Clinical Application of Diode Laser in Vestibuloplasty: A Case Report

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ABSTRACT

Reduced vestibular depth is often associated with a diminished width of keratinized gingiva, which compromises plaque control and makes oral hygiene maintenance more difficult. Vestibuloplasty is an established procedure for correcting shallow vestibular depth and can be performed using a scalpel, electrocautery, cryosurgery, or laser. With recent advancements in dentistry, laser therapy has become increasingly preferred over conventional techniques owing to its clinical advantages. Among the various options, diode lasers are widely used in oral soft tissue procedures. This case report outlines the management of a shallow vestibule using a diode laser.

Keywords: Vestibuloplasty; Diode laser; Laser dentistry; periodontal regeneration

INTRODUCTION

Adequate vestibular depth plays a crucial role in maintaining periodontal health by facilitating effective plaque control and proper oral hygiene practices. Reduced vestibular depth is often associated with high muscle attachment, leading to inadequate width of attached gingiva, gingival inflammation, and recession.

Vestibuloplasty is a mucogingival surgical procedure aimed at deepening the vestibule and repositioning muscle attachments to improve gingival conditions. The introduction of lasers in periodontics has revolutionized soft tissue procedures. Diode lasers, in particular, offer advantages such as excellent haemostasis, reduced bacterial load, minimal postoperative pain, and faster healing. Conventional techniques such as scalpel surgery, electrosurgery, and cryosurgery have been widely used; however, they are often associated with intraoperative bleeding, postoperative discomfort, and delayed healing.

This case report presents the management of a shallow vestibule in the mandibular anterior region using a diode laser.

CASE REPORT

A 21-year-old female patient reported to the Department of Periodontology with a chief complaint of difficulty in brushing the lower anterior teeth region for the past two years. The patient expressed discomfort while placing the toothbrush in the mandibular anterior area, which resulted in inadequate plaque control. On clinical examination, generalized gingival inflammation with bleeding on probing was observed. Further intraoral assessment revealed a shallow vestibular depth

measuring approximately 3 mm in relation to tooth 31 and 2 mm in relation to tooth 41, assessed using a UNC-15 periodontal probe. Additionally, Miller's Class I gingival recession was noted in relation to 31 and 41. Based on these findings, a diagnosis of chronic generalized gingivitis associated with mucogingival deformity in the mandibular anterior region was established.

Figure 1. Pre-operative

Figure 2. Diode laser application

Figure 3. Immediate post-op

Figure 4. Periodontal Dressing (Coe-Pak)

Figure 5. 1 week post-op

Figure 6. 2 week post-op

Initial periodontal therapy was performed, which included scaling and root planing along with detailed oral hygiene

instructions. The patient was re-evaluated after two weeks, and a marked reduction in gingival inflammation was observed. Following phase I therapy, a surgical intervention in the form of vestibuloplasty using a diode laser was planned to increase the vestibular depth and facilitate better oral hygiene maintenance.

After obtaining informed consent and confirming normal hematological parameters, the surgical procedure was initiated. The patient was asked to perform a preprocedural rinse with 0.2% chlorhexidine, and extraoral antisepsis was carried out using povidone-iodine solution. Local anesthesia was administered using 2% lignocaine with adrenaline (1:200,000). All necessary laser safety precautions were followed, including the use of protective eyewear by the operator, assistant, and patient.

Vestibuloplasty was performed using a 940 nm diode laser set at 1.5 W in pulsed contact mode with a 300 µm fiber optic tip. The laser was applied in a brushing motion along the vestibular area to release the muscle attachments and deepen the vestibule. The procedure was completed with minimal bleeding and provided a clear surgical field throughout. Notably, there was no requirement for sutures, and the overall operative time was reduced.

A periodontal dressing was placed over the surgical site following completion of the procedure. Postoperative instructions were given, including the use of analgesics as needed, warm saline rinses several times a day, and avoidance of mechanical cleaning in the treated area for one week. The patient was also advised to apply cold compression intermittently during the first 24 hours.

At one-week follow-up, the surgical site demonstrated satisfactory healing with the presence of a protein coagulum and no signs of infection, pain, or discomfort. The patient reported good compliance and minimal postoperative morbidity. By the end of two weeks, complete epithelialization of the surgical area was observed, along with a noticeable reduction in gingival inflammation. An increase in vestibular depth was evident clinically, facilitating improved accessibility for oral hygiene measures.

