

# GINGIVAL DEPIGMENTATION - GROWING TREND IN COSMETIC DENTISTRY

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## ABSTRACT

Gingival hyperpigmentation or black gums has been considered as less attractive or unaesthetic by majority of population. Most of the people believe that their smile is more important to their appearance than hair and eyes. Gingival depigmentation refers to those periodontal plastic surgical procedures aimed at reducing or removing the hyperpigmentation. Review article here briefs out those treatment procedures.

**Keywords:** Depigmentation, Melanin, Laser, Scalpel.

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## INTRODUCTION

A genuine smile comes from the heart, but a healthy smile needs a good dental care. Aesthetics has always been of prime importance in our society. An aesthetic smile require a harmonious interrelationship of the pink with white. The soft tissue periodontal plastic procedures were not only done to enhance the dentofacial harmony. The domain of periodontics over the year has changed from being strictly a health service to one where smile enhancement has been brought to the forefront of treatment planning<sup>1</sup>.

Melanin producing cells in our body are called melanocytes. The active melanocytes convert tyrosine to melanoprotein mediated by tyrosinase enzymes, which are primarily responsible for the gingival color. The color of gingiva also depends on other factors like the

severity of melanogenesis and depth of epithelial and gingival vascularization. In the process of melanogenesis, melanin pigments gets accumulated in melanosomes and further gets transferred to prickle and basal cell layers<sup>2</sup>.

Gingival colour is generally described as coral pink. Excessive deposition of melanin located in the basal and supra-basal cell layers of the epithelium will result in gingival hyper pigmentation. (Dummett, 1979)

Pigmentation can be either by physiological process such as degradation products of melanin, melanoid, carotene, oxyhemoglobin, reduced hemoglobin, bilirubin and iron<sup>3</sup> and/or due to pathological diseases, and conditions (fig 1). Furthermore, environmental risk factors such as tobacco smoking, ethnicity and age also influence the color of gingiva.<sup>4</sup>

