

# Crown lengthening using diode laser: A case series

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## ABSTRACT

Crown lengthening is a surgical procedure used to increase the extent of supragingival tooth structure for restorative or esthetic purposes. Crown lengthening involves the surgical removal of hard and soft periodontal tissues to gain supracrestal tooth length, allowing longer clinical crowns and reestablishment of the biologic width. Crown lengthening can be done by scalpel, electrosurgery and laser. However, the use of lasers provides many advantages compared to other methods. The advantages of laser over scalpel surgical procedures include greater precision, a relatively bloodless surgical and postsurgical course, sterilization of the surgical area, minimal swelling and scarring, coagulation, vaporization, cutting, minimal or no suturing, and less or no postsurgical pain. The present case series describes three cases of crown lengthening using diode laser.

**Key words:** Crown lengthening, diode laser, scalpel surgery

## INTRODUCTION

Crown lengthening is a surgical procedure used to increase the extent of supragingival tooth structure for restorative or esthetic purposes.<sup>[1]</sup>

Crown lengthening involves the surgical removal of hard and soft periodontal tissues to gain supracrestal tooth length, allowing longer clinical crowns and reestablishment of the biologic width. The biological width is defined as the sum of the junctional epithelium and supracrestal connective tissue attachment (Cohen 1962). Gargiulo *et al.*, (1961) who measured the human dentogingival junction, found that the average space occupied by the sum of the junctional epithelium and the supracrestal connective tissue fibers is

2.04 mm.<sup>[2]</sup> Crown lengthening surgery can be aesthetic or functional.

Crown lengthening can be done by scalpel, electrosurgery and laser. However, the use of lasers provides many advantages compared to other methods. The present case series describes three cases of crown lengthening using diode laser. The usage of laser provides an alternative, effective method that produces good results with patient satisfaction.

## CASE REPORT

Three patients with reduced clinical crown height were treated for crown lengthening with diode laser. The surgical procedure was explained to the patients and consent forms were signed. The patients had no systemic diseases during the time of treatment.

### Case 1

A 30-year-old male patient visited the Department of Periodontics, Vivekanandha Dental College for Women, Tiruchengode with a complaint of short clinical crown height of tooth 37. On clinical examination, it was found that the clinical crowns of were much shorter than the anatomic crown. Root canal treatment had been completed for the tooth two years before and the clinical crown height was insufficient for the placement of fixed dental prostheses. Clinical crown lengthening was done using a diode laser [Figure 1a-d].

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### Case 2

A 31-year-old male patient visited the Department of Periodontics, Vivekanandha Dental College for Women, Tiruchengode with a complaint of short clinical crown height of teeth 25, 26. On clinical examination, it was found that the clinical crowns of 25, 26 were much shorter than the anatomic crown. Clinical crown lengthening was done using a diode laser [Figure 2a-c].

### Case 3

A 61-year-old male patient visited the Department of Periodontics, Vivekanandha Dental College for Women, Tiruchengode with a complaint of short clinical crown height of tooth 48. On clinical examination, it was found that his clinical crown was much shorter than the anatomic crown. Root canal treatment had been completed for the tooth one year before, and the clinical crown height was insufficient for the placement of fixed dental prostheses. It was decided to increase the clinical crown height using a diode laser [Figure 3a-c].

### Procedure

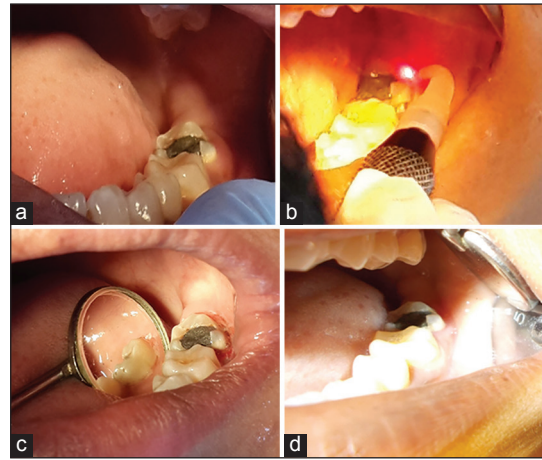
Safety glasses were worn by the operator, patient and assistant. Plastic instruments were used to avoid reflection of the laser beam as proposed by FDA laser safety rules.<sup>[3]</sup> Topical anesthetic gel was applied to the surgical field. The diode laser unit was used at energy settings 1.5 watts in Continuous Wave (CW) mode with small brush-like strokes back and forth with deeper progression along the same initial laser incision to remove the tissue and tip was kept in continuous motion.<sup>[4]</sup> Remnants of the ablated tissues were removed using sterile gauze soaked in saline.

Patients were prescribed analgesics for use when required and postoperative instructions were given. Patients did not complain of any pain or discomfort, during surgery or follow up.

