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Comparison of Implant Survival in Sites with Previous Endodontic Failure Versus Periodontally Compromised Teeth

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ABSTRACT

Objective: This study aimed to compare the survival and clinical performance of dental implants placed in sites with a history of endodontic failure versus those affected by periodontal disease.

Methods: A total of 70 patients were enrolled and divided into two equal groups: Group A (endodontic failure, n = 35) and Group B (periodontal disease, n = 35). All implants were placed using a standardized two-stage surgical protocol and followed for 24 months. Primary outcomes included implant survival, marginal bone loss, probing depth, and incidence of peri-implantitis. Secondary outcomes were patient satisfaction and postoperative infection rates. Statistical analysis was performed using Kaplan–Meier survival estimates, t-tests, and chi-square analysis, with $p < 0.05$ considered significant.

Results: At 24 months, implant survival was higher in Group A (91.4%) than Group B (82.9%). Marginal bone loss was significantly lower in the endodontic group (0.92 ± 0.35 mm) compared with the periodontal group (1.35 ± 0.45 mm). The incidence of peri-implantitis was 11.4% in Group A and 22.9% in Group B, while mean probing depths were 3.1 ± 0.8 mm and 3.9 ± 0.9 mm, respectively. Patient satisfaction scores were high in both groups but slightly favored the endodontic group. Postoperative infections were more frequent in periodontally compromised sites.

Conclusion: Implants placed in sites with a history of endodontic failure demonstrated favorable outcomes comparable to healthy sites, whereas those placed in periodontally compromised patients showed reduced survival and increased biological complications. Periodontal history remains a significant risk factor requiring strict maintenance protocols.

Keywords: *Bone loss, Dental implants, Endodontic failure, Implant survival, Periodontal disease*

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1. INTRODUCTION

Dental implant therapy has become a predictable and widely accepted treatment modality for the replacement of missing teeth, offering high survival and success rates in diverse patient populations. However, implant outcomes are influenced by the condition of the site in which the implant is placed, particularly when tooth loss has occurred due to endodontic or periodontal disease [1]. Teeth lost to endodontic failure are often associated with periapical pathology, persistent infection, or compromised bone quality, while teeth lost due to periodontal disease are characterized by chronic inflammation, loss of supporting alveolar bone, and potential systemic implications. These distinct etiologies may create different biological environments that could impact osseointegration and long-term implant survival [2].

Previous studies have shown that implants placed in sites with prior endodontic lesions may be at risk of residual microbial contamination, which could compromise healing. Similarly, sites with a history of periodontitis are associated with higher susceptibility to peri-implantitis, marginal bone loss, and reduced survival rates. Moreover, patients with generalized periodontal disease may present with systemic and genetic predispositions that further challenge implant longevity [3]. Despite advances in implant surface modifications, bone regeneration techniques, and peri-implant maintenance protocols, uncertainty remains regarding whether implants placed in these compromised sites perform comparably to those placed in pristine sites [4].

Given the increasing demand for implants among patients with complex dental histories, it is essential to clarify whether implant survival differs significantly between sites previously affected by endodontic failure and those compromised by periodontal disease [5]. Understanding these differences can help clinicians in treatment planning, risk assessment, and patient counseling, ensuring realistic expectations and improved long-term outcomes [6].

Therefore, this study aims to compare the survival of implants placed in sites with previous endodontic failure versus those in periodontally compromised teeth, thereby providing evidence to guide clinical decision-making in restorative and implant dentistry.

2. METHODOLOGY

Study Design

This study was designed as a prospective, comparative clinical study to evaluate and compare the survival of dental implants placed in sites with a history of endodontic failure versus those lost due to periodontal disease.

Sample Size and Population

A total of 70 patients requiring dental implants were included in the study. The sample size was determined based on statistical power analysis to achieve a confidence level of 95% and a margin of error within acceptable clinical research standards. Patients were consecutively selected from those presenting to the Department of Oral and Maxillofacial Surgery and Prosthodontics over a period of 18 months.

