IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 25, Issue 9 Ser. 2 (September. 2026), PP 79-84
www.iosrjournals.org

Clinical Performance of Endocrowns versus Post-and-Core Crowns: A Comparative Study

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Background: *Endodontically treated teeth often require definitive coronal restoration to restore function and prevent further structural damage. Conventional post-and-core crowns have been widely used; however, endocrowns have emerged as a conservative alternative that preserves remaining tooth structure and utilizes adhesive retention. The present study was conducted to compare the clinical performance of endocrown restorations with conventional post-and-core crown restorations in endodontically treated teeth.*
Aim: The aim of the present study was to clinically evaluate and compare the performance and survival of endocrown restorations with conventional post-and-core crown restorations in endodontically treated teeth over a 24-month follow-up period.
Materials and Methods: *A prospective comparative clinical study was conducted on 60 endodontically treated teeth in 60 patients. The teeth were divided equally into two groups of 30 each. Group I received endocrown restorations, while Group II received conventional post-and-core followed by full-coverage crown restorations. Clinical and radiographic evaluations were performed at baseline and at 3, 6, 12, 18, and 24 months. The restorations were evaluated using modified United States Public Health Service (USPHS) criteria for retention, marginal adaptation, anatomical form, surface texture, color match, secondary caries, fracture, postoperative sensitivity, periodontal condition, and patient satisfaction. Restoration survival and clinical complications were also assessed.*
Results: *Both treatment groups demonstrated satisfactory clinical performance throughout the 24-month follow-up period. At 24 months, the survival rate was 93.3% in the endocrown group and 86.7% in the post-and-core crown group. The difference in survival between the two groups was not statistically significant ($p>0.05$). Two failures were observed in the endocrown group compared with four failures in the post-and-core group. Minor complications included marginal discoloration, loss of retention, and restoration fracture. No cases of secondary caries were observed, and periodontal parameters remained satisfactory in both groups.*
Conclusion: *Within the limitations of the present study, both endocrown and conventional post-and-core crown restorations demonstrated satisfactory clinical performance over 24 months. Endocrowns showed a slightly higher numerical survival rate and may be considered a predictable and conservative alternative to conventional post-and-core crown restorations in appropriately selected endodontically treated teeth. Further studies with larger sample sizes and longer follow-up periods are recommended to establish their long-term clinical effectiveness.*
Keywords: *Endocrown, post-and-core crown, endodontically treated teeth, clinical performance, restoration survival, fracture resistance.*

I. Introduction

Endodontically treated teeth are structurally compromised because of the loss of tooth structure resulting from caries, trauma, previous restorations, and endodontic access preparation. The reduction in remaining coronal

tooth structure may compromise the biomechanical integrity of the tooth and increase its susceptibility to fracture. Therefore, appropriate restoration of endodontically treated teeth is essential to restore function, protect the remaining tooth structure, and achieve long-term clinical success.

For many years, the conventional treatment of extensively damaged endodontically treated teeth has involved the use of a post-and-core foundation followed by a full-coverage crown. In this approach, an intraradicular post is used primarily to retain the core when adequate coronal tooth structure is unavailable. However, placement of a post requires additional removal of radicular dentin and may increase the risk of root perforation, crack formation, and catastrophic root fracture. Consequently, alternative restorative approaches that preserve tooth structure have gained increasing attention.

Endocrowns have emerged as a minimally invasive restorative option for the rehabilitation of endodontically treated teeth, particularly teeth with substantial loss of coronal structure. An endocrown is generally a single-piece restoration that derives its retention and stability from both adhesive bonding to the remaining tooth structure and extension into the pulp chamber. By avoiding the placement of an intraradicular post, endocrowns allow greater preservation of radicular dentin and may reduce the risk of post-related complications. Their simplified preparation and adhesive approach have made them an attractive alternative to conventional post-and-core restorations.

Recent biomechanical investigations have demonstrated considerable interest in comparing the behavior of endocrowns with conventional post-and-core restorations. Qiu et al. [1], using finite element analysis, evaluated endocrown and post-and-core crown restorations in endodontically treated mandibular second molars with different root morphologies. Their findings contribute to the understanding of how restoration design and root morphology influence stress distribution and biomechanical behavior.

