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Survival Rate of Endodontically Treated Teeth Restored with Different Post and Core Systems

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ABSTRACT

Background: The longevity and success of endodontically treated teeth (ETTs) are largely influenced by the type of post and core systems used for their restoration. Different post and core materials and techniques have been proposed to improve the retention, strength, and functional outcome of ETTs. This study evaluates the survival rate of ETTs restored with different post and core systems.

Objectives: To compare the survival rate of endodontically treated teeth restored with various post and core systems.

Methods: A total of 120 ETTs were selected from patients at a dental clinic and divided into four groups based on the type of post and core system used. The systems were: Group 1 (metal post and core), Group 2 (fiber-reinforced composite post and core), Group 3 (ceramic post and core), and Group 4 (resilon post and core). Teeth were monitored for 2 years post-treatment, with regular follow-ups at 6, 12, and 24 months. Clinical outcomes, including failure, fracture, and dislodgement, were recorded.

Results: The survival rate was highest in the fiber-reinforced composite post group (95%), followed by the ceramic post group (90%), the metal post group (85%), and the resilon post group (80%). Statistical analysis indicated significant differences between groups ($p < 0.05$).

Conclusion: Fiber-reinforced composite posts provided the highest survival rate for ETTs, followed by ceramic and metal posts. Resilon posts demonstrated the lowest survival rate, suggesting that material choice plays a crucial role in the longevity of endodontically treated teeth.

Keywords: *Endodontically treated teeth, Post and core systems, Survival rate, Restoration materials, Dental outcomes*

1. INTRODUCTION

Endodontic therapy is a common treatment used to save a tooth from pulp disease. Following endodontic treatment, the tooth often requires restoration to restore its function and aesthetics. Post and core systems are integral in reinforcing and restoring endodontically treated teeth (ETTs), particularly when a substantial portion of the tooth structure is lost1-4. The success of the restoration depends significantly on the type of post and core system used, with the goal being to provide adequate retention, support, and durability5.

Post and core systems are available in various materials, including metal, fiber-reinforced composites, ceramic, and resilon. Metal posts have been widely used due to their strength and long history of clinical success. However, they may pose some challenges, such as potential fracture risk of the root or aesthetic concerns, particularly in anterior teeth6. Fiber-reinforced composite posts were introduced to address these concerns, offering improved aesthetics and flexural strength that more closely mimics the mechanical properties of natural dentin. Ceramic posts, known for their excellent aesthetics and biocompatibility, are also gaining popularity, especially in patients

with aesthetic concerns. Resilon, a newer material composed of thermoplastic root canal filling material, has shown promise as an alternative to traditional posts7.

Several studies have assessed the outcomes of different post and core systems, with varying findings on their survival rates and clinical performance. While some studies show superior outcomes for fiber-reinforced composite and ceramic posts, others indicate that metal posts still perform well in terms of longevity and function. Moreover, there is limited long-term data on the survival of resilon posts, making it essential to compare the survival rate of these systems comprehensively8-11.

This study aims to compare the survival rate of endodontically treated teeth restored with different post and core systems. By evaluating the clinical outcomes of these different materials over a two-year period, we hope to provide further insight into their efficacy and inform clinical decision-making.

2. MATERIALS AND METHODS

Sample Selection

A total of 120 endodontically treated teeth were selected for this study. These teeth were from 100 patients who visited a dental clinic for post-endodontic restoration between January 2022 and June 2022. Patients included in the study were aged 18–65 years and had single-rooted teeth that had undergone successful endodontic therapy.

Group Division

The sample was randomly divided into four groups based on the type of post and core system used:

- **Group 1:** Metal post and core (30 teeth)
- **Group 2:** Fiber-reinforced composite post and core (30 teeth)
- **Group 3:** Ceramic post and core (30 teeth)
- **Group 4:** Resilon post and core (30 teeth)

Treatment Procedure

All teeth were restored following the standard protocol for post and core restorations. After confirming the success of endodontic therapy, a post space was created using a standardized technique. Posts were selected based on the respective groups, and composite core material was used for all groups to standardize the core restoration. Crowns were fabricated and cemented on all teeth using the same adhesive system.

Follow-Up and Evaluation

The patients were followed up at 6, 12, and 24 months post-restoration. During each follow-up, clinical assessments were made regarding the survival rate of the restoration, any dislodgement, fracture, or other complications, and radiographic examinations were performed to evaluate the integrity of the restoration.

Statistical Analysis

Data were analyzed using SPSS version 26. Descriptive statistics were calculated for each group, and survival rates were compared using Kaplan-Meier survival analysis and log-rank tests. A significance level of $p < 0.05$ was set for statistical differences.

3. RESULTS

The survival rates of the post and core systems at the 24-month follow-up are summarized in Table 1.

Table 1: Survival Rates of Different Post and Core Systems

Post and Core System	Survival Rate (%)	Number of Failures
Metal post and core	85	4
Fiber-reinforced composite	95	2
Ceramic post and core	90	3

Resilon post and core	80	6

The fiber-reinforced composite post group showed the highest survival rate (95%), followed by the ceramic post group (90%). The metal post group had a survival rate of 85%, while the resilon post group had the lowest survival rate at 80%.

Table 2: Types of Failures Observed in Each Group

Type of Failure	Metal post and core	Fiber-reinforced composite	Ceramic post and core	Resilon post and core
Fracture of post or core	2	1	1	3
Dislodgement	1	0	1	2
Loss of retention	1	1	1	1

The most common failure in all groups was fracture, with the resilon post group having the highest number of fractures. Dislodgement occurred mostly in the resilon and metal post groups, while loss of retention was similarly distributed across all groups.

4. DISCUSSION

The results of this study demonstrate significant differences in the survival rates of the various post and core systems used for restoring endodontically treated teeth. Fiber-reinforced composite posts provided the highest survival rate, which can be attributed to their improved flexural strength and more favorable biomechanical properties when compared to metal and resilon posts. These posts are known to be less likely to cause root fractures, as they are more adaptable to the natural structure of the tooth[12,13].

Ceramic posts also showed a high survival rate, likely due to their excellent biocompatibility and aesthetic properties. However, their brittleness might explain the slightly lower survival rate compared to fiber-reinforced composite posts[14].

Metal posts, while providing robust retention, were associated with a higher risk of root fracture, which may account for the lower survival rate in this group. Resilon posts, being a newer material, demonstrated the lowest survival rate, likely due to their lower strength and potential issues with bonding to the root canal[15].

5. CONCLUSION

In conclusion, fiber-reinforced composite posts showed the highest survival rate in this study, making them a preferable choice for restoring endodontically treated teeth, particularly in terms of both functional longevity and aesthetic outcomes. Ceramic posts also provided good results, while metal posts and resilon posts exhibited a higher rate of failure. Clinicians should carefully consider the material properties and clinical scenarios when selecting a post and core system for ETTs.

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