Aesthetic laser therapy correction of gingival hyperpigmentation

By Howard Glückman, Jonathan Du Toit, South Africa

A beautiful smile is dependent on many factors. One of those factors is the gingival scaffold Symmetry, proportion, as well as colour and appearance of the gingiva are critical to an aesthetically pleasing smile. Physiological gingival hyperpigmentation does not present as clinical pathology requiring treatment, nonetheless it may be of aesthetic concern to the patient. Minimally invasive intervention by means of cryosurgery, electrosurgery, laser therapy or other may produce dramatic change in the appearance of the patient’s smile with a sustainable, long-term aesthetic outcome.

Hereafter a case is presented demonstrating laser therapy removal of gingival hyperpigmentation with stable, pink gingival aesthetics at the 2-year follow-up.

Case report
A 34-year-old female patient of Indian descent presented by referral to a specialist in periodontics for "pink guns". The patient was a non-smoker and the medical history was non-contributory. Examination of the face noted multiple, poorly defined hyperpigmented macules of the lips, mild in severity and greater in number on the lower lip. The patient's high smile line was noted with excessive gingival display, and greater in number on the lower lip. The patient initially sought treatment of the mandible only. Digital smile design (DSD) and smile analysis of the patient indicated need for correction of the altered passive eruption. De-epithelialization of the affected areas as well as crown lengthening by laser gingivoplasty was opted for. The working field was retracted and isolated (Extracurta, Ivoclar Vivadent), and local anaesthesia achieved by slow infiltration of a 2% articaine with adrenaline (0,200,000).local anaesthetic solution (Lipidene™ forte, 3M ESPE). The area, mucosa and teeth surfaces, were cleaned with sterile gauze soaked in chlorhexidine gluconate aqueous solution (never use an alcohol solution with medical lasers). An Er,Cr:YSGG laser (Waterlase Plus 2, Biolase) was used for all the periodontal soft tissue surgeries. The crown lengthening by gingivectomy was first carried out as per the DSD guide, with a fine tip (MGG), applied more parallel to the tooth, with the unit's power settings at 75 Hz, with water and air settings 50 and 40 respectively. Thereafter, a broader, chisel tip (MCG) was interchanged for the depigmentation/gross de-epithelialization, with power settings increased to 92 Hz. The tip size and power allowed for faster removal of tissue with water and air settings on for cooling. Broad, gradual strokes de-epithelialized the pigmented areas up to 3 - 4 mm beyond the lesions' borders. To conclude the procedure, the unit was set to "laser bandage" mode, with lowered power settings at 1.5 W.75 Hz, and water and air off for hemo-stasis, leaving a layer of coagulum that would aid with the tissue healing. After the entire affected area was de-epithelialized (Fig. 3) post-operative instructions were given (no tooth brushing near the treated area for 1 week, rinse with chlorhexidine mouthwash 3 times a day). The patient presented at the 2-year recall with no notable signs of repigmentation.

The patient remained a score of zero on both indices. The gingival contour and colour remained stable with aesthetic results pleasing to the patient (Fig. 6).

Discussion
Pigmentation of the gingiva may pose an aesthetic concern to the patient seeking cosmetic correction thereof. Laser depigmentation is an evidence-supported, beneficial treatment modality. "Laser" is an acronym for light amplification by stimulated emission of radiation. Possibly the first report of laser radiation on soft tissues was as early as 1990. The first commercial laser for use in dentistry, the diode 532 nm YAG laser, was introduced in 1990. At present, a range of laser wavelengths are used in dentistry for a plethora of applications (Table 1). The fundamental mode of action of lasers is that waves consisting of photons (basic unit of radiant energy, light) travel at the speed of light and these waves can be defined by their wavelength and amplitude. Amplitude is the vertical height of the wave, and in lasers this corresponds to "brightness", its potential energy to do work. Wave-length is the distance between two corresponding points on the wave – the unit typically in laser dentistry is...

