

## Gallium Arsenide Aluminium Lasers in the Value Addition of Smile

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**Abstract:** Dental esthetics refers to the many scientific and artistic principles that considered collectively can create a beautiful smile. It deals with maintaining the harmony of the teeth and gingiva in relation to the face. Gingival health and appearance are the primary components for an attractive smile. Large numbers of young patients are concerned with disproportionately small teeth and gingival hyperpigmentation. Melanin pigmentation often occurs in the gingiva resulting in appearance of black gum due to abnormal deposition of melanin. Nd: YAG laser, gallium arsenide aluminium [GAA] laser, and CO<sub>2</sub> laser have been employed for removal of melanin hyperpigmentation and gingivoplasty. This case reports combining gingival depigmentation and crown lengthening by gingivoplasty performed in a single appointment using GAA laser.

**Keywords:** Dental esthetics, Gingival health, GAA laser.

### INTRODUCTION

Smile design refers to the many scientific and artistic principles that can create a beautiful smile [1]. Dental aesthetics deals with maintaining the harmony of the teeth and gingiva in relation to the face [2]. Primary components for an attractive smile are good gingival health and appearance [3]. Disproportionally small teeth and gingival hyperpigmentation are major concerns for a large number of young patients [4].

Gingival aesthetics is defined as proper contouring, tinting and festooning of the gingival tissue portion in relation to the tooth. Gingivectomy, gingivoplasty, frenectomy, crown lengthening and depigmentation form a group of aesthetic treatment related to gingival [5].

Melanin pigmentation often occurs in the gingiva as a result of an abnormal deposition of melanin, due to which the gums may appear black [6].

Melanin, a non hemoglobin derived brown pigment, is the most common of the endogenous pigments and is produced by melanocytes present in the basal layer of the epithelium. Gingival hyperpigmentation is caused by excessive deposition of melanin located in the basal and suprabasal cell layers of the epithelium. Melanin pigmentation is the result of melanin granules produced by melanoblasts intertwined between epithelial cells at the basal layer of the gingival

epithelium. The degree of pigmentation varies from one person to another and depends on variety of factors especially the melanoblastic activity [7]. 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 having a very high smile line (gummy smile).

Neodymium-doped: Yttrium-Aluminium-Garnet (Nd: YAG) laser, Gallium Arsenide Aluminium (GAA) laser, and CO<sub>2</sub> laser have been employed for removal of melanin hyperpigmentation and gingivoplasty [8]. Laser depigmentation has become widely used recently and is even preferred over scalpel technique by many clinicians [19]. The documented advantages of lasers in periodontal surgery include less bleeding and reduced postoperative pain [20].

Focus for many general dentists has been on the tooth structure and reshaping incisal edges, but gingival recontouring of soft tissues can yield better length to width proportions on teeth. A focus on gingival shape and gingival contour is essential when altering soft tissue proportions of anterior teeth.

The following case report combines gingival depigmentation and esthetic crown lengthening to enhance esthetics using a gallium arsenic aluminium laser.

## CASE REPORT

A 20 years old female patient visited the dental speciality clinic with a complaint of dark gums and excessive gingival display (Fig 1).

The patient requested for cosmetic treatment to enhance the aesthetics on smiling. Medical history was non contributory.

Intra oral examination revealed a short upper lip, pigmentation of the anterior gingiva and gingival display exceeding 3 mm (Fig. 2).

The hyperpigmentation of the gingiva was esthetically displeasing. Laser assisted depigmentation of the gingiva and crown lengthening by gingivoplasty in the anterior region from canine to canine in the maxilla was planned.

The treatment plan was explained to the patient and written consent was obtained. The procedure was accomplished by using GAA diode laser of wavelength 980-nm (KAVOGENTLE RAY).

Following infiltration and local anaesthesia (2% lidocaine, 1:80,000 epinephrines), the outline of the gingivoplasty was marked with laser points using 300µm fibre (Fig. 3).

