Paediatric laser dentistry. Part 2: Hard tissue laser applications

G. Olivi*
C. Caprioglio**
M. Olivi***
M. D. Genovese***

*Visiting Professor, University Cattolica del Sacro Cuore of Rome
Private Practice, Rome, Italy
**Visiting Professor University of Pisa, Italy
Private Practice, Pavia, Italy
*** Private Practice in Rome, Italy

e-mail: olivilaser@inlaser.it
claudiagiulia.caprioglio@gmail.com

ABSTRACT

Erbium lasers can provide effective and minimally invasive caries removal in children. The bonding phase remains a critic step as well as the choice of material. Glass ionomers exhibits lower bonding properties in laser irradiated teeth compared to the conventional method or to composite and resin modified glass ionomer. Laser can also provide effective decontamination and coagulation effects in vital and non vital pulp therapy of primary teeth, improving and simplifying the cleaning and disinfecting steps.

Keywords *Laser caries removal; Laser pulpotomy; Paediatric dental care.*

Introduction

Lasers can be used as a suitable alternative or complementary tool to many conventional diagnostic and therapeutic procedures in preventive and restorative dentistry, as well as in endodontics. As reported by Martens [2003] children are the first in line to receive dental laser treatment according to micro-dentistry's motto "filling without drilling".

Some of the clinical advantages of lasers (Table 1) are very important for minimally invasive dentistry in paediatric dental care. Among other advantages, the absence of contact and vibration and the different noise produced during cavity preparation are few of the reasons for the higher acceptance of laser therapy when compared to conventional techniques for caries removal [Takamori et al., 2003]. Despite the patient's subjective experience during laser cavity preparation, reported by some adolescents as unpleasant due to smell and longer chair time, laser was preferred by the majority (62.9%) of adolescents [Mosskull Hjertton and Bågesund, 2013]. In addition, the application of "laser analgesia" before caries removal can be more comfortable for children [Olivi et al., 2011].

Laser in preventive dentistry

Laser for caries prevention

Many studies have investigated the use of different laser wavelengths alone or in combination with fluoride gel or varnish, to modify the superficial enamel ultra-structure in order to increase the acid resistance of the tooth [Delbem et al., 2003; Zezell et al., 2009; Vitale et al., 2011; Ana et al., 2012; Rechmann et al., 2011-2013]. Results were positive but several long term clinical studies are necessary to validate this application before extensive diffusion of the procedure in preventive dentistry.

Laser for fissure sealant and preventive resin restoration

Despite the significant body of evidence of high fissure sealant retention without the use of any unnecessary and undesirable removal of sound enamel when the teeth are diagnosed as sound [Welbury et al., 2004; van Loveren and van Palenstein Helderman, 2015], the use of different laser wavelengths can be considered in addition to conventional protocols for pit and fissure treatments, for several reasons.

The combination of laser diagnosis (laser fluorescence, LF, at 655nm) and erbium laser irradiation (2780nm and 2940nm) of pits and fissures is promising for a truly minimally invasive treatment. When LF detects a healthy enamel (scores 0-10/0-13), erbium lasers can be used (low energy: 40>70mJ) for selective enamel cleaning [Hossain et al., 2012], disinfection and conditioning (macro-roughening) [Olivi et al., 2011]. When LF scores

Minimally invasive	Selective for carious tissue
Decontaminating effect	In carious lesion and root canal
Microretentive surface	Rough, cleansed and debrided surface; no smear layer
Soft tissue application	Easy gingivectomy close to decayed proximal surface, pulp vaporisation and coagulation

TABLE 1 Clinical advantages of laser in conservative dentistry and endodontics.