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Evaluation of Soft Tissues Around Single Tooth Implants in the Anterior Maxilla Restored With Cemented and Screw-Retained Crowns

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Abstract

Background

The aesthetic and functional success of dental implants, especially in the anterior maxilla, is critically dependent on the health and stability of the surrounding soft tissues. This study aims to evaluate the soft tissue parameters around single tooth implants restored with either cemented or screw-retained crowns.

Materials and Methods

A total of 40 patients with single tooth implants in the anterior maxilla were selected for this study. The patients were divided into two groups: Group A (n=20) with cemented crowns and Group B (n=20) with screw-retained crowns. Clinical parameters such as probing depth (PD), clinical attachment level (CAL), bleeding on probing (BOP), and keratinized tissue width (KTW) were measured at baseline and after 6 months. Soft tissue esthetics were assessed using the Pink Esthetic Score (PES).

Results

At the 6-month follow-up, Group A showed a mean PD of 2.5 ± 0.4 mm, CAL of 2.8 ± 0.3 mm, and KTW of 3.2 ± 0.5 mm. In contrast, Group B demonstrated a mean PD of 2.3 ± 0.5 mm, CAL of 2.6 ± 0.4 mm, and KTW of 3.4 ± 0.6 mm. The mean PES was 11.2 ± 1.3 for Group A and 11.8 ± 1.4 for Group B. There were no statistically

significant differences between the groups in terms of PD, CAL, BOP, KTW, and PES ($p>0.05$).

Conclusion

Both cemented and screw-retained crowns on single tooth implants in the anterior maxilla showed comparable outcomes in terms of soft tissue health and esthetics. The choice of restoration method should be based on clinical judgment and patient preference, as both options provide satisfactory results.

Keywords

Single tooth implants, anterior maxilla, cemented crowns, screw-retained crowns, soft tissue evaluation, pink esthetic score, clinical attachment level, keratinized tissue width.

Introduction

The anterior maxilla is a critical aesthetic zone in dentistry, where the success of dental implants is highly dependent on the health and stability of the surrounding soft tissues. The restoration of single tooth implants in this region requires careful consideration to achieve optimal functional and aesthetic outcomes. Two common methods for implant-supported restorations are cemented crowns and screw-retained crowns, each with its advantages and potential drawbacks.

Cemented crowns are known for their excellent aesthetic integration due to the absence of visible screw access holes and the ability to achieve a more natural emergence profile (1). However, they may pose challenges such as difficulty in retrieving the prosthesis and the potential risk of cement-induced peri-implantitis if excess cement is not properly removed (2). On the other hand, screw-retained crowns facilitate easy retrieval and maintenance, reducing the risk of biological complications, but they may compromise aesthetics due to visible screw access holes and may present challenges in achieving an optimal emergence profile (3).

Previous studies have compared the clinical and aesthetic outcomes of these two restoration methods, but the results have been inconclusive. Some studies suggest that screw-retained crowns are associated with better peri-implant tissue health due to easier maintenance (4), while others report no significant differences between the two methods in terms of soft tissue health and stability (5). Given these conflicting findings, further research is necessary to provide clearer insights into the comparative performance of cemented and screw-retained crowns in the anterior maxilla.

This study aims to evaluate the soft tissue parameters around single tooth implants in the anterior maxilla restored with cemented and screw-retained crowns. By assessing clinical parameters such as probing depth (PD), clinical attachment level (CAL), bleeding on probing (BOP), and keratinized tissue width (KTW), along with the Pink Esthetic Score (PES), this study seeks to determine whether there are significant differences in the outcomes of these two restoration methods. The findings will contribute to the existing body of knowledge and assist clinicians in making informed decisions regarding the most suitable restoration method for implants in the aesthetic zone.

Materials and Methods

Study Design and Participants

This prospective clinical study was conducted. The study included 40 patients (20 males and 20 females) aged between 25 and 50 years, who required single tooth implant placement in the anterior maxilla. Patients were selected based on the following inclusion criteria: good general health, non-smokers, adequate bone volume for implant placement, and willingness to participate in the study. Exclusion criteria included systemic conditions affecting healing (e.g., diabetes), active periodontal disease, and previous implant failure.

Implant Placement and Restoration

All patients underwent a standardized surgical protocol for implant placement. Implants were placed using a two-stage surgical approach, allowing for a healing period of 3 months before the second-stage surgery. Following osseointegration, patients were randomly assigned into two groups:

- Group A (n=20): Restored with cemented crowns
- Group B (n=20): Restored with screw-retained crowns

Prosthetic Procedure

For Group A, cemented crowns were fabricated and cemented using a temporary cement to facilitate potential future retrieval. Special care was taken to remove any excess cement. For Group B, screw-retained crowns were fabricated and torqued to the manufacturer's recommended values. Screw access holes were filled with composite resin to match the adjacent tooth color.

Clinical Parameters Assessment

Clinical parameters were measured at baseline (before crown placement) and at 6 months post-restoration. The parameters included:

- **Probing Depth (PD):** Measured at six sites per implant using a periodontal probe.
- **Clinical Attachment Level (CAL):** Recorded at the same six sites per implant.
- **Bleeding on Probing (BOP):** Assessed as the presence or absence of bleeding within 15 seconds after probing.
- **Keratinized Tissue Width (KTW):** Measured from the gingival margin to the mucogingival junction.

Aesthetic Assessment

The aesthetic outcome was evaluated using the Pink Esthetic Score (PES), which assesses the following parameters: mesial papilla, distal papilla, soft tissue level, soft tissue contour, alveolar process, soft tissue color, and soft tissue texture. Each parameter was scored on a scale from 0 (worst) to 2 (best), with a maximum possible score of 14.

