

GINGIVAL DEPIGMENTATION WITH DIODE LASER, ELECTROSURGERY AND SCALPEL: A COMPARATIVE REPORT OF 2 CASES

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Abstract

There exists an increasing demand for cosmetic therapy of gingival hyperpigmentation. This study aims to compare three depigmentation techniques: scalpel, electrosurgery and diode laser.

A split-mouth depigmentation was done using scalpel, electrosurgery and diode laser in two patients with melanin hyperpigmentation in the anterior maxilla and mandible. The patients filled a questionnaire and scored the pain after surgery based on numeric pain score scale. The clinical parameters such as bleeding, gingival colour, pain and wound healing were evaluated immediately after, and 1 & 2 weeks postoperatively. All the surgical sites were disclosed with a solution called Mira-2-tone dye to evaluate healing and degree of epithelisation after the 1st and the 2nd week of depigmentation. Photographs were also taken 4 weeks postoperatively to evaluate the esthetic result.

In both the patients, laser showed fastest initial epithelisation/healing assessed 1 week post-surgery. Scalpel showed least initial epithelisation when comparing the three treatment modalities. The patients also reported least pain and discomfort with laser.

Diode laser is better than electrosurgery and scalpel in terms of healing and patient acceptance for gingival depigmentation.

Key Words: Melanin, Pigmentations, Lasers

Introduction

Anatomic variations impose challenges to clinicians to Physiologic pigmentation of the oral mucosa is clinically manifested as multifocal or diffuse melanin pigmentation with variable amount in different ethnic groups. Melanin pigmentation is the result of melanin granules produced by melanoblasts intertwined between epithelial cells at the basal layer of gingival epithelium.¹

Gingival hyperpigmentation is seen as a genetic trait in some populations irrespective of age and gender hence it is termed physiologic or racial gingival pigmentation. The degree of pigmentation varies from one individual to another which is mainly dictated by the melanoblastic activity. Melanosis of gingiva is frequently encountered among dark skinned ethnic groups, as well as in medical conditions such as Addison's syndrome, Peutz- jegher's syndrome and Von Recklinghausen's disease (neurofibromatosis).²

Although clinically melanin pigmentation of the gingival does not present any medical problems it can be an esthetic concern for the patient, especially in fair skinned people with moderate or severe gingival pigmentation. Gingival depigmentation is a periodontal plastic surgical procedure whereby the hyperpigmentation is removed or reduced by various techniques. Selection of technique should be based on clinical experiences and individual preferences. Gingival depigmentation can be carried out using surgical, chemical, electrosurgical and cryosurgical procedures. Recently, laser ablation has been recognized as one of the most effective, comfortable and reliable techniques.³

The present case report is a comparative split-mouth study that evaluates the effectiveness of diode laser,

electrosurgery and scalpel for gingival depigmentation in terms of healing and patient acceptance.

Case Description

The study was conducted in patients visiting the OPD of the Department of Periodontics, Babu Banarasi Das college of Dental Sciences. Two patients of either sex requesting for esthetic treatment for gingival hyperpigmentation were selected.

Treatment plan

A split-mouth depigmentation procedure was planned utilizing three treatment modalities- diode laser (940 nm), electrosurgery, and conventional scalpel technique. The entire procedure was explained to the patient and written informed consent was obtained. A complete medical, family history and blood investigations were carried out to rule out any systemic involvement and contraindication for surgery.

Surgical Procedure

A split-mouth depigmentation was carried out to compare scalpel, electrosurgery and diode laser. Local infiltration was given for scalpel and electrosurgical techniques (Lignocaine with adrenaline in the ratio 1:80000 by weight), while only topical lignocaine spray was used for sites to be lased.

Thin slices of pigmented layer (entire pigmented epithelium along with a thin layer of connective tissue) were excised utilizing the scalpel technique (15 no. blade). Bleeding was controlled using pressure pack with sterile gauze.

For electrosurgery, light brushing strokes were used and the tip was kept moving all the time. Prolonged application of electrode to the tissues was avoided to prevent heat

accumulation which could induce undesirable tissue damage.

