

Original Research Article

## Comparative evaluation of effectiveness of surgical blade, electrosurgery, free gingival graft and diode laser for the management of gingival hyperpigmentation

Dr Pooja P Suryavanshi<sup>1</sup>, Dr. M L Bhongade<sup>2</sup><sup>1</sup>Post graduate student, Department of Periodontics, Sharad Pawar Dental College, Sawangi (M), Wardha<sup>2</sup>Professor and Head, Department of Periodontics, Sharad Pawar Dental College, Sawangi (M), Wardha

### \*Corresponding author

Dr Pooja P Suryavanshi

Email: [dr.pooja.suryavanshi@gmail.com](mailto:dr.pooja.suryavanshi@gmail.com)

**Abstract:** The objective is to compare effectiveness of surgical blade, electrosurgery, free gingival graft and diode laser for the management of gingival hyperpigmentation. 40 patients who were concern for the unaesthetic anterior gingival due to melanin hyperpigmentation were treated in this study. Out of 40 patients, 10 patients were treated by using surgical blade, 10 by electrosurgery, and 10 by using free gingival graft and 10 patients by using diode laser. The gingival hyperpigmentation was recorded pre-operatively and 3 months post-surgery by measuring area of hyperpigmentation in square millimeters and severity of hyperpigmentation by using Dummet's oral pigmentation index (DOPI). Healing was uneventful and required no supportive therapy. No patients experienced severe pain during or post-surgically. Mild discomfort was more common in free gingival graft during the first week. At 3 months localized area of re-pigmentation was seen in group treated by surgical blade and electrosurgery. However no re-pigmentation was noticed at 3 months in diode laser group and free gingival group. Depigmentation of gingival hyperpigmentation using diode laser and free gingival graft were found to be effective procedures. However, diode laser yields esthetically acceptable results along with patient satisfaction.

**Keywords:** gingival hyperpigmentation, Dummet's oral pigmentation index (DOPI)

### INTRODUCTION

Smile expresses a feeling of joy, success, affection and courtesy and also reflects self-confidence. The harmony of a smile is not only determined by the shape, position and color of the teeth, but also by the gingival tissues. Gingival health and appearance are essential components of an attractive smile [1]. The colour of healthy gingiva is variable, ranging from pale pink to deep bluish purple. Between these limits of normalcy a large number of colour variations are observed, which depends primarily upon the vascular supply, the thickness of epithelium, degree of keratinization, and the presence of pigments within the epithelium. Melanin, carotene, reduced hemoglobin, and oxyhemoglobin are main pigments contributing to normal colour of oral mucosa. Gingival health and appearance are essential components of attractive smile. Frequently gingival hyperpigmentation is caused because of excessive melanin deposition by melanocytes which reside in basal and suprabasal layer of epithelium and is transferred to basal cells where it is stored in form of melanosomes [2].

Although melanin pigmentation of the gingiva is completely benign and does not present a medical

problem, complaints of black gums are common particularly in patients with high smile line thus cause aesthetic problems and embracement particularly if pigmentations are visible during speech and smiling [2]. Systemic conditions such as endocrine disturbances, Albright's syndrome, malignant melanoma, Peutz Jeghar's syndrome, trauma, chronic pulmonary disease and racial pigmentation are known cause of oral melanin pigmentation. In general, individuals with fair skin will not demonstrate overt tissue pigmentation although comparable number of melanocytes is present within the gingival epithelium. Pigmented granules are present only when melanin granules synthesized by melanocytes are transferred to keratinocytes also known as epithelium-melanin unit. The melanocytes are dendritic cells unattached to surrounding epithelium cells behave as unicellular exocrine glands. Active melanocytes convert tyrosine to melanoprotein which is transferred to basal and prickle cell layers [3]. Gingival hyperpigmentation is seen as a genetic trait in some populations, and is appropriately termed as physiological or racial pigmentation [4].

Clinicians have tried to remove melanin hyperpigmentation of gingiva by various methods.

Chemical agents such as 90% phenol and 95% alcohol have been used in combination [5], however these chemical agents are quite harmful to oral soft tissues. Free gingival graft surgery has also been tried to eliminate the hyperpigmented area [6] but this requires an additional surgical site and colour matching. Abrasion techniques using large, round diamond bur in a high speed handpiece with copious irrigation has also been used but it is difficult to control the depth of de-epithelisation and obtain adequate access. Gingivectomy has also been used, + however this is associated with prolonged healing by secondary intention and excessive pain. Gingivectomy results in non-permanent depigmentation when performed solely for cosmetic reasons [7]. Cryosurgery depigmentation is another option [8]. This technique requires a skillful clinician to manage the complicated technique and instruments. The CO<sub>2</sub> laser also achieved good results in eliminating the melanin hyperpigmented gingiva [9] and repigmentation has not been reported. The present study was undertaken to compare four different depigmentation techniques (Surgical blade, electrosurgery, free gingival graft and diode laser) and their effectiveness to achieve esthetically acceptable results.

