

Diode Laser – Assisted Vestibuloplasty: A Pre Prosthetic Surgical Approach – A Case Report

Dr Shashank k¹, Dr Koustubh Shinde², Dr Sanjay Venugopal³, Dr Raghavendra Prasad S⁴

¹Post Graduate Student, Department of Periodontology & Implantology, Sri Siddhartha Dental College and Hospital

²Post Graduate Student, Department of Prosthodontics and Crown & Bridge, Sri Siddhartha Dental College and Hospital

³Professor & Head of the Department, Department of Periodontology & Implantology, Sri Siddhartha Dental College and Hospital

⁴Professor & Head of the Department, Department of Prosthodontics and Crown & Bridge, Sri Siddhartha Dental College and Hospital

Abstract

Adequate vestibular depth plays a vital role in ensuring stability and retention of complete dentures, as insufficient sulcus depth can impair mastication, compromise comfort, and reduce patient satisfaction. Vestibuloplasty is a commonly employed pre-prosthetic surgical procedure to enhance sulcus depth and improve denture-bearing capacity. Conventional scalpel techniques, while effective, are frequently associated with intraoperative bleeding, the need for sutures, postoperative pain and edema, delayed healing, and relapse of vestibular depth. To overcome these drawbacks, laser-assisted approaches have been introduced in periodontal and pre-prosthetic surgery. Among various systems, diode lasers are increasingly utilized due to their compact design, precision in incision, excellent hemostatic properties, and favorable soft tissue interaction. Their application has been associated with improved intraoperative visibility, reduced morbidity, faster healing, and predictable outcomes. This case describes a 61-year-old male who reported with the chief complaint of loose-fitting complete dentures in both maxillary and mandibular arches. Clinical evaluation revealed inadequate vestibular depth, with preoperative measurements of 3 mm in the maxillary anterior & 4 mm in the maxillary posterior. In Mandible 4mm vestibular depth After obtaining informed consent, diode laser-assisted vestibuloplasty was planned to improve the denture foundation. Under local anesthesia with 2% lignocaine containing 1:80,000 adrenaline, a 980-nm diode laser was used to perform vestibular deepening in both arches. The procedure was accomplished with minimal bleeding, excellent operative control, and no requirement for suturing. The surgical site was irrigated with saline, protected with a periodontal dressing, and postoperative analgesics were prescribed. Healing occurred uneventfully by secondary intention, with the patient reporting minimal discomfort. At the 15-day follow-up, significant vestibular depth gain was observed, with 6 mm in the maxilla and 7 mm in the mandible. At one month, a new set of complete dentures was fabricated and delivered, which demonstrated improved stability, retention, and overall patient satisfaction. This case highlights the clinical advantages of diode laser-assisted vestibuloplasty, including bloodless surgery, reduced morbidity, elimination of suturing, and rapid, predictable healing. While alternative laser systems such as CO₂ and Er:YAG have been employed in pre-prosthetic procedures, diode lasers remain widely adopted because of their portability, affordability, and efficiency. Current evidence, though largely derived from case reports and small clinical series, supports the utility of diode lasers in vestibuloplasty, but further controlled studies are required to establish long-term benefits and standardized protocols. In conclusion, diode laser-assisted vestibuloplasty is a minimally invasive and effective pre-prosthetic surgical technique that provides significant vestibular depth gain, enhances denture retention, and improves patient-centered outcomes.

Keywords: diode laser, vestibuloplasty, pre-prosthetic surgery, denture retention, soft tissue surgery, case report.

Introduction

Vestibuloplasty remains one of the most widely performed pre-prosthetic surgical procedures, with the primary aim of deepening the vestibular sulcus to provide a stable foundation for complete denture retention and function. An adequate vestibule is essential not only for improving prosthesis stability but also for maintaining oral comfort, efficient mastication, and overall patient satisfaction. In recent years, innovative modifications have been explored to increase the predictability and precision of vestibuloplasty. One such advancement has been the integration of conventional methods with laser-assisted approaches, as demonstrated in reports where Clark's technique was combined with anterior laser soft tissue release to achieve superior outcomes in edentulous patients.¹

The application of diode lasers in vestibuloplasty has been documented in several clinical reports. In a single-case study, diode laser use resulted in successful deepening of the vestibule with minimal morbidity and improved postoperative comfort compared to scalpel methods.² Another report described its application following resection of denture hyperplasia, where diode laser vestibuloplasty was shown to facilitate uneventful healing, functional restoration, and long-term prosthetic success.³ These findings highlight the growing recognition of diode lasers as a minimally invasive tool in pre-prosthetic surgery.

