

Endocrown – A Paradigm Shift in Rehabilitation: A Report of Two Cases

Abstract

Along with the advent of dentistry, the ideal restoration of an endodontically treated tooth has been a widely discussed and controversial topic. Coronal rehabilitation of an endodontically treated tooth is quite a challenge for clinicians as considerations should be taken for its minimally invasive preparation and the retention and stability of the restoration. With the development of adhesive systems, the need for intraradicular anchorage and thus the post-core system is greatly reduced. Endocrown is a restorative option for an endodontically treated tooth, and it serves as a suitable alternative to the conventional post-core restoration and full-coverage restoration. This novel approach promotes the stability and retention of the indirect restoration without the need of a cast metal core or reconstruction with intracanal post, thereby reducing the treatment time. Thus, endocrown has become a promising alternative in the esthetic and functional rehabilitation of an endodontically treated tooth.

Keywords: Endocrown, endodontically treated tooth, minimally invasive dentistry

Introduction

Over the years, rehabilitation of the endodontically treated tooth has been a widely discussed topic, with several innovations taking place from its advent.^[1] Depending on the extent of the coronal destruction of the tooth structure, post endodontic restoration varies from a direct restorative procedure (such as amalgam, glass-ionomer cement, and composite resins) to indirect procedures such as metal and ceramic inlays, onlays, and to post-retained full-coverage crowns.^[2] Several disadvantages were noted in the post-retained restorations such as weakening of the tooth structure, root fractures, or in its application in narrow and calcified canals.^[3] With technological advancements and evolution in the material aspect, there has been a change in the concept of restoration of an endodontically treated tooth with a paradigm shift being from the conventional post and core approach to a lesser aggressive and an adhesive mode of restoration.^[4,5]

An alternative treatment modality was introduced in the form of endocrown. The term endocrown was coined by Bindl and Mörmann in the year 1999,^[6] however, its

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initial literature existence dates back to 1995 by Pssiss, who termed it as “ceramic monoblock technique [Figure 1].”^[7] It embarks the concept of minimally invasive dentistry which acquires macromechanical retention from the floor and walls of the pulp chamber and also micromechanical retention from its adhesive cementation.^[8]

The purpose of this clinical case report would provide us an insight into the restoration of a posterior tooth with a rather conservative and esthetic endocrown, highlighting its indication and uses along the way.

Case Reports

Case report 1

A 32-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain in the lower right back tooth region. On clinical and radiographical examination, a diagnosis of symptomatic irreversible pulpitis was made and root canal therapy was initiated. On completion of the endodontic therapy, an interocclusal clearance of 1.5 mm, a pulp chamber depth of 4 mm, and a cervical margin of 2 mm were seen. Based on this amount of remaining tooth structure and thickness of the walls, a post endodontic restoration of lithium disilicate ceramic endocrown was

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decided. Two millimeters of gutta-percha was removed from the canal orifices, and the orifices were sealed using resin