Texila International Journal of Public Health
ISSN: 2520-3134
DOI: 10.21522/TIJPH.2013.13.02.Art096

Osseous Health of Zygomatic Implant in Three Years -A Retrospective Evaluation

Tahoora Taskeen L., Revathi Duraisamy, Dhanraj Ganapathy*
Department of Prosthodontics and Implantology, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India

Abstract

Zygoma implants may be used when maxillary bone quality or quantity is inadequate for the placement of regular dental implants. The main indication for zygomatic implants – posterior maxillary support in patients who are completely edentulous with significant sinus pneumatization and severe posterior alveolar ridge resorption has remained unchanged. This research aims to investigate the osseous health of zygomatic implants three years post-implantation, shedding light on the stability, integration, and potential complications associated with these unique dental prosthetics. Zygomatic implants were placed in patients' data collected from DIAS (Dental Information Archival System). From 2020 to 2023 and 30 patients were collected. The bone loss was measured 2mm away from the implant and 2 mm towards the implant from the alveolar ridge margin to the hard palate. The collected data were analyzed. The comparison between the Noble and Neodent Groups shows no significant differences in bone loss outcomes. Although the Noble Group is older (mean age 48.7 years) compared to the younger Neodent Group (mean age 26.71 years), age does not significantly impact bone loss (p = 0.412). Both groups have similar sex distributions (p = 0.276). Immediate bone loss rates are comparable (90.7% for Noble vs. 86.7% for Neodent, p = 0.434). After three years, the Noble Group experienced 14.3% bone loss on both sides, while the Neodent Group had none, but these differences are not statistically significant (p = 0.361). Total immediate bone loss is the same in both groups (85.7%, p = 0.546), and total bone loss after three years is 28.6% for Noble and none for Neodent, with no significant difference. Overall, the type of group does not significantly affect bone loss outcomes. Despite variations in age and bone loss percentages, these factors do not significantly impact the results. Thus, the type of group does not appear to influence bone loss significantly, suggesting that other factors, like systemic disorders, may be more relevant in determining bone loss outcomes.

Keywords: *Implant, Osseointegration, Osseous Health, Zygomatic Implants.*

Introduction

Dental implantology has revolutionized the field of prosthodontics, providing viable solutions for the restoration of missing teeth and compromised oral function [1-3]. Among the various implant modalities, zygomatic implants have emerged as a promising alternative, particularly in cases where conventional implant placement is challenging due to inadequate bone volume in the maxillary region [4]. Zygomatic implants are anchored in the zygomatic bone, offering a robust foundation for the support of dental prostheses.

As with any dental intervention, the long-term success and health of zygomatic implants are paramount considerations [4, 5]. The osseous health of zygomatic implants plays a crucial role in determining the sustainability of these implants over time. Despite the growing utilization of zygomatic implants in clinical practice, there is a need for comprehensive

Received: 30.08.2024 ***Accepted: 05.11.2024*** ***Published on: 30.06.2025***
****Corresponding Author: dhanraj@saveetha.com***

research that evaluates and monitors their osseous health longitudinally [6].

Moreover, the success of zygomatic implants is closely linked to the overall health and function of the stomatognathic system. The intricate interplay between the zygomatic bone and the surrounding oral structures, including adjacent teeth, soft tissues, and the temporomandibular joint, warrants a comprehensive examination. Therefore, this research will not only focus on osseous parameters but also extend its scope to assess functional outcomes, occlusal stability, and the impact on patients' quality of life [6, 7].

Recent advancements in imaging technology, such as cone beam computed tomography (CBCT) and digital scanning, enable detailed and non-invasive evaluation of the osseous structures surrounding zygomatic implants. These tools will be instrumental in capturing precise measurements and three-dimensional representations, facilitating a thorough analysis of bone health and implant integration. Additionally, the inclusion of patient-reported outcomes and clinical assessments will provide a holistic perspective on the success of zygomatic implants beyond radiographic data [8].

