



Comparison of Sinus Augmentation Outcomes in Patients With Treated vs. Untreated Periodontal Disease

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Abstract: Background: **Objective:** This study aimed to compare the outcomes of maxillary sinus augmentation in patients with chronic periodontitis who either received periodontal therapy prior to surgery or remained untreated. The investigation focused on determining whether periodontal treatment influences healing quality, graft integration, and complication rates following sinus augmentation. **Materials and Methods:** A comparative analysis was conducted between treated and untreated periodontitis patients undergoing sinus lift procedures. Radiographic bone gain, graft density, post-operative complications, soft tissue healing, and implant stability were assessed at 3- and 6-month intervals using standardized clinical and radiographic evaluations. **Results:** The results demonstrated that patients who received periodontal therapy exhibited significantly greater bone gain, higher graft density values, improved soft tissue healing, and superior implant stability when compared with untreated individuals. Furthermore, the untreated group showed a higher incidence of membrane perforation, infection, and graft resorption, indicating a less favorable healing environment. **Conclusion:** Untreated chronic periodontitis was associated with compromised sinus augmentation outcomes, whereas prior periodontal therapy contributed to enhanced healing and more predictable graft performance. These findings support the importance of managing periodontal inflammation before sinus augmentation procedures to optimize clinical success.

Keywords: sinus, augmentation, periodontal

INTRODUCTION

Maxillary sinus augmentation has become a predictable procedure for rehabilitating the posterior maxilla with dental implants, particularly in cases where significant bone resorption and sinus pneumatization have compromised available bone height. As implant therapy becomes increasingly common, understanding the various factors that influence the outcome of sinus augmentation has gained substantial importance. One factor that has been consistently linked with long-term implant prognosis is periodontal health, as the condition of the periodontium contributes directly to the quality of the supporting tissues.^{1,2}

Periodontal disease is widely recognized as a chronic inflammatory condition leading to progressive destruction of the periodontal apparatus and alveolar bone. When periodontal breakdown occurs in the maxillary posterior region, the combination of bone loss and subsequent tooth extraction often accelerates sinus floor pneumatization. This anatomical alteration reduces the residual bone height available for implant placement, making sinus augmentation essential. However, the inflammatory burden associated with untreated periodontal disease may affect surgical healing and the success of graft integration.^{3,4,5}

Many studies have demonstrated that periodontal pathogens and systemic inflammatory mediators may persist even after tooth extraction when periodontal disease remains untreated. These factors have the potential to influence the healing environment within the sinus and interact with graft materials. Conversely, patients who undergo comprehensive periodontal therapy prior to sinus augmentation may present with a more favorable biological environment, reduced inflammation, and improved bone turnover capacity. Understanding how these differences translate into clinical outcomes is essential for optimizing treatment planning.

Despite the established relationship between periodontitis and implant outcomes, limited research has specifically compared sinus augmentation success in treated versus untreated periodontal patients. Clinicians often rely on empirical decisions regarding the timing and necessity of periodontal therapy prior to sinus lift procedures. In the absence of definitive evidence, treatment planning varies widely, resulting in inconsistencies in patient care and potential compromise of graft stability.⁶⁻⁸

This study aims to address this gap by evaluating and comparing the outcomes of sinus augmentation in patients with a history of periodontal disease who either received comprehensive periodontal therapy

before the procedure or did not. By analyzing radiographic bone gain, graft integration, healing patterns, and complication rates, the research seeks to clarify whether periodontal treatment status has a measurable impact on sinus augmentation success. The findings may guide clinicians toward more evidence-based protocols and enhance the predictability of implant rehabilitation in periodontally compromised patients.

MATERIALS AND METHODS

This study was designed as a comparative clinical investigation involving a total sample size of 40 patients requiring maxillary sinus augmentation in the posterior region. All participants were diagnosed with a history of chronic periodontitis, but differed based on whether they had undergone comprehensive periodontal therapy prior to the sinus lift procedure. Patients were divided into two equal groups: 20 with completed periodontal treatment and 20 with untreated periodontal disease. Selection was based on clinical records, periodontal charting, and radiographic assessment, ensuring that both groups had similar baseline bone height and alveolar conditions.

Standardized surgical protocols were followed for all patients, including the lateral window sinus lift technique with the same graft material to minimize procedural variability. Healing outcomes and complications such as membrane perforation, infection, and graft resorption were documented throughout the follow-up period. Clinical examinations were performed at regular intervals to monitor soft tissue healing and implant site stability. Comprehensive periodontal therapy for the treated group included scaling and root planing, oral hygiene reinforcement, and periodontal re-evaluation prior to sinus augmentation. Untreated periodontal patients underwent sinus lift without receiving prior periodontal therapy, allowing for a direct comparison of outcomes based purely on their periodontal status. Both groups were instructed to follow standardized postoperative care protocols to avoid confounding effects from inconsistent patient compliance.

Follow-up assessments were performed at 1 week, 1 month, 3 months, and 6 months postoperatively to evaluate healing progression and measure graft maturation. Final analysis compared radiographic bone gain, incidence of complications, and clinical healing quality between the two groups. Statistical tests were applied to determine the significance of observed differences, with the goal of identifying whether untreated periodontal inflammation negatively influences sinus augmentation outcomes.

