



ORIGINAL RESEARCH PAPER

Maxillofacial Surgery

A PROSPECTIVE COMPARATIVE OBSERVATIONAL CLINICAL STUDY EVALUATING OUTCOMES AND COMPLICATIONS OF SCREW-RETAINED VERSUS CEMENT-RETAINED IMPLANT PROSTHESES

KEY WORDS: Dental Implants; Screw-retained Prosthesis; Cement-retained Prosthesis; Peri-implantitis; Marginal Bone Loss

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ABSTRACT

Background Dental implant-supported prostheses are widely used for the rehabilitation of missing teeth. The method of prosthesis retention—screw-retained or cement-retained—plays a crucial role in determining clinical success, biological response, and long-term maintenance. However, there remains an ongoing debate regarding the superiority of these retention systems. **Aim** To comparatively evaluate clinical outcomes, biological and mechanical complications, and patient satisfaction between screw-retained and cement-retained implant-supported prostheses. **Study Design** A Prospective Comparative Observational Clinical Study **Methodology** A total of 60 patients requiring single implant-supported prosthetic rehabilitation were included and divided into two groups: screw-retained prostheses (n = 30) and cement-retained prostheses (n = 30). Patients were equally divided into two groups (screw-retained and cement-retained) in a non-randomized manner, with allocation determined based on clinical feasibility and operator decision rather than random assignment. Clinical and radiographic evaluations were performed at baseline, 6 months, and 12 months. Parameters assessed included marginal bone loss, peri-implant soft tissue health, prosthetic complications, and patient satisfaction. Statistical analysis was conducted using independent t-tests and chi-square tests, with significance set at $p < 0.05$. **Results** The screw-retained group demonstrated significantly lower marginal bone loss at 6 months (0.45 ± 0.12 mm) and 12 months (0.78 ± 0.20 mm) compared to the cement-retained group (0.62 ± 0.15 mm and 1.12 ± 0.25 mm, respectively) ($p < 0.05$). Peri-implant mucositis was observed in 3 patients (10%) in the screw-retained group and 8 patients (26.7%) in the cement-retained group. Peri-implantitis occurred in 1 patient (3.3%) in the screw-retained group and 5 patients (16.7%) in the cement-retained group. Mechanical complications included screw loosening in 6 patients (20%) and crown decementation in 5 patients (16.7%). Aesthetic satisfaction scores were higher in the cement-retained group, whereas maintenance satisfaction was higher in the screw-retained group. **Conclusion** Screw-retained implant prostheses demonstrate superior biological outcomes and ease of maintenance, while cement-retained prostheses provide improved aesthetics. The choice of retention system should be individualized based on clinical requirements and aesthetic considerations.

INTRODUCTION

Dental implant therapy has emerged as a predictable and widely accepted modality for replacing missing teeth, with long-term survival rates exceeding 90–95% [1,2]. Successful implant rehabilitation depends not only on osseointegration but also on the design and retention mechanism of the prosthetic superstructure. Among these, the prosthesis retention method plays a critical role in determining biological stability, mechanical reliability, and patient satisfaction [3].

Implant-supported prostheses are primarily retained using

either screw-retained or cement-retained systems. Screw-retained prostheses are directly attached to the implant using fixation screws, offering the advantage of retrievability. This helps in easier maintenance, repair, and management of biological or mechanical complications [4]. However, screw access openings may compromise aesthetics, particularly in the anterior region, and may influence occlusal morphology if not effectively managed.

In contrast, cement-retained prostheses provide superior aesthetics due to the absence of screw access channels and

allow for improved occlusal design and passive fit [5]. Despite these advantages, residual cement has been identified as a significant etiological factor contributing to peri-implant inflammation, mucositis, and peri-implantitis [6,7]. Incomplete removal of excess cement stays a clinical challenge and may adversely affect long-term implant success.

Earlier systematic reviews and clinical studies have reported conflicting outcomes about the superiority of these retention systems [8,9]. While screw-retained prostheses are commonly associated with mechanical complications such as screw loosening, cement-retained prostheses tend to show a higher incidence of biological complications, including peri-implant mucositis and peri-implantitis [10]. Additionally, patient-centred outcomes such as aesthetics and maintenance convenience play a crucial role in treatment planning.

