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CASE REPORT

# Diode Lasers: The Cutting Edge

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**ABSTRACT**

Lasers offer many useful clinical applications for general dentists in the diagnosis and treatment of patients, as long as the clinician receives the proper training to use this technology safely and effectively. This article consists of 3 case reports where the Diode laser has been effectively used for treatment of periodontal pockets, crown lengthening and exposure of a canine for orthodontic treatment.

**Keywords:** Lasers, Periodontics, Crown lengthening, Orthodontics, Pain free.

## INTRODUCTION

Every discipline in dentistry has been positively affected by laser technology. From operative dentistry to periodontics, prosthetics to cosmetics and implantology, lasers have made tremendous impact on the delivery of dental care in the twenty-first century and continues to improve and evolve.[1]

Over the last four decades, various wavelengths have been successfully used in dentistry. The application of lasers is wavelength specific and depends on its absorption and interaction in different oral tissues. The diode is a versatile laser and has been successfully used in three wavelengths, 980 nm, 810 nm and, more recently, the 940 nm. It has numerous applications in esthetic dentistry, such as crown lengthening procedures, gingival depigmentation, preimpression gingival troughing and frenectomies.

This article features some of the clinical applications of the 980 nm diode for the management of soft tissue.

## CASE REPORTS

### Case 1: Canine Exposure

Localization and determination of a tooth's exact position is the foremost step in surgical exposure of an impacted tooth. This can often be done by palpation in labial impactions. However, the use of periapical radiographs and occlusal radiographs plays a major role in palatal and middle alveolar impactions. Use of the buccal object rule is helpful in determining the location of impacted teeth (Figs 1 to 4).

Traditionally, the exposure of the canine has been performed surgically with a blade followed by bonding an orthodontic bracket and a ligature wire. The tooth is then gradually repositioned using controlled forces. The problems associated with this technique include the morbidity of the procedure and the difficulty in maintaining isolation for bonding. A diode laser has been used in this case to illustrate the minimally invasive technique of exposing a canine for orthodontic repositioning. Since the canine tip was out of the bone, it was possible to use a soft tissue laser. In cases where the tooth is embedded in bone, a hard tissue laser, such as the Erbium Cr YSGG or Erbium YAG, is recommended.[3]

**Fig. 1:** 13-year-old patient with an impacted lower canine needing a surgical exposure

**Fig. 2:** Diode laser is used to create a window in the soft tissue. Tip of the canine is visible. The procedure was performed under topical anesthesia

**Fig. 3:** The soft tissue window is enlarged to enable placement of the orthodontic bracket. Good hemostasis was achieved

**Fig. 6:** Intraoral view of the prominent lingual frenum

**Fig. 4:** 3-month postoperative view of the impacted canine being orthodontically repositioned

**Fig. 7:** The diode laser being used to excise the frenum under local infiltration of anesthesia

**Fig. 5:** 9-year-old girl with a tongue tie

**Fig. 8:** Immediate postoperative view of the frenectomy

## Case 2: Lingual Frenectomy

The diode laser is an effective tool for the surgical excision of the lingual or labial frenum. The procedure can be performed under topical anesthesia in cooperative patients. Since it has a hemostatic effect, it provides a bloodless field of operation (Figs 5 to 10).

## Case 3: Pocket Debridement

The diode laser is an effective tool for the management of mild to moderately deep periodontal pockets. It can be used as an adjunct to conventional techniques for pocket debridement and decontamination. It is used to create a tough around the affected teeth by excising the inner wall of the diseased pocket. This