RESULTS

Table 1: Baseline Characteristics of Participants (n = 40)

Parameter	Treated Perio Group (n=20)	Untreated Perio Group (n=20)	p-value
Mean Age (years)	47.8 ± 6.2	48.3 ± 5.9	0.78
Gender (M/F)	9 / 11	10 / 10	0.76
Mean Residual Bone Height (mm)	3.8 ± 0.6	3.7 ± 0.7	0.62
Smoking Status (%)	20%	25%	0.71
Sinus Membrane Thickness (mm)	1.4 ± 0.3	1.5 ± 0.4	0.43

Table 2: Radiographic Bone Gain After Sinus Augmentation

Time Interval	Treated Perio Group (mm)	Untreated Perio Group (mm)	p-value
3 Months	7.2 ± 1.1	6.1 ± 1.4	0.01
6 Months	8.4 ± 1.0	7.0 ± 1.3	0.003
Overall Mean Bone Gain	8.1 ± 1.2	6.8 ± 1.6	0.004

Table 3: Post-operative Complications

Complication	Treated Perio Group (n=20)	Untreated Perio Group (n=20)	p-value
Sinus Membrane Perforation	2 (10%)	4 (20%)	0.38
Post-operative Infection	1 (5%)	5 (25%)	0.04
Graft Resorption (>25%)	1 (5%)	4 (20%)	0.15
Total Complications	4 (20%)	13 (65%)	0.006

Table 4: Healing Outcomes and Graft Integration (6-month Evaluation)

Parameter	Treated Perio Group	Untreated Perio Group	p-value
Good Soft Tissue Healing (%)	90%	55%	0.008
Graft Density (HU – CBCT)	940 ± 120	810 ± 140	0.01
Implant Site Stability (ISQ)	72.5 ± 4.1	65.3 ± 5.0	<0.001
Overall Graft Success Rate (%)	95%	70%	0.01

DISCUSSION

Maxillary sinus augmentation is a widely accepted procedure for restoring adequate bone volume in the posterior maxilla, where bone height is often compromised. However, chronic periodontitis represents a significant biological challenge due to its persistent inflammatory burden, microbial dysbiosis, and associated bone loss, all of which may negatively influence wound healing and graft integration. Understanding the relationship between periodontitis and sinus augmentation outcomes is crucial for improving implant success, reducing complications, and enhancing long-term stability. This study examined the impact of chronic periodontitis on maxillary sinus augmentation outcomes and assessed the potential benefits of periodontal therapy prior to surgery.⁹⁻¹⁰

In the present study, both the treated and untreated periodontitis groups showed comparable baseline parameters, including age, sex, smoking status, residual bone height, and sinus membrane thickness, ensuring adequate comparability. Patients who underwent periodontal therapy prior to sinus augmentation demonstrated significantly greater bone gain at 3 and 6 months, as well as higher mean bone gain overall. Additionally, this group exhibited a substantially reduced rate of post-operative complications—particularly infection—along with better soft tissue healing, higher graft density, greater implant stability, and superior graft success at 6 months. These results strongly suggest that untreated chronic periodontitis adversely affects bone regeneration and graft integration, while periodontal therapy prior to sinus augmentation greatly enhances clinical and radiographic outcomes.

Özcan MU et al. reported that periodontal parameters such as severe CAL loss and deep PPD were associated with increased sinus membrane reactivity and greater graft resorption, although bone gain and graft height were not significantly affected. This aligns with the current study's finding that untreated periodontal inflammation may compromise graft stability and healing, supporting the biological rationale that ongoing inflammation alters sinus membrane behavior and healing potential.¹¹

Bonsmann B et al. demonstrated that a history of severe periodontitis significantly increased the risk of early implant failure following sinus augmentation, along with other risk factors such as low residual bone height and very low insertion torque. Their results correlate with the present study, which also indicated poorer implant stability and higher complication rates in patients with untreated periodontitis, emphasizing the systemic effect of periodontal disease on implant prognosis even in grafted sites.¹²

Maska B et al. found that sinus mucosal thickening—

closely associated with periodontal disease—did not negatively affect implant or graft success after sinus augmentation. Although this seems different from the present findings, the discrepancy may be related to the fact that their study focused primarily on mucosal thickening rather than active inflammatory periodontal status. Their 100% success rate suggests that mucosal thickening alone is not detrimental, whereas the current study highlights that active or untreated periodontal inflammation—not mucosal thickness itself—may compromise healing.¹³

Overall, the present study supports and extends findings from Özcan MU et al. and Bonsmann B et al. by reinforcing that chronic periodontitis adversely affects sinus augmentation outcomes, particularly when left untreated. While Maska B et al. found no negative impact of mucosal thickening alone, the current study suggests that active periodontal inflammation, rather than structural mucosal changes, is the determining factor influencing graft success. Therefore, periodontal treatment prior to sinus augmentation appears crucial for optimizing clinical outcomes across different patient profiles.

It is important to note that differences in sample size among the studies may influence the strength, generalizability, and statistical significance of observed associations. Larger multicenter studies, such as that by Bonsmann B et al., provide more robust evidence regarding risk factors for implant failure, whereas smaller retrospective analyses may be more limited but still offer meaningful insights into specific clinical parameters. The present study, like others evaluating radiographic and clinical healing, may benefit from future expansion with larger sample sizes and longer follow-up periods to further validate and refine the observed associations.

CONCLUSION

Untreated chronic periodontitis was associated with compromised sinus augmentation outcomes, whereas prior periodontal therapy contributed to enhanced healing and more predictable graft performance. These findings support the importance of managing periodontal inflammation before sinus augmentation procedures to optimize clinical success.

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