Laser pediatric crowns performed without anesthesia: a contemporary technique

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Extensive caries resulting in the need for a stainless steel crown in primary teeth may now be prepared with the use of the WaterlaseTM YSGG Laser, (Biolase®) hard and soft-tissue laser. The use of the laser eliminates the need for local anesthesia, thereby providing optimal patient comfort and compliance.
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INTRODUCTION

The advent of lasers along with the trend towards prevention and preservation shifts dentistry away from previous familiar conventional methods. The Waterlase laser system is setting the standard as its use is becoming more widespread among dental professionals across the country. At various wavelengths, a laser is capable of cutting hard and soft tissues. The Er:Cr:YSGG laser in particular cuts biocalcified tissues effectively through the use of a hydrokinetic system delivering photons into an air-water matrix system. The laser energy absorbed by this water matrix partially facilitates the cutting effects.[1]

The Waterlase™ YSGG Laser (Biolase®) received FDA approval in 1998 and is replacing the initial Nd:YAG and CO_2 lasers due to the lack of precision in cutting biocalcified tissues. Reports of thermal and surface pulpal changes have been associated with the previous laser systems during the preparation phase of treatment, increased pulpal changes do not occur with Waterlase™ YSGG Laser (Biolase®).[1,4] Pulpal temperatures associated with the hydrokinetic system either showed no change or decreased by up to 2 degrees C. Wet bur preparations resulted in a 3 degrees to 4 degrees C rise. With dry bur preparations, a 14 degrees C rise in temperature was recorded.[5] In fact using the Waterlase™ YSGG Laser (Biolase®), no histological changes were noted immediately or at 30 days.[5]

However, the CO_2 and Nd:YAG lasers known to induce cracking, fissuring, melting and recrystallization of the tooth enamel surfaces render themselves useless in the cutting of hard tissues and are useful primarily for soft tissue ablation.[2]

Case report/technique

A 5 year old female presents to the office with a fractured and failing large class 2 restoration with a vital pulp. No anesthesia is rendered. The doctor, patient, and assistant are required to use laser safety glasses prior to commencing the procedure. The fiber delivery system ending in a sapphire crystal tip that is 750mm in diameter bathed in an air-water spray emits photons at a wavelength of 2.78mm being pulsed at a duration from 140 to 200μs and a repetition of 20Hz.[1] The energy density and fluency at the tissue interface are directly proportional to the power setting.[2]

The Waterlase™ YSGG Laser (Biolase®) is set to begin cutting the surface layer of enamel. Initial cuts are made at a setting of 5.5 watts, 65% air and 55% water. The dentin layer is cut at a setting of 4 watts lased at a 90 degree angle to the original enamel cuts to create an ablated surface. The fiber-optic tip is directed 45 degree angle at a focal point approximately 1 to 2mm from the tissue surface. Defocusing beyond 2mm will cease the cutting effect. Therefore, the distance of the fiber tip and the tissue regulates cutting efficiency.[2] The crown is prepared with the same specifications as in the conventional method however the tooth surface is left roughened not smooth, Figure 1. The final preparation differs in many ways. The buccal, lingual, mesial, and distal walls do not require an occlusal taper. The preparation surface is left with thousands of mini undercuts that improve the bond of the resin crown. The occlusal

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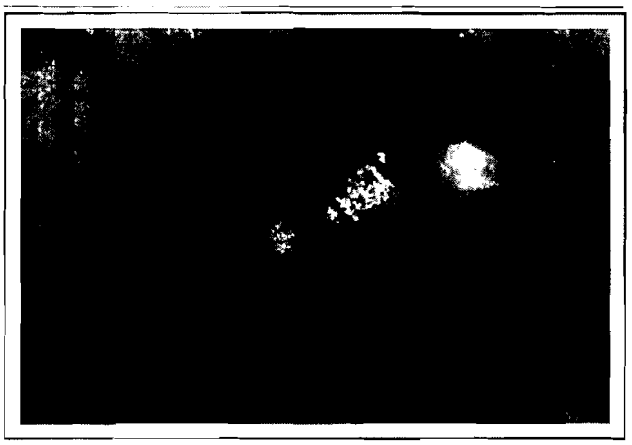

Figure 1. Finished Preparation

Figure 2. Crown seated

table is left unrefined with the depth sufficient to provide a 2mm bulk of material later. The margins are refined after the crown is cemented.

DISCUSSION

The Waterlase™ YSGG Laser gains popularity by its mechanism of action, whereby, eliminating the use of anesthetic. The patient is comfortable, feels no vibratory sensation and experiences no contact between tooth and the fiber optic tip.[2]

Weighing 88 pounds, the Waterlase™ YSGG Laser requires 80 pounds per square inch air pressure provided by an external source.[4] The powered hydrokinetic system produces a wavelength absorbed maximally in water molecules and targets the hydroxyl groups of enamel and dentin.[2] The media, which provides for photon amplification includes heterogeneous crystals such as erbium: yttrium scandium, gallium, and garnet. A rough surface is created with cuts resulting in no smear layer formation enhancing bonding and shear strengths.[2] Crown preparations are started first by desensitizing the tooth with a low wattage and low water for 60 to 90 seconds. This is followed by the dentin setting and finally the enamel setting of 5.5 Watts. This setting if used in the deeper dentin layers may result in pulpal trauma, therefore a second setting of 4 Watts is recommended for dentin.

Effective caries removal has been demonstrated along with minimal intraoperative hemorrhage, no adverse pulpal thermal or histopathologic responses.[2] One additional advantage of Er:Cr:YSGG lasers, they have proven to reduce caries by 40 to 60% comparable to a daily application of sodium fluoride dentifrice.

CONCLUSION

The Waterlase™ YSGG Laser (Biolase®) laser has efficiently proven to be safe and effective in the cutting of enamel, dentin, cementum and bone. The pediatric population will especially benefit from the advent of a hard tissue-cutting laser. Properties such as maximal comfort will provide greater range of compliance amongst the younger age groups increasing efficiency and satisfaction in treatment.

The wave of the future in the new millennium of dentistry follows the idea of preservation, prevention, and maximum patient comfort levels. The Waterlase™ YSGG Laser system has offered these luxuries and presents as the first system to be clinically significant in the utility of hard tissue surgery.[1] The Waterlase™ YSGG Laser (Biolase®) shows great promise for cavity preparation and is on a path to replace conventional handpeice usage amongst dental professionals.

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