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Clinical Paper
Dental Implants

Efficacy and safety of a diode laser in second-stage implant surgery: a comparative study

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Abstract. For more than a decade, peri-implant tissues have been treated with soft tissue lasers to create a bloodless flap for implant placement and to uncover implants with minimal bleeding, trauma, and anaesthesia. This study was designed to assess if dental implant uncovering is possible with a diode laser without anaesthesia, and to compare its performance with traditional cold scalpel surgery. Thirty patients with a total of 45 completely osseointegrated implants participated in this study. Patients were divided into two groups. For the study group, second-stage implant surgery was done with a 970 nm diode laser. For the control group, the implants were exposed with a surgical blade. Certain parameters were used for evaluation of the two techniques. The use of the diode laser obviated the need for local anaesthesia; there was a significant difference between the two groups regarding the need for anaesthesia ($P < 0.0001$). However, there were no significant differences between the two techniques regarding duration of surgery, postoperative pain, time for healing, and success of the implants. The diode laser can be used effectively for second-stage implant surgery, providing both the dentist and the patient with additional advantages over the conventional methods used for implant exposure.

Keywords: laser; second-stage implant surgery; implant.

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With the expansion of implant dentistry and laser technology in clinical practice, surgical lasers have been used with good results in a variety of ways in implantology, ranging from placement, to second-stage surgery for exposure of the buried implant and gingival management, through to the treatment of peri-implantitis.[1–6] The diode laser is housed in a small, portable, compact, surgical unit that can be used for a multitude of dental procedures, on both soft and hard tissue. These lasers have a wide range of wavelengths that are characterized by good absorption in the chromophores found in soft tissue, such as haemoglobin and melanin, resulting in excellent soft tissue incisions, ablation, and coagulation, as well as antimicrobial effectiveness. Most dental diode lasers employ a flexible optic fibre to deliver the treatment beam to the target area. This optic fibre usually comes in the form of an easily handled headpiece.[1,2]

In a study on the use of the diode laser to uncover dental implants, Yeh et al.[3] concluded that the soft tissue diode laser offers an alternative technique for uncovering dental implants and that the technique provides an efficient, safe, and patient-friendly method for the performance of second-stage implant surgery, allowing a faster rehabilitation phase. Miller[6] used another type of soft tissue laser – the Er, Cr; YSGG laser – for the same purpose, and reported good and encouraging results with the use of this laser on more than 200 patients over 6 years. Miller found that tissue stability appeared to be enhanced when the laser

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was employed compared to when conventional resection techniques were used. In 2010, Gianfranco et al.[7] used two laser systems, Er:YAG and a diode laser, to uncover implants in two separate cases, and demonstrated good clinical results regarding patient satisfaction and rapid healing of the tissues.

Arnabat-Dominguez et al.[8] published a clinical study on the application of the Er:YAG laser in second-stage implant surgery, and observed many advantages with respect to the conventional technique. The authors added that the technique described could be used in all cases except situations where aesthetic considerations prevail in anterior areas, or in the event of a lack of keratinized gingiva surrounding the implant. However, a recent study reported that implant rehabilitation of the anterior sector, despite the important aesthetic demands involved, can benefit from the advantages of second-stage surgery by laser in contrast to the traditional cold scalpel technique.[9]

This study was designed to assess if dental implant uncovering is possible with a diode laser without anaesthesia and to compare its performance with traditional cold scalpel surgery.

Patients and methods

Thirty healthy patients participated in this study; 19 were women and 11 were men, and they ranged in age from 25 to 54 years. The study was carried out in accordance with the guidelines of the Declaration of Helsinki on medical protocol and ethics and with the approval of the regional ethics review board. Details of the treatment were discussed with the patients, and all signed an informed consent agreement.

