# Treatment of gingival hyperpigmentation

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**An attractive smile** has always been at the centre of people's attention in perfecting their aesthetic appearance. In the modern age, aesthetics has become a very important aspect of dental practice and doctors must confront both the attainment of acceptable gum aesthetics and the management of biological and functional problems.

The gingiva is the most frequently affected intraoral tissue that can lead to an unsatisfactory appearance. The gingival colour plays a very important and central role in every perception of aesthetics and varies between different individuals, from pale pink to deep bluish-violet hue. The hue depends on several different factors. The vascular supply of the gingiva, the degree of keratinisation, the epithelial thickness, and the presence of pigmented cells are the most important components that can change the gingival colour.




**Fig. 1:** Diode laser 810 nm (Ceralas D15/810 nm, Biolitec).

## Introduction

The oral hyperpigmentation is the discolouration of the mucosa or the gingiva. Gum melanin pigmentation (GMP) is a widespread form that can occur in all races.[1,2] Regardless of age and gender, it is seen predominantly as a genetic feature of some populations. It has been reported that the prevalence of melanin pigmentation varies among different populations between 0 to 88 %, regarding ethnic factors and smoking habits.[1–4]

It is permanent, usually symmetrical and is therefore called physiological or racial gingival pigmentation.[2,4] This appearance is predominantly observed in the form of a deep, diffuse dark brownish to blackish gingival colour and is characterised by a normal gingival appearance. Complaints of "black gums" are common and demands for depigmentation are normally made for aesthetic reasons.[1,2,4]

Oral melanin pigmentation is associated with a variety of etiological factors. Endogenous factors in systemic diseases such as von Recklinghausen's disease, Addison's disease, McCune-Albright's syndrome, Peutz-Jeghers' syndrome and lentigo labialis, as well as exogenous factors such as amalgam tattooing, or chronic intoxications (lead, quicksilver, bismuth poisoning), smokers melanosis, malaria drugs or antidepressants leading to an oral pigmentation.[4–7]

Most pigmentations are caused by five major pigments: melanin, oxyhaemoglobin, melanoid, carotene, and reduced haemoglobin. Iron and bilirubin are further cofactors.[2,4]


Fig. 2


Fig. 3

Melanin, a brown pigment, is located in the basal and suprabasal layer of the gingival epithelium. The melanocytes have a higher activity and an excessive melanin production is associated with the hyperactivity. Even three hours after birth, melanin enters the oral mucosa, and in some cases it is the only pigmentation mark on the entire body.[2,4] Melanin, is the most common cause of endogenous gum discolouration and is the most prevalent gingival pigmentation.

The brownish or blackish discolouration of the oral mucosa, localised in certain gums or as a generalised appearance, is presented more as an aesthetic rather as a medical issue.[4] This problem is aggravated in patients with a "gummy smile". Gum depigmentation is a perio-plastic surgical treatment in which gingival black discolouration is reduced and completely removed by various techniques.[8–11]

A) Method for excision of the pigmented portion:
- scalpel surgery
- cryosurgery
- chemicals (95 % alcohol and 90 % phenol)
- electrosurgery
- Gingivectomy using a diamond bur
- Laser:
  a) Nd:YAG (Neodymium:yttrium-aluminium-garnet) laser
  b) Er:YAG (erbium:yttrium-aluminium-garnet) laser
  c) $CO_2$ lasers
  d) diode laser

B) Methods for covering the pigmented gingiva with transplants of less pigmented areas:
- free gingival graft
- acellular skin transplants

Laser depigmentation is becoming more and more popular as the preferred treatment method for oral hyperpigmentation. The dental lasers have been used in dental medicine since the early 1980s. The diode laser has been introduced into the dental field within the last two decades. It is a semiconductor laser constructed with a combination of galium (Ga), arsenic (Ar) and other elements such as aluminium (Al) and

**Fig. 2:** Clinical situation at the first presentation of the patient with generalised gingival hyperpigmentation.
**Fig. 3:** Pre-op situation of gingival melanin pigmentation.

**Fig. 4:** 810 nm diode laser.
**Fig. 5:** Immediate post-op situation in the 1st quadrant.
**Fig. 6:** Postoperative situation directly after the depigmentation in the 4th quadrant.