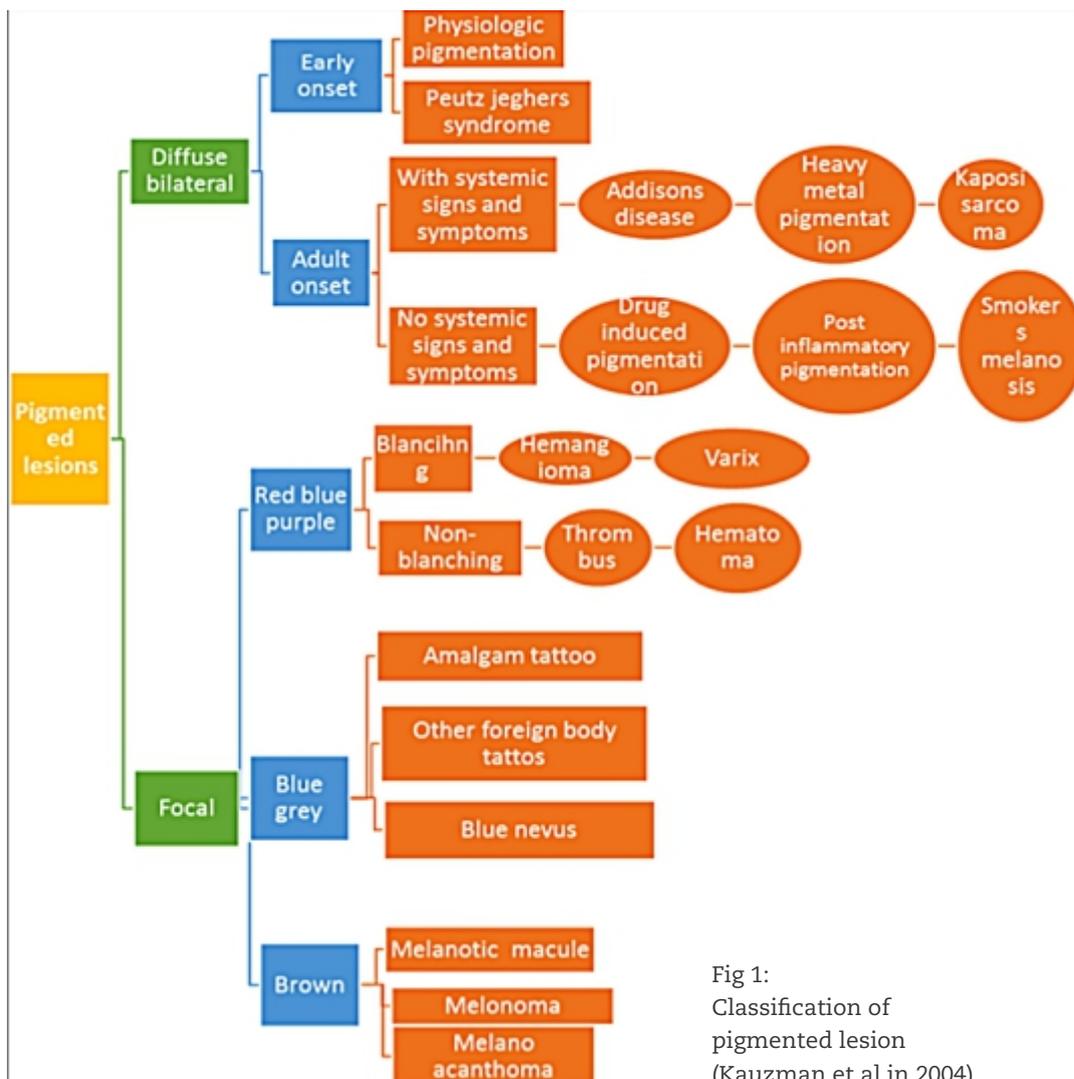


Fig 1:  
Classification of  
pigmented lesion  
(Kauzman et al in 2004)

Gingival hyper pigmentation is considered unaesthetic and unattractive by many people, especially those with high smile line and it brings down their confidence to smile. Many treatment modalities or gingival depigmentation procedures have been advocated for removal/reduction of pigmentation.

This review article briefs out various treatment approaches prevalent in dentistry for the management of gingival hyper pigmentation.

According to Roshni & Nandakumar<sup>5</sup>; different gingival depigmentation methods are:

### A. Methods used to remove the gingival pigmentation:

#### 1. SURGICAL METHODS:

- Scalpel surgical technique
- Bur abrasion method
- Electro-surgery
- Cryosurgery
- Lasers
- Radiosurgery

#### 2. CHEMICAL METHODS

### B. Methods used to mask the gingival pigmentation:

- Free gingival graft.
- Acellular dermal matrix allograft.

The selection of the appropriate depigmentation technique ought to be based on the type of presenting pigment, gingival biotype, clinical experience, patient's financial status and individual preferences<sup>6</sup>.

### SCALPEL SURGICAL TECHNIQUE

One of the very first and most commonly practiced technique is the surgical removal of undesirable pigmentation using scalpels. In this technique, the pigmented gingival epithelium along with a layer of the underlying connective tissue is surgically removed by splitting the epithelium with blade allowing the denuded connective tissue to heal by secondary intention. Care should be taken not to leave any pigmented remnants over the denuded area<sup>5</sup>.

Scalpel surgery causes bleeding during and after the procedure and it is necessary to cover the surgical site that is exposed, with periodontal dressing for 7 to 10 days. After 6 weeks the attached gingiva will regenerate with only a delicate scar. The newly formed gingiva is clinically non-pigmented<sup>7</sup>.

### BURABRASION METHOD

In this abrasion technique a large round diamond bur is used in a high speed hand piece with copious irrigation for depigmentation. The procedure requires 45 min to 1 hour for com-



a. Pre operative  
b. Immediate post operative  
c. After 2 weeks

pletion. Pressure application should be minimal and feather light brushing strokes without holding the bur in one place is recommended. Extensive care is required to avoid over pitting of the gingival surface or removal of excessive tissue due to high speed<sup>8</sup>.

Depending on the extent of the procedure, the denuded lamina propria of the depigmented areas may be covered by a surgical dressing for few days or by a surgical stent that matches the color of surrounding tissue<sup>9</sup>.

It is relatively simple, safe, non-aggressive method and easy to perform, but difficulty remains in controlling the depth of de-epithelization and obtaining an adequate access.

Also depigmentation should be performed cautiously with the adjacent teeth well protected, since the inappropriate application can result in gingival recession, injury to underlying periosteum and bone, delayed wound healing, as well as enamel loss<sup>10</sup>.

## ELECTROSURGERY

According to Oringer's (1975) "exploding cell theory", it is predicted that the electrical energy leads to molecular disintegration of melanin cells present in basal and suprabasal cell layers of operated and surrounding sites. Electrosurgery works on this principal.

The diamond loop electrode fitted is mostly preferred. The tip of the electrode is swiftly moved over the pigmented tissue to be excised under local anaesthesia. Electrode is used in a light brushing stroke and the tip is kept in motion all the time. The contact time of the tip of the electrode with the tissue should be very brief.



De-pigmentation by Electrocautery  
Pic courtesy: Int J Oral Health Med Res  
2017;3(6):36-39.

