

## “Semiconductor Diode Lasers in Periodontics : An Innovative and Safe”

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### **Abstract:**

The diode laser is a solid-state semiconductor laser that typically uses a combination of Gallium (Ga), Arsenide (Ar), and other elements, such as Aluminum (Al) and Indium (In) to change electrical energy into light energy. Semiconductor diode laser has been used for gingivectomy, frenectomy, incisional and excisional biopsy, soft tissue tuberosity reduction, operculum removal, coagulation of graft donor site, and exposure of soft tissue covering osseointegrated implants. The advantages of laser use includes a relatively bloodless operating field, sterilization of the wound site, minimal swelling and scarring, reduction of surgical time and less postoperative pain to the patient. The following article describes about the effectiveness of the surgical diode laser for various periodontal soft tissue surgeries.

**Key words:** diode laser, gingivectomy, frenectomy, polyp, operculum, depigmentation.

### **Introduction:**

Lasers have been an exciting technology, widely used in medicine, kind to tissues, and excellent for healing. There is now a convergence of documented scientific evidence, ease of use and greater affordability that makes the diode laser a “must have” for every dental practice. While dental lasers have been commercially available for several decades, and their popularity among patients is unparalleled, the dental profession has taken to this treatment modality rather slowly. LASER

is an acronym for Light Amplification by Stimulated Emission of Radiation. Lasers are commonly named for a substance which is stimulated to produce the coherent light beam.

The diode laser has become an important tool in the dental armamentarium due to its exceptional ease of use and affordability. It also has key advantages with regard to periodontal treatment. The diode laser is well absorbed by melanin, hemoglobin, and other chromophores that are present in periodontal disease<sup>1</sup>. Hence the diode

specifically targets unhealthy gingival tissues. The semiconductor diode laser is emitted in continuous-wave or gated-pulsed modes, and is usually operated in a contact method using a flexible fiber optic delivery system. Since the diode basically does not interact with dental hard tissues, the laser is an excellent soft tissue surgical laser, indicated for cutting and coagulating gingival and oral mucosa, and for soft tissue curettage<sup>2</sup>. The diode laser exhibits thermal effects using the "hot-tip" effect caused by heat accumulation at the end of the fiber, and produces relatively thick coagulation layer on the treated surface. Fig. 1 shows the Semiconductor Diode Laser unit containing (ezlase –Biolase) handpiece, foot control, glasses, tip kit etc.

Periodontal disease is a chronic inflammatory disease caused by a bacterial infection. Hence the bactericidal and detoxifying effect of laser treatment is advantageous in periodontal therapy. Moreover, there is a significant suppression of A. Actinomycetecomitans, and invasive bacterium that is associated with aggressive form of periodontal disease that are not readily treated with conventional scaling and root planning. A. Actinomycetecomitans is not only present on the diseased root surface, but it also invades the adjacent soft tissues, making it difficult to remove by mechanical periodontal

instrumentation alone<sup>3, 4, 5</sup>. This necessitates the use of adjunctive antibiotic therapy. The diode laser provides a non-antibiotic solution.

### **Effect of Diode Lasers on Wound Healing:**

Diode lasers are very effective for soft tissue applications including incision, hemostasis and coagulation<sup>6</sup>. Advantages of the laser over scalpel blade include a bloodless operating field, minimal swelling and scarring, and much less or no surgical pain<sup>7</sup>. The surface produced heals favourably as an open wound, without the need for sutures and surgical dressings<sup>8</sup>. Studies have shown enhanced, faster and more comfortable wound healing when the diode laser is used in conjunction with scaling and root planing<sup>7</sup>.

Histological testing of roots where the diode laser was used after scaling and root planning demonstrated no detectable surface alteration to root or cementum. There were no signs of thermal side effects in any of the teeth treated<sup>9</sup>. Many studies have indicated no adverse tissue events, demonstrating the safety of the diode laser. The following procedures are easy entry points for the new laser user:

**Gingivectomy-** The diode laser makes restorative dentistry a breeze. Any gingival tissue that covers a tooth during preparation can be easily removed as haemostasis is simultaneously achieved. As shown in Fig. 2, 3 and 4 excess gingival tissue can be easily managed to improve the esthetic aspect.

**Operculectomy-** Operculum is nothing but the soft tissue covering the third molar that is totally or partially erupted in the oral cavity. If it is not removed, it causes

pericoronitis which is the inflammation of the gingiva in relation to the crown of an incompletely erupted tooth leading to pain in the region. It can be easily removed by the Diode laser. Fig. 5,6 and 7 shows the procedure of operculectomy by using the Diode laser.

**Gingival depigmentation-** Pigmented gingival tissue often forces patients to seek cosmetic treatment. Semiconductor diode laser light at 800 to 900nm is poorly absorbed in water, but highly absorbed in hemoglobin and other pigments. Thus, it can be readily used for gingival depigmentation procedure as shown in Fig. 8,9 and 10.

The time has come to embrace the routine use of Lasers for the treatment of periodontal disease. The diode Laser has been shown to be effective and safe for this purpose. Laser Assisted Periodontal Therapy is non-invasive. With diode laser there is a reduced need for systemic or locally applied antimicrobials. This leads to fewer allergic reactions and antibiotic resistance<sup>10</sup>. The soft tissue diode laser has become a “must have” mainstream technology for every general practice. The science, ease of use, and affordability make it simple to incorporate.

Given the incredible ease of use and its versatility in treating soft tissue, the diode laser becomes the “soft tissue handpiece” in the dentist’s armamentarium. The dentists can use the soft tissue handpiece to remove, refine and adjust soft tissues in the same way that the traditional dental handpiece is used on enamel and dentin. This

extends the scope of practice of the general dentist to include many soft tissue procedures. The patient’s gingival health is improved in a minimally invasive, gentler manner.

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**ILLUSTRATIONS AND LEGENDS:**

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Fig. 1- Semiconductor Diode Laser



Fig. 2- Excessive gingival display



Fig. 3- Gingivectomy by laser



Fig. 4- Postoperative view



Fig. 5-Pericoronal flap with 38



Fig. 6- Operculectomy by laser



Fig. 7- Postoperative view



Fig. 8- Gingival hyperpigmentation



Fig. 9- Depigmentation by Laser



Fig. 10- Postoperative view



**This original research work was conducted in Dept. of Periodontics, Rural Dental College, Loni - 413736. Tal. – Rahata, Dist. Ahmednagar, Maharashtra, INDIA By Corresponding Author ,  
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**Date of initial acceptance: 2 October 2011**

**Date of Peer review approval: 12 November 2011**

**Date of final approval: 29 November 2011**

**Date of Publication: 2 December 2011**

**Source of support: Nil, Conflict of interest: Nil**