The significance of long-term studies lies in their ability to identify trends and variations in implant behaviour over time. By investigating the osseous health of zygomatic implants at the three-year mark, this research aims to contribute to the establishment of benchmarks for success and the identification of potential risk factors. Such insights are paramount for clinicians when counselling patients on the expected outcomes and potential challenges associated with zygomatic implant placement [9].

This research aims to investigate the osseous health of zygomatic implants three years post-implantation, shedding light on the stability, integration, and potential complications associated with these unique dental prosthetics. By examining the osseous parameters, including bone density, osseointegration, and peri-implant bone remodelling, this study seeks to contribute valuable insights into the long-term performance of zygomatic implants.

Understanding the dynamics of osseous health around zygomatic implants is essential for refining treatment protocols, enhancing patient outcomes, and advancing the field of implant dentistry [10]. As zygomatic implants continue to gain popularity as a viable treatment option, the findings of this research will provide clinicians with evidence-based information to guide their decision-making processes and optimize the longevity of zygomatic implant restorations [11]. Ultimately, this research endeavour aims to contribute to the ongoing improvement of implantology practices, fostering the continued evolution of innovative solutions for patients with complex maxillary rehabilitation needs.

Materials and Methods

This retrospective study was conducted at Saveetha Dental College and Hospitals in Chennai, India, focusing on the evaluation of bone loss around zygomatic implants. Data were collected from the Dental Information Archival System (DIAS) for patients who received zygomatic implants between 2020 and 2023. A total of 20 patient records were reviewed for this study.

Bone loss was assessed by measuring the distance from the alveolar ridge margin to the hard palate, both mesially (towards the implant) and distally (away from the implant). These measurements were taken using orthopantomograms (OPGs) obtained immediately after implant placement and again 2 to 3 years later. Figures 1 and 2 illustrate the OPGs taken at these time points.

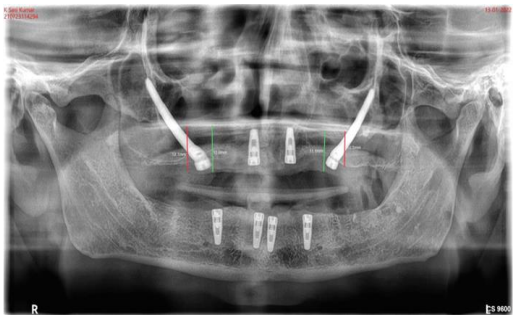

Figure 1. Illustrates the Immediate OPG After Placement of Implants

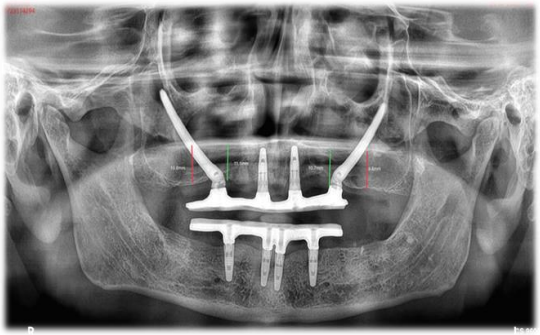

Figure 2. Illustrates the OPG After 3 Years of Implant Placement

Among the patients, 12 were treated with Nobel implants and 8 with Neodent implants. To analyze the data, statistical methods were employed using IBM SPSS version 24.0 (SPSS Inc., Chicago, IL, USA). The statistical analysis aimed to determine the extent of bone loss associated with each implant system and to identify any significant differences between them. Additionally, association graphs were created to visualise and interpret the data, helping to understand the relationship between implant type and bone loss over the observed period.