Keeping the tip in one place could lead to excessive heat buildup (Lateral heat accumulation) and destruction of the tissues<sup>11</sup>.

After each use, the tip of the electrode is wiped on the rough surface of the saline-soaked gauze to remove all debris.

It takes lesser time and causes minimum bleeding, but when used for prolonged time it induces heat accumulation and causes undesired tissue destruction<sup>12</sup>.

The surgical procedure is followed by immediate clot formation. The underlying tissue become acutely inflamed with some necrosis. This clot is then replaced by granulation tissue. After 24 hours there is increase in new connective tissue cells mainly angioblasts. By third day numerous young fibroblasts are found. The granulation tissue grows coronally creating a new marginal gingiva. Simultaneously after 12-24 hours epithelial cells at the margins start to migrate over the granulation tissues separating it from clot. Surface epithelialization is generally complete after 5-14 days<sup>13</sup>.

## LASERS

Commonly employed lasers for the procedure are

- Neodymium; aluminum-Yttrium-Garnet (Nd-YAG) laser
- Erbium-YAG lasers
- Carbon-di-oxide CO<sub>2</sub> laser
- Diode lasers

All the suggested wavelengths are fast and effective in removing pigmentation and is well tolerated by patients. Esthetic results after laser therapy is often highly positive and satisfactory.

Diode lasers basically does not interact with dental hard tissues; it causes minimal damage to the periosteum and bone underlying the gingiva, and hence is an excellent soft tissue surgical laser. It exhibits thermal effects using the "hot-tip" effect caused by heat accumulation at the end of the fibre and produces a relatively thick coagulation layer on the treated surface.<sup>14</sup> The protein coagulum formed on the wound surface as a result of irradiation might act as a biologic wound dressing sealing the ends of sensory nerve endings.



a. Pre operative view      b. Immediate post operative      c. After 2 weeks

According to findings the duration of the procedure was faster using the diode than erbium group laser, due to high absorption of diode wavelengths in melanin pigmentation<sup>15</sup>.

After 1-2 weeks of laser therapy, re-epithelization is completed. At fourth week gingiva is similar to normal untreated gingiva but with absence of melanin pigmentation. The healing of laser wounds are slower than healing of scalpel wounds due to a sterile inflammatory reaction that occurs after laser use<sup>16</sup>.

#### RADIOSURGERY

Radiosurgery is the most advanced form of electro surgery. It includes the removal of soft tissue with the aid of radio frequency energy.

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 making it more efficient compared to conventional methods.<sup>17</sup>

The pigmented areas are lightly touched with the electrode tip. Remove the electrode as soon as the tissue around the electrode becomes whitish. Repeat the procedure for all pigmented areas. After the first week, slight redness is observed around the margins of the surgical site. Epithelization is completed in 10 days and at 2 weeks post-op a second procedure can be performed in cases with heavy pigmentation.<sup>18</sup>

#### CRYOSURGERY TECHNIQUE

Robert Boyle reported almost 300 years ago the concept of cell destruction by freezing. The effect of cold temperature on living cells behaves like ionizing radiation, and the maxi-

mum lethal effect is obtained when they are applied to cells undergoing mitosis. Most vital tissues freeze at approximately  $-2^{\circ}\text{C}$ , Ultra low temperature (below  $-20^{\circ}\text{C}$ ) results in total cell death<sup>19</sup>.



a. Pre operative



b. Tissue blanching seen immediately after application of tetrafluoroethylene (TFE)



c. Post operative (after 3 months)  
Pic Courtesy : Dent. J. 2020, 8, 88

Some of the cryogen commonly utilised for this procedure include the following. Cryogen effective temperature: Salt ice -20°C, CO2 slush -20°C, fluorocarbons (Freons)-30°C, nitrous oxide -75°C, CO2 snow-79°C, liquid nitrogen -20°C (Swab) -196°C (Spray), tetrafluoroethane (TFE) -20°C to -40°C.<sup>20</sup>

Following the procedure, at second to third day superficial necrosis becomes apparent and a whitish slough could be separated from the underlying tissue, that leaves a clean pink surface. In one to two weeks normal gingiva is formed. In 3-4 weeks, keratinization gets completed<sup>21</sup>.

No postoperative pain, hemorrhage, infection or scarring is seen in these patients.

### FREE GINGIVAL GRAFT

Free Gingival Grafts are used to create a widened zone of attached gingiva and in root coverage procedures.

