fowler et al.(2000),* a free gingival graft is required after depigmentation procedure for better esthetic outcome. It showed no evidence of repigmentation even after 4.5 years. ***Vikas V Pakhare etal (2017)*** in their case report, used free gingival autograft for treating gingival melanin hyperpigmentation and no repigmentation was seen even after 6 months.[16]

Advantages:

1. No reoccurrence
2. Esthetically appreciated

Disadvantages:

1. Second surgical site needed
2. More discomfort to patients
3. Extensive procedure
4. Poor colour matching of tissue
5. Healing is slow and painful
6. Limited donor area available

Acellular dermal matrix allograft: Surgical blade no. 15 is used for two vertical incisionon 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 technique yields better result compared to gingival abrasion method.[14]

Advantages:

1. Less time compared to free gingival graft
2. Less post operative discomfort
3. Less post operative complications

Disadvantages:

1. Clinical expertise required
2. Expensive procedure
3. Contraction of graft can happen

Reasons for repigmentation: "Reappearance of melanin pigmentation after a certain period of depigmentation is called repigmentation".[14]

- ✓ Migration of melanin pigments from untreated area to treated area causes repigmentation.
- ✓ Repigmentation can occur by the left over melanocytes during surgery
- ✓ Hormonal changes, Excessive sunlight exposure genetic and ethnic factors(17)

Prevention of repigmentation: Complete removal of melanin pigment including free gingiva, interdental gingiva and marginal gingiva.[14]

Repigmentation based on evidence[15-23]:

Kaur et al 2010	Higher reoccurance of pigmentation in the dark-complexioned patients seen as compared to wheatish- or brown-complexioned patients in a 9 month followup.
Hegde et al 2013	Er:YAG-laser-treatedsites resulted more repigmentation than the surgically or CO2-laser-treated sites.
Kumar et al 2013	3 out of 10 cases showed mild areas of repigmentation on the 30th day where other 7 cases didnot show any repigmentation till 2 years.
Ribeiro et al 2014	Slight reapperance of pigmentation was found in five of the patients using Nd;YAG laser and scalpel technique.
Grover et al 2014	In 11 cases, four laser and seven scalpel, a patchy repigmentation was observed at the end of 3 months
Giannelli et al 2014	Er:YAG and diode lasers gave satisfactory clinical results, with no recurrence of gingival pigmentation in a six month study.

Gupta et al 2014	7 sites in the scalpel excision group showed recurrence, whereas only 4 site showed recurrence in the electrosurgically treated group.
Basha et al 2015	Repigmentation appeared in the interdental and marginal tissues in both surgical stripping method and laser technique.
Suragimath et al 2016	At the end of one year, slight melanin repigmentation was observed in three subjects treated with scalpel depigmentation procedure.
Bakutra et al 2017	At 12 months followup study repigmentation is significantly lesser in surgical stripping compared to laser ablation method.
Narayankar et al 2017	Recurrence of pigmentation was observed in five cases in scalpel group and two cases in TFE group in 6 month followup.
Gholami et al 2018	After 12 months, surgical stripping and Er, Cr:YSGG laser treatment techniques showed similar trends in re-pigmentation where as one laser treated site, a short melanin strip recurrence seen.
Kamboj et al 2020	Repigmentation was observedin four cases out of 16 sites treatedwith electrocautery technique.
Chandra et al 2020	At 6 month, nearly 62.5% of cases showed postsurgical repigmentation of gingiva in both scalpel and laser techniques

Conclusion

The patients which show excessive gingiva should be advised for the procedure of Depigmentation thickness of gingiva, the level of experience the clinician holds, the preference of the patient, and rate with which pigmentation recurs,are the major factors which influence treatment selection the available studies in the field of depigmentation are mainly case reports, so Randomised control trials with longer follow up period are required to establish better treatment needs for gingival depigmentation.

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