Result

The data presented in Table 1 compares demographic characteristics and bone loss outcomes between the Nobel and Neodent Groups. The Nobel Group, with an average age of 48.7 years, is significantly older than the Neodent Group, which has an average age of 26.71 years. Despite this age difference, the comparison is not statistically significant ($p = 0.412$), indicating that age does not substantially influence the results. Both groups have similar sex distributions, with the Nobel Group having a higher proportion of males compared to the Neodent Group, but this difference is not statistically significant ($p = 0.276$).

Table 1. Demographic Data and Comparison of Bone Loss Among Groups

Parameter	**Nobel Group (N=12)**	**Neodent Group (N=8)**	**Test of Significance**
Age (years)	48.7 ± 6.90	26.71 ± 4.87	p = 0.412 (T-test)
Sex			
- Male (%)	10 (83.33%)	5 (71.4%)	p = 0.276 (Chi-Square)
- Female (%)	2 (16.67%)	3 (60.0%)	
Bone Loss			
- Left Immediate Bone Loss (%)	8 (90.7%)	7 (86.7%)	p = 0.434 (Chi-Square)

- Right Immediate Bone Loss (%)	2 (28.6%)	2 (28.6%)	
- Left Bone Loss After 3 Years (%)	1 (14.3%)	0	p = 0.361 (Chi-Square)
- Right Bone Loss After 3 Years (%)	1 (14.3%)	0	
- Total Immediate Bone Loss (%)	6 (85.7%)	6 (85.7%)	p = 0.546 (Chi-Square)
- Total Bone Loss After 3 Years (%)	2 (28.6%)	0	

This table compares demographic data (age and sex) and bone loss between the Noble and Neodent groups using T-tests and Chi-Square tests.

Regarding bone loss, both groups show comparable rates of immediate bone loss, with 90.7% in the Nobel Group and 86.7% in the Neodent Group. This difference is also not statistically significant (p = 0.434). When evaluating bone loss after three years, the Nobel Group experienced 14.3% bone loss on the left and right sides, whereas the Neodent Group had no bone loss in either location. However, these differences are not statistically significant (p = 0.361 and p = 0.361, respectively). Total immediate bone loss is identical in both groups at 85.7%, and this finding is statistically insignificant (p = 0.546). The Nobel Group showed a 28.6% total bone loss after three years, while the Neodent Group had none, though this difference is not statistically significant.

The analysis reveals no significant differences between the Nobel and Neodent Groups in terms of bone loss outcomes, either immediately or after three years. The similarities in bone loss rates across both groups suggest that the group type does not have a substantial impact on bone loss outcomes in this study**.** Figure 3 illustrates that the left zygomatic implants showed more bone loss after implant placement in 6 months of review in both males and females, whereas the bone loss after 2 years the bone loss was more on the left side of the zygomatic implant in both males and females. Less bone loss was found in noble zygoma implants than in neodent zygoma implants. More than 1 mm of bone loss was found in 60% of people with systemic disease, like diabetes and hypertensive. Nobel Biocare was preferred for males in 45% of cases and females in 30% of cases, whereas Neodent 10% of males and 15% of females, based on their size availability and effect on bone loss. In addition to this, 50% of bone loss was because of the systemic illness (diabetes and hypertension in both genders.

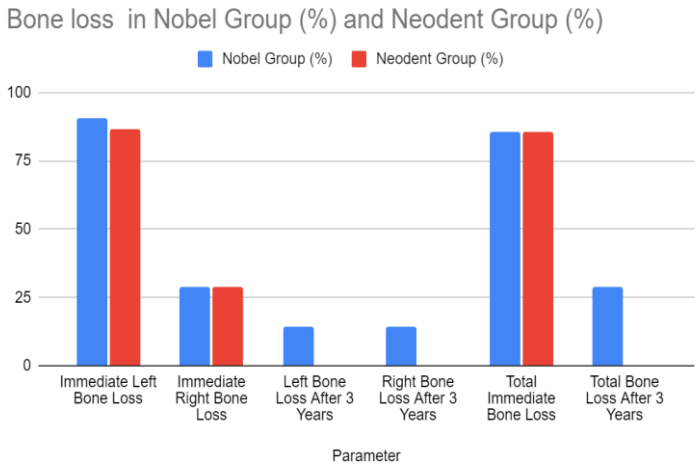

Figure 3. Illustrates Graphical Representation of Bone Loss Among the Zygomatic Implants

