Lasers in Pediatric Dentistry

Hector R. Martinez Menchaca[1,2], Gerardo Rivera Silva[2]

[1]Department of Orthodontics, Pediatric Dentistry and Special Care, School of Dentistry, University of Louisville, KY, USA. [2]Tissue Engineering and Regenerative Medicine Laboratory, University of Monterrey, NL, MEX

Since the first laser accepted by the Food and Drug Administration, specifically for dental practice, the neodymium-yttrium-aluminum-garner (Nd:YAG), major steps forward in science and technology have been applied to improve dentistry [1]. These advances have resulted in modernized workflows providing accurate and effective treatments.

Currently, the use of the different types of lasers could change the pattern of dental practice, and are classified by diverse manners according to: Tissue applicability (soft or hard tissues); the lasing medium utilized (gas or solid lasers); the range of wavelength; and the risk related with its application [2].

In pediatric dental procedures the different types of lasers have various uses that need to be clarified *(Table 1)*. Including diagnostic purposes as the laser fluorescence applied for detection of oclussal caries and carcinogenic lesions. Relevant to the use of lasers well-defined protections should be taken to guarantee their safe and efficient application. The dentist, assistant and patient must utilize protective eyewear. The use of cautioning marks posted outside the nominal exposure area safeguarding that the laser is in good operating order. High volume suction should be utilized to clear any vapor plume generated during tissue ablation especially of viral lesions in immunocompromised patient to prevention of infection [3]. Furthermore, palliative pharmacological treatments may be more adequate in these patients to avoid viral transmission [4].

Each dental office should have a Laser Safety Officer to control the appropriate application of the laser, organize staff training, supervise the use of protective eyewear, and know the related regulations (infection protocol, biosafety protocol and medicolegal considerations) [5]. The dentist should take a course from a reputable laser provider with the purpose of use the correct laser specific for the indicate procedure. The parents or tutors prior to initiation of laser application must sign informed consent.

Lasers permit pediatric dentists to offer an integral management and are safe and successful when the operator has an appropriate training. Applying laser for dental caries elimination, bone removal, and soft and hard tissues treatments can decrease postoperative infections and anxiety in infants, children, adolescents, and persons with special health care needs. In soft tissues will reduce the use of

Table 1. *Lasers and their applications in pediatric dentistry.*

Type of lasers: **Uses:**	**Photobiostimulating**	**Nd:YAG***	**980 nm diode**	**810 nm diode**	**Er:YAG***	**Er,Cr:YSGG***	**Co2 laser**
Analgesic effect	Yes	NA	Limited	Limited	Yes	Yes	Yes
Aphthous ulcer	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Apicoectomy	NA	NA	NA	NA	Yes	Yes	Yes
Bactericidal activity	NA	Yes	Yes	Yes	Yes	Yes	Yes
Biopsy	NA	Yes	Yes	Yes	Yes	Yes	Yes
Bone ablation	NA	NA	NA	NA	Yes	Yes	Limited
Caries elimination	NA	Limited	NA	NA	Yes	Yes	Limited
Exposure of unerupted teeth	NA	Limited	NA	NA	Yes	Yes	Yes
Gingivectomy	NA	Yes	Yes	Yes	Yes	Yes	Yes
Healing	Somewhat faster	Similar	Similar	Similar	Faster	Faster	Similar
Hemostasia	Limited	Yes	Yes	Yes	Controlled	Yes	Yes
Herpes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hypersensitivity							
Lingual frenum revision	NA	Yes	Yes	Yes	Yes	Yes	Yes
Mandibular frenum analysis	NA	Yes	Yes	Yes	Yes	Yes	Yes
Maxillary frenum analysis	NA	Yes	Yes	Yes	Yes	Yes	Yes
Nerve repair and regeneration	Yes	NA	NA	NA	Yes	Yes	Yes
Periodontal treatment	NA	Yes	Yes	Yes	Selective uses	Selective Uses	Yes
Photodynamic therapy for malignancies	Yes	NA	NA	NA	Yes	Yes	Yes
Pulpotomy	NA	Yes	NA	NA	Yes	Yes	Yes
Reduced gag reflex	Yes	NA	NA	NA	NA	NA	NA
Reduced postoperative pain	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tissue welding	NA	Yes	Yes	Yes	Yes	Yes	Yes
Wound healing	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Nd: YAG (Neodymium Yttrium Aluminum Garnet Laser); *Er:YAG (Erbium: Yttrium Aluminum Garnet); *Er,Cr:YSGG (Erbium, Chromium: Yttrium Scandium Gallium Garnet).

Corresponding author: Dr. Hector R. Martinez Menchaca DDS, MSc, 501 South Preston Street. Louisville, KY. 40202, USA, Tel: (502) 852-5312; e-mail: hector.martinez@louisville.edu

cutting armamentarium and sutures. Irreversibly, specific laser technologies including a combination of diagnostic and therapeutic approaches will become basic elements of modern dental practice.

The search to find practical laser apparatus continues to be the aim of dental technology developers. Because it is desirable that the next generation of dentists may have a clinically useful system for using only laser equipment to treat their patients. Moreover, dental schools around the world should begin to include dental laser pedagogical models in their curriculum that teach about the latest laser innovations and their type of usages in dental practice.

References

1. Coluzzi D. Fundamentals of dental lasers: Science and instruments. *Dental Clinics of North America*. 2004; **48**: 751-70.

2. Martens LC. Laser physics and review of laser applications in dentistry for children. European Archives of *Paediatric Dentistry*. 2011; **12**: 61-7.

3. Garden JM, O'Bannon MK, Bakus AD, Olson C. Viral disease transmitted by laser-generated plume (aerosol). *Archives of Dermatology*. 2002; **138**: 1303-7.

4. Boj JR, Poirer C, Hernandez M, Espassa E, Espanya A. Review: Laser soft tissue treatments for paediatric dental patients. *European Archives of Paediatric Dentistry*. 2011; **12**: 100-5.

5. Piccone PJ. Dental laser safety. *Dental Clinics of North America*. 2004; **48**: 795-807.