Laser pediatric Class II composites utilizing no anesthesia

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Interproximal lesions can now be restored without local anesthesia and removing unnecessary healthy tooth structure. This paper will focus on a new ultra-conservative technique in Class II composites utilizing the laser, a new technique in cavity preparation.
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INTRODUCTION

Over the years, the use of medical lasers have become so widespread that it has grown to be the standard of care for a vast variety of medical procedures that were once performed with scalpels. Similarly with the advent of new technological advances in dentistry, the drill can also now be replaced by the laser, introducing a new philosophy in dentistry called "microdentistry." "Microdentistry" represents a paradigm shift away from the classical GV Black preparations. The GV Black Class II amalgam restoration is a preparation, which removes more healthy tooth structure than is necessary for retention of the restorative material. This paper describes the preparation and restoration of a Class II lesion of a primary molar using the Waterlase laser (Biolase Corporation).

The Waterlase system is a breakthrough new valuable dental instrument that employs the Er,Cr:YSSG laser at a wavelength of 2780nm. The laser energy is delivered through a fiberoptic system to a sapphire tip terminal that is bathed in an adjustable mixture of air and water vapor. It generates precise hard-tissue cuts by virtue of laser energy interaction with water at the tissue interface and has therefore been termed a hydrokinetic system.[2,3] In October 1998, the Food and Drug Administration cleared the Waterlase system for dental procedures. The combination of laser energy and water-spray creates "HydroKinetic" energy, and is a patented technology invented by Biolase scientists and engineers. It is superior to the traditional drill for several reasons, the primary advantage being the elimination of the injection and patient discomfort.

LASER TECHNIQUE

A 6 year old boy had a carious lesion on the distal surface of his mandibular primary molar, tooth #L (Figure 3). Due to the painless nature of the laser, local anesthetic was not administered. The laser allows 4 different preset power settings to cut hard and soft tissue depending on what is being cut. The degree of ablation for both soft and hard tissues increases linearly with increasing power.[2] For the purpose of this paper, only the hard tissue settings will be discussed.

The handpiece was held so that the laser tip was at a 45 degree angle and 1.5 mm from the point of entry. During preparation, the sapphire tip was moved carefully back and forth and up and down in the area of interest. Effective hard tissue cutting is achieved at 1 to 1.5mm from the sapphire tip.[1] Defocusing beyond 2 mm from the tissue surface mitigates the cutting effect; thus the distance between the fiber tip and the tissue regulates the cutting efficacy.[1] To cut enamel, the power setting was set at 1, which is a power output of 5.5 W. Once dentin was reached, the setting was changed to #2, which is a power output of 3.5 W. Caries was removed with maximum preservation of healthy tooth structure, and the restoration was completed with acid etch, bonding, and composite.

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Clinical case performed without anesthesia:

Figure 1. Setting to cut Enamel uses power.

Figure 2. Setting to cut dentin uses power setting of 5.50 W setting of 3.5 W.

Figure 3. Tooth # L with distal-occlusal decay.

Figure 4. Sapphire tip of laser should be placed at 45 degree angle to surface of tooth.

Figure 5. Caries removed and matrix band placed.

Figure 6. The completed restoration.

DISCUSSION

The laser-powered hydrokinetic system offers a number of advantages over the traditional drill. It is an excellent tool because it eliminates the need for local anesthetic. The patient response to the laser has been shown to be extremely satisfying. According to a study[1] there was a significant decrease in discomfort levels for patients being treated with the laser, who did not receive local anesthetic. It has been hypothesized that the painless nature of the laser is attributed to the transient anesthetic effect it has on the tooth by blocking nerve conduction at the Na/K pump and ablating the dentinal tubules. When decay is drilled out of the tooth with a handpiece the friction creates heat, which is felt by the nerve and perceived by the tooth as pain. Because there is no heat build-up and no friction with the laser, there is no need to anesthetize the patient. There is also no concern for heat damaging effects to the pulp one would be concerned with in high-speed drills. According to studies, there are no adverse thermal effects to the pulp with the laser. Pulpal temperatures associated with the hydrokinetic laser system either showed no change or decreased by up to 2˚C compared to wet bur preparations, which resulted in a 3-4 increase in pulpal temperature.[3]

In addition to the laser being painless, it is less noisy, which also eases the fear and anxiety of patients. Safety is another primary advantage over the traditional drill. Since anesthetic is not needed with lasers, there is no need to worry about complications related to administration of local anesthetics such as allergy, toxicity, drug interactions and tongue/lip biting. Using a handpiece with a spray of water rather than a rotating high-speed bur also will put the mind of the dentist at ease, while he is working on an uncooperative patient likely to move around.

Lasers mark a new exciting period in dentistry called microdentistry, which is a shift from the traditional GV Black principles of cavity design towards conservation of healthy tooth structure. The philosophy of the World Congress of Microdentistry is to remove dental disease and replace the lost tooth structure with a biologically and structurally acceptable material in a manner, which preserves the maximum amount of healthy tooth structure. This is also known as "minimally-invasive dentistry." Mutilation of healthy tooth structure for retention and resistance purposes does not apply for teeth cut with lasers due to a cutting mechanism in which it changes the architecture of the enamel/dentin. Small preparations not only preserve the structural integrity of the tooth, they also minimize insult to the pulp. In contrast to high speeds, laser-cut surfaces are clean and devoid of a smear layer, which therefore enhances the bond strength. A study[4] has shown that with non-etched enamel, bond strength values for non-etched laser-cut surfaces were significantly higher than for the bur cut surfaces.

The HKS laser also has a bactericidal effect, reducing the quantity of bacteria and its penetration into the dentinal tubules, which is the key to pulpal health.[5,6]

Although presently the use of lasers in dentistry is not as widespread, its use will continue to gain support as more knowledge is gained about its advantages over the drill. It will only be a matter of time before it becomes the new standard of care in dentistry. There is no doubt that fear of the injection and pain keeps most patients dreading the dentist. Therefore this is a valuable instrument to provide patients with a satisfying experience, thus changing the perception and attitudes many have of dentistry.

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