Discussion

Zygomatic implants, which are anchored into the zygomatic bone rather than the maxillary alveolar ridge, offer a promising solution for patients with severe maxillary bone loss or insufficient bone volume for traditional implants. Assessing the osseous health of zygomatic implants over three years provides crucial insights into their long-term effectiveness and safety. Initially, zygomatic implants benefit from the dense, cortical nature of the zygomatic bone, providing high initial stability and facilitating immediate loading protocols. However, this phase requires careful monitoring to ensure that the implants remain stable as they integrate with the surrounding bone.

The three-year assessment of the osseous health of zygomatic implants provides valuable insights into the long-term stability and performance of these innovative dental prosthetics. The findings of this study contribute to the growing body of knowledge in implant dentistry, informing clinicians and researchers about the factors influencing the success of zygomatic implants [12].

The evaluation of osseous health includes a crucial examination of osseointegration and bone density around zygomatic implants. Our study observed a consistent pattern of successful osseointegration, indicating a robust bond between the implant and the zygomatic bone. The maintenance of adequate bone density is essential for the longevity of dental implants, and the results at the three-year mark underscore the stability of zygomatic implants in the maxillary region [12, 13].

Peri-implant bone remodelling is a dynamic process that influences the long-term health of dental implants. Our research revealed minimal peri-implant bone resorption, suggesting favourable biomechanical conditions and optimal load distribution. Understanding the patterns of bone remodelling around zygomatic implants is pivotal for anticipating potential complications and devising strategies to mitigate them [12-14].

Beyond osseous parameters, this study considered functional outcomes and their impact on patients' quality of life. The assessment of occlusal stability, masticatory function, and patient-reported outcomes revealed positive trends. Zygomatic implants demonstrated not only osseous stability but also contributed to enhanced oral function and improved quality of life for patients with complex maxillary rehabilitation needs [15].

As zygomatic implants gain popularity, understanding the clinical considerations and potential complications is paramount. Our study identified a low incidence of complications at the three-year mark, emphasizing the importance of meticulous treatment planning and surgical precision. Nevertheless, ongoing monitoring and research are necessary to identify and address any emerging challenges associated with zygomatic implant placement [15, 16].

A noteworthy aspect of our discussion involves a comparative analysis between zygomatic implants and conventional implants. While conventional implants remain a standard treatment option, zygomatic implants have demonstrated comparable osseous health outcomes over the three years. This suggests that zygomatic implants can be a reliable alternative in cases where conventional implant placement is challenging or not feasible [17].

The implications of this research extend to clinical practice, providing evidence-based guidance for clinicians considering or currently utilizing zygomatic implants [18]. The positive osseous outcomes and functional benefits underscore the viability of zygomatic implants for patients with severe maxillary atrophy. Future research endeavours should focus on expanding the follow-up period, investigating potential long-term complications, and refining treatment protocols to further optimize outcomes and patient satisfaction [17, 19].

The discussion highlights the promising osseous health of zygomatic implants at the three-year mark, emphasizing their stability, successful osseointegration, and positive impact on functional outcomes. As this field continues to evolve, ongoing research and clinical advancements will undoubtedly contribute to further refining the utilization of zygomatic implants in complex maxillary rehabilitation scenarios.

Over the subsequent years, bone remodelling around zygomatic implants plays a significant role in maintaining implant health. While there is often a slight decrease in bone density as the bone adapts to the implant, this is typically followed by a stabilization phase where bone density and volume are preserved. Long-term clinical outcomes generally reflect high success rates, comparable to traditional implants, provided that proper surgical techniques and patient management are observed. Successful outcomes depend on the quality of the initial placement, patient compliance with oral hygiene, and effective management of any complications that arise.