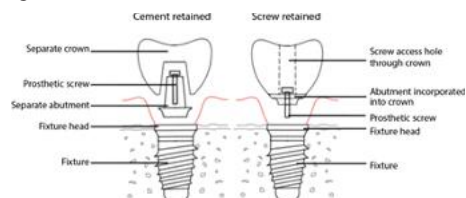


Figure 1: Structural Differences Between Cement-Retained and Screw-Retained Implant Prostheses

Given these considerations, there is still a need for well-designed prospective clinical studies comparing these two retention systems under standardised conditions. Therefore, the present study was undertaken to evaluate and compare marginal bone loss, peri-implant health, mechanical complications, and patient satisfaction between screw-retained and cement-retained implant-supported prostheses.

MATERIALS AND METHODS

Study Design

This prospective clinical study was carried out over 12 months to evaluate and compare clinical outcomes and complications associated with screw- and cement-retained implant-supported prostheses.

Study Setting

The study was carried out in the Department of Oral and Maxillofacial Surgery at Panineeya Mahavidyalaya Institute of Dental Sciences and Research Centre. All clinical procedures were performed under standardised protocols by experienced clinicians.

Ethical Approval and Consent

Ethical approval for the study was obtained from the Institutional Ethical Committee. The study was conducted under the Declaration of Helsinki.

Written informed consent was obtained from all participants before inclusion in the study.

Sample Size and Study Population

A total of 60 patients requiring single implant-supported prosthetic rehabilitation were included in the study. Patients were equally divided into two groups (screw-retained and cement-retained) in a non-randomized manner, with allocation determined by clinical feasibility and operator decision rather than random assignment.

- Group I: Screw-retained prosthesis (n = 30)
- Group II: Cement-retained prosthesis (n = 30)

The sample size was decided based on earlier similar clinical studies and the feasibility of recruitment within the study duration.

Inclusion Criteria

- Patients aged between 20–60 years
- Patients needing single tooth implant-supported prosthesis
- Adequate bone volume for implant placement
- Good oral hygiene status
- Patients willing to take part and follow the follow-up protocol

Exclusion Criteria

- Patients with uncontrolled systemic diseases (e.g., diabetes, immunocompromised conditions)
- Smokers and tobacco users
- Patients with active periodontal disease
- Patients with parafunctional habits (bruxism)
- Pregnant or lactating women
- Patients with poor compliance or unwillingness to follow up

Clinical Procedure

All patients underwent implant placement under standardised surgical protocols. Following a healing period to allow osseointegration, prosthetic rehabilitation was performed according to group allocation.

- In Group I, prostheses were placed using screw fixation directly to the implant.
- In Group II, prostheses were cemented using provisional or permanent luting agents, ensuring removal of excess cement.

Outcome Measures

The following parameters were assessed:

Primary Outcome

Marginal Bone Loss (MBL):

Measured radiographically using standardized intraoral periapical radiographs at baseline, 6 months, and 12 months.

Secondary Outcomes

- **Peri-implant soft tissue health:** Assessed using plaque index and bleeding on probing
- **Biological complications:** Presence of peri-implant mucositis and peri-implantitis
- **Mechanical complications:** Screw loosening, prosthesis decementation
- **Patient satisfaction:** Evaluated using a structured questionnaire (aesthetic and maintenance satisfaction)

Follow-up Protocol

Patients were evaluated at:

- Baseline
- 6 months
- 12 months

All assessments were performed by calibrated examiners to ensure consistency.

Statistical Analysis

Data were analyzed using statistical software (SPSS version XX or equivalent).

- Continuous variables (e.g., marginal bone loss) were expressed as mean $\pm$ standard deviation
- Categorical variables (e.g., complications) were expressed as frequencies and percentages

Statistical tests used:

- Independent t-test for comparison of mean values
- Chi-square test for categorical variables

A p-value of < 0.05 was considered statistically significant. A total of 60 patients were included in the study, with 30 patients in each group. All patients completed the 12-month follow-up period, and no dropouts were reported.

Marginal Bone Loss
 Marginal bone loss (MBL) was significantly lower in the screw-retained group compared to the cement-retained group at both 6 and 12 months.

