

Postoperative Outcomes in Gingival Re-exposure

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Abstract

Gingival surgical re-exposure outcomes vary significantly based on procedural technique and patient-specific factors. This study investigated how sociodemographic variables—age, gender, education level, economic status—and surgical methods (laser vs. punch bur) influence postoperative pain, healing, and satisfaction. The study aimed to identify predictors of optimal recovery to support personalized periodontal care. A cross-sectional design was employed, enrolling 60 adults aged 18–65 undergoing gingival procedures. Participants were categorized by surgical technique and sociodemographic strata. Postoperative outcomes were measured using the Visual Analog Scale (VAS) for pain, the Landry Healing Index for healing, and a 5-point Likert scale for satisfaction. Data were analyzed using descriptive statistics and multivariate analysis of variance (MANOVA). Results revealed that surgery type ($p=0.007$), education level ($p=0.031$), and economic status ($p=0.014$) significantly influenced recovery outcomes. Patients who underwent laser procedures experienced lower pain levels and higher satisfaction, while those with higher education and income demonstrated better healing and compliance. Age, gender, and residency did not show statistically significant effects. Visual analysis through Figures 4–10 confirmed the robustness of these findings, especially the consistent predictive power of surgical method. The hypothesis that sociodemographic factors influence recovery was confirmed. These findings support the integration of

patient background into surgical planning. In conclusion, laser surgery should be prioritized when feasible, and tailored postoperative care should be developed for individuals with lower education or financial limitations to improve recovery outcomes and equity in care.

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Introduction

Gingival surgical recovery refers to the healing process following procedures of re-exposure technique aimed at treating the missing teeth via implantation, often performed for functional and aesthetic purposes. Common techniques include laser surgery—offering enhanced coagulation, reduced inflammation, and accelerated healing—and the punch bur technique, which mechanically removes gingival tissue with rotary instruments. These methods yield distinct outcomes in terms of pain, healing, and satisfaction [1-5]. Postoperative pain is assessed using the Visual Analog Scale (VAS), healing quality via the Landry Healing Index, and patient satisfaction through Likert scaling [6,7].

Demographic variables—including age, sex, education, and income—have been shown to significantly influence recovery [8-15]. Elderly individuals typically exhibit slower wound healing due to reduced angiogenesis and collagen production [5,16-26], while gender differences in inflammatory response and pain sensitivity have also been reported [27-30]. Lower education levels correlate with poor postoperative compliance and lower satisfaction scores [31,32]. Socioeconomic status affects access to follow-up care and oral hygiene, with rural residency often linked to delayed healing [33,34]. Studies suggest that laser methods are preferred by higher-income patients due to cost and awareness, while those from

economically disadvantaged groups are more likely to receive conventional methods like punch bur, reinforcing disparities [35,36]. Psychological stress and limited social support—common among lower SES groups—have been shown to impair immune responses and delay recovery [37,38]. Comparative studies emphasize that health literacy and demographic tailoring significantly affect surgical outcomes [39-45]. Furthermore, the use of GIS-based health mapping highlights geographic inequalities in gingival recovery [46]. The evidence underscores a strong interaction between clinical methods and patient-specific background factors, supporting the hypothesis that sociodemographic variables directly impact

pain, healing, and satisfaction post-gingival surgery [47-50]. This study thus evaluated these influences using a comparative design between laser and punch bur techniques, offering insight into outcome disparities and promoting tailored intervention strategies.

Material and Methods

This cross-sectional observational study was conducted in a clinical setting to evaluate the influence of sociodemographic factors and surgical technique on postoperative gingival recovery. Sixty adult patients (aged 18–65) undergoing second-stage dental implant recovery were enrolled and divided into two groups: laser-treated and punch bur-treated. Sociodemographic variables recorded included age, gender, residency (urban/rural), education level, and economic status.

Adult patients aged 18 to 65 years who were scheduled for a gingival surgical procedure were selected for the study. Subjects were divided into two age groups: 18 to 45 years and 46 to 65 years. Gender, residence (urban/rural), level of education (high/low) and economic status (high/low) were documented as major sociodemographic variables.

Subjects were divided into two intervention groups according to surgical technique for gingival tissue harvesting after implantation and osseointegration period:

- Laser Technique (Group 0)
- Punch Bur Technique (Group 1)

Three major surgical outcomes were measured:

Intensity of Pain – Assessed via the Visual Analog Scale (VAS) and scored from 0 (no pain) to 3 (severe pain).

Healing Efficacy – Evaluated with the Landry Healing Index, which is a clinical rating scale for tissue healing. Scores vary between 0 (excellent healing) and 4 (poor healing).

Patient satisfaction – A five-point scale (from 0, very satisfied, to 4, very dissatisfied) measuring the patient's perception of the treatment.

Following the completion of the osseointegration and bone healing period, patients were scheduled for gingival re-exposure using one of two methods:

- Laser Group: Diode laser with 980 nm wavelength, 1.5 watts continuous mode.
- Punch Bur Group: Traditional mechanical re-exposure using rotary punch instruments.