Similarly, Fraga et al. [2] conducted a systematic review and meta-regression analysis evaluating the mechanical behavior of endocrowns compared with post-and-crown restorations. The increasing number of comparative studies included in such analyses indicates that endocrowns have become an important alternative to conventional restorative techniques. However, the mechanical performance of these restorations may be influenced by several factors, including the type and amount of remaining tooth structure, restorative material, ferrule effect, adhesive procedures, and tooth location.

The influence of the ferrule effect is particularly important when comparing endocrowns with post-and-core restorations. Koochaki et al. [3] investigated fracture resistance and failure patterns of endocrowns and post-and-core restorations in maxillary central incisors with and without a ferrule. Their study highlights the importance of remaining coronal tooth structure and ferrule design in determining the fracture behavior of endodontically treated anterior teeth.

In posterior teeth, Gadhe et al. [4] compared endocrowns with conventional post-and-core restorations followed by full crowns and evaluated their fracture resistance. Posterior teeth are subjected to substantial functional and occlusal forces, making the selection of an appropriate restorative technique particularly important. The ability of an endocrown to utilize the pulp chamber and remaining tooth structure for retention may provide a conservative alternative to conventional post placement in selected clinical situations.

The application of endocrowns has also been investigated extensively in anterior teeth. Mously et al. [5], in a systematic review, evaluated anterior endocrowns as an alternative to conventional core-crown restorations. Although endocrowns were initially more commonly associated with posterior teeth because of their large pulp chambers and favorable adhesive surfaces, increasing evidence suggests that they may also have potential applications in anterior teeth when appropriate case selection and restorative materials are used.

Despite the growing body of evidence supporting endocrowns, their clinical performance compared with conventional post-and-core crowns remains an important area of investigation. Differences in tooth morphology, remaining tooth structure, ferrule presence, restorative material, occlusal loading, cementation technique, and clinical conditions can influence treatment outcomes. Moreover, much of the available evidence is derived from in-vitro studies, finite element analyses, and systematic reviews, whereas long-term clinical evidence remains comparatively limited.

Therefore, a direct comparison of the clinical performance of endocrowns and post-and-core crowns is clinically relevant. Evaluation of parameters such as retention, marginal integrity, fracture or failure, periodontal response, postoperative complications, and overall restoration survival may provide valuable information regarding the effectiveness of these two restorative approaches. A better understanding of their relative advantages and limitations can assist clinicians in selecting a restoration based on the amount of remaining tooth structure, tooth position, functional demands, and long-term prognosis.

The present study, therefore, aims to comparatively evaluate the clinical performance of endocrowns and post-and-core crowns in endodontically treated teeth. The findings of this study may contribute to evidence-based decision-making regarding the selection of conservative and conventional restorative strategies for the rehabilitation of structurally compromised endodontically treated teeth.

II. Methodology

The present study was designed as a prospective comparative clinical study to evaluate and compare the clinical performance of endocrown restorations and conventional post-and-core crown restorations in endodontically treated teeth. The study was conducted in the Department of Prosthodontics in association with the Department of Conservative Dentistry and Endodontics, Government Dental College and Hospital, after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants before treatment.

A total of 60 endodontically treated teeth from 60 patients were included and divided into two groups of 30 teeth each. Group I received endocrown restorations, while Group II received conventional post-and-core followed by full-coverage crowns. Patients aged 18–60 years with adequately treated endodontic teeth and sufficient remaining tooth structure were included. Teeth with vertical root fracture, inadequate root canal treatment, active periapical pathology, severe periodontal disease, or poor restorability were excluded.

A detailed clinical and radiographic examination was performed before treatment. For the endocrown group, conservative tooth preparation was carried out with preservation of maximum sound tooth structure and adequate preparation of the pulp chamber for bonding. For the post-and-core group, conservative post-space preparation was performed while maintaining an adequate apical seal, followed by post cementation, core build-up, and full-crown preparation. Definitive restorations were fabricated using a standardized laboratory or digital workflow and were evaluated for marginal adaptation, proximal contacts, occlusion, contour, and fit before cementation.

The restorations were clinically evaluated at baseline, 3, 6, 12, 18, and 24 months using modified USPHS criteria. Retention, marginal adaptation, anatomical form, surface texture, color match, secondary caries, fracture, postoperative sensitivity, periodontal condition, periapical status, and patient satisfaction were recorded. Standardized intraoral periapical radiographs were obtained for radiographic assessment.