Table 1: Comparison of Marginal Bone Loss (mm)

Time Interval	Screw-Retained (Mean ± SD)	Cement-Retained (Mean ± SD)	p-value
6 months	0.45 ± 0.12 mm	0.62 ± 0.15 mm	0.003*
12 months	0.78 ± 0.20 mm	1.12 ± 0.25 mm	0.001*

Statistically significant

Interpretation:
 The screw-retained group showed significantly less marginal bone loss at both follow-up intervals.

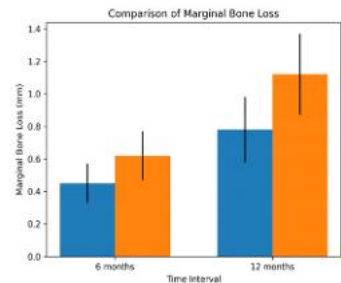


Figure 2. Comparison of marginal bone loss between screw-retained and cement-retained implant prostheses at 6 and 12 months. The cement-retained group showed significantly greater bone loss at both time intervals ($p < 0.05$).

Biological Complications
 Biological complications were more frequently observed in the cement-retained group.

Table 2: Distribution of Biological Complications

Complication	Screw-Retained (n=30)	Cement-Retained (n=30)	p-value
Mucositis	3 (10%)	8 (26.7%)	0.048*
Peri-implantitis	1 (3.3%)	5 (16.7%)	0.041*

Statistically significant

Interpretation:
 The cement-retained group showed a significantly higher incidence of peri-implant diseases.

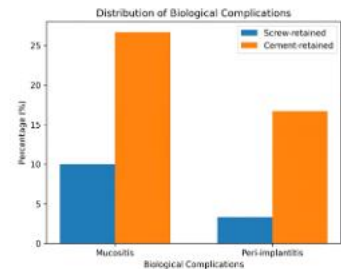


Figure 3. Distribution of biological complications in screw-retained and cement-retained implant prostheses. The cement-retained group proved a significantly higher incidence of mucositis and peri-implantitis ($p < 0.05$).

Mechanical Complications
 Mechanical complications differed between the two groups.

Table 3: Mechanical Complications

Complication	Screw-Retained (n=30)	Cement-Retained (n=30)	p-value
Screw loosening	6 (20%)	0 (0%)	0.010*
Decementation	0 (0%)	5 (16.7%)	0.020*

Statistically significant

Interpretation: Screw loosening was observed only in the screw-retained group, whereas prosthesis decementation was seen exclusively in the cement-retained group.

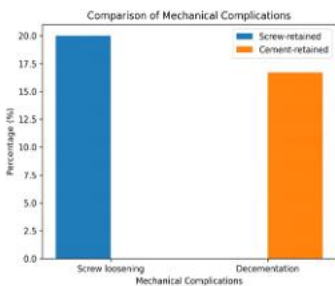


Figure 4. Mechanical complications seen in screw-retained and cement-retained implant prostheses. Screw loosening was exclusive to the screw-retained group, while decementation occurred only in the cement-retained group ($p < 0.05$).

Patient Satisfaction
 Patient satisfaction was assessed based on esthetic and maintenance parameters.

Table 4: Patient Satisfaction Scores

Parameter	Screw-Retained	Cement-Retained	p-value
Esthetic Satisfaction	Moderate	High	0.032*
Maintenance Satisfaction	High	Moderate	0.028*

Statistically significant

Interpretation:
 Cement-retained prostheses showed higher esthetic satisfaction, whereas screw-retained prostheses demonstrated superior maintenance satisfaction.

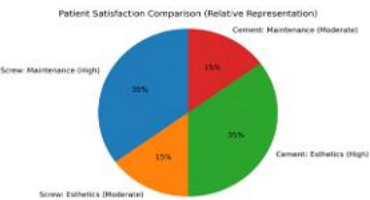


Figure 5. Graphical overview of patient satisfaction outcomes. Cement-retained prostheses demonstrated higher esthetic satisfaction, whereas screw-retained prostheses showed superior maintenance satisfaction ($p < 0.05$).