**Fig. 9:** One-week postsurgical view showing satisfactory wound healing

**Fig. 12:** Bleeding on probing. Pocket depths of 4 to 7 mm were recorded

**Fig. 10:** Postoperative view of the released tongue tie

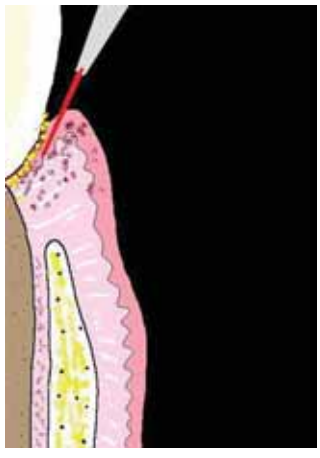

**Fig. 13:** Illustration depicting the use of a diode laser in the management of a periodontal pocket

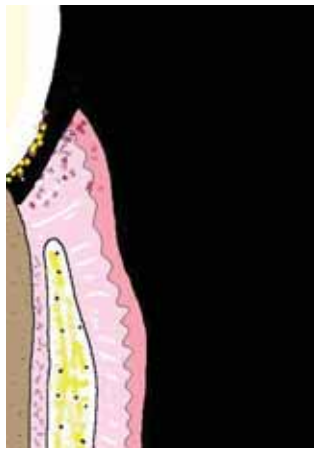

**Fig. 14:** Gingival troughing done to gain access to the subgingival calculus

**Fig. 11:** 40-year-old lady with chronic generalized periodontitis

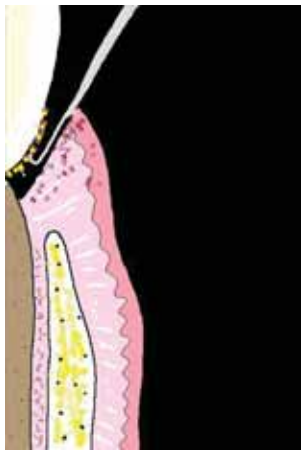

**Fig. 15:** Ultrasonic and manual scalers used for subgingival scaling and root planing

provides better access for instrumentation in the subgingival region for removal of local irritants. Besides, the bactericidal effect of the laser helps in reducing the pathogens in the depth of the pocket[2] (Figs 11 to 19).

## Case 4: Gingival Recontouring

Crown lengthening procedures require a high degree of precision, especially when they are being combined with simultaneous esthetic procedures. These procedures have been

**Fig. 16:** Subgingival scaling done using an ultrasonic scaler

**Fig. 19:** Postoperative view of the healthy gingiva

**Fig. 17:** Immediate postoperative view of following two rounds of pocket debridement therapy with the diode laser. The procedure was performed with topical anesthesia

**Fig. 20:** Preoperative view of a 28-year-old lady having a gummy, seeking a better smile without orthodontic intervention

**Fig. 18:** 3-week postoperative view of the healthy soft tissue with complete resolution of the pockets (staining of teeth caused by the use of 2% chlorhexidine mouthrinse)

**Fig. 21:** View of the anterior teeth with spacing and proclination of the lateral incisors

very successfully performed with the use of a scalpel and electrosurgery. The fine tip of a diode laser offers unsurpassed precision and can be easily manipulated to perform these procedures. The amount of attached gingival, the location of the crest of the ridge and how much crown lengthening is needed are to be factored irrespective of the tool used for the surgery. These factors will also determine the need for a full flap and osseous recontouring *vs* gingivectomy. Due to its minimal collateral tissue damage and reduced heat transfer, the healing of gingiva cut with the diode laser is more predictable and reduces the possibility of inadvertent posthealing recession. Also, the excellent hemostatic action enables simultaneous restorative procedures, thus reducing treatment time (Figs 21 to 24).

**Fig. 22:** After evaluation of the biologic width, the diode laser was used for esthetic recontouring of the gingiva

**Fig. 25:** View of the soft tissue healing after 3 weeks

**Fig. 23:** Immediate postoperative view

**Fig. 26:** 3-week postoperative view of the patient's smile

**Fig. 24:** Immediate postoperative view following esthetic recontouring of the teeth and simultaneous closure of diastemas with composite resin

## CONCLUSION

Fear of pain and the morbidity associated with a procedure are two common reasons for most patients to defer surgeries. The diode laser is an effective cutting tool which provides comfort to the patient and the operator to perform a range of procedures.[1,2] Most procedures can be performed under reduced anesthesia in selected patients, and the postoperative healing is quite uneventful. The diode laser is a minimally invasive tool used to deliver results comparable, or at times better than conventional tools.

*Note:* The diode laser is to be used for soft tissue surgeries only. It should be used with utmost care around root surfaces and in proximity to bone. Thorough understanding of scientific principles and training is mandatory for avoiding complications and achieving desirable results.

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