Statistical Analysis

Data were analyzed using SPSS software (version 25.0; IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated for all variables. Differences between groups were analyzed using the independent t-test for continuous variables and the chi-square test for categorical variables. Statistical significance was set at $p<0.05$.

Results

Clinical Parameters

The clinical parameters were assessed at baseline and at the 6-month follow-up. The results are summarized in Table 1.

Table 1: Clinical Parameters at Baseline and 6-Month Follow-Up

Parameter	**Group A (Cemented Crowns)**	**Group B (Screw-Retained Crowns)**	**p-value**
	Baseline	6 Months	Baseline
Probing Depth (PD) (mm)	2.6 ± 0.5	2.5 ± 0.4	2.5 ± 0.6
Clinical Attachment Level	2.9 ± 0.4	2.8 ± 0.3	2.7 ± 0.5
(CAL) (mm)			
Bleeding on Probing (BOP)	20%	15%	25%
Keratinized Tissue Width	3.3 ± 0.6	3.2 ± 0.5	3.5 ± 0.5
(KTW) (mm)			

At the 6-month follow-up, Group A exhibited a mean PD of 2.5 ± 0.4 mm, CAL of 2.8 ± 0.3 mm, and KTW of 3.2 ± 0.5 mm. Group B demonstrated a mean PD of 2.3 ± 0.5 mm, CAL of 2.6 ± 0.4 mm, and KTW of 3.4 ± 0.6 mm. There were no statistically significant differences between the two groups in any of the clinical parameters ($p>0.05$).

Aesthetic Parameters

The aesthetic outcomes were evaluated using the Pink Esthetic Score (PES). The results are summarized in Table 2.

Table 2: Pink Esthetic Score (PES) at 6-Month Follow-Up

Parameter	Group A (Cemented Crowns)	Group B (Screw-Retained Crowns)	p-value
Mesial Papilla	1.6 ± 0.5	1.7 ± 0.4	0.40
Distal Papilla	1.5 ± 0.6	1.6 ± 0.5	0.42
Soft Tissue Level	1.8 ± 0.4	1.9 ± 0.3	0.35
Soft Tissue Contour	1.7 ± 0.5	1.8 ± 0.4	0.38
Alveolar Process	1.6 ± 0.5	1.7 ± 0.5	0.39
Soft Tissue Color	1.8 ± 0.3	1.9 ± 0.3	0.30
Soft Tissue Texture	1.7 ± 0.4	1.8 ± 0.3	0.35
Total PES	**11.2 ± 1.3**	**11.8 ± 1.4**	0.28

The mean PES was 11.2 ± 1.3 for Group A and 11.8 ± 1.4 for Group B. There were no statistically significant differences between the two groups in any of the individual PES parameters or the total PES ($p>0.05$).

Both cemented and screw-retained crowns on single tooth implants in the anterior maxilla showed comparable outcomes in terms of soft tissue health and esthetics. The choice of restoration method should be based on clinical judgment and patient preference, as both options provide satisfactory results.

Discussion

This study aimed to evaluate the soft tissue parameters around single tooth implants in the anterior maxilla restored with either cemented or screw-retained crowns. The findings indicate that both restoration methods result in comparable outcomes in terms of soft tissue health and aesthetics, with no statistically significant differences observed between the two groups.

The mean probing depth (PD) and clinical attachment level (CAL) were similar between the groups at the 6-month follow-up, suggesting that both cemented and screw-retained crowns maintain peri-implant tissue health effectively. These results are consistent with previous studies that have found no significant differences in PD and CAL between cemented and screw-retained restorations (1,2). Furthermore, the absence of significant differences in bleeding on probing (BOP) between the groups indicates that both restoration methods have a similar impact on peri-implant mucosal inflammation.

Keratinized tissue width (KTW) is an important factor for peri-implant health, providing a protective barrier against mechanical and microbial challenges (3). In this study, both groups exhibited comparable KTW values, further supporting the notion that both cemented and screw-retained crowns can maintain adequate soft tissue dimensions around implants. This finding aligns with other studies that have reported no significant differences in KTW between these two types of restorations (4).

Aesthetic outcomes, as assessed by the Pink Esthetic Score (PES), were also similar between the groups. The mean PES values for both cemented and screw-retained crowns were within the acceptable range, indicating satisfactory soft tissue aesthetics. This finding corroborates previous research that has shown similar PES outcomes for cemented and screw-retained implant restorations. The PES parameters, including mesial and distal papilla, soft tissue level, contour, color, and texture, did not differ significantly between the groups, suggesting that both restoration methods can achieve comparable aesthetic results (5-9).

Despite the advantages of screw-retained crowns, such as easier retrieval and maintenance, the aesthetic outcomes were not compromised in this study, as evidenced by the PES results. This can be attributed to meticulous prosthetic planning and execution, including the careful management of screw access holes with composite resin to match the adjacent tooth color. Conversely, cemented crowns, known for their superior aesthetic integration due to the absence of screw access holes, did not show a significant aesthetic advantage over screw-retained crowns in this study.

One of the limitations of this study is the relatively short follow-up period of 6 months. Long-term studies are needed to evaluate the durability of the soft tissue outcomes and to identify any potential late complications associated with each restoration method. Additionally, the study's sample size was limited, and larger studies are required to confirm these findings.

Conclusion

In conclusion, this study demonstrates that both cemented and screw-retained crowns on single tooth implants in the anterior maxilla provide comparable outcomes in terms of soft tissue health and aesthetics. The choice of restoration method should be based on clinical judgment, patient preferences, and specific case requirements, as both options are viable for achieving satisfactory results.

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