The primary outcome was the clinical success and survival of the restorations. Secondary outcomes included fracture, loss of retention, marginal defects, secondary caries, postoperative sensitivity, periodontal response, periapical changes, repair or replacement, and patient satisfaction. All findings were recorded in standardized case-record forms and analyzed using appropriate statistical tests. Chi-square/Fisher's exact test and independent t-test/Mann–Whitney U test were used as applicable, while Kaplan–Meier survival analysis and log-rank test were used to compare restoration survival. A p-value of <0.05 was considered statistically significant.

The study was conducted according to the ethical principles of the Declaration of Helsinki. Patient confidentiality was maintained throughout the study, and all participants provided written informed consent. The methodology was developed with reference to previous studies evaluating endocrowns and post-and-core restorations.

III. Results

The present study included 60 endodontically treated teeth restored with either endocrown or conventional post-and-core crown restorations. Thirty teeth were included in each group. All patients were evaluated at baseline and during follow-up visits at 3, 6, 12, 18, and 24 months. The clinical parameters were assessed using modified USPHS criteria.At the end of the 24-month follow-up period, the overall clinical success rate was higher in the endocrown group than in the post-and-core crown group. Minor complications were observed in both groups, including marginal discoloration, loss of retention, postoperative sensitivity, and fracture. However, the differences between the two groups were not statistically significant for most individual clinical parameters.

Table 1. Distribution of patients according to treatment group

Treatment group	No. of teeth	Percentage
Endocrown	30	50%
Post-and-core crown	30	50%
Total	60	100%

Table 2. Clinical success at different follow-up periods

Follow-up	Endocrown n (%)	Post-and-core crown n (%)	p-value
3 months	30 (100)	30 (100)	1.000
6 months	30 (100)	29 (96.7)	0.313
12 months	29 (96.7)	28 (93.3)	0.554
18 months	29 (96.7)	27 (90.0)	0.301
24 months	28 (93.3)	26 (86.7)	0.488

Table 3. Distribution according to restoration-related complications at 24 months

Complication	Endocrown n (%)	Post-and-core crown n (%)
No complication	28 (93.3)	26 (86.7)
Marginal discoloration	1 (3.3)	2 (6.7)
Loss of retention	0 (0)	1 (3.3)
Restoration fracture	1 (3.3)	1 (3.3)
Secondary caries	0 (0)	0 (0)
Total	30 (100)	30 (100)

Table 4. Periodontal response at 24 months

Periodontal parameter	Endocrown	Post-and-core crown	p-value
Mean probing depth (mm)	2.21 ± 0.42	2.34 ± 0.48	0.271
Bleeding on probing, n (%)	3 (10.0)	5 (16.7)	0.451
Gingival inflammation, n (%)	2 (6.7)	4 (13.3)	0.389

Table 5. Overall restoration survival at 24 months

Group	Surviving restorations	Failed restorations	Survival rate
Endocrown	28	2	93.3%
Post-and-core crown	26	4	86.7%

The findings demonstrated that endocrown restorations showed a slightly higher clinical success and survival rate than conventional post-and-core crown restorations at 24 months. The difference in survival between the two groups was not statistically significant ($p>0.05$). Endocrowns also demonstrated fewer biological and mechanical complications during the follow-up period. Overall, both treatment modalities showed satisfactory clinical performance over the 24-month observation period.

IV. Discussion

The present study compared the clinical performance of endocrown restorations with conventional post-and-core crown restorations over a 24-month follow-up period. Both groups demonstrated satisfactory clinical performance; however, the endocrown group showed a slightly higher survival rate of 93.3% compared with 86.7% in the post-and-core crown group. Although this difference was not statistically significant, the findings showed a favorable clinical trend toward endocrown restorations.

Fehrenbach et al. [6], in a systematic review and network meta-analysis, evaluated the mechanical performance of endocrown restorations in anterior teeth. Their findings demonstrated that endocrowns could provide favorable mechanical outcomes, although the performance was influenced by restorative material and restoration design. The present study showed similar favorable clinical performance of endocrowns, with a higher numerical survival rate compared with post-and-core crowns.

Lenz et al. [7] reported in their systematic review that endocrown and conventional core-crown restorations demonstrated comparable biomechanical performance in appropriately selected endodontically treated teeth. This finding was consistent with the present study, where both groups showed satisfactory clinical outcomes and the difference in survival was not statistically significant.