DISCUSSION

Reduced vestibular depth is a clinically significant mucogingival deformity commonly associated with high muscle attachment, particularly of the mentalis muscle, resulting in an inadequate width of keratinised gingiva and compromised plaque control. This anatomical limitation predisposes patients to persistent gingival

inflammation, gingival recession, and difficulty in maintaining effective oral hygiene. Vestibuloplasty is therefore indicated to restore a favorable gingiva–mucosal relationship by deepening the vestibular sulcus, repositioning muscle and frenal attachments, and increasing the zone of attached gingiva. Conventional techniques such as Edlanplasty and Kazanjian vestibuloplasty have been widely used, particularly in preprosthetic surgery, whereas Clark's vestibuloplasty is more applicable in dentate patients presenting with mucogingival deformities.

The incorporation of laser technology into periodontal therapy has significantly improved the precision and predictability of soft tissue procedures. Various laser systems, including CO_2, Nd:YAG, Er:YAG, Er,Cr:YSGG, and diode lasers, have been successfully utilized in mucogingival surgeries. Among these, diode lasers are particularly advantageous due to their compact design, cost-effectiveness, and high affinity for hemoglobin and melanin, which allows efficient soft tissue ablation with excellent haemostasis. Pirnat (2007) highlighted the versatility of diode lasers in oral soft tissue procedures, emphasizing their ability to provide precise cutting with minimal collateral damage. Similarly, Coleton (2004) reported improved surgical outcomes and patient comfort with the use of lasers in periodontal procedures that coincide with this case report.

In the present case, diode laser-assisted vestibuloplasty facilitated controlled tissue incision and muscle detachment with minimal intraoperative bleeding and without the need for sutures, thereby reducing surgical time and enhancing patient comfort. The favorable healing response observed can be attributed to the unique biological effects of laser-tissue interaction. Laser irradiation promotes coagulation of small blood vessels and sealing of sensory nerve endings, which explains the reduced intraoperative bleeding and minimal postoperative pain. Moritz et al. (1998) demonstrated that diode lasers exhibit significant bactericidal effects within periodontal tissues, thereby contributing to reduced postoperative infection and enhanced wound sterility.

Furthermore, laser-treated wounds are associated with reduced myofibroblast activity, which minimizes wound contraction and supports the maintenance of achieved vestibular depth. Nammour et al. (2014) reported that laser-assisted soft tissue procedures result in reduced scar formation due to decreased fibroblastic activity and collagen contraction. The formation of a denatured protein coagulum

over the surgical site acts as a natural biological dressing, protecting the wound from mechanical trauma and microbial contamination. Kalakonda et al. (2016) observed improved patient perception and postoperative healing outcomes following diode laser-assisted vestibuloplasty when compared to conventional scalpel techniques.

Additionally, laser therapy has been shown to enhance cellular responses involved in wound healing. Walsh (1997) reported increased macrophage activity and mast cell degranulation following laser irradiation, which facilitates efficient wound debridement and accelerates tissue repair. These biological effects collectively contribute to favorable early healing, as observed in the present case, where satisfactory epithelialization and absence of complications were noted within two weeks.

The clinical findings of minimal bleeding, reduced postoperative discomfort, and uneventful healing in this case are consistent with previously published literature supporting the advantages of laser-assisted mucogingival surgery. Moreover, the elimination of sutures and reduced dependence on pharmacological management further enhance patient compliance and acceptance.

However, certain limitations must be acknowledged. The present report is based on short-term follow-up, and thus, the long-term stability of the increased vestibular depth cannot be definitively assessed. Additionally, despite the clinical advantages, factors such as higher equipment cost and the requirement for specialized training may limit the widespread adoption of laser-assisted techniques. Future longitudinal studies with larger sample sizes are required to establish the long-term efficacy and predictability of diode laser-assisted vestibuloplasty.

SUMMARY

This case report demonstrates that laser-assisted vestibuloplasty results in improved patient acceptance and favorable healing, along with a significant increase in vestibular depth. Diode lasers can therefore be considered a safe and effective alternative to conventional techniques. However, despite these advantages, laser procedures carry certain risks and are associated with higher equipment costs.

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