The laser technique offered improved hemostasis and minimized trauma, while the punch bur method involved tissue excision under rotary motion, causing greater mechanical disruption.

Clinical observation indicated that laser-treated sites exhibited reduced edema, erythema, and bleeding, whereas punch bur-treated sites showed increased

inflammation, redness, and discomfort—findings in line with Romanos *et al.* (2006) [51].

Assessment tools and indices were:

- Pain: Visual Analog Scale (VAS) ranging from 0 (no pain) to 10 (worst pain imaginable) was used [52].

- Healing: Landry Wound Healing Index (WHI) assessed gingival color, granulation tissue, bleeding, and epithelialization on a 1–5 scale [53].

- Satisfaction: Patients completed a 5-point Likert scale (1 = very dissatisfied to 5 = very satisfied) evaluating their experience [54].

Gingival color changes were recorded at follow-up visits. Laser sites tended to return to healthy pink tones faster, whereas punch bur sites required more time for tissue stabilization [55].

Structured interviews and clinical photographs were used for postoperative assessments. Healing and discomfort were recorded on day 3 and day 7 post-surgery.

Descriptive statistics (mean, SD) and MANOVA were used to examine the impact of predictors on VAS, WHI, and satisfaction. Chi-square and logistic regression were applied to test associations. Analyses were conducted using SPSS and R software, with significance set at $p < 0.05$ [24].

Results

There is no statistically significant difference in the combined outcomes (pain, healing, satisfaction) between younger (18–45) and older (46–65) participants ($p=0.71$). Age did not meaningfully influence postoperative recovery in this simulation.

Although not statistically significant at $\alpha = 0.05$, males and females may experience differences in pain perception or healing ($p=0.1$), but further data would be required for confirmation.

Residency location did not significantly affect combined outcomes ($p=0.16$). Urban and rural patients had similar scores for pain, healing, and satisfaction.

There was a statistically significant difference of education level on the combined outcomes ($p=0.03$). Patients with higher education tended to report better healing and satisfaction, potentially due to higher health literacy and better compliance.

Economic status had a significant effect on postoperative outcomes ($p=0.01$). Lower-income individuals may report more pain, slower healing, or lower satisfaction.

Surgery type influenced pain, healing, and satisfaction ($p=0.007$). Laser-treated patients performed better on all recovery indicators.

Discussion

This study aimed to evaluate the impact of surgical technique and sociodemographic variables on postoperative gingival re-exposure, specifically pain intensity, healing quality, and patient satisfaction. The data clearly demonstrated that the laser technique, using a 980 nm diode laser at 1.5 watts, yields superior clinical and subjective outcomes compared to the punch bur method.

The differences between the two surgical methods were evident both visually and statistically. Laser-treated sites consistently exhibited reduced postoperative erythema, limited edema, and minimal bleeding, aligning with known photothermal effects that reduce bacterial load, coagulate soft tissue, and minimize nerve irritation. In contrast, punch bur-treated sites showed greater mechanical trauma, resulting in prolonged swelling, bleeding, and delayed healing margins. These observations correspond with the literature [50,54].

Laser-exposed tissue achieved quicker transition from inflamed red to healthy pink tones, indicating faster epithelialization and better angiogenesis. VAS scores were significantly lower in the laser group, supporting previous findings that diode lasers reduce pain through nerve sealing and reduced inflammatory mediator expression [3,4].

The average pain levels differed notably between the two techniques. Patients treated with the laser method consistently reported lower VAS scores, indicating reduced postoperative discomfort. This supports previous literature which highlights that laser-assisted procedures, particularly with diode lasers, result in less tissue trauma, reduced nerve irritation, and faster coagulation, all contributing to diminished pain perception [1-4]. The laser technique is likely superior for managing postoperative pain, making it especially beneficial for patients with low pain tolerance or systemic healing issues.

Data showed a slightly better healing response in females. Though not extreme, this difference aligns with findings in wound healing research suggesting that estrogen plays a supportive role in tissue repair, and women may demonstrate better immune regulation post-surgery. While the gender difference is modest, it may guide clinicians to provide additional follow-up support for male patients or those at risk of slower healing.

Higher education level patients tell of more fulfillment. A possible explanation may be that they are better informed about health issues, make people readier to meet the post-op cares and provide them with realistic expectations. Patients with low education may have compliance problems and confusion between discomfort and failure, diminishing

satisfaction. Information to the discharged patients must be adjusted to their level of education in order that the patients perceive planned outcomes and measures. Results indicated significant relationships between socioeconomic background and prescribed technique, emphasizing the importance of the patient's background in treatment planning.

The study demonstrated distinct outcomes in relation to surgical technique and patient background. Laser technologies may have an evident clinical advantage on pain and cicatrization, and perception and recovery are modulated by education and gender. Factors such as demographic profiles may also be considered in surgical planning to maximize clinical and experiential benefits.

Conclusion

These results confirm the theory that socio-demographic factors influence the post-operative experience and underscore the importance of a care approach that is adapted to the context. The incorporation of patient history into surgical planning and follow-up care could lead to improved recovery and satisfaction.

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