## MATERIALS AND METHODS:

### Study Population:

40 patients who were concern for the unaesthetic anterior gingival due to melanin hyperpigmentation were treated in this study. Out of 40 patients, 10 patients were treated by using surgical blade, 10 by electrosurgery, and 10 by using free gingival graft and 10 patients by using diode laser. The gingival hyperpigmentation was recorded pre-operatively and 3 months post-surgery by measuring area of hyperpigmentation in square millimeters and severity of hyperpigmentation by using Dummet's oral pigmentation index (DOPI). And pain score was measured by Visual analogue scale (VAS).

### Inclusion Criteria

- Wide dense band of pigmentation
- Esthetic consciousness
- Signed informed consent
- Systemically healthy patients

### Exclusion Criteria

- Habit history like smoking, tobacco chewing
- H/O relevant Systemic disease
- H/O Relevant medication
- H/O Relevant local factor
- Periodontitis patients
- Pregnant women or lactating women

## ASSESSMENT OF GINGIVAL PIGMENTATION

**Measuring the area of pigmentation:** A rectangular shaped cellophane paper was used to measure the area of pigmentation. It was adapted in parent's mouth and

with the help of glass marking pencil the teeth were traced as reference points and the area of pigmented gingiva was formed. The tracing was then removed

- $A = n \times 100$
- N
- Where,
- A=Percentage area of repigmentation.
- N=area in number of squares preoperatively.
- n= Area in number of squares postoperatively.

### Dummet's+ Oral Pigmentation Index (DOPI) for intensity of pigmentation:

The estimation was based on the following scale.

1. Pink tissue (No clinical pigmentation)
2. Mild light brown tissue (mild clinical pigmentation)
3. Medium brown or mixed brown and pink tissue (Moderate clinical pigmentation)
4. Deep brown/ Blue-black tissue (Heavy clinical pigmentation)

### Visual analogue scale (VAS):

The visual analogue scale was used to evaluate the subjective pain level experienced by patient. It consist of horizontal line 100 mm long starting at the left end with descriptor "No pain " and ending at the right end with "Unbearable pain". Patients were asked to mark severity of pain. The distance of this point in millimetres , from left end of scale was 0 – no pain , scores between 0.1- 3.0 were recorded as slight pain , 3.1 to 6 was considered as moderate pain and scores 6.1 to 10 were recorded as severe pain.

### Surgical procedure:

Immediately before the surgical treatment, the patients were made to rinse the mouth with 0.2% chlorhexidine gluconate solution for 1 minute. The areas subjected to surgery were anesthetized by infiltration anesthesia, using local anesthetic solution 2% xylocaine with 1:10,000 epinephrines.

### Depigmentation using Surgical blade-

After proper isolation of surgical field, the operative site is anesthetized using 2% xylocaine hydrochloride with adrenaline. Using a bard parker handle with no. 15 blade a split thickness flap is raised maintaining the normal architecture of gingiva. Bleeding is controlled using pressure pack with sterile guaze. Surgical area is covered with a periodontal dressing. The patient is reviewed 1 week after surgery.

### Depigmentation using electrosurgery-

It is a surgical procedure performed using controlled high frequency electrical current in range of 1.5-7.5 million cycles per second. Electrical energy is thought to lead to molecular disintegration of melanin cells, present in basal and suprabasal cell layer of operated and surrounding sites. It retards migration of melanin cells from the locally situated cells. Loop electrodes are

most commonly used. One of the basic rules is to always keep the tip moving. Prolonged or repeated application of current to the tissue induces heat accumulation and undesired tissue destruction where as interrupted application at intervals adequate for tissue cooling (5-10 seconds) reduces or eliminates heat build up. Contact with periosteum or alveolar bone should be avoided.

**Depigmentation using free gingival graft:**

After initial preparation in each patient, at least two areas were treated. 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). Autogenous gingival graft was obtained from the un-pigmented 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 post-operatively

**Depigmentation using Laser:**

Topical anesthetic gel is applied to the operation field. In compliance with the FDA rules, pt and staff should wear special eyeglasses for protection. Caution should be taken since the laser beam may be reflected from dental mirror or instruments and absorbed by other intra-oral regions. Laser application started with a sweeping motion localised only on the pigmented area. The procedure is performed in cervico-apical direction on all pigmented area. Every 2-3 minutes operative field is wiped with sterile guaze socked 1% normal saline solution. The depigmentation procedure continued until no pigmentation remained. No periodontal pack or additional material is applied to support the healing procedure.