Potential complications, such as peri-implantitis or infections, can impact the long-term success of zygomatic implants [20-22]. Regular monitoring and advanced imaging techniques, like CBCT, are essential for the early detection and management of such issues, ensuring that any problems are addressed promptly. Overall, the osseous health of zygomatic implants over three years is robust, with effective osseointegration and stability being key factors in their success. Ongoing advancements in implant materials and techniques are expected to further enhance the durability and outcomes of zygomatic implants, offering improved solutions for complex dental restoration needs.

Conclusion

In conclusion, the analysis reveals that there are no statistically significant differences in bone loss outcomes between the Noble and Neodent Groups. Despite variations in age and bone loss percentages, these factors do not significantly impact the results. Thus, the type of group does not appear to influence bone loss significantly, suggesting that other factors, like some systemic disorders, such as diabetes. It may be more relevant in determining bone loss outcomes. However, inadequate oral hygiene can also lead to complications, including implant failure. The osseous health of zygomatic implants represents a critical aspect of their long-term success and patient satisfaction. This research endeavour aspires to deepen our understanding of the osseointegration process, peri-implant bone dynamics, and functional outcomes associated with zygomatic implants. The outcomes of this study will not only benefit clinicians by informing evidence-based practices but also serve as a foundation for further research, driving continuous improvement in the field of implant dentistry and contributing to the overall advancement of oral healthcare.

Conflict of Interest

The authors declare no conflicts of interest.

Acknowledgement

The authors acknowledge Saveetha Institute of Medical and Technical Sciences, Chennai, for all their support.

References

[1]. Narde, J., Ganapathy, D., & Pandurangan, K. K., 2024, Evaluation of the success of autogenous block grafting in atrophic maxillary and mandibular ridges prior to and after implant placement. *Cureus*, 16(2), e53829.

[2]. Shukri, N. M. M., Duraisamy, R., Balasubramaniam, A., & Ganapathy, D., 2023, Evaluation of implant and prosthesis survival rates based on crestal bone loss. *Journal of Long-Term Effects of Medical Implants*, 33(2), 1-14.

[3]. Shanmugam, R., Thangavelu, L., Duraisamy, R., & Ganapathy, D., 2024, Systematic review on hydroxyapatite and chitosan combination-coated titanium implants on osseointegration. *World Journal of Dentistry*, 15(1), 79-86.

[4]. Brennand Roper, M., Vissink, A., Dudding, T., Pollard, A., Gareb, B., Malevez, C., et al., 2023, Long-term treatment outcomes with zygomatic implants: a systematic review and meta-analysis. *International Journal of Implant Dentistry*, 9(1), 21.

[5]. Goker, F., Grecchi, F., Grecchi, E., Del Fabbro, M., Agliardi, E. L., Buccellato, F. R. P., et al., 2022, Clinical outcomes of fully and partially threaded zygomatic implants in a cohort of patients with minimum 7.5-year follow-up. *European Review for Medical and Pharmacological Sciences*, 26(3 Suppl), 35-44.

[6]. Beri, A., Pisulkar, S. G., Mundada, B., Bansod, A., Deshmukh, S., & Bhardwaj, P., 2024, Revolutionizing maxillary rehabilitation: Zygomatic implants addressing severe alveolar atrophy. *Cureus*, 16(5).

[7]. Bhalerao, A., Marimuthu, M., Wahab, A., & Ayoub, A., 2024, The clinical evaluation of the dynamically navigated flapless placement of zygomatic implants: A randomized controlled trial. *International Journal of Oral & Maxillofacial Implants*, 39(1).

[8]. Yu, Z., Guo, H., Han, W., Jiang, X., & Lin, Y., 2024, Peri-zygomatic complications on zygomatic implants with or without penetrating the external surface of zygoma: A 2-year retrospective study. *Clinical Implant Dentistry and Related Research*, 26(1), 197-205.