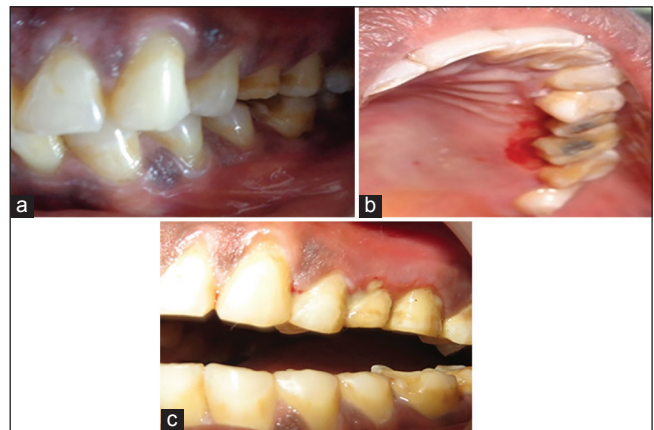
### DISCUSSION

Laser stands for Light Amplification by Stimulated Emission of Radiation. On May 16, 1960, Theodore H. Maiman operated the first functioning laser.<sup>[5]</sup> Lasers can be classified into two types according to the depth of penetration: Type where the laser light penetrates the tissue more deeply (such as Nd: YAG and diode lasers), and type where the laser light is absorbed in the superficial layers (such as Er: YAG laser).<sup>[6]</sup> 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). It has a wavelength ranging from 810 to 980 nm.

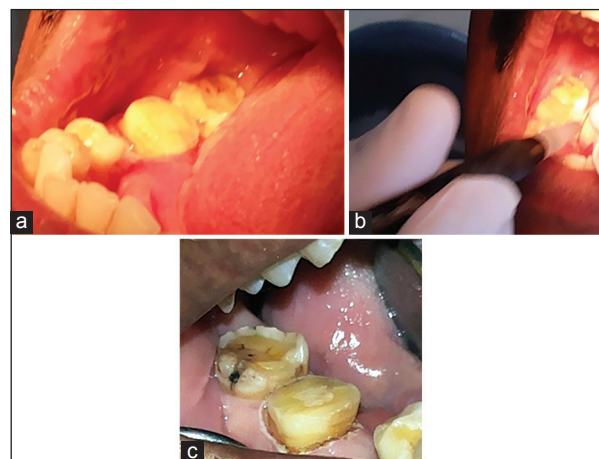
Laser radiant energy interacts with the tissue in several ways: reflection, transmission, scattering and absorption. When



**Figure 1: Case 1 (a) Preoperative view, (b) Crown Lengthening using diode laser, (c) Immediate Intra operative view, (d) Postoperative view**



**Figure 2: Case 2 (a) Preoperative view, (b) Immediate Intra operative view, (c) Post operative view**



**Figure 3: Case 2 (a) Preoperative view, (b) Crown lengthening using diode laser, (c) Immediate Intra operative view**

the tissue is initially heated by laser beam, it is subjected to warming (37°C to 60°C), protein denaturation, coagulation (> 60°C), welding (70°C to 900°C), vaporization (100°C to

150°C), vaporization and carbonization (>200°C).<sup>[7]</sup> Laser light at 800 to 980 nm is poorly absorbed in water, but highly absorbed in hemoglobin and other pigments.<sup>[8]</sup> As the diode laser does not interact with dental hard tissues, surgeries can be performed safely in close proximity to dental hard tissues.

Rapid cell vaporization with loss of intracellular fluid, chemical mediators and denaturation of intracellular substance and protein results in a less intense local inflammatory response and consequently less pain and edema;<sup>[9]</sup> therefore, less amount of local anesthesia is required to perform laser surgery in comparison to scalpel surgery.<sup>[10]</sup>

Indications for crown lengthening:<sup>[11]</sup>

- a. Functional crown lengthening:
  - To access subgingival caries
  - To increase the clinical crown height reduced by tooth wear, caries or fracture extending subgingivally
  - Correcting the position of the restorative margin when there has been invasion of the biologic width
- b. Aesthetic crown lengthening:
  - Correction of short clinical crowns due to wear or altered passive eruption
  - Creating gingival symmetry in the smile line
  - Correcting irregular/uneven gingival margins
  - Correcting for hyperplastic tissue overgrowth

Contraindications:<sup>[12]</sup>

- Inadequate crown-to-root ratio
- Nonrestorability of caries or root fracture
- Esthetic compromise
- High furcation
- Tooth arch relationship inadequacy

The advantages of laser over scalpel surgical procedures include greater precision, a relatively bloodless surgical and postsurgical course, sterilization of the surgical area, minimal swelling and scarring, coagulation, vaporization, cutting, minimal or no suturing, and less or no postsurgical pain.<sup>[13,14]</sup>

## CONCLUSION

The use of laser has several advantages over the scalpel surgery. Crown lengthening by diode laser was found to be a safe and efficient procedure. Post-operative patient satisfaction was good. The gingival healing was found uneventful with no infection, pain, swelling or scarring.

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