The Future of Laser Pediatric Dentistry

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Summary: A review of laser technology applied to different pediatric dental treatments is discussed in the present paper. Its usage in surgical cases, operative dentistry, oral pathology, pulpal treatments, and prevention is analyzed. The current and the future situation of laser treatment in pediatric dentistry is evaluated with a promising view towards an improvement in our treatments and obtaining standardized protocols.

Keywords: pediatric dentistry, laser dentistry, modern dentistry.

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The concept of microdentistry was introduced in dentistry many years ago. The old concept "extension for prevention" changed to "prevention of extension".[1] In keeping with this, new preparation designs and new materials have undergone continuous development. The other concept that must be taken into consideration is prevention. For much of the history of dentisty, treatment was the main goal of our profession, but little by little it is being replaced by prevention as our principle objective. Microdentistry and prevention have changed our way of practicing so much that young dentists today would find the dentistry of the 1970s unrecognizable. This psychological and technological evolution includes adhesion techniques, the different uses of fluorides, the concept of tooth preservation, and air abrasion.

Laser technology is also an advancement that fits into the two concepts expressed above. Modern pediatric dentistry must take advantage of all new advances, and once tested and proven useful, apply them to improve the standard of care of children and adolescents. The use of lasers in medicine is so widespread nowadays that it has become the standard treatment in many fields, such as ophthalmology and dermatology, for many routine procedures. In general and pediatric dentistry, this is not yet the case, but I am confident that it will be in the near future. It is important to be open to new technology, not only to offer better quality treatment to our patients but also to make our profession more enjoyable. If we enjoy what we are doing, we are in a better state of mind to help pediatric dentistry progress by being more creative in terms of developing new techniques or modifying and improving the existing ones. In spite of the enthusiasm which this technology inspires among pediatric dentists who use it, further research and more experience is still needed to better understand the advantages and disadvantages that it offers, and finally to establish treatment protocols.

APPLICATION IN PEDIATRIC DENTISTRY

There are different types of lasers available. The properties of each type make them suitable for different tissues and procedures. Due to their versatility, two types of lasers are more frequently used by pediatric dentists, Er:YAG and Er,Cr:YSGG, since they can be used in hard and soft tissues.

In our clinical practice, we have experienced a major change in our way of performing surgical treatments. An improvement in tissue removal and coagulation has been observed with many treatments. Reduced postoperative discomfort, edema, scarring, and shrinkage

Fig 1a

Fig 1b

Figs 1a and b Frontal and lateral view of a prominent lingual frenum in a 9-year-old patient, showing reduced tongue mobility.

Figs 2 Same patient as in Fig 1. Topical anesthesic (20% benzocaine gel) placed for 2 min with a cotton pellet. No further infiltration of anesthesia was needed and no type of sedation was administered.

Fig 3 Same patient as in Fig 1. Handpiece of the Er,Cr:YSGG laser used for the frenectomy.

Fig 4 Same patient as in Fig 1. Checking tongue mobility during the procedure to make sure how much tissue removal is needed in order to obtain desirable results.

Fig 5 (right) Same patient as in Fig 1. Good tissue healing one week postoperatively.

Fig 6a

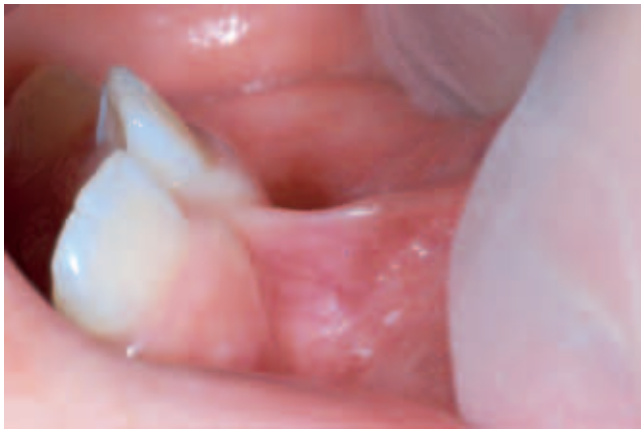

Fig 6b

Figs 6a and b Frontal and lateral view of a prominent maxillary frenum in a 10-year-old patient.