Expanding beyond isolated case reports, diode laser vestibuloplasty has also been evaluated in small case series. In such studies, consistent vestibular depth gains and reliable clinical outcomes were achieved across multiple patients, reinforcing the technique's predictability.⁴ In addition, the versatility of diode lasers, particularly those operating at a

wavelength of 980 nm, has been emphasized in dental literature. Their compact design, ease of handling, precise incision capability, and hemostatic effect make them especially well-suited for procedures involving delicate oral soft tissues.⁵ Patient-centered outcomes have further strengthened the case for diode laser use in vestibuloplasty. Comparative studies assessing diode laser versus scalpel techniques have shown that patients treated with lasers report reduced postoperative pain, improved comfort, and faster recovery.⁶ Such findings are clinically significant, as patient satisfaction is often a critical determinant of the overall success of prosthetic rehabilitation.

The introduction of lasers in pre-prosthetic surgery is not entirely new. Early studies with carbon dioxide (CO₂) lasers established many of the benefits now associated with diode systems, including bloodless surgical fields, precise ablation, and reduced morbidity.⁷ These pioneering applications laid the foundation for the broader acceptance of lasers in oral surgery and paved the way for diode lasers to become a practical, efficient, and patient-friendly option in modern prosthodontic and periodontal practice.

Taken together, the available evidence underscores diode laser-assisted vestibuloplasty as a safe and effective alternative to traditional scalpel techniques. The present case report builds on this literature by describing diode laser vestibuloplasty performed in both maxillary and mandibular arches, with objective pre- and postoperative measurements used to illustrate its clinical benefits.

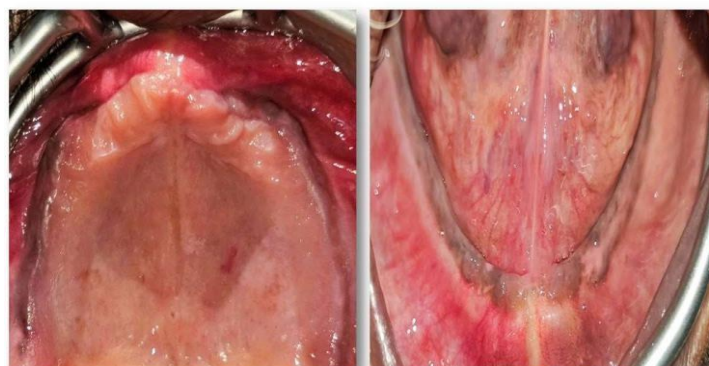
Case Presentation

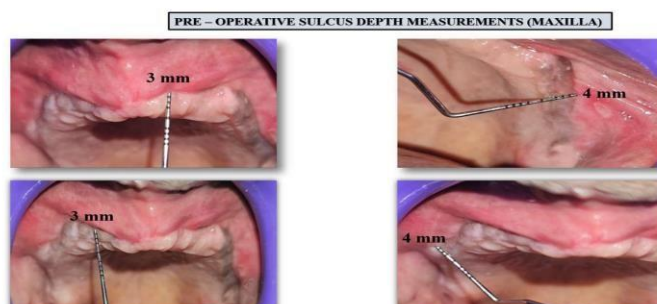
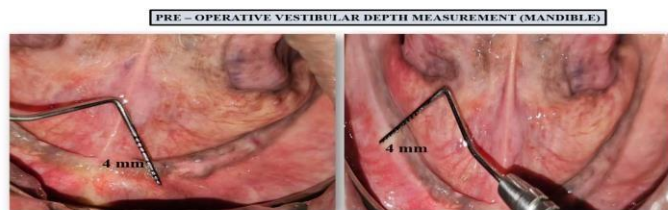
A 61-year-old male presented with the primary concern of instability of his complete dentures in both the maxillary and mandibular arches. He reported difficulty in chewing and discomfort while wearing the prostheses. Medical history and general examination revealed no systemic conditions that could interfere with oral surgical procedures. Extraoral findings were within normal limits. Intraoral inspection showed edentulous ridges with shallow vestibular sulci. On measurement, the Vestibular depth was measured clinically as the vertical distance from the crest of the residual alveolar ridge to the deepest point of the mucobuccal fold, using a graduated periodontal probe. Was found to be approximately 3 mm in the maxillary Anterior and 4 mm in the maxillary posterior region and in mandible it was found to be 4mm, confirming the inadequate vestibular depth as the cause of poor denture retention.



