

# Use of a Diode Laser for Gingival Troughing in Conservative and Prosthetic Dentistry

Dr Almut Marsch

## ABSTRACT

This case report describes the successful use of the SIROLaser Advance / Xtend for gingival troughing to visualize preparation margins. The indication for gingival troughing to visualize the preparation margin is only a small area of use of the diode laser in dental surgery, but it has a great effect on workflow in the practice. Using a diode laser considerably facilitates and accelerates the workflow. This is illustrated using examples of digital and analog impression taking. In conservative dentistry for subgingival cavities as well, laser gingival troughing can have a favorable effect on the success of treatment. In addition to modeling the surrounding periodontium, a particular advantage of using the laser is the resulting (virtually) bloodless, dry field. This aspect is important for conservative treatment, as the majority of available adhesives require an absolutely dry, bloodless surface to develop their full potential.

## KEYWORDS

Gingival troughing, diode laser, 970 nm, gingivoplasty, gingival troughing, CEREC, CAD/CAM

## Introduction

The successful use of the diode laser in soft tissue surgery is undisputed in literature.<sup>1</sup> Due to the availability of new treatment equipment, there have been some changes in the standard procedures in dental practices in recent years. In dental prosthetics, the laser with its coagulating effect opens up new possibilities in impression taking.

The visualization of the preparation margin is a decisive factor for a perfect restoration in both conservative and prosthetic dentistry. Errors in this stage of treatment lead to over/under-contouring and the risk of gingivitis, discolored margins, secondary caries, and premature loss of the restoration. The detailed visualization of the preparation margin is difficult, especially if it is in a subgingival location, making gingival troughing necessary.

When making analog impressions, the aim is to create a space into which the impression material can flow freely. A dry and bloodless field increases precision, however most modern impression materials can withstand low moisture due to their thixotropic properties. This is different for digital impressions. For this, both the dry, bloodless field produced by the laser and the precise visualization of the preparation margin are important. This is particularly important because the CAD/CAM model can no longer be modified.

In addition to modeling the surrounding periodontium, a particular advantage of using the laser is the resulting (virtually) bloodless, dry field. This aspect is important for conservative treatment, as the majority of available adhesives re-

quire an absolutely dry, fluid and bloodless surface to develop their full potential.

There were formerly various methods available for gingival troughing:<sup>2</sup>

- a) Mechanical methods with retraction cords or paste.
- b) Chemomechanical methods with retraction cords soaked with a hemostatic solution.
- c) Surgical techniques such as gingivectomy.
- d) Electrosurgery with an electrotome. In this method, the gingival sulcus is widened with a thin electrode; the disadvantage is the tendency to recession.
- e) Laser surgery with the Nd:YAG<sup>3</sup>, Er:YAG, Er,Cr:YSGG laser<sup>4</sup>, or diode laser. The hemostatic effect varies depending on the laser system.

A comparison of gingival troughing using laser, electrotome, and retraction cords has already been described in literature.<sup>5</sup> Laser proved to be superior to the other two methods; the disadvantages of widening with retraction cords are bleeding and the tendency to recession and when using the electrotome, more recession occurred than when using laser.

## Materials and methods

In my practice, laser gingival troughing is performed mainly for preparing CEREC (CAD/CAM) restorations. In around 80 % of approx. Ten CEREC (CAD/CAM) sessions per month, the diode laser is used to create an optimal CAD/CAM model. The diode laser used is the SIROLaser Advance (Sirona Dental Systems, Bensheim). The SIROLaser Advance has a wide range of



**Fig. 1:** The mesial papilla and a small overlap in the distolabial area made it difficult to get an optimal digital impression. – **Fig. 2:** Situation after removing part of the mesial papilla; the circular chamfer is readily visible. – **Fig. 3:** Digital impression with CEREC.

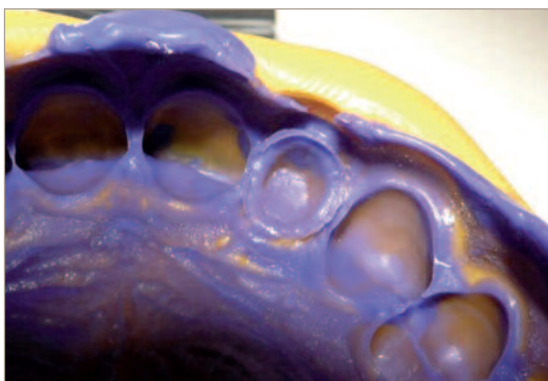
applications. It is used in the fields of periodontology, endodontics, and surgery. Other indications are for the treatment of herpes, aphthae, and dentin hypersensitivity.

The infrared diode laser with a wavelength of 970 nm has a maximum capacity of 7 W continuous output but can also be operated with a pulse frequency of up to 10,000 Hz and a variable duty cycle. The cover of the handpiece and the removable fibers can be autoclaved in order to comply with hygiene standards. The most common indications for treatment in dental practices have preset parameters and thus allow quick access, but can also be customized at any time. The following preset parameters were used for gingival troughing:

- Power 2.0 W
- Mode PF (pulsed)
- Duty cycle 50 %
- Frequency 20 Hz
- Recommended fiber 320 µm.

After activating the laser, the tip of the fiber is moved gently over the tissue. The fiber should be kept parallel to the tooth to avoid unnecessary contact with the dental hard tissue and unintended irradiation of the bone.

In the following case, analog impressions were made in addition to digital impressions, as the processing was to be carried out by an external laboratory to optimize the color. This young patient had lost a large amount of dental hard tissue due to trauma to the front teeth. The attempt to reconstruct the tooth with a composite was unsuccessful. As already



**Fig. 4:** Analog impression.

mentioned, the laser is frequently used only as a supportive measure in difficult areas to optimize the treatment result. In this case, the mesial papilla and a small overlap in the distolabial area made it difficult to get an optimal digital impression (Fig. 1).

Overlapping gingival tissues while scanning can lead to faulty impressions, as these areas may not be scanned. Therefore, when making digital impressions, it is important to have a precisely defined preparation margin. This is all the more important because the fit can be checked only in the mouth. Only a tactile, not visual, inspection can be made of the proximal areas. Using the laser, some tissue was removed from the mesial papilla to make a circular chamfer visible (Fig. 2). Then, both a digital (Fig. 3) and an analog (Fig. 4) impression were made.

## Summary

The future of dentistry is digital. Based on this premise, the supportive use of laser for gingival troughing is appropriate. In many cases, the conventional method using retraction cords and the corresponding coagulants may be sufficient for making analog impressions. For the high requirements of digital scanning, additional equipment such as the laser or HF device are advantageous because of their coagulation properties, as only dry surfaces yield a clear image. The laser in pulse mode is better than most HF devices because of its gentle action that allows tissues to heal more quickly. From the economic point of view, a laser is certainly a better investment because of its wide range of uses. ◀

## Literature

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