Fig 7 Same patient as in Fig 6. Very little bleeding can be observed while performing the frenectomy with an Er,Cr:YSGG laser.

Fig 8 Same patient as in Fig 6. Intraoral view after laser excision. The wound does not require suturing. This case was performed with the infiltration of 1/4 of a carpule of 2% lidocaine and 1:100,000 epinephrine (9 mg of anesthetic).

are associated with the use of laser.[2] Very rapid healing is what we routinely see not many days after treatments. The need for analgesics and anti-inflammatory medication has dropped drastically. Laser indications in pediatric dentistry include: frenectomies (lingual frenum, Figs 1 to 5; maxillary labial frenum, Figs 6 to 8), cosmetic gingival recontouring, gingival hyperplasia removal, operculectomies, exposure of unerupted teeth (palatally impacted canine, Figs 9 and 10), some oral pathology conditions such as pyogenic granulomas or mucoceles, and even aphthous ulcers (Figs 11a and 11b) and herpes labialis.[2,3] In some soft tissue surgery, less or no local anesthesia is needed compared to conventional techniques.

For cavity preparation, laser technology represents a challenge. The pediatric dental profession is certainly not looking for an instrument to replace the high- and low-speed handpieces. Some preparations can be done without anesthesia, but at this stage, we cannot be sure beforehand in what patients and cases it will be possible. A majority of children feel discomfort when lasing deep parts of the dentin, while only a minority feel it in superficial dentin. Only occasionally can we reach the pulp chamber and the pulp without pain. In our experience, primary teeth with scleroticized carious defects in which the pulp has retreated react less sensitively to laser in terms of pain perception than permanent teeth with carious defects. Using laser equipment for obtain-

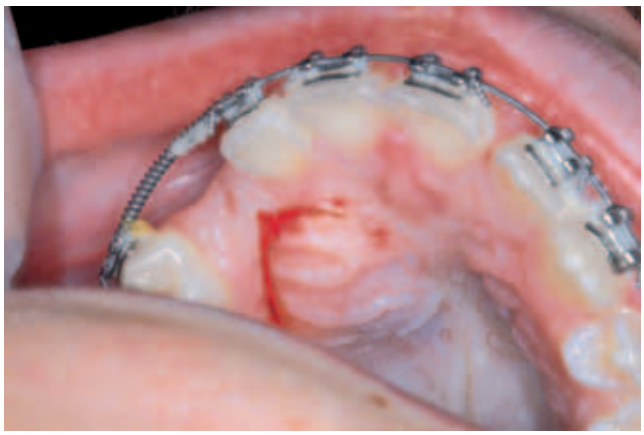

Fig 9 Only laser incisions with an Er,Cr:YSGG laser were performed for exposing a right palatally impacted canine.

Fig 10 The canine exposed in Fig 9 is ready for bonding the orthodontic attachment. The operating field is dry enough for this purpose.

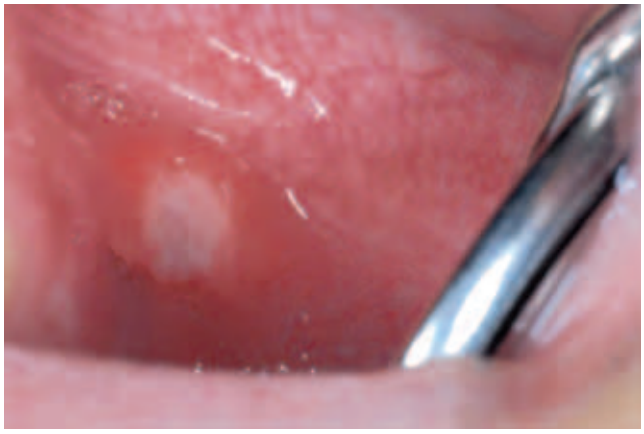

Fig 11a

Fig 11b

Figs 11a and b Aphthous ulcer on buccal mucosa in a 12-year-old boy before and after lasing the lesion with an Er,Cr:YSGG laser using low wattage.