Fig. 4


Fig. 5


Fig. 6

**Fig. 7:** Four days post-op: stage-appropriate wound healing with aesthetically pleasing depigmented gum.
**Fig. 8:** Postoperative situation four days after surgery in the 1st quadrant.
**Fig. 9:** Immediate post-op situation in the 2nd quadrant.
**Fig. 10:** Situation directly after the surgery.
**Fig. 11:** Two weeks after surgery: aesthetically pleasing depigmented gum.
**Fig. 12:** Postoperative view after two weeks: depigmented maxilla.




indium (In). It has a very wide range of indications that can be perfectly integrated into the dental treatment spectrum.

Diode laser has energy and wavelength properties that are specifically targeted to the soft tissue. It has a great affinity to haemoglobin and melanin, and is more efficient and better for the removal of deep soft tissue problems. With the diode laser (Fig. 1), there is the possibility of a minimally invasive treatment for the removal of unaesthetic gingival melanin discolourations, a periodontal dressing is not required postoperatively.[9] By its application one can achieve a very simple gum contour.

Further advantages of the diode laser are the reduced demand local anaesthesia, easy handling, excellent haemostasis, as well as minimal thermal damage to deeper soft tissue combined with a decontaminating and sterilising effect, as well as negligible postoperative complaints and pain. In addition, there is scientific evidence in the literature that the application of the diode laser for depigmentation is a more effective treatment method, with very low recurrence rate compared to the mechanical method.[9, 11, 13–15]

## Case presentations

In the following, there are presented clinical cases of localised and generalised gingival hyperpigmentation. Furthermore, the management and the operative depigmentation using the diode laser will be explained, the phases of the operation and the postoperative wound healing of the patients. The study was performed in the Department of Dentistry of the General Hospital Western Attica, in Athens, Greece, and in patients with gum hyperpigmentation. For the operations, the Ceralas D15/810 nm (Biolitec; Fig. 1), a 810 nm diode laser, was used.

### Case 1

The 27-year-old female patient was introduced to our department for dental examination. She found the generalised blackish pigmentation of the gingiva in the upper as well as the lower jaw very disturbing. The "blackish" tooth was psychologically stressful for her. Apart from an allergy to pollen, the patient was generally healthy. She said that she is an occasional smoker. Furthermore, the patient mentioned that she was teased in her childhood because of her gum colour.

The sufficient conservative and prosthetic restored mouth had a moderate oral hygiene. The clinical examination showed a healthy gingiva without any signs of inflammation. There was a generalised hyperpigmentation in the area of the maxillary and mandibular facial "attached" gingiva. The dental panoramic radiograph showed no vertical and horizontal bone loss. The clinical diagnosis of a generalised gingival melanin hyperpigmentation was made (Figs. 2 & 3).

The patient's desire was an aesthetic gum correction. Moreover, she mentioned being very sensitive to pain and was afraid of a possible haemorrhage after the operation. In order to take the concerns of the patient into consideration, we suggested two methods: the diode laser as well as the conventional depigmentation with scalpel or diamond drills. The patient decided the minimally invasive laser treatment.

For the gingival depigmentation the Ceralas D15/810 nm (Fig. 4) with a setting of 2.5 W in continuous wave mode (cw) and 400 µm fiber was used without contact with the soft tissue. The operation took place in two sessions. In the first session the depigmentation of the 1st and 4th quadrant was carried out. For local surface anaesthesia, Emla Creme 5 % (AstraZeneca) was applied circularly around the tissue which would be depigmented. Then the patient and the treatment team were equipped with appropriate laser goggles. Afterwards, the hyperpigmented tissue was excised.

Initially, the fibre was placed approximately 8–10 mm in distance from the operating area and then approached until a visible response of the tissue from the laser light was started. Simultaneously, the treatment was continued with simple varnish-like movements and in non-contact with the soft tissue (Figs. 5 & 6). After the operation, the patient was instructed to cool and protect the operating area. In addition, the patient received a prescription for painkillers, if necessary, and an appointment was made on the fourth postoperative day for a regular wound control and continuation of the second session.

In the operating area, a proper wound healing was observed, with a significant colour difference, in the area of the facial gingiva of the 1st and 4th quadrant (Figs. 7 & 8). Furthermore, the depigmentation of the 2nd and 3rd jaw regions took place in a similar way (Figs. 9 & 10). One week postsurgical, the patient presented again for control in our department. There was no evidence of postoperative infections or scarring in the operating area. The healing process was very good and painless, and there was no restriction on the intake of food. In addition to that, the attached gingiva appeared pink with normal appearance. The patient was very satisfied with the end result (Figs. 11 & 12).