Sites for laser technique were de-epithelized using 940 nm diode laser at 2.0 W power in continuous mode. A 400µm tip was used to gently remove the pigmented outer layer of epithelium together with a layer of underlying connective tissue. Light brushing strokes were used and the tip was kept in motion all the time in order to avoid thermal injury to the tissues. Remnants of ablated tissue were removed with sterile gauze dampened with saline.

On completion of depigmentation, a periodontal dressing was placed over the surgical areas. Post-operative instructions were given to the patient, NSAID in the form of Diclofenac sodium was given thrice daily for 3 days in all the cases.

Clinical evaluation and patient's questionnaire

Clinical photographs were taken at the preoperative state, immediately after the procedures, and 1, 2, and 4 weeks after surgery. The surgical sites were evaluated for bleeding, gingival colour, pain and wound healing immediately after, and 1 & 2 weeks after the surgery as given by Ishii *et al*⁴ and Kawashima *et al*⁵ (Table 1). Patients filled out a questionnaire about pain and discomfort, and were asked to score the pain based numeric pain score scale immediately after and at 1 & 2 weeks after surgery. The surgical area was disclosed by a plaque-disclosing solution (Mira-2-tone, GMBH & Co. Duisburg, Germany) after the 1st and 2nd week to evaluate degree of epithelisation/healing. This solution has been used previously for detecting even minor areas of gingival abrasion, which would otherwise be largely undetectable,⁶ and this method has been suggested to be a sensitive tool for the identification of areas lacking epithelium or sufficient keratinization.⁷ It has also been used for evaluating healing after gingivectomy and gingivoplasty procedures.⁶

Table 1: Clinical evaluation scores

Evaluation	Score			
	A	B	C	D
Bleeding	None	Slight	Moderate	Severe
Colour	Improvement	Slight improvement	No change	Deterioration
Pain	None	Slight	Moderate	Severe
Wound healing	Complete epithelisation	Incomplete epithelisation	Ulcer	Tissue defect or necrosis

Case 1

A 21 year old female patient reported with the chief complaint of "black" coloured gums in relation to the upper and lower front teeth (Figure 1). On examination, generalized melanin pigmentation of the gingiva was found and a diagnosis of melanin hyperpigmentation of the gingival was made. A split mouth treatment was planned. The maxillary left anterior segment (central incisor to first premolar) was de-epithelized using scalpel. Maxillary right anterior segment (central incisor to first premolar) was depigmented using electrosurgery, and for mandibular

anterior segment (canine to canine) diode laser (940 nm) was used.

Case 2

A 25 year old male reported with the chief complaint of black gums visible while smiling and speaking (Figure 2). When examined, generalized melanin pigmentation of the gingiva was found and a diagnosis of melanin hyperpigmentation of the gingival was made. A split-mouth approach was planned. The maxillary left anterior segment was de-epithelized using electrosurgery. Maxillary right anterior segment was ablated using diode laser (940 nm), while the mandibular anterior segment was de-epithelized using scalpel. After the procedures, periodontal dressing was placed.



Figure 1 Clinical photographs of Case 1

(a) Preoperative view, (b) immediate postoperative, (c) 1 week postoperative- Disclosed with Mira-2-tone dye, (d) 2 weeks postoperative- Disclosed with Mira-2-tone dye, (e) 4 weeks postoperative

Results

As the patients were under anesthesia, no evaluation of pain or discomfort was made during and immediately after surgery. The evaluation of the clinical parameters and patient response for patient 1 and 2 are given in Table 2 & Table 3 respectively. Bleeding occurred at the scalpel site. Both the patients complained of pain at the scalpel site after one week. Patient 1 also reported discomfort at the electrosurgery site after one week. However there was no discomfort and pain at the laser treated site for both the patients. Staining with Mira-2-tone dye revealed lowest stained areas at the laser sites and darkest stained areas at the scalpel sites on the 7th day in both Case 1 (Figure 1c) and Case 2 (Figure 2b), indicating faster surface epithelisation at the sites depigmented with diode laser. After 2 weeks, the first patient showed equally stained areas, indicating similar degree of epithelisation at all the

three surgical sites (Figure 1d). However the second patient showed darker stained areas at the scalpel site, indicating slower epithelisation and healing than sites treated with laser and electrocautery (Figure 2c). After 4 weeks, the patients were satisfied with the esthetically improved gingival colour (Figure 1e & Figure 2d).