Table 1: Lasers currently used in dentistry

![Figure 1: Preoperative view of the patient's smile](image)

![Figure 2: Retracted, preoperative, intraoral view demonstrating the degree of pigmentation and extension of the affected areas](image)

![Figure 3: Immediately postoperative, crown lengthening and de-epithelialization of pigmented tissue completed](image)

![Figure 4: 10-days postoperative, rapid healing with dramatic result in gingival colour](image)

![Figure 5: The patient's smile 10 days after the laser de-epithelialization and crown lengthening](image)

![Figure 6: Patient's smile at the 2-year recall, dental bleaching, increased clinical crown, canin pink gingiva, all contribute to a healthy, aesthetic smile](image)
The ablative action of the laser over a wider area allowed for removal of the superficial gingival layers rather than just the pigmented gingiva. Oral mucosa is high in water content and the laser effect primarily involves the thermal change in the tissue. When water temperature is raised to 100°C water vaporization of the water within the mucosa occurs, called ablation. Incision and excision of oral soft tissues here at this temperature: Between 60° and 100°C tissues will denature without vaporization of underlying tissue, ideal for the removal of diseased denaturalization tissue, for homogenizing and coagulating tissue. Charring of the tissues will however occur at temperatures around 500°C. When removing hyperpigmented tissues, lower temperatures are needed, and much less energy is needed since chromophores absorb less. Conversely, higher energy would be needed to excise fibrotic tissue, with less chromophores. Lasers used for the aesthetic correction of physiologic hyperpigmentation have been extensively described in the literature, and suggested as superior to other treatments due to the fast healing, reduced pain and discomfort, clean and dry operating field, and stable results.14 The formation of procoagulation on the laser treated wound surface reduces postoperative pain. Laser light may also "seal" free ends of cuttings.15 The patient treated in the case presented here required only one ampoule local anesthetic infiltration per quadrant delivered segmentally across the working area. The operating field was dry and void of any profuse bleeding. Nearly the entirety of the hyperpigmented lesions had the superficial layers of tissue layers removed. Healing was rapid with no report of pain, infection, or discomfort. As at early as 10 days postoperatively the area was nearly entirely healed with radical results in tissue colour and contour. The literature reports the expected chromosomal and degrees of regeneration followling even by various modes of treatment. Depigmentation by laser ranks low (16%) in terms of percent age (regeneration) (Table 2).

Conclusion

I.C C Y N G laser therapy for the epidermal bleaching can successfully alter blue – black/dark brown gingiva to uniform light brown colour with numerous benefits for both patient and clinician. The results can be dramatic in patients with gingival hyperpigmentation.

Table 2: Literature review 1952 – 2013; pigmentation recurrence rates (%) by random-effects Poisson regression

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of studies</th>
<th>Depigmentation rate (%)</th>
</tr>
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<tbody>
<tr>
<td>Bur fat</td>
<td>16</td>
<td>8.99</td>
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<tr>
<td>Scalpel gingioplasty</td>
<td>23</td>
<td>4.25</td>
</tr>
<tr>
<td>Gingival graft</td>
<td>3</td>
<td>1.96</td>
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<tr>
<td>Laser</td>
<td>27</td>
<td>1.16</td>
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<tr>
<td>Electro surgery</td>
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<td>0.32</td>
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</tbody>
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References


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Figure 7: (a) Components of a gas or solid active-medium laser, e.g. CO2 or Nd:YAG laser, and (b) a diode laser. Adapted from Principles and Practice of Laser Dentistry 2nd ed (p. 14), by Converse RA, 2015, St. Louis: Mosby-Ellis

Figure 8: Wave lengths of the various laser lights and their position within the EM spectrum. Adapted from Principles and Practice of Laser Dentistry 2nd (p. 14), by Converse RA, 2015, St. Louis: Mosby-Ellis

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