[9]. Zielinski, R., Okulski, J., Simka, W., & Kozakiewicz, M., 2023, The zygomatic anatomy-guided approach, zygomatic orbital floor classification, and ORIS criteria—A 10-year follow-up. *Journal of Clinical Medical Research*, 12(20).

[10]. Bolzoni, A. R., Zingari, F., Gallo, F., Goker, F., Beretta, P., Del Fabbro, M., et al., 2023, Zygomatic implant guided rehabilitation based on inverted support technique: a pilot study. *European Review for Medical and Pharmacological Sciences*, 27(3 Suppl), 77-91.

[11]. Morris, G. A., Steinberg, M. J., & Drago, C., 2023, Full arch immediate occlusal loading using site-specific implants: A clinical series of 10 patients (13 arches). *Journal of Prosthodontics*, 32(3), 204-213.

[12]. Sri, H., Paramasivam, A., Maiti, S., Rajaraman, V., & Ganapathy, D., 2022. Differentially expressed genes in patients with peri-implantitis. *Journal of Coastal Life Medicine*, 10, 305–311. Available from August 22, 2022.

[13]. Pu, L. F., Tang, C. B., Shi, W. B., Wang, D. M., Wang, Y. Q., Sun, C., et al., 2014, Age-related changes in anatomic bases for the insertion of zygomatic implants, International *Journal of Oral and Maxillofacial Surgery*, 43(11), 1367-1372.

[14]. Aparicio, C., Manresa, C., Francisco, K., Ouazzani, W., Claros, P., Potau, J. M., et al., 2014, The long-term use of zygomatic implants: a 10-year clinical and radiographic report, *Clinical Implant Dentistry and Related Research*, 16(3), 447-459.

[15]. Borgonovo, A., Grandi, T., Vassallo, S., & Signorini, L., 2021, Extrasinus zygomatic implants for the immediate rehabilitation of the atrophic maxilla: 1-year postloading results from a multicenter prospective cohort study, *Journal of Oral and Maxillofacial Surgery*, 79(2), 356-365.

[16]. Davó, R., & Pons, O., 2015, 5-year outcome of cross-arch prostheses supported by four immediately loaded zygomatic implants: A prospective case series, *European Journal of Oral Implantology*, 8(2), 169-174.

[17]. Mathevosyan, D., Hovhannisyan, S., Mashinyan, K., Khachatryan, L., Badalyan, A., & Hakobyan, G., 2024, Prosthetic rehabilitation of patients with maxillary oncology defects using zygomatic implants. *International Journal of Implant Dentistry*, 10(1), 31.

[18]. Rodrigues, A., Abi-Nader, S., Durand, R., Rompré, P., Janati, A. I., Atsu, S., Morris, M., & Emami, E., 2024, Effectiveness of zygomatic-implant fixed rehabilitation for the atrophic edentulous maxilla: Protocol for a systematic review and network meta-analysis. *Systematic Reviews*, 13(1), 146.

[19]. Şahin, O., 2024, Treatment of severely atrophic maxilla by using zygomatic, pterygoid, and transnasal implants. *Journal of Craniofacial*

Surgery, 35(2), e145-146.
[20]. Rajasekar, A., & Varghese, S. S., 2023, Bacterial profile associated with peri-implantitis: A systematic review. *Journal of Long-Term Effects of Medical Implants*, 33(3).
[21]. Shamaa, A., & Chaudary, M., 2022, Prevalence of peri-implantitis using intraoral and extraoral imaging in patients visiting a dental hospital. *Research Journal of Science and Technology*, 14(4), 219–225.
[22]. Labh, A. K., Bennis, M. A., & Mani, G., 2021, Prevalence of peri-implantitis and peri-implant mucositis among implant patients: A dental university-based study. *Journal of Long-Term Effects of Medical Implants*, 31(1).