Aesthetic laser therapy correction of physiological gingival hyperpigmentation

By Howard Gluckman, 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. Physiologic gingival hyperpigmentation does not present as clinical pathology requiring intervention, nonethe-

Hyperpigmentation was noted in the mandible and maxilla, with the latter greater in severity (Fig. 2). The Oral Pigmentation Index in terms of pigmentation intensity (heavy clinical pigmentation) and scored on the Takahashi melanin pigmentation index in terms of its extension (formation of continuous ribbons extending from the neighbouring solu-
tory units). In both the mandible and the maxilla the hyperpigmentation appeared mostly as singular, non-smoker and the medical his-
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Case report

A 34-year-old female patient of In-
dian descent presented by refer-
dent to the dental clinic requesting aesthetic outcome.

Intraoral ex-

molar and premolar teeth surfaces, were cleaned with

Clinical crown size, coral-pink gingiva, all contribute to a healthy, aesthetic smile.

Figure 1: Preoperative view of the patient's smile

Figure 2: Retracted, preoperative, intraoral view demonstrating the degree of pigmentation and extension of the affected areas

Figure 3: Immediately postoperative, coronal lengthening and deep epithelialization of pigmented tissue completed

Figure 4: Patient’s smile 10 days post laser deep epithelialization and crown lengthening

Figure 5: The patient’s smile 10 days after the laser deep epithelialization and crown lengthening

Figure 6: Patient’s smile at the 2-year recall, dental bleaching, increased clinical crown, canki pink gingiva, all contribute to a healthy, aesthetic smile

Discussion

Pigmentation of the gingiva may pose an aesthetic concern to the pa-
tient seeking cosmetic correction thereof. Laser depigmentation is an evidence-supported, beneficial treat-
ment modality. “Laser” is an acr

ym for light amplification by stimu-
lated emission of radiation. Possibly the first report of laser radiation on oral soft tissues was as early as 1965. The first commercial laser for use in dentistry, the diode laser was introduced in 1995. At pre-

sent, a range of laser wavelengths are used in dentistry for a plethora of ap-
lications (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. The wavelength is the distance between two corresponding points on the wave – the unit typically in laser dentistry is...
Commercially available dental lasers emit light and wavelengths ranging 500–10,000 nm. As such, a dental laser is suited for the visible or invisible and nonionizing range of the EM spectrum. An erbium laser for example then may have an additional light source in the device for therapeutic application.

Furthermore, the point of cautery is the place in the laser operating room to wear laser protective eyewear. The active medium is activated there may be four possible interactions between the laser light and the target area, depending on the tissue’s optical properties, depending on the surface of the light’s wavelength. Reflection will occur when the light is deflected off the surface, with no effect. This may cause injury to the neighboring, absorbing tissues, and may cause injury to a nearby person’s unprotected skin. The excitation source will excite energy, electric coil, lamp strobe, etc. The active medium is surrounded by optical resonators (typically mirrors), and the optical resonators are embedded in the laser cavity from these components. The active medium may consist of a container of a crystal ( erbium:YAG laser), a solid-state semiconductor (diode laser), or a fluid. The cavity is surrounded by the pumping mechanism which may be an excitation source (source of energy – electric coil, arc lamp, etc). The excitation source will excite photons, and as they return to resonators they emit energy in the form of photons. Cooling the laser cavity are optical resonators (typically mirrors) that reflect waves back and forth, thereby enabling the amplifying of the beam. As with normal light, the clinician may note that laser light wave length is dependent on the material and can correlate the type of laser to its respective wavelength (Fig. 1).

The ablative action of the laser over a wider area allowed for removal of the superficial gingival layers rather than the targeted lesion. Oral mucosa is high in water content and the laser’s effect primarily involves the thermal change in the tissue. When water temperature is raised to 100°C vaporization of the water within the mucosa occurs, called ablation. Incision and excision of oral soft tissues here is this temperature: Between 60°C and 100°C proteins will denature without vaporization of underlying tissue, ideal for the removal of diseased degranulation tissue, for hemostasis and coagulation. Charring of the tissues may however occur at temperatures around 200°C. While removing hyperpigmented tissues, lower temperatures are needed, and much less energy is needed since chromophores absorb differently. Lasers used for the aesthetic correction of physiological hypopigmentation 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. The formation of new collagen on the treated wound surface reduces postoperative pain. Laser light may also “seal” the wound edges if required. The patient treated in the case presented here required only a simple 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 hypopigmented lesions had the superficial layers of tissue layers removed. Healing was rapid with no report of pain, infection, or discomfort. At as early as 10 days postoperative the area was nearly entirely healed with radical results in tissue colour and contour. The literature reports the expected chronological and degrees of repigmentation following one of various modes of treatment. Depigmentation by laser ranks low (1% in terms of percent repigmentation).

Conclusion
In vitro, YAG laser therapy for the epi- thelization can successfully alter blue – black/dark brown gingiva to uniform pink colour with numerous benefits for both clinician and patient. The results can be dramatic in hard tissue but it is not an option for patients seeking this treatment, remaining stable over the long-term, contributing greatly to an aesthetically pleasing smile.

References

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Figure 6: Wavelengths of the various laser lights and their position within the EM spectrum. Adopted from Principles and Practice of Laser Dentistry (2nd ed), by Convissar RA, 2015, St. Louis: Mosby Elsevier

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

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>Repigmentation rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bur abrasion</td>
<td>16</td>
<td>8.99</td>
</tr>
<tr>
<td>Scalpel gingivoplasty</td>
<td>23</td>
<td>4.25</td>
</tr>
<tr>
<td>Gingival graft</td>
<td>3</td>
<td>1.96</td>
</tr>
<tr>
<td>Laser</td>
<td>27</td>
<td>1.15</td>
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<tr>
<td>Electro surgery</td>
<td>2</td>
<td>0.44</td>
</tr>
<tr>
<td>Cryosurgery</td>
<td>12</td>
<td>0.32</td>
</tr>
</tbody>
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Table 4: Clinical Periodontology. St. Louis: Elsevier; 2012.

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