DISCUSSION
 The present prospective clinical study compared screw-retained and cement-retained implant-supported prostheses with respect to marginal bone loss, biological and mechanical complications, and patient satisfaction. The findings indicate that screw-retained prostheses demonstrate superior biological outcomes, whereas cement-retained prostheses provide enhanced esthetic satisfaction.

Figure 6: Clinical Presentation of Cement-Retained Versus Screw-Retained Implant Prostheses



Cemented prosthesis

Screw-retained prosthesis

Marginal bone loss was significantly lower in the screw-retained group at both 6 and 12 months. This finding is consistent with previous studies that have highlighted the role of residual cement as a major contributing factor to peri-implant inflammation and bone loss [6,7]. Linkevicius et al. reported that even minimal excess cement can induce inflammatory reactions, leading to progressive peri-implant bone resorption [6]. Similarly, Korsch and Walther demonstrated a higher prevalence of peri-implant disease in cement-retained restorations due to undetected cement remnants [7].

The incidence of biological complications, including peri-implant mucositis and peri-implantitis, was significantly higher in the cement-retained group. These results are in agreement with previous systematic reviews that have emphasized the association between cement-retained prostheses and increased biological complications [8,9]. Schwarz et al. further reported that peri-implant diseases are strongly influenced by local irritants such as residual cement, which can act as a nidus for bacterial accumulation [10].

In contrast, screw-retained prostheses eliminate the risk of excess cement, thereby reducing the likelihood of peri-implant inflammation. However, mechanical complications such as screw loosening were observed in this group. This finding aligns with earlier studies by Wittneben et al., which reported screw loosening as a common mechanical complication associated with screw-retained restorations [4]. Despite this, such complications are generally manageable due to the retrievability of screw-retained prostheses, which allows for non-invasive correction.

Cement-retained prostheses, on the other hand, exhibited complications such as decementation. While these restorations offer improved esthetics and passive fit, their retrieval can be challenging and may require invasive procedures, potentially compromise the integrity of the prosthesis and surrounding tissues [5].

Patient satisfaction outcomes revealed a clear distinction between the two systems. Cement-retained prostheses demonstrated higher esthetic satisfaction due to the absence of screw access openings, which can affect appearance, especially in the anterior region. Conversely, screw-retained prostheses showed higher maintenance satisfaction, as they allow easier access for repair and hygiene maintenance. These findings are consistent with previous reports emphasizing the importance of balancing esthetics with long-term maintenance in implant prosthodontics [3].

Recent advancements, such as angulated screw channel systems, have attempted to overcome esthetic limitations associated with screw-retained prostheses. Mangano et al.

demonstrated that these systems significantly improve esthetic outcomes while maintaining the advantages of retrievability [14]. Such innovations may further shift clinical preference toward screw-retained systems in the future.

Despite the strengths of this study, certain limitations must be acknowledged. The sample size was relatively small, and the follow-up period was limited to 12 months. Long-term studies with larger sample sizes are required to validate these findings. Additionally, variations in operator skill and cementation techniques may influence outcomes and should be standardized in future research.

Overall, the findings of this study suggest that screw-retained prostheses offer superior biological stability and ease of maintenance, whereas cement-retained prostheses provide better esthetic outcomes. The choice of retention system should therefore be individualized based on clinical requirements, aesthetic demands, and patient-specific factors.

CONCLUSION

Within the limitations of this prospective clinical study, screw-retained implant prostheses demonstrated superior biological outcomes, with significantly lower marginal bone loss and reduced incidence of peri-implant diseases compared to cement-retained prostheses. Cement-retained prostheses, however, provided better aesthetic outcomes due to the absence of screw access openings.

Mechanical complications differed between the two systems, with screw loosening observed in screw-retained prostheses and decementation in cement-retained prostheses. While screw-retained restorations allow easier retrievability and maintenance, cement-retained restorations offer improved occlusal morphology and aesthetics.

Therefore, the selection of prosthesis retention type should be based on a comprehensive evaluation of biological, mechanical, and aesthetic considerations tailored to individual patient needs.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

CONSENT

As per international standards, written informed consent has been collected and preserved by the author(s).

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study. No financial or personal relationships influenced the outcomes or reporting of this research.

Funding Statement

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COMPETING INTERESTS

The authors have declared that no competing interests exist.

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