Forty-five implants were inserted in these patients using a two-stage technique. The implants were inserted through a small crestal incision, except two implants that were inserted with the use of a punch. After 12 weeks the patients attended appointments for the second-stage surgery. At that time, the implant sites were examined for the presence of adequate healthy keratinized tissue surrounding the implant site and only those patients with this criterion were enrolled in the present study. The patients were then divided into two groups using a simple randomization procedure. For allocation of the subjects, a computer-generated list of random numbers was used, with a randomization ratio of 1:1, using Random Allocation Software (version 1.0, May 2004). One nurse, blinded to the study protocol, enrolled all participants and assigned them to one of the two groups outlined below.

The control group comprised 15 patients, with 22 implants. For these patients, the implants were exposed through a circular incision using a No. 15 surgical blade. After infiltration anaesthesia of the soft tissues covering the implant site and with the help of the surgical guide used during implant insertion, a small circular area of the tissues less than the size of the implant was excised to precisely determine the site of the implant. At that time, the circular incision was widened to completely uncover the implant, then the healing abutment was attached.

The study group comprised 15 patients, with 23 implants. For these patients, the second-stage surgery was done using a 970 nm diode laser system (SIROlaser; Sirona Dental Systems GmbH, Germany). The programme for implant uncovering was selected by moving between the integrated programmes in the device. The power used was 4 W, the mode was continuous emission, and the optic fibre used was 320 μm.

The implant sites were assessed with the help of the surgical guides used for the insertion of the implants, then the laser was used to create a small opening, which was increased until any part of the cover screw appeared. Next, ablation of the tissue over the implant was performed until the surgical opening became just large enough to allow removal of the screw. After this step, the cover screw of the implant was removed and a suitable healing abutment was attached.

While the laser was in use, an assistant was asked to hold the suction tip near the area of surgery, and a saline drip was applied to the surgical site. Application of the laser was intermittently stopped every 20–30 s to examine the tissues for any burning effects to the gingiva and to avoid any increase in soft tissue or bone temperature. In most of the patients, no injectable anaesthesia was used, only topical anaesthesia; however, one patient felt some pain, so local anaesthetic was infiltrated.

Postoperatively, no patients in either group were prescribed antibiotics. For analgesia, paracetamol 500 mg four times daily was prescribed only when necessary. The patients were asked to return after 1 week for the clinical assessment of healing.

All implant placement and surgery for implant exposure in both groups was performed by the author. The evaluation of tissue healing after the second-stage

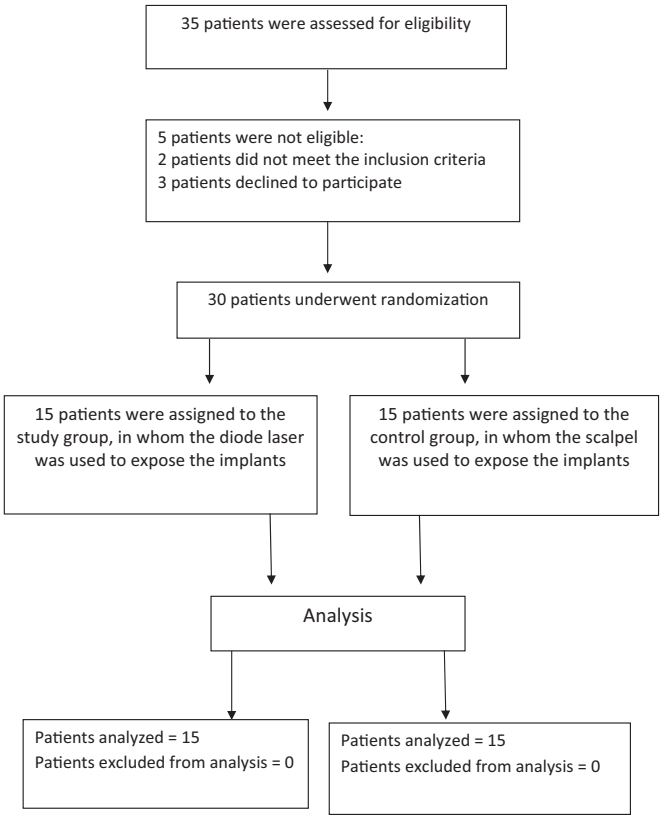

Fig. 1. Consort flow diagram.