Figure 2 Clinical photographs of Case 2 (a)Preoperative view, (b) 1 week postoperative- Disclosed with Mira-2-tone dye, (c) 2 weeks postoperative- Disclosed with Mira-2-tone dye,(d) 4 weeks postoperative.

Evaluation	Scalpel	Electrocautery	Diode laser
Bleeding			
Immediate	D	A	A
1 week	B	A	A
2 weeks	A	A	A
Colour			
Immediate	A	A	A
1 week	A	A	A
2 weeks	A	A	A
Pain			
Immediate	-	-	-
1 week	C	B	A
2 weeks	A	A	A
Wound Healing			
Immediate	-	-	-
1 week	B	B	B
2 weeks	A	A	A

Table 2 Clinical evaluation of Patient 1

Discussion

Although numerous techniques have been employed to treat gingival hyperpigmentation, the selection of the technique should be based on clinical expertise and patient affordability and preference. Inappropriate technique may lead to postoperative pain, discomfort and delayed wound healing.

The present split-mouth study was carried out to compare three commonly used techniques, scalpel, electrocautery and diode laser for depigmentation.

Table 2 Clinical evaluation of Patient 2

Evaluation	Scalpel	Electrocautery	Diode laser
Bleeding			
Immediate	D	A	A
1 week	B	A	A
2 weeks	A	A	A
Colour			
Immediate	A	A	A
1 week	A	A	A
2 weeks	A	A	A
Pain			
Immediate	-	-	-
1 week	B	A	A
2 weeks	A	A	A
Wound Healing			
Immediate	-	-	-
1 week	B	B	B
2 weeks	B	A	A

Scalpel 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. The new epithelium that forms is devoid of melanin pigmentation. It is a relatively simple technique and economical, but it causes undesirable haemorrhage during and after surgery.

Electrosurgery uses electric energy to cause molecular disintegration of melanin cells of operated and surrounding sites, as explained by Olinger's "Exploding cell theory"⁸. Contact of the electrode with periosteum and vital teeth may cause damage to the tissues; hence it is technique sensitive and requires expertise.

Lasers designed for surgery deliver concentrated and controllable energy to the tissue. For a laser to have a biological effect the energy must be absorbed by the tissue. Laser energy is absorbed by specific chromophores within the irradiated tissue. *Diode laser* falls in the region of near infra-red in the spectrum. Diode laser energy is highly absorbed in pigments like melanin, haemoglobin etc⁹. Hence they are highly efficient for gingival depigmentation. The most commonly used diode wavelengths are 810, 940 and 980 nm. They are used in continuous wave mode and gated pulsed mode. We have used 940 nm diode laser in continuous mode. This choice was dictated by the extensive and deep pigmentation in the patient that guaranteed an effective absorption of the laser energy owing to the richness of chromophores (melanin) at site. The laser technique has many advantages¹⁰ which include (1) a relatively bloodless surgical and postsurgical course; (2) ability to coagulate, vapourize and cut tissues; (3)

sterilization of the wound site; (4) minimal swelling and scarring.

The present study used a disclosing solution, Mira-2-tone dye, which has been effectively used earlier for assessing wound healing /surface epithelization after gingivectomy or gingivoplasty procedures. It stains areas lacking sufficient keratinization, or where gingival is abraded. Darkly stained areas are considered as sites still undergoing wound healing with lack of enough layers of epithelium. A faster healing and surface epithelisation was seen with diode laser, with no associated pain & discomfort.

Conclusion

Within its limitation, the findings of this study show that laser is better than scalpel and electrosurgery in terms of healing and patient acceptance.

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