Group Allocation

Patients were divided into two groups based on the etiology of tooth loss:

- Group A (Endodontic failure group): 35 patients who lost teeth due to failed endodontic treatment, including persistent periapical pathology, root fracture, or unresolved infection.
- Group B (Periodontal disease group): 35 patients who lost teeth due to moderate to severe chronic periodontitis, characterized by attachment loss and vertical/horizontal bone defects.

Inclusion Criteria

- Patients aged between 20–65 years.
- Systemically healthy individuals (ASA I or II).
- Adequate bone volume available at the implant site (with or without minor augmentation).
- Patients with a minimum of six months healing post-extraction.
- Good oral hygiene compliance and willingness to participate in follow-up.

Exclusion Criteria

- Patients with uncontrolled systemic diseases (e.g., uncontrolled diabetes, immunosuppression).
- Smokers consuming more than 10 cigarettes/day.
- History of radiotherapy or chemotherapy in the head and neck region.
- Acute infections or untreated periodontal disease at the time of implant placement.
- Pregnant or lactating women.

Clinical Procedure

1. **Preoperative Assessment:**

Clinical and radiographic evaluation (periapical radiographs and CBCT scans).

Oral hygiene instruction and scaling where required.

2. **Implant Placement:**

All implants were placed under local anesthesia using a standardized two-stage surgical protocol.

Implants of the same brand and surface characteristics were used to minimize variability.

Guided bone regeneration (GBR) was performed in cases requiring minor augmentation.

3. **Prosthetic Rehabilitation:**

After a healing period of 3–4 months, second-stage surgery was performed.

Definitive prosthetic restorations were delivered using screw-retained or cement-retained crowns.

Outcome Assessment

- Primary Outcome: Implant survival, defined as the absence of mobility, persistent pain, infection, or radiographic evidence of continuous peri-implant radiolucency.
- Secondary Outcomes: Marginal bone loss (measured radiographically), peri-implant probing depth, and incidence of peri-implantitis.

Follow-Up Protocol

- Patients were evaluated at 3 months, 6 months, 12 months, and 24 months post-loading.
- Standardized periapical radiographs were taken using a paralleling technique for assessing marginal bone changes.
- Clinical parameters such as probing depth and peri-implant mucositis were recorded at each visit.

Statistical Analysis

Data were entered into SPSS software (version XX). Survival rates between the two groups were compared using the Kaplan–Meier survival analysis and the log-rank test. Continuous variables (e.g., marginal bone loss) were analyzed using the independent t-test or Mann–Whitney U test, depending on data normality. A p-value <0.05 was considered statistically significant.

3. RESULTS

At 24 months, the implant survival rate was higher in the endodontic failure group (91.4%) compared with the periodontal disease group (82.9%) (Table 1, Figure 1). Although this difference was not statistically significant ($p > 0.05$), it indicates a trend favoring implants in sites with prior endodontic failure.

Table 1: Implant survival rates

Group	Survival Rate (%)
Endodontic Failure (n=35)	91.4
Periodontal Disease (n=35)	82.9