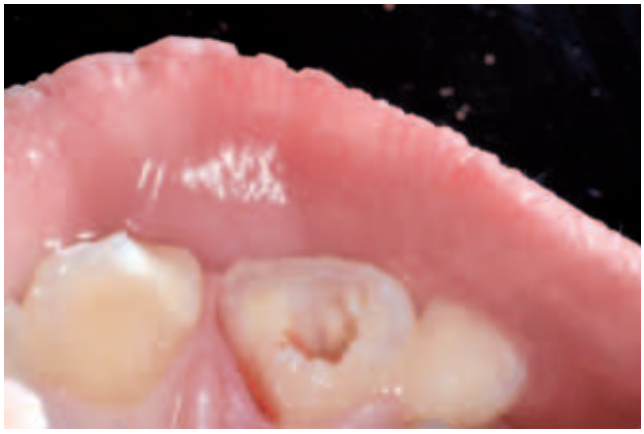

Fig 12a

Fig 12b

Figs 12a and b Pulpotomy in a 9-year-old boy, performed with an Er,Cr:YSGG laser on a left maxillary permanent central incisor with an open apex only two hours after the trauma had taken place.

ing anesthesia is another challenge of this relatively new technology. The use of low wattage for desensitizing tissues and low percentage of air and water in trying to obtain analgesia is still an open field.[4,5] We have been able to properly perform any kind of preparation design. The sometimes considerable additional time required with the laser compared to the conventional handpiece is a factor that each dentist must weigh, and decide what is more convenient for each treatment. With the laser, there is no smear layer formation, enhancing bond strengths of resin materials.[6]

It can also be used for some pulpal treatments. Pulpotomies in both primary and permanent dentitions (Fig 12) and hemostasis of root pulp stumps can be achieved with laser technology.[1,7] In primary teeth, there is then no need for formocresol. Although we feel that laser pulpotomies are a very good treatment option, more follow-up cases are still needed, in addition to more research on the which bases should be placed after lasing the pulp. Currently, we are using zinc-oxide eugenol and calcium hydroxide cements. Laser irradiation in root canals also reduces the number of microorganisms, thus promoting canal decontamination.[8]

Laser enameloplasty prior to sealant placement is another use for this technology. The caries (ie, acid) resistance of enamel is enhanced, and the need for acid etching is reduced or eliminated.[9] It remains to be seen if laser etching alone provides good adhesion; as with any other new technique, more experience is needed to determine whether laser etching can completely replace acid etching. The combined use of topical fluoride and laser application shows promising results in caries prevention.[10]

Dentists must adapt behavior management techniques to the new laser equipment. The fact that some units have a handpiece for laser emission similar to the classic handpiece makes it easier for the dentist and young patients to accept it. Sedation may prove helpful in elevating the discomfort threshold in pediatric patients. The pediatric dentist must carefully evaluate the individual situation, and if necessary, choose among different sedative agents (benzodiazepines, hydroxizine, etc). The different types of lasers must also be considered in terms of cost:benefit ratios, and the best approach chosen for every pediatric dental treatment.

DISCUSSION

The introduction of laser dentistry a few years ago caused the pendulum to swing towards its use. As with every pendulum, it will not stop swinging until an equilibrium is achieved between novelty effect, effectiveness, replacement of old treatments, modification of old techniques, and the knowledge of the areas in which it is not useful at all in current pediatric dentistry.

As with any new approach in dentistry, we hope that it improves treatment for the benefit of our patients. It is time for analysis and reform in our dental schools and teaching, if pediatric dentistry is to meet the needs of our time. Even the most thoughtful and probing analysis will be imperfect; even the most earnestly pursued remedies will not be entirely successful. Although we cannot reach the ideal, we can move towards it. At the very least, we will have had the sense and courage to try. The future is promising.

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