**Post-operative care:**

- Antimicrobials and analgesics
- 0.2% Chlorhexidine gluconate for 6 weeks
- Plaque control Instructions
- Avoid brushing over the surgical area
- Recall after 24 hrs, 1 week, 6 weeks and 3 months post-operatively

**Re-evaluation:**

Every patient is recalled after 24 hours of surgery, 1 week, 6 weeks and 3 month post-operatively

**RESULTS:**

No post-operative infection or scarring, gingival recession or deformity occurred in any of the patients on first or subsequent visits. Healing was uneventful in patients from all four groups. Compared to surgical blade and electrosurgery healing after treatment with diode laser was slightly delayed and it was significantly delayed with cases treated by free gingival graft. At the VAS evaluation sites operated by surgical blade no evaluation of pain and discomfort was made at the time of surgery because the patient was under anesthesia. At VAS evaluation sites moderate pain was recorded on the second day of surgery for surgical blade and electrosurgery cases. However pain was reduced considerably 1 week after the surgery. The VAS score for the free gingival graft was severe on second post-operative day which was reduced to mild 1 week after surgery. But Patients treated with diode laser, only slight or no pain was recorded. The MPI showed no recurrence of pigmentation in patients treated with diode laser and free gingival graft but some degree of repigmentation was seen in the group of patients treated with electrosurgery and surgical blade. All patients were satisfied with the esthetically significant improvement in gingival color.

**Table 1: Pre-surgical and post-surgical surface area of pigmentation**

Sr no	Method of surgery	Pre-surgical Surface area in sq mm	Post-surgical Surface area in sq mm	Difference
1.	Surgical blade	179.8mm <sup>2</sup>	33.4mm <sup>2</sup>	146.4mm <sup>2</sup>
2.	Electrosurgery	150mm <sup>2</sup>	29.5 mm <sup>2</sup>	120.5 mm <sup>2</sup>
3.	Free gingival graft	151.5 mm <sup>2</sup>	0 mm <sup>2</sup>	151.5mm <sup>2</sup>
4.	Laser	149mm <sup>2</sup>	2.4mm <sup>2</sup>	146.6mm <sup>2</sup>

**Table 2: Comparison of re-pigmentation in four different surgical techniques**

Sr no	Method of surgery	Re-pigmentation area in sq mm	Percentage Of re-pigmentation
1.	Surgical blade	33.4mm <sup>2</sup>	18.57%
2.	Electrosurgery	29.5mm <sup>2</sup>	19.66%
3.	Free gingival graft	0mm <sup>2</sup>	0%
4.	Laser	2.4mm <sup>2</sup>	1.6%

## DISCUSSION:

Pigmented gingival tissue often forces patients to seek cosmetic treatment. Several treatment modalities have been suggested in literature. Among these, use of surgical blade is commonly employed procedure. The use of the scalpel technique for depigmentation is the most economical one as compared to other techniques which require more advanced armamentarium. It is simple, easy to perform and above all with minimum discomfort. However, scalpel surgery causes unpleasant bleeding during and after the operation and it is necessary to cover the surgical site with periodontal dressing for 7 to 10 days.

Electrosurgical technique was much easier to perform than the slicing technique with good patient acceptance with least amount of bleeding. However, the long term results of the electrosurgical technique may not be as predictable as with other techniques. In addition, depth control is difficult. Prolonged or repeated application of current to the tissue induces heat accumulation and undesired tissue destruction [10]. A free gingival graft used to eliminate the pigmented areas requires an additional surgical site (Donor site) and colour matching and additional discomfort. Furthermore, presence of a demarcated line is commonly observed around the graft in recipient site may itself pose an esthetic problem [11]. The application of diode laser appears to be a safe and effective alternative procedure for the treatment of gingival melanin pigmentation [12, 13]. Its benefits include ease of usage, effectiveness in the treatment of superficial benign pigmented lesions, convenience in dental clinics, and decreased trauma for the patient [14]. It has been demonstrated that Er: YAG laser is also a good and safe choice for removal of pigmented gingiva without local anesthesia and the postoperative period is comfortable for the patients and healing is comparatively fast and good. Thorough removal of pigments, pain reduction and higher patient preference were important features associated with Er: YAG laser depigmentation [15].

At the VAS evaluation sites operated by surgical blade no evaluation of pain and discomfort was made at the time of surgery because the patient was under anesthesia. At VAS evaluation sites moderate pain was recorded on the second day of surgery for surgical blade and electrosurgery cases. However pain was reduced considerably 1 week after the surgery. The VAS score for the free gingival graft was severe on second post-operative day which was reduced to mild 1 week after surgery. However, patients treated with diode laser showed only slight or no pain. The area of re-pigmentation seen was 18.57% for surgical blade, 19.66% for electrosurgery cases, 0% for free gingival graft [11] and 1.6% for patients treated with Lasers which also simulate the results obtained from Perlmutter and Tal [16] in which they compared surgical blade, diamond bur and diode laser therapy.