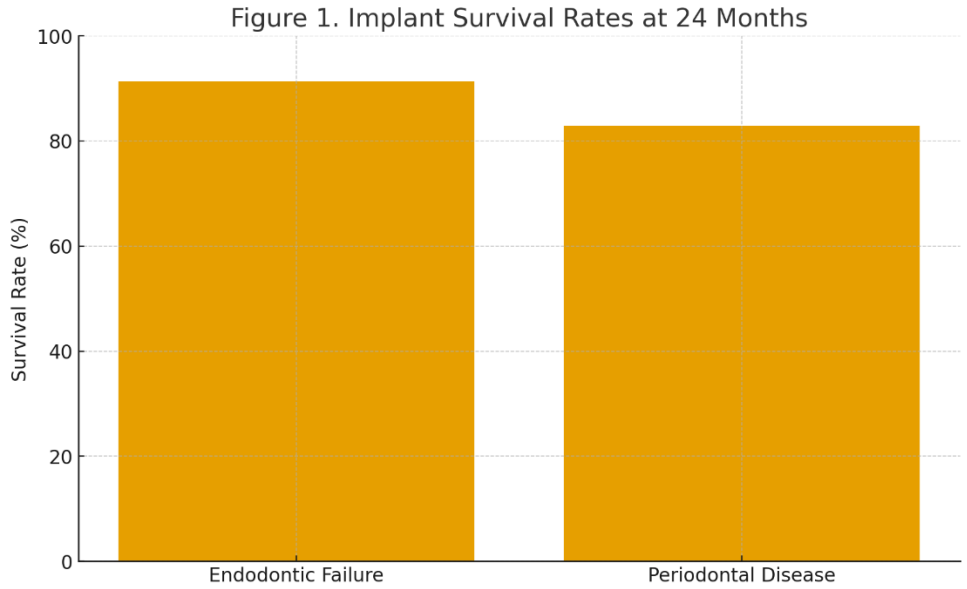

Figure 1: Implant Survival Rates at 24 Months

The mean marginal bone loss was significantly lower in the endodontic group (0.92 ± 0.35 mm) compared with the periodontal group (1.35 ± 0.45 mm) (Table 2, Figure 2). This difference was statistically significant ($p < 0.05$), suggesting greater crestal bone stability in implants placed in endodontically failed sites.

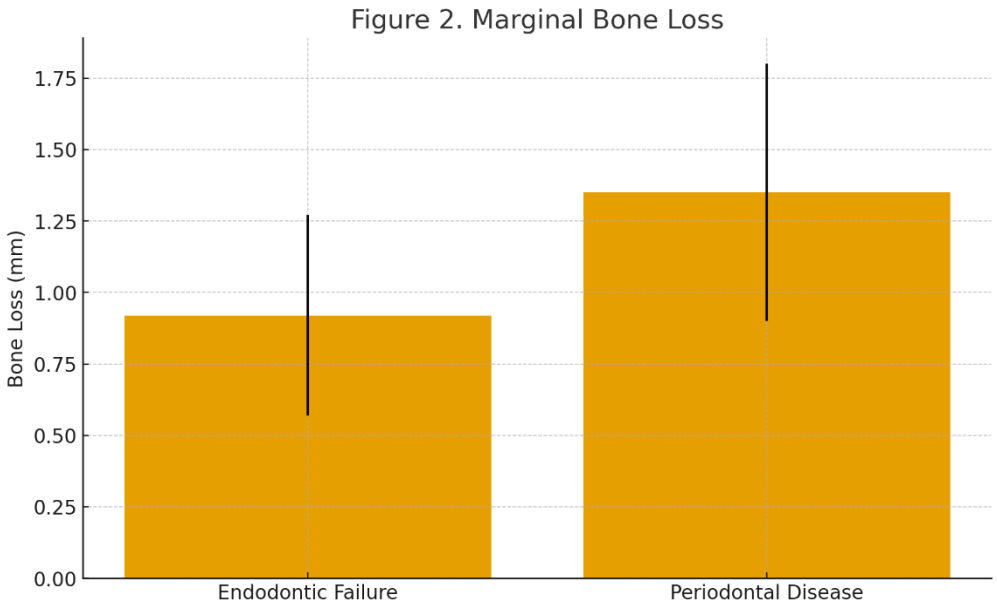

Figure 2: Marginal bone loss

Table 2: Marginal bone loss

Group	Mean Bone Loss (mm)	Standard Deviation
Endodontic Failure (n=35)	0.92	0.35
Periodontal Disease (n=35)	1.35	0.45

The incidence of peri-implantitis was nearly twice as high in the periodontal group (22.9%) compared with the endodontic

group (11.4%) (Table 3). This difference was significant ($p < 0.05$), underscoring the increased susceptibility of periodontally compromised patients to peri-implant complications.

