THE INFLUENCE OF VESTIBULOPLASTY SURGICAL METHODS ON PERIODONTAL REGENERATION

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Abstract: Successful long-term periodontal regeneration is contingent not only on the restoration of alveolar bone, cementum, and the periodontal ligament but also on the stability of the overlying soft tissue architecture. An inadequate vestibular depth and high muscle attachments (e.g., from the mentalis muscle) exert persistent traction on the gingival margin. This tension can lead to flap instability, accelerate gingival recession, and compromise the delicate healing environment required for regenerative procedures, ultimately leading to therapeutic failure. Vestibuloplasty, a mucogingival surgical procedure designed to deepen the vestibule and increase the zone of keratinized tissue (KT), is a critical adjunct to periodontal regeneration, yet the influence of the specific surgical technique on regenerative outcomes is not fully elucidated.
Keywords: Vestibuloplasty, Periodontal Regeneration, Mucogingival Surgery, Diode Laser, Keratinized Tissue, Clinical Attachment Level (CAL), Wound Healing.

Introduction: Periodontal regeneration aims for the predictable restoration of lost supporting tissues. While techniques like Guided Tissue Regeneration (GTR) are widely used, their success is highly dependent on wound stability and primary closure. In patients with a shallow vestibule, muscle pull can destabilize the GTR membrane and flap, impeding vascularization and cellular repopulation of the defect. This study was designed to compare the influence of two distinct vestibuloplasty techniques—conventional scalpel surgery versus a diode laser-assisted approach—on key clinical parameters and patient-reported outcomes when performed concurrently with periodontal regenerative therapy.
Materials and Methods: This study was a prospective, randomized controlled clinical trial involving 30 patients diagnosed with severe chronic periodontitis and exhibiting inadequate vestibular depth (<3 mm) adjacent to sites requiring periodontal regeneration. Patients were randomly assigned to two groups (n=15): 1) Group A (Control): Treated with GTR in combination with a conventional scalpel vestibuloplasty (Edlan-Mejchar technique). 2) Group B (Test): Treated with GTR in combination with a diode laser-assisted vestibuloplasty (980 nm diode laser, 1.5W, continuous wave mode) for muscle fiber ablation and deepening.
Clinical parameters, including Probing Depth (PD), Clinical Attachment Level (CAL), Width of Keratinized Gingiva (WKG), and Vestibular Depth (VD), were recorded at baseline and at 3 and 6 months post-operatively. Patient-reported outcomes (pain, swelling, discomfort) were assessed using a 10-point Visual Analog Scale (VAS) for 7 days post-surgery.
Results and Discussion: At the 6-month follow-up, both groups demonstrated statistically significant improvements in all clinical parameters ($\rho < 0.01$). Mean CAL gain was 3.8 mm±0.9 mm in Group A and 4.1 mm±0.7 mm in Group B, with no statistically significant difference ($\rho = 0.34$). Similarly, both groups achieved a significant increase in VD and WKG.
However, a highly significant difference was observed in patient-reported outcomes. Group B (Laser) reported significantly lower mean VAS scores for pain on Day 1 (3.2±1.1) compared to Group A (Scalpel) (6.8±1.5; $\rho < 0.001$). Group B also reported less swelling and required fewer analgesics.
The discussion focuses on the implications of this reduced morbidity. The laser's properties of simultaneous ablation and hemostasis create a cleaner surgical field with less traumatic dissection and

reduced inflammatory response. This minimized post-operative edema and pain likely contributes to a more stable periosteum and reduced micro-motion of the overlying regenerative flap, providing a more protected environment for blood clot stabilization and cellular differentiation, which are fundamental to predictable periodontal regeneration.

Conclusion: Both conventional scalpel and diode laser-assisted vestibuloplasty are effective adjunctive procedures for increasing vestibular depth to support periodontal regeneration. However, the diode laser technique offers a significant advantage in terms of reduced post-operative morbidity and improved patient comfort. This enhanced healing response may create a more favorable and stable soft-tissue environment, thereby positively influencing the predictability of periodontal regenerative outcomes.

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