The concept of using Free Gingival Graft for managing hyperpigmented gingiva was first described by Tamizi and Taheri<sup>22</sup> who replaced pigmented gingiva with unpigmented free gingival autografts in 10 patients. In their study, at least two areas were grafted; one with a full thickness flap and another with a partial thickness flap. They reported that there was no evidence of repigmentation for 4.5 years post-operatively in areas that received a full thickness flap, and only one instance of repigmentation was observed 1 year post-operatively in a patient treated with a partial thickness flap.

Although studies have shown favourable results, this technique required the use of additional surgical sites that add on to patients discomfort, and healing of the grafted sites was also reported to be slow and painful. Moreover, the satisfactory esthetic could not be achieved in most of the cases due to color differences between the palatal tissues and the gingiva<sup>23</sup>.

Immediately after placement of the graft a fibrin clot forms between graft and the underlying tissue. Clot acts as a medium to transport nutrients from the recipient area to connective tissue of the graft. In the first week after surgery, re epithelization occurs with cells originating from lateral wound margins of epithelial ridges. By third day connective tissue proliferation begins and by the end of the first week a

tenuous fibrous attachment between the graft and the recipient site is established. And by 14th day the epithelium presents a near normal histologic thickness<sup>24</sup>.

### ACELLULAR DERMAL MATRIX ALLOGRAFT (ADMA)

Acellular Dermal matrix Allograft are used mainly for treatment of soft tissue defects.<sup>25</sup> The acellular and non-immunogenic nature of this allograft promotes healing by repopulation and revascularization that favours to limit scarring.<sup>26</sup>

In a 12 month study, this method using ADMA for managing gingival melanin pigmentation was more efficient as compared to epithelium abrasion procedures<sup>27</sup>. The clinical studies demonstrated that ADMA has advantages of reduced surgical time (due to elimination of the surgical procedure for donor tissue), decreased post-operative complications, unlimited amount of graft material and a predictable and satisfactory esthetic result. However, it is expensive and requires clinical expertise.

### CHEMICAL METHOD

In this treatment modality chemical agents are used to destroy the epidermis and/or dermis, aiding in depigmentation<sup>28</sup>. Chemical agents used are; phenols, salicylic acid, glycolic acid, trichloroacetic acid, etc. These agents are classified into four types depending on their penetration: Very superficial, Superficial, Medium depth and Deep 90% phenol and 95% alcohol.

Phenol can penetrate the subepithelial connective tissue and cause necrosis or apoptosis of melanocytes. This result in reduced efficacy of melanocytes to normally synthesize melanin. Phenol never cause complete destruction, rather it only compromises melanocytic activity.

Chemical exfoliation is carried out by applying a phenol pellet and maintaining it for 1 minute in position. It can be repeated subsequently until satisfactory depigmentation is achieved. The area needs to be rinsed with 99% alcohol.

### Ascorbic acid

Topical or parenteral application of Vitamin C (ascorbate, ascorbic acid) is one of the thera-

peutic approaches involved in skin depigmentation.

Melanin is one of the main reservoirs for Reactive Oxygen Species, copper and calcium. (Tsai et al., 2014). Once vitamin C is introduced to the target tissue, it binds efficiently to melanin due to its affinity to these reactive oxygen species (ROS), calcium and copper. This cause intracellular deficiency of these items and results in inability of the cells to produce melanin.

Vitamin C interacts with copper ions at the tyrosinase-active site and inhibits action of the enzyme tyrosinase, thereby decreasing the melanin formation. Vitamin C also acts on the perifollicular pigment.<sup>29,30,31</sup>

Gingival depigmentation using scalpel is so far the most widely practiced and convenient treatment approach. A recent systematic review also supports this fact, in which it was concluded that using scalpel have a good result in gingiva and scalpel is still a gold standard to treat gingiva hyperpigmentation<sup>32</sup>. Although it hurts, they cause minimal injury and gingival recurrence<sup>33</sup>.

A major concern in the management of gingival hyperpigmentation is relapse or recurrence. It varies with each method. Patients must be educated regarding the possibility for the relapse following the procedure. They must be informed that repeated therapy for hyperpigmentation is quite normal and does not result in any adverse effects. It is advised that the clinicians should thoroughly educate their patients and must obtain an informed consent with special mention on gingival pigmentation recurrence from the patient prior to the procedure.

## CONCLUSION

With the growing progress in esthetic dentistry, gingival depigmentation is nowadays becoming a common treatment procedure that is preferred by both the dentists as well as the patients. Various depigmentation techniques have been utilised for achieving the desired esthetics. However each method has its own advantages and disadvantages. Choosing the appropriate technique has often become a topic of debate. At the end all it matters is to provide optimum result that last for long and is of patient satisfaction.

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