LASER ASSISTED SURGICAL PROCEDURE SET - UP

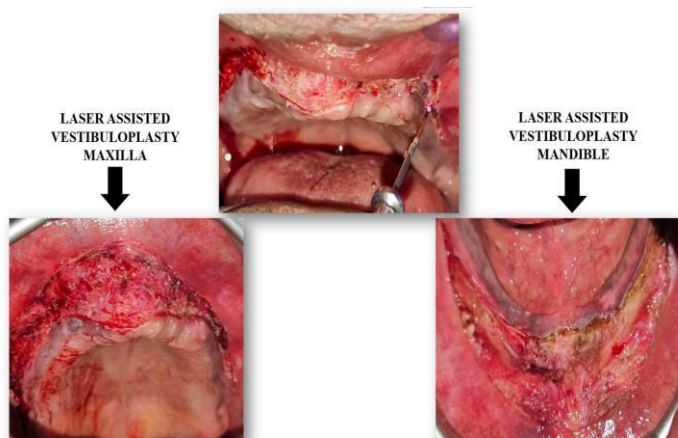
PRE - OPERATIVE PHOTOGRAPHS





Treatment

The procedure was carried out under local anaesthesia using 2% lignocaine with 1:80,000 adrenaline. A diode laser system (Guilin LX 16 Woodpecker; 980 nm wavelength) was used in continuous mode according to recommended soft tissue surgical protocols. Laser incisions were made along the mucogingival junction, and vestibular deepening was achieved by extending the sulcus inferiorly in the mandible and superiorly in the maxilla. The use of the diode laser provided good visibility due to minimal intraoperative bleeding and eliminated the need for suturing.



Once adequate sulcus depth was achieved, the surgical site was irrigated with sterile saline. A protective periodontal dressing (Co-pack) was placed over the wound surface. Postoperative instructions were given verbally and in writing, with emphasis on avoiding mechanical trauma, maintaining gentle oral hygiene, and adhering to prescribed medication. Analgesics were prescribed for postoperative pain management.

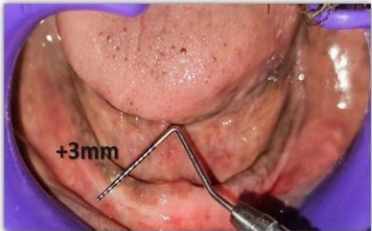
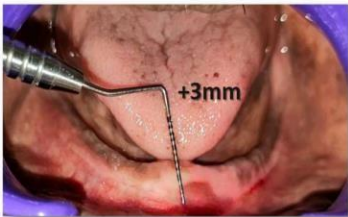


Follow-Up

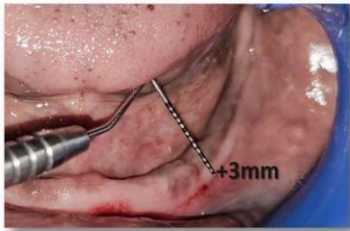
The patient was reviewed after 15 days. Healing was progressing satisfactorily by secondary intention, with no evidence of infection, swelling, or excessive discomfort. Repeat measurements showed that the vestibular depth had increased to

6.5 mm in the maxilla and 7 mm in the mandible. At one-month, soft tissue healing was complete, and a new set of complete dentures was fabricated and delivered. On insertion, the dentures demonstrated improved stability and retention. The patient reported greater comfort and function with the new prostheses, expressing satisfaction with the outcome of treatment.