**Case 2**

A 40-year-old male patient was introduced to our department on February 2015, due to an isolated brownish-black discolouration in the upper jaw (Fig. 13). The patient was healthy and had no allergies. Intraorally there were no periodontal pockets or recessions. He showed a good oral hygiene. The patient prosthetic restorations were sufficient. Extraorally, there could not be detected external signs of internal diseases (healthy skin colour).

There were no pathological facial asymmetries and the lip closure was competent. The patient had an average laugh line. There was a localised hyperpigmentation interdental of the maxillary facial gingiva in region 21/11. The desire of the patient was a minimally invasive and possibly painless elimination of this gingival decolouration. Therefore, diode laser treatment was offered. The patient agreed with this treatment method.

For the excision of the localised melanin pigmentation, the Ceralas D15/810 nm (Fig. 14) with a setting of 2.5 W in continuous wave mode (cw) and 400 µm fiber was used, without contact with the soft tissue. For local surface anaesthesia, Emla Creme 5 % (AstraZeneca) was applied circularly around region 21/22. Afterwards, the patient and the treatment team were equipped with appropriate laser goggles and we performed the excision of the black gingival discolouration. First, the fibre was placed approximately

**Fig. 13:** Initial view at the first presentation of the patient: noticeable discolouration in the interdental area of the maxillary front tooth region.
**Fig. 14:** Postoperative view directly after the excision of the gingival pigmentation.
**Fig. 15:** One day after surgery: optimal wound healing.


Fig. 13


Fig. 14


Fig. 15


Fig. 16


Fig. 17

**Fig. 16:** One day after surgery: optimal wound healing.
**Fig. 17:** Complete healing, no scar and discolouration can be detected.

8–10 mm away from the operative area and then approached until it started a visible reaction of the tissue from the laser light. The treatment was continued in non-contact with the soft tissue.

The patient presented a week after the surgery for regular wound control in our department (Fig. 15). In the operating area we had a proper wound healing. The patient was very happy with the end result and very surprised that he had no postoperative pain (Figs. 16 & 17).

## Discussion and conclusion

Smile is the mirror of self-confidence and joy. The British philosopher John Ray said: "Beauty is power, a smile is its sword". A perfect smile is not only about the tooth position, form and colour, but also about the gingival harmony and contour. Excessive gingiva display and gingival hyperpigmentation has become a major concern for a large number of patients. Doctors have to deal with the attainment of acceptable gum aesthetics as well as the treatment of biological and functional problems.[1,3,4]

Although several depigmentation techniques are currently used, a one-step laser treatment is usually sufficient to eliminate the pigmented zones. The diode laser depigmentation is a relatively safe, minimally invasive, convenient and effective treatment method.[5,8,9,11] Despite this, the selection of the appropriate depigmentation method should be based on the clinical experience of the operator and the individual preferences.[12–15]_

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### Kurz & bündig

Die Gingivafarbe spielt eine sehr wichtige Rolle in der Wahrnehmung der Ästhetik und variiert zwischen Individuen von blassrosa bis zu einem tiefblau-violetten Farbton. Dabei hängt der Farbton von verschiedenen Faktoren ab: u. a. von der vaskulären Versorgung der Gingiva, dem Grad der Keratinisierung, der Epitheldicke und dem Vorhandensein pigmentierter Zellen. Die orale Hyperpigmentierung ist eine weit verbreitete Form der Verfärbung der Schleimhaut oder Gingiva. Dabei ist Melanin verantwortlich für die meisten gingivalen Pigmentierungen. Zur Behandlung der zumeist bräunlichen Verfärbungen gibt es verschiedene Methoden. Diese reichen von der Entfernung mit Skalpel, Elektrochirurgie und Gingivektomie bis hin zur Abdeckung betroffener Stellen mit pigmentierten Gingivatransplantaten. Eine zunehmend beliebtere Methode stellt die Behandlung mittels Laser dar. Hier eignet sich vor allem der Diodenlaser, da seine Eigenschaften bezüglich Energie und Wellenlänge speziell auf Weichgewebe abgestimmt sind. Im Artikel schildern die Autoren zwei Patientenfälle mit einer lokalisierten und mit einer generalisierten Hyperpigmentierung. In beiden Fällen wurde ein 810 nm-Diodenlaser zur Beseitigung der Verfärbungen verwendet. Das Ergebnis in beiden Fällen war sehr positiv für Behandler und Patient. Auf minimalinvasivem Wege konnte eine zufriedenstellende Farbe der Gingiva hergestellt werden.

Literature



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