

Waterlase : An Innovative Technology in Periodontics

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Abstract

Laser is an acronym for “light amplification by stimulated emission of radiation”. Introduced in dentistry as they are precise and effective way to perform many dental procedures. Treatment with lasers provides a hope of overcoming the disadvantages of conventional dental procedures like severe heat, vibration and pressure. To overcome this a new revolutionary tool is introduced named , The waterlase which is unique combination of laser energy and water , a process called HYDROPHOTOMICS, to perform many traditional dental procedure with less need of anesthesia. In this review article various periodontal applications of waterlase have been described.

Introduction

Periodontal disease consists of a group of inflammatory diseases initiated by bacteria that colonize the teeth and infect their surrounding soft tissues. The end result of this infection is the clinical manifestation of disease which results in several distinct signs and symptoms. Removal of calculus using conventional and hand instruments has

been reported to be incomplete and time consuming (Yukna et al, 1997). In order to improve the effectiveness and efficacy of root surface debridement, various devices such as sonic and ultrasonic scalers, and more recently lasers have been used (Lee, 2007).

Goldman et al (1964) described the effects of ruby laser on enamel and dentine with a disappointing result. The lasers available in dentistry are mainly Ruby, Nd:YAG, Co2, Ho:YAG, Er:YAG, Er,Cr:YSGG, Nd:YAP, Argon, Diode.

Meyer et al reintroduced use of Laser in dentistry in the year 1984. While lasers have been involved in dentistry for more than 20 years, until recently, no single laser had been cleared for all oral tissues, including hard and soft tissue. It was discovered 1988 in Europe and 1989 in united states.

Conventional mechanical debridement using curettes is still technically demanding and time consuming, and power scalers cause uncomfortable stress to the patients from noise and vibration. Complete removal of bacterial deposits and their toxins from the root surface and within

the periodontal pockets is not necessarily achieved with conventional, mechanical therapy (23).

Although systemic and local antibiotics are occasionally administered into periodontal pockets for the purpose of disinfection, with frequent use of antibiotics there is a potential risk of producing resistant microorganisms. Therefore, development of novel systems for scaling and root planing, as well as further improvement of currently used mechanical instruments, is required.

As lasers can achieve excellent tissue ablation with strong bactericidal and detoxification effects, they are one of the most promising new technical modalities for nonsurgical periodontal treatment. Another advantage of lasers is that they can reach sites that conventional mechanical instrumentation cannot. The adjunctive or alternative use of lasers with conventional tools may facilitate treatment, and has the potential to improve healing.

In 2000 waterlase was discovered & in 2004 Waterlase MD. The newly developed Waterlase™ performs scaling and root planing along with the disinfection of the gingival sulcus

What Is Waterlase..?

Erbium-Chromium doped: Yttrium-Selenium Gallium-Garnet (Er, Cr: YSGG) laser is commercially available as Waterlase (Fig. 1). It uses a patented ablated by the waterlase. During the waterlase irradiation, the waterlase energy is absorbed selectively by water molecules and hydrous organic components by water molecules and hydrous organic components of biological tissues, causing evaporation of water and organic components and resulting in thermal effects due to the heat generated by this process.



Fig.1:Waterlase



Fig.2:Waterlase I plus

Er, Cr: YSGG laser is a suitable procedure for use on bone without any evidence of charring or melting (Cobb, 2006). When cutting hard tissue, no physical contact is made with the tissue. That is, the laser energy is transferred to the water, which is then transferred to the tooth vaporizing the tissue.

Soft tissue procedures are performed using a different mode of operation where direct Er, Cr: YSGG laser energy is applied to incise, excise or ablate these tissues. . In soft tissue procedures the water is applied for hydration, cooling or to keep tissue clean. A flexible fiber-optic device delivers the waterlase laser energy.

Moritz et al (1997) suggested that Er: YSGG laser in combination with scaling supports healing of periodontal pockets by elimination of bacteria. Aoki et al (2000)

proposed that Er: YSGG laser has calculus removal ability comparable to ultrasonic scaling.

Watanabe et al. demonstrated efficient calculus removal with no side effects and uneventful reduction of pocket after Er:YAG scaling.

Uses in General Dentistry

A. Hard tissue indications

- Tooth preparation to obtain access to root canals
- Biomechanical preparation of root canals
- Laser root canal disinfection after endodontic treatment.
- Cutting of bone to prepare a window access to the apex of the root.
- Apicoectomy - amputation of the root end.
- Root end preparation for retro fill amalgam or composite.
- Cutting, shaving, contouring and resection of oral osseous tissues (FDA clearance 1998).

B. Soft tissue indications including pulpal tissues

- Excisional and incisional biopsies
- Implant recovery.
- Incision and drainage of abscess
- Pulp extirpation

Advantages of Er, Cr: YSGG Laser (Waterlase)

1. The Waterlase laser cuts hard and soft tissue without heat, vibration or pressure and procedures are performed with less anesthesia. It also, reduces bleeding, post-operative pain and swelling, and the need for pain medication in many cases.
2. Waterlase is used for removal of decay in tooth while leaving the surrounding tooth structure unaffected.

3. The gentle action of the Waterlase laser reduces damage to healthy portions of the tooth, minimizing trauma.
4. Since the need for anesthesia is reduced; cavity preparation can be simultaneously performed in several areas of the mouth, rather than the need for multiple visits.

Uses in Periodontics

1. Incisions for Full thickness/ Partial thickness flap
2. Laser soft tissue curettage
3. Removal of granulation tissue from bony defects
4. Sulcular debridement
5. Ostectomy
6. Osteoplasty and osseous recontouring
7. Osseous crown lengthening

Drawbacks, Cautions and Contraindications

1. As the Waterlase is quite expensive, it may not make it into many smaller dental practices.
2. Causes splashing of water and blood from periodontal pockets.
3. High speed evacuation intraoral suction and extraoral evacuation is required.
4. In periodontal pockets irradiated target areas not visualized.

Future Development

There is a great potential for laser systems to be developed further to include additional features and functions.

The Alexandrite laser is a solid-state laser, which could remove dental calculus selectively. Mechanism of selective ablation has not been clarified yet. The development of this laser for clinical use is widely expected due to its excellent ability for selective calculus removal from the tooth structure.

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