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# CROWN LENGTHENING USING DIODE LASER: A CASE REPORT

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**ABSTRACT:**

The removal of soft tissue or both soft tissue as well as alveolar bone for the restoration of the biologic width may be part of a surgical procedure to extend the length of the crown. Scalpel, electrosurgery, and laser methods can be used to extend the crown length. However, using lasers has a lot of benefits over other approaches. Greater precision, a generally bloodless surgical field and postsurgical course, minimum swelling and scarring, coagulation, vaporisation, cutting, minimal or no suturing, and less or no postoperative pain are some benefits of laser surgery over scalpel surgery. In this particular case, a diode laser was employed to extend the crown length and restore functionality.

KEYWORDS : Diode laser, Gingivectomy, biologic width

## INTRODUCTION:

Minimally invasive techniques and safety are fundamental principles in modern dentistry, and significant advancements have been made in tools and materials to achieve these objectives. Among the recently developed tools, lasers have emerged as valuable instruments in various dental procedures including frenectomy, frenotomy, crown lengthening, and operculectomy. These lasers offer new possibilities for precise and minimally invasive treatments in dentistry.[1]

Short clinical crowns can be caused by various factors such as caries, erosion, tooth deformity, fractures, attrition, severe tooth reduction, eruption disharmony, exostosis, and genetic variations. In cases where cavities or fracture borders are positioned below the gum line, the existing crown length may be insufficient for proper restorative retention. Excessive gingiva or partial eruption of the anatomical tooth crown can also contribute to this issue. To address these situations and increase the clinical crown length, crown lengthening procedures are performed with the ultimate goal of providing a suitable foundation for crown placement.

The biological width is calculated as the total of the attachments to the supra-crestal connective tissue and the junctional epithelium. The average space occupied by the junctional epithelium and the supra-crestal connective tissue fibres at the human dento-gingival junction, according to Gargiulo et al. (1961), is 2.04 $mm^2$.

Crown lengthening surgery is performed to increase the height of the visible portion of the tooth, which can be for cosmetic or functional reasons. Various methods such as scalpel, electrosurgery, and lasers can be utilized to extend the crown. However, employing lasers provides several advantages over alternative approaches. In the present case report, a diode laser was used for crown lengthening, demonstrating the efficacy and positive outcomes associated with laser treatment. The utilization of lasers offers a distinct and efficient strategy that leads to patient satisfaction.[3]

## CASE REPORT

A female patient, 42 years of age, presented to the Department of Periodontics with a complaint of reduced clinical crown height. The patient was thoroughly informed about the crown lengthening surgery using a diode laser and provided her consent by signing the necessary documents. Notably, the patient did not have any systemic illnesses and was undergoing treatment in a healthy condition.

During the clinical examination, it was observed that the clinical crowns of teeth 35 and 37 were visibly shorter than their anatomical crowns. These teeth had previously undergone root canal therapy two years ago, and the existing clinical crown height was inadequate to support a fixed dental prosthesis. The pre-operative measurement of the biologic width indicated it was sufficient at 4mm. Consequently, a treatment plan was formulated to perform crown lengthening and gingivectomy using a diode laser.

To ensure safety, all individuals involved in the procedure, including the patient, assistant, and operator, wore protective eyewear. Compliance with FDA laser safety regulations was maintained by utilizing plastic tools to prevent laser beam reflection. Local anesthesia was administered at the operative site before initiating the tissue removal process. The diode laser unit was operated at 1.5 watts of energy in continuous wave (CW) mode, employing short back-and-forth brush-like strokes with gradual progression along the original laser incision. Constant movement of the laser tip was ensured throughout the procedure. The primary goal of the gingivectomy was to enhance visibility of the crown's cut edges before crown replacement. Any remaining ablated tissues were carefully eliminated using sterile gauze soaked in saline. Patients were prescribed analgesics for pain management, and detailed post-operative instructions were provided. Remarkably, neither during the procedure nor in the following days did the patients report any pain or discomfort.

Following the surgery, the prepared borders of the crown became clearly visible. Immediate placement of temporary crowns was carried out. Once the wound had successfully healed after a period of two weeks, the permanent crown was delivered to fully restore the patient's masticatory function.




## DISCUSSION

A laser is defined as an acronym for "Light Amplification by Stimulated Emission of Radiation." The first functional laser was developed and operated by Theodore H. Maiman in 1960. Laser technology can be categorized into two groups based on the depth of tissue penetration: lasers that can penetrate deep into tissues (such as Nd: YAG and diode lasers) and lasers that primarily interact with the surface layers of tissue (such as Er: YAG lasers).[4]

The diode laser is a solid-state semiconductor laser that often incorporates gallium (Ga), arsenide (Ar), as well as additional substances like aluminium (Al) and indium (In). It emits light within a wavelength range of 810 to 980 nm, offering advantages such as reduced pain, less swelling, decreased blood loss during surgery and healing, and the elimination of sutures. Laser surgery provides improved prognosis and presents several benefits when compared to conventional surgical techniques.[5,6]

When exposed to laser radiation, the tissue exhibits various responses, including absorption, transmission, reflection, and dispersion. As the tissue is subjected to the laser beam's heat, it undergoes several thermal effects, such as warming (raising the temperature from 37°C to 60°C), protein denaturation, coagulation (at temperatures above 60°C), welding (ranging from 70°C to 900°C), vaporization (between 100°C and 150°C), and carbonization (above 200°C). Laser light within the 800 to 980 nm range is highly absorbed by pigments like hemoglobin, while water absorption is relatively low. Due to this property, diode lasers can be safely used in close proximity to oral hard tissues without direct contact.[7]

Crown lengthening is primarily performed for two main reasons, each addressing specific therapeutic goals while simultaneously enhancing both functionality and aesthetics. From an aesthetic standpoint, crown lengthening is often employed to improve gingival symmetry, correct uneven gingival margins, and modify

hyperplastic tissue overgrowth. Functionally, it is utilized when a prosthetic crown cannot be adequately placed due to a clinically insufficient crown height at the intended site.[8]

Compared to scalpel surgery, laser surgery necessitates a reduced amount of local anesthesia. This is attributed to the rapid vaporization of cells, loss of intracellular fluid, chemical mediator effects, and denaturation of intracellular material and proteins. These factors collectively lead to a milder local inflammatory response, resulting in decreased discomfort and less swelling.[9]

Considering the presence of an adequate amount of attached gingiva in this particular case, the closed flap crown lengthening technique was determined to be the most suitable approach. One of the key benefits of this technique is the absence of swelling, trauma, or discomfort, and the avoidance of sutures.[10] While closed flap crown lengthening may not be applicable in all cases, it undoubtedly assists surgeons in addressing minor surgical cosmetic concerns. To ensure optimal results, it is essential to possess a sufficient understanding and experience of how lasers interact with both soft and hard tissues when selecting appropriate parameters. Consequently, combining the utilization of new technology with adherence to fundamental therapy guidelines yields the best outcomes.

To establish the status of this method as a standard treatment for crown lengthening, it is necessary to conduct prospective randomized controlled trials. These trials are essential in demonstrating the clinical advantages and capabilities of lasers in this specific field.

## CONCLUSION

In comparison to the conventional procedure, crown lengthening performed with a diode laser exhibited several advantages, including faster healing times, manageable pain levels, minimal bleeding, and decreased post-operative complications. Notably, the gingival healing process showed no indications of infection, discomfort, edema, or scarring.

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