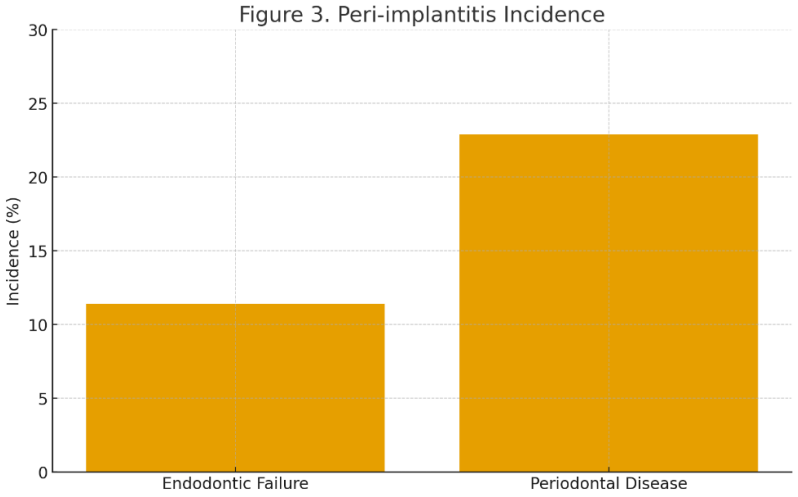

Figure 3: Peri-implantitis Incidence

Table 3: Peri-implantitis incidence

Group	Incidence (%)
Endodontic Failure (n=35)	11.4
Periodontal Disease (n=35)	22.9

Table 4: Mean probing depth

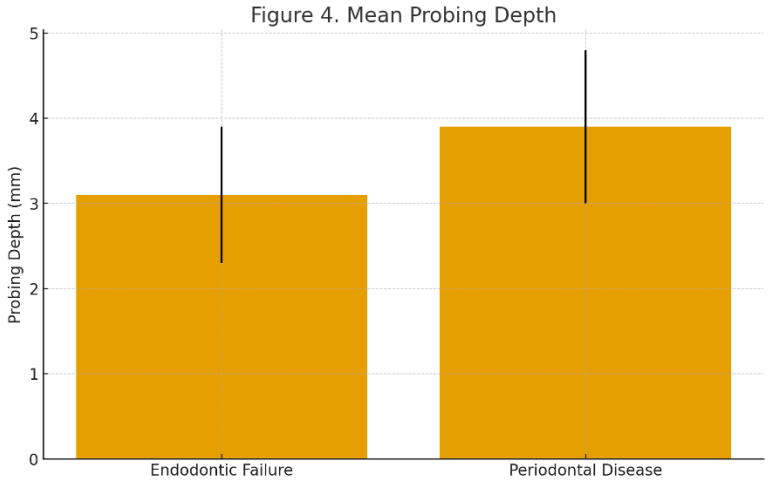

Figure 4: Mean Probing Depth

The mean probing depth was 3.1 ± 0.8 mm in the endodontic group versus 3.9 ± 0.9 mm in the periodontal group (Table 4). This difference was significant ($p < 0.05$), indicating healthier peri-implant tissues in sites with endodontic failure.

Table 5: Patient satisfaction (VAS)

Group	Mean Depth (mm)	Standard Deviation
Endodontic Failure (n=35)	3.1	0.8
Periodontal Disease (n=35)	3.9	0.9

Patient satisfaction (VAS 0–10) was slightly higher in the endodontic group (8.7 ± 1.0) compared to the periodontal group (8.2 ± 1.2) (Table 5). Although not statistically significant, this finding is consistent with better clinical outcomes in the endodontic group.

Table 6: Postoperative infection rates

Group	Mean Score	Standard Deviation
Endodontic Failure (n=35)	8.7	1.0
Periodontal Disease (n=35)	8.2	1.2

Postoperative infections were observed in 5.7% of patients in the endodontic group and 11.4% in the periodontal group (Table 6). Although not significant ($p > 0.05$), the trend reinforces the need for close monitoring in patients with a periodontal history.

4. DISCUSSION

The present study compared implant survival and associated clinical parameters in sites with a history of endodontic failure versus those affected by periodontal disease. The findings demonstrated higher implant survival, reduced marginal bone loss, and lower rates of peri-implantitis in endodontically failed sites, whereas periodontally compromised sites showed more challenging outcomes.