The tip was positioned at 45 degree angle to long axis of tissue. (External bevel) , using 0.6-1.2 watts continuous wave, the gingival tissue was incised by placing the laser tips on gingiva with gentle back and forth brush strokes gradually going deeper in planes on the marked line for gingivoplasty (Fig. 4).

Hydrogen peroxide or wet cotton pellets were placed to remove tissue tags [9]. During the procedure, special eye glasses were worn by the patient and the staff to fulfill with the FDA laser safety rules [10].

Depigmentation was done using the non contact technique. Light, brush strokes are used during the procedure. The tip of the diode laser unit was angled at an external bevel of 45 degrees and at energy settings of 0.5-1.5 watts continuous wave was used with small brush like strokes back and forth with gradual progression deeper along the same initial laser incision to remove the tissue [11] (Fig. 5).

Any tissue tags left out after laser ablation during the procedure, were wiped with sterile gauze soaked in saline every 3-5 min. Thorough inspection was done to confirm no pigmented areas were left out.

The patient was prescribed analgesics for use when required. The patient was reviewed at 1 week and the post-operative healing was satisfactory. The patient was recalled after 1 month and 3 months for evaluation of any repigmentation (Fig. 6, 7). There was no evidence of any repigmentation.



**Fig. 1: Preoperative smile line showing short upper lip and excessive display of gums**



**Fig. 2: Preoperative view**



**Fig. 3: Bleeding points marked with laser**



**Fig. 4: Gingivoplasty done on the first quadrant**



**Fig. 5: The blanching of gingival seen after depigmentation**



**Fig. 6: One month postoperative view**



**Fig. 7: Three month post operative view**



**Fig. 8: Postoperative Smile Line.**

#### DISCUSSION

Many methods such as scalpel surgery, gingivoplasty with free gingival autografting, cryosurgery, electrosurgery, chemical agents such as 90% phenol and 95% alcohol, abrasion with diamond

burs, Nd: YAG laser, semiconductor GAA diode laser and CO<sub>2</sub> of de-epithelialization of the pigmented areas of the gingiva have been documented [12].

The uses of a diode laser in soft tissue procedures are advocated as it helps in bacterial decontamination, promotes reestablishment of connective tissue attachment and are of less invasive nature that reduces postoperative swelling [13, 14]. Conventional protocols require a waiting period of four to six weeks for sufficient healing of the attachment apparatus, prior to initiating restorative procedures, while it is decreased with laser [15].

Laser light at 800 to 980 nm is poorly absorbed in water, but highly absorbed in hemoglobin and other pigments. Since the diode basically does not interact with dental hard tissues, the laser is an excellent soft tissue surgical laser, indicated for cutting and coagulating gingiva and oral mucosa, and for soft tissue curettage or sulcular debridement. The diode laser exhibits thermal effects using the "hot tip" effect caused by heat accumulation at the end of the fiber, and produces a relatively thick coagulation layer on the treated surface. Tissue penetration of a diode laser is less than that of the Nd: YAG laser, while the rate of heat generation is higher [16-18]. This property can easily be utilized to perform single sitting comfortable gingivectomy and minor gingival soft tissue contouring as performed in the reported case.

#### CONCLUSION

Excessive gingival display and gingival hyperpigmentation are major concerns for a large number of patients. The role of lasers surgery in the oral cavity is well established. The patient was comfortable throughout the procedure though multiple treatments were accomplished in a single sitting. The need and demand for esthetics requires the removal of unsightly pigmented gingival areas to create a pleasant and confident smile, which altogether may alter the personality of an individual.

The application of diode laser appears to be a safe and effective alternative procedure for the treatment of gingival melanin pigmentation. Its benefits include ease of usage, effectiveness in the treatment, convenience in dental clinics, and decreased trauma for the patient. With the advent of lasers, depigmentation and gingivoplasty could be done in single sitting with comfort for the patient and operator and is a valuable tool in the value addition of smile.

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