POST –OPERATIVE PHOTOGRAPHS

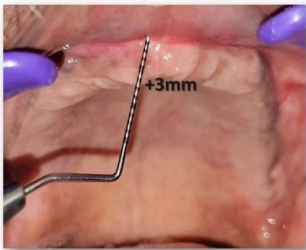


7 mm

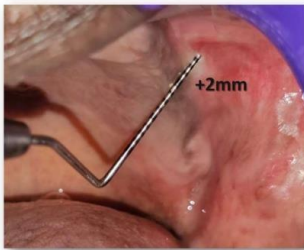


7 mm

POST – OPERATIVE SULCUS DEPTH MEASUREMENTS



6 mm



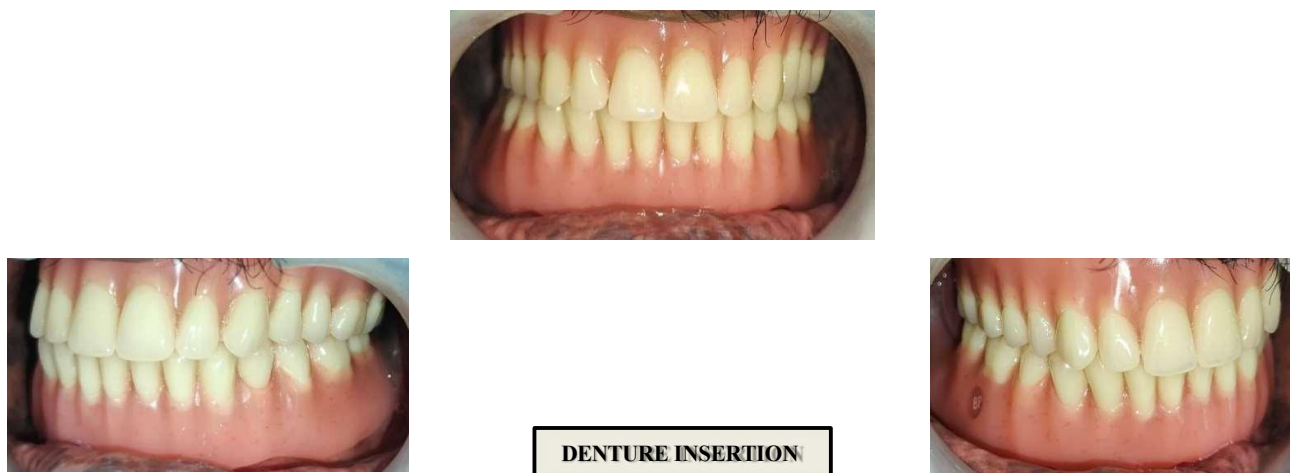
6 mm

PRE AND POST OPERATIVE VESRTIBULAR DEPTH COMPARISON
MANDIBULAR ARCH

SITE	Preoperative Vestibular Depth (mm)	Postoperative vestibular depth (mm)	Increase in Depth (mm)
ANTERIOR MANDIBLE(R)	4mm	7mm	+3mm
POSTERIOR MANDIBLE(R)	4mm	7mm	+3mm
ANTERIOR MANDIBLE(L)	4mm	7mm	+3mm
POSTERIOR MANDIBLE(L)	4mm	7mm	+3mm

PRE AND POST OPERATIVE VESRTIBULAR DEPTH COMPARISON
MAXILLARY ARCH

SITE	Preoperative Vestibular Depth (mm)	Postoperative vestibular depth (mm)	Increase in Depth (mm)
ANTERIOR MAXILLA(R)	3mm	6mm	+3mm
POSTERIOR MAXILLA(R)	4mm	6mm	+2mm
ANTERIOR MAXILLA(L)	3mm	7mm	+4mm
POSTERIOR MAXILLA(L)	4mm	7mm	+3mm



Discussion

Vestibular depth plays a pivotal role in denture stability, retention, and patient comfort. Shallow sulci compromise prosthetic function and may lead to mucosal trauma and dissatisfaction. Conventional vestibuloplasty techniques, such as those of Clark and Kazanjian, are effective but often involve significant bleeding, extended surgical time, and the need for sutures, which can prolong recovery and increase morbidity [8]. These drawbacks highlight the need for minimal ly invasive alternatives.

Laser technology has gained wide acceptance in soft tissue surgery, offering advantages of precision, hemostasis, and reduced patient discomfort. Diode lasers, in particular, are favored for pre-prosthetic procedures because of their compact design, cost-effectiveness, and selective absorption in hemoglobin and pigmented tissues [9]. This allows for efficient incision and coagulation with minimal collateral damage. The result is a clearer operative field, less postoperative pain, and faster healing compared to conventional scalpel methods [10]. Clinical evidence supports the application of diode lasers in vestibuloplasty. Case reports and small series consistently demonstrate predictable sulcus deepening, reduced intraoperative bleeding, and uneventful healing [11]. The 980-nm diode laser, used in the present case, has been highlighted for its efficiency in soft tissue ablation while maintaining intraoperative control [12]. Although CO₂ and Er:YAG lasers also offer advantages, diode lasers remain more accessible due to portability, affordability, and ease of handling [13].

In this patient, vestibular depth improved from 5 mm to 6.5 mm in the maxilla and from 4 mm to 7 mm in the mandible within two weeks. Healing by secondary intention was uneventful, and the absence of sutures enhanced comfort. At the one-month follow-up, the patient reported significantly improved denture stability and satisfaction, reflecting the functional benefits of the technique. These outcomes align with prior reports where diode laser vestibuloplasty resulted in favorable healing and enhanced prosthesis retention [14].

Nevertheless, the current evidence base is limited, consisting primarily of case reports and small-scale studies. Long-term stability of the vestibular depth and comparative trials against scalpel or alternative laser systems remain underexplored. Larger randomized studies are required to validate the long-term clinical reliability of diode laser-assisted vestibuloplasty.