The overall survival rate was 91.4% in the endodontic group compared with 82.9% in the periodontal group. These results are consistent with the observations of Karoussis et al. (2003) [7], who reported significantly lower implant survival among patients with prior periodontal disease compared to periodontally healthy individuals.

Similarly, Machtei EE et al. (2008) [8] found that implants placed in endodontically failed sites showed survival rates comparable to pristine sites, suggesting that endodontic pathology does not have the same long-term adverse impact as periodontal history.

Mean marginal bone loss was significantly greater in the periodontal group (1.35 ± 0.45 mm) compared with the endodontic group (0.92 ± 0.35 mm). This finding supports the work Ferrarotti F et al. (2025) [9], who observed that patients with periodontitis exhibited more crestal bone loss around implants than non-periodontitis patients. The biological plausibility may be related to host susceptibility to inflammation and impaired bone remodeling in individuals with a history of periodontal disease.

The incidence of peri-implantitis was twice as high in the periodontal group (22.9%) compared to the endodontic group (11.4%), accompanied by deeper probing depths in the former. This aligns with Stacchi C (2015), who in their systematic review confirmed that periodontitis history is a major risk indicator for peri-implantitis.

In contrast, implants placed in endodontically compromised sites appear less vulnerable once proper debridement and healing have occurred.

Although both groups reported high satisfaction, the slightly higher VAS score in the endodontic group (8.7 vs 8.2) reflects better clinical performance. This echoes findings from Schou S et al. (2006) [11], who noted that while implant survival is generally favorable across etiologies, patients with prior periodontal disease often experience more biological complications, which may indirectly affect satisfaction.

5. FUTURE AIMS AND SCOPE

AI-driven algorithms can analyse radiographic datasets (CBCT, periapical radiographs) to predict implant survival risks based on site conditions, bone density, and patient history. Machine learning can also aid in the early detection of peri-implantitis through automated monitoring of clinical and radiographic changes [12].

The Metaverse can revolutionise education and training in implantology by creating immersive 3D simulations where clinicians practice implant placement in complex endodontic- or periodontitis-related scenarios. Virtual patient avatars, modelled from real patient datasets, could allow risk-free rehearsal of surgical techniques before actual treatment [13]. Metaverse platforms can provide patients with personalized visualizations of their oral health status and implant treatment plan, increasing understanding, compliance, and satisfaction.

International teams can meet in Metaverse-based “virtual labs” to share live implant surgery simulations, datasets, and AI analytics, fostering global collaboration without geographical barriers [14].

6. CONCLUSION

Collectively, these results indicate that implants placed in sites with prior endodontic failure perform comparably to those placed in healthy sites, while implants in periodontally compromised patients are at higher risk of biological complications and reduced survival. The findings reinforce the need for rigorous periodontal therapy, maintenance protocols, and careful case selection when treating periodontitis patients with implants.

REFERENCES

[1] Chatzopoulos GS, Wolff LF. Assessing the Long-Term Survival of Dental Implants in A Retrospective Analysis: Immediate Versus Delayed Placement. Clin Exp Dent Res. 2025 Feb;11(1):e70096. doi: 10.1002/cre2.70096. PMID: 40051165; PMCID: PMC11885415.

[2] Sălceanu, M.; Melian, A.; Dascălu, C.; Giuroiu, C.; Concita, C.; Topoliceanu, C.; Melian, D.; Frumuzache, A.; Solomon, S.M.; Mârţu, M.-A. Endo-Periodontal Lesions in Endodontically Treated Teeth with Periapical Pathology. Diagnostics 2025, 15, 1663. https://doi.org/10.3390/diagnostics15131663

[3] Kadkhodazadeh M, Amid R. A New Classification for the Relationship between Periodontal, Periapical, and Peri-implant Complications. Iran Endod J. 2013 Summer;8(3):103-8. Epub 2013 Aug 1. PMID: 23922570; PMCID: PMC3734511.