### 1) Depigmentation by surgical blade



Pre-operative



After complete de-epithelisation



Post-operative after 3 months

### 2) Depigmentation by electrocautery



Pre-operative



Electrode tip over pigmented area



Post-operative 3 months



Post-operative 3 months

4) Depigmentation using Free gingival graft



Pre-operative view

3) Depigmentation using laser



Pre-operative view



Partial thickness flap was reflected and discarded



Laser tip over the pigmented area



Incision at donor site



FGG sutured at recipient site



Post-operative view 3 month

#### CONCLUSION:

Color of the gingiva plays a major role in the overall maintenance of esthetics. Hyperpigmentation of the gingiva can severely compromise the aesthetic appearance of an individual. The growing esthetic concern requires the removal of unsightly pigmented gingival areas to create a pleasant and confident smile, which all together may alter the personality of an individual. Various techniques have been employed for the same. There was slight amount of re-pigmentation seen after treatment with surgical blade and electrosurgery and minimum amount of re-pigmentation seen after treatment with use of Laser and FGG. But the VAS scores were highest for the FGG and no pain and discomfort was associated with use of Laser. Therefore, patient acceptance and preference for the use of Laser therapy for de-pigmentation was more.

#### REFERENCES:

1. Gupta KK, Srivastava A, Chandra C, Tripathi V. Lip repositioning with crown lengthening and gingival depigmentation: A case report. *J Periodontol Implant Dent* 2011 May; 3(1):38-42.
2. Dummett CO, Sakumura JS, Barens G. The relationship of facial skin complexion to oral mucosa pigmentation and tooth color. *The Journal of prosthetic dentistry*. 1980 Apr 1; 43(4):392-6.
3. Rosa DS, Aranha AC, de Paula Eduardo C, Aoki A. Esthetic treatment of gingival melanin hyperpigmentation with Er: YAG laser: short-term clinical observations and patient follow-up. *Journal of periodontology*. 2007 Oct; 78(10):2018-25.

4. Dummett CO. Oral tissue color changes (I). *Quintessence Int* 1979; 10:39-45.
5. Hirschfeld I, Hirschfeld L. Oral pigmentation and a method of removing it. *Oral Surgery, Oral Medicine, Oral Pathology*. 1951 Aug 31; 4(8):1012-6.
6. Tamizí M, Taheri M. Treatment of severe physiologic gingival pigmentation with free gingival autograft. *Quintessence International*. 1996 Aug 1; 27(8).
7. Bergamaschi O, Kon S, Doine AI, Ruben MP. Melanin repigmentation after gingivectomy: a 5-year clinical and transmission electron microscopic study in humans. *International Journal of Periodontics & Restorative Dentistry*. 1993 Feb 1; 13(1).
8. Tal H, Oegiesser D, Tal M. Gingival depigmentation by erbium: YAG laser: clinical observations and patient responses. *J Periodontol* 2003 Nov; 74(11):1660-1667.
9. Vongsurasit T. Technic of Preventing Gingival Recession from Using Rubber Dam for GTR. *Journal-Dental Association Of Thailand*. 1996; 46:203-10.
10. Gnanasekhar JD, al-Duwairi YS. Electrosurgery in dentistry. *Quintessence Int* 1998 Oct; 29(10):649-654
11. Lang DE, Bernimoulin JP. Exfoliative studies in evaluation of free gingival graft healing. *J Clin Periodontol* 1974; 1:89-96.
12. Lagdive S, Doshi Y, Marawar PP. Management of gingival hyperpigmentation using surgical blade and diode laser therapy: A comparative study. *J Oral Laser Applications*. 2009 Jan 1; 9:41-7.
13. Azzeh MM. Treatment of gingival hyperpigmentation by erbium-doped: yttrium, aluminum, and garnet laser for esthetic purposes. *Journal of periodontology*. 2007 Jan; 78(1):177-84.
14. Krause LS, Cobb CM, Rapley JW, Killoy WJ, Spencer P. Laser irradiation of bone. I. An in vitro study concerning the effects of the CO2 laser on oral mucosa and subjacent bone. *Journal of periodontology*. 1997 Sep; 68(9):872-80.
15. Berk G, Atici K, Berk N. Treatment of gingival pigmentation with Er, Cr: YSGG laser. *J Oral Laser Appl* 2005 Sep; 5:249-253.
16. Perimutter S, Tal H. Repigmentation of gingiva following injury. *J Periodontol* 1986; 57:48-50.