Conclusion

Diode laser-assisted vestibuloplasty represents a minimally invasive and effective pre-prosthetic surgical approach for enhancing vestibular depth and improving denture retention. In this case, the procedure resulted in significant sulcus deepening, uneventful healing, and improved patient satisfaction without the need for sutures. While current evidence and our findings highlight the clinical advantages of diode lasers over conventional techniques, larger and long-term studies are required to establish their reliability and ensure widespread adoption in pre-prosthetic surgery.

Reference

1. Balaji V, Pushpalatha G, Venugopal S, Baskar D, Reddy A, Sritam S. Precision vestibuloplasty in the edentulous maxilla: integrating Clark's technique with anterior laser-assisted soft tissue release. *Cureus*. 2025;17(7):e88690. doi:10.7759/cureus.88690
2. Subedi S, Ranjit R, Bista S. Vestibuloplasty using diode laser: a case report. *J Nepal Soc Perio Oral Implantol*. 2021;5(2):97-99.
3. Akhil KP, Kumar T, Kumar R. Vestibuloplasty following denture hyperplasia resection with diode laser: a case report. *J Clin Diagn Res*. 2020;14(6):ZD06-ZD08. doi:10.7860/JCDR/2020/44523.13804
4. Gaikwad I, Patil M, Deshmukh J. Vestibuloplasty using diode laser: a case series. *Acta Sci Dent Sci*. 2023;7(8):18-20.
5. Derikvand N, Chinipardaz Z, Ghasemi S, Chiniforush N. The versatility of 980-nm diode laser in dentistry: a case series. *J Lasers Med Sci*. 2016;7(3):205-208. doi:10.15171/jlms.2016.35
6. Kalakonda B, Farista S, Koppolu P, Baroudi K, Uppada UK, Mishra A. Evaluation of patient perceptions after vestibuloplasty procedure: comparison of diode laser and scalpel techniques. *J Clin Diagn Res*. 2016;10(5):ZC96-ZC100. doi:10.7860/JCDR/2016/17623.7820
7. Pogrel MA. The carbon dioxide laser in soft tissue preprosthetic surgery. *J Prosthet Dent*. 1989;61(2):203-208. doi:10.1016/0022-3913(89)90374-0
8. Terheyden H, Wolfart S, Schulze R, Kämmerer PW. Preprosthetic surgery: narrative review and current perspectives. *J Clin Med*. 2023;12(23):7262. doi:10.3390/jcm12237262
9. Nammour S, Gerges E, Bou-Tayeh R, Zeinoun T. Oral crest lengthening for increasing removable denture retention by means of CO₂ laser. *Sci World J*. 2014;2014:738643. doi:10.1155/2014/738643
10. Karas M, Akgün Ö, Karahan ÖI, et al. Low level laser therapy in conjunction with diode laser-assisted and conventional vestibuloplasty: comparison of wound healing and vestibular depth gain. *Photodiagnosis Photodyn Ther*. 2023;40:103125. doi:10.1016/j.pdpdt.2023.103125 Pirnat S. Versatility of an 810-nm diode laser in dentistry: an overview. *J Laser Health Acad*. 2007;4(2):1-9.
11. Yilmaz E, Ozcelik O, Comert M, Ozturan S, Seydaoglu G. Laser-assisted laterally positioned flap operation: a randomized controlled clinical trial. *Photomed Laser Surg*. 2014;32(1):67-74. doi:10.1089/pho.2013.3597
12. Malcangi G. Therapeutic and adverse effects of lasers in dentistry. *Photonics*. 2023;10(6):650. doi:10.3390/photonics10060650
13. Neckel CP, Mehl A, Kremers L, Wöstmann B. Vestibuloplasty: a retrospective study on conventional and laser operation. *Lasers Surg Med*. 1998;23(3):234-241. doi:10.1002/(SICI)1096-9101(1998)23:3<234::AID-LSM8>3.0.CO;2-Q
14. Fokam ST, Kamga JP, Nde Fon P, Ebogo P, Bonglavnyuy E. Vestibuloplasty to enhance denture stability: report of two cases. *Pan Afr Med J*. 2022;41:313. doi:10.11604/pamj.2022.41.313.34587
15. Romanos GE. Current concepts in the use of lasers for periodontal soft tissue surgery. *Dent Clin North Am*. 2004;48(4):889-906. doi:10.1016/j.cden.2004.05.004
16. Miserendino LJ, Pick RM. *Lasers in Dentistry*. Chicago: Quintessence Publishing; 1995.
17. Carlsson GE, Hedegård B. Clinical aspects of mandibular vestibuloplasty. *J Prosthet Dent*. 1966;16(1):10-24. doi:10.1016/0022-3913(66)90121-3