[4] Kligman S, Ren Z, Chung CH, Perillo MA, Chang YC, Koo H, Zheng Z, Li C. The Impact of Dental Implant Surface Modifications on Osseointegration and Biofilm Formation. J Clin Med. 2021 Apr 12;10(8):1641. doi: 10.3390/jcm10081641. PMID: 33921531; PMCID: PMC8070594.

[5] Setzer FC, Kim S. Comparison of long-term survival of implants and endodontically treated teeth. J Dent Res. 2014 Jan;93(1):19-26. doi: 10.1177/0022034513504782. Epub 2013 Sep 24. PMID: 24065635; PMCID: PMC3872851.

[6] Paterson C, Roberts C, Bail K. 'Paper care not patient care': Nurse and patient experiences of comprehensive risk assessment and care plan documentation in hospital. J Clin Nurs. 2023 Feb;32(3-4):523-538. doi: 10.1111/jocn.16291. Epub 2022 Mar 29. PMID: 35352417; PMCID: PMC10084263.

[7] Karoussis IK, Salvi GE, Heitz-Mayfield LJ, Brägger U, Hämmerle CH, Lang NP. Long-term implant prognosis in patients with and without a history of chronic periodontitis: a 10-year prospective cohort study of the ITI Dental Implant System. Clin Oral Implants Res. 2003 Jun;14(3):329-39. doi: 10.1034/j.1600-0501.000.00934.x. PMID: 12755783.

[8] Machtei EE, Mahler D, Oettinger-Barak O, Zuabi O, Horwitz J. Dental implants placed in previously failed sites: survival rate and factors affecting the outcome. Clin Oral Implants Res. 2008 Mar;19(3):259-64. doi: 10.1111/j.1600-0501.2007.01466.x. Epub 2008 Jan 3. PMID: 18177430.

[9] Ferrarotti F, Baima G, Mohammadi G, Carboncini C, Romano F, Aimetti M. Peri-Implant Soft Tissue Increase at Small Buccal Bone Dehiscences With Either Volume-Stable Collagen Matrix or Connective Tissue Graft: A Randomized Controlled Trial. Clin Oral Implants Res. 2025 Jul;36(7):846-858. doi: 10.1111/clr.14430. Epub 2025 Mar 19. PMID: 40105088; PMCID: PMC12230890.

[10] Stacchi C, Berton F, Perinetti G, Frassetto A, Lombardi T, Khoury A, Andolsek F, Di Lenarda R. Risk Factors for Peri-Implantitis: Effect of History of Periodontal Disease and Smoking Habits. A Systematic Review and Meta-Analysis. J Oral Maxillofac Res. 2016 Sep 9;7(3):e3. doi: 10.5037/jomr.2016.7303. PMID: 27833728; PMCID: PMC5100643.

[11] Schou S, Holmstrup P, Worthington HV, Esposito M. Outcome of implant therapy in patients with previous tooth loss due to periodontitis. Clin Oral Implants Res. 2006 Oct;17 Suppl 2:104-23. doi: 10.1111/j.1600-0501.2006.01347.x. PMID: 16968387.

[12] Anand S, Shyamala N, Vaishnavi I, Ramanathan R. Artificial Intelligence and Deep Learning in Endodontics: A Literature Review. Oral Sphere J Dent Health Sci. (2025); 1(2): 111-115. https://doi.org/10.63150/osjdhs.2025.7

[13] Brar ADK, K M P, Das M, Saxena P, Kulkarani K, Priya P, Kashwani R. Metaverse in dentistry: Bridging virtual innovation with real-world patient care and education. Bioinformation. 2025 Feb 28;21(2):262-267. doi: 10.6026/973206300210262. PMID: 40322712; PMCID: PMC12044159.

[14] Kashwani, R., Sawhney, H. (2025). Dentistry and metaverse: A deep dive into potential of blockchain, NFTs, and crypto in healthcare. Int Dent J Stud Res, 11(3), 94-98. https://doi.org/10.18231/j.idjsr.2023.021