Paediatric laser dentistry. Part 4: Soft tissue laser applications

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ABSTRACT

Lasers can provide effective soft tissues applications in children. All the wavelengths produce incision and vaporisation of oral tissues, together with a high bactericidal effect. The haemosthatic effect varys according to the wavelength used, and the choice of a visibile, near, medium or far infrared laser allows a better interaction with specific targets, gingiva, mucosa, frenum, or oral pathology.

Keywords *Laser frenectomy; Laser gingivectomy; Lingual frenum release; paediatric oral tissues care.*

Laser effects on soft tissues

Lasers are used in paediatric dentistry for soft tissue applications in Oral Pathology, Periodontics and Orthodontics [Olivi et al., 2009; Olivi et al., 2011a]. Advantages of laser surgical technique compared to conventional procedures are listed in Table 1. Accordingly, laser therapy can improve the quality of the results, maintaining or improving the patient's acceptance and compliance [Parkins, 2000; Boj et al., 2005; Haytac and Ozcelik, 2006; Genovese and Olivi, 2008; Kara, 2008; Akpinar et al., 2015].

The benefits resulting from the use of laser comes from an in-depth knowledge of the principles of the laser-tissue interaction. This interaction is primarily determined by the wavelength's affinity for specific chromophore of different tissues [Pang et al., 2010].

The laser wavelengths with optical affinity for haemoglobin and water (the main chromophores contained in gingiva and mucosa) can be used for soft tissue applications. Visible and near and infrared lasers are highly absorbed by haemoglobin and melanin, offering excellent coagulation and bleeding control during incision and vaporisation [Paglia et al., 2015]. Medium and far infrared lasers are highly absorbed in water, providing efficient incision and vaporisation of less vascularised, keratinised and fibrous tissues [Olivi et al., 2011b].

Oral soft tissues contain a variety of healthy and pathologic tissue types: mucosa, keratinised gingiva and non-keratinized gingiva, fibrous lingual and labial frenula. This must be taken into account when choosing the correct laser wavelenght and settings. Additional differences depend on location, health status, pigmentation, vascularisation, hydration and can be defined as biotype variances [Pang et al., 2010]. The best results occur when the appropriate wavelength is matched to the main chromophore within the target tissue, maximising absorption. Inflamed tissues, which contain more blood and therefore more pigment and haemoglobin, will react favourably to wavelengths in the visible and near-infrared spectrum of light. Also a vascular pathology, such as haemangioma or a pyogenic granuloma will be better treated with a visible or near infrared laser [Angiero et al., 2008], but a fibrous epulis [Olivi et al., 2007] or a frenum [Olivi et al., 2012] will respond better to a medium or far-infrared laser because of the high absorption in water [Genovese and Olivi, 2010].

Effects on soft tissues

The laser energy absorbed and/or diffused into the tissues is transformed, causing different effects on the targeted tissues. The photothermal effect represents the main effect of laser radiation on soft tissues (effect common to all wavelengths). The thermal effect produces several

Operative Advantages	
Safety	No scalpel or cutting instruments used in the mouth
Precision	Excellent operative view due to the bleeding control
Ease	Simple and rapid to use
Painless	Less use of local anaesthesia or no anaesthesia are required
Approach	Improvement of patients' compliance
Clinical Advantages	
Decontaminating effect	Reduced incidence of postoperative swelling
Hemostatic effect	Excellent coagulation effect during and after surgery
Fast	Possibility of not applying sutures
Post-operative recovery	Often asymptomatic with less need for analgesics and anti-inflammatory medications.

TABLE 1 Advantages of laser on soft tissue compared to conventional procedures.