Saker et al. [8] investigated the influence of ferrule design and pulpal extension on the fit and fracture resistance of zirconia-reinforced lithium silicate endocrowns. They reported that preparation design, particularly ferrule configuration and pulpal extension, influenced the mechanical behavior of endocrowns. In the present study, conservative preparation with adequate pulpal extension was performed, which may have contributed to the favorable performance of the endocrown group.

Morimoto et al. [9], in their overview of systematic reviews, reported that one-piece endodontic crowns represented a viable restorative option for endodontically treated posterior teeth. Their findings supported the use of endocrowns in appropriately selected cases, particularly when sufficient tooth structure and suitable bonding conditions were available. The results of the present study also demonstrated satisfactory clinical performance of endocrowns over the 24-month follow-up period.

The 3D finite element and Weibull analysis study [10] demonstrated that variations in pulpal extension affected stress distribution and the mechanical behavior of endocrown-restored maxillary molars when compared with conventional post-and-core crowns. These findings emphasized the importance of appropriate internal preparation and stress distribution. The favorable performance of endocrowns in the present study may partly be related to conservative preparation and adequate internal extension.

Qamar et al. [11] systematically evaluated lithium disilicate endocrowns and post-and-core crown restorations and reported satisfactory mechanical performance of endocrowns. Their findings suggested that endocrowns could be a suitable alternative to conventional post-and-core restorations in selected endodontically

treated teeth. The present study supported these findings, as endocrowns demonstrated a slightly higher survival rate and fewer complications.

Bozkurt et al. [12] compared the pull-out bond strength of monolithic zirconia endocrowns with post-and-core crown restorations in endodontically treated anterior teeth. Their study highlighted the importance of retention and adhesive bonding in determining restoration performance. In the present study, no loss of retention was observed in the endocrown group, whereas one case of retention loss occurred in the post-and-core group.

Chaar et al. [13] evaluated the fracture resistance of maxillary premolars restored with different endocrown designs and restorative materials after artificial ageing. Their findings indicated that restoration design and material selection had an important influence on fracture resistance. In the present study, one restoration fracture was observed in each group, indicating satisfactory fracture resistance and clinical performance of both restorative approaches.

Hofsteenge and Gresnigt [14] investigated the influence of dentin wall thickness and adhesive surface on the mechanical behavior of endocrown and post-and-core restorations. Their findings emphasized the importance of preserving adequate remaining tooth structure and maximizing the adhesive surface. The conservative preparation used for endocrowns in the present study may have contributed to the favorable clinical outcome by preserving more sound tooth structure.

Silva-Sousa et al. [15] evaluated the effect of endocrown and ferrule designs on the mechanical behavior of anterior endodontically treated teeth. Their findings demonstrated that restorative design and the amount of remaining tooth structure influenced the mechanical behavior of restored teeth. The present study similarly showed satisfactory performance of endocrowns, supporting their use as a conservative restorative option in appropriately selected cases.

V. Conclusion

In the present study, marginal discoloration, loss of retention, and restoration fracture were observed in only a small number of cases, while no secondary caries were recorded. Periodontal parameters remained satisfactory in both groups, with no statistically significant difference between them. Overall, both treatment modalities demonstrated satisfactory clinical performance during the 24-month follow-up period.

The slightly higher survival rate observed with endocrowns may be attributed to their conservative preparation, preservation of radicular dentin, adhesive retention, and reduced number of restorative components. However, as the difference between the two groups was not statistically significant, endocrowns should not be considered universally superior to conventional post-and-core crown restorations. Rather, they may be considered a predictable and conservative treatment option for appropriately selected endodontically treated teeth.

The present study demonstrated that both endocrown and conventional post-and-core crown restorations provided satisfactory clinical performance in endodontically treated teeth over a 24-month follow-up period. Endocrown restorations showed a slightly higher survival rate (93.3%) compared with conventional post-and-core crown restorations (86.7%), although the difference was not statistically significant.

The favorable performance of endocrowns may be attributed to their conservative tooth preparation, preservation of sound tooth structure, adhesive retention, and avoidance of extensive post-space preparation. Both treatment modalities showed acceptable marginal adaptation, periodontal response, retention, and fracture resistance during the observation period.

Within the limitations of the present study, endocrowns may therefore be considered a predictable and conservative alternative to conventional post-and-core crown restorations for appropriately selected endodontically treated teeth. However, larger clinical studies with longer follow-up periods are required to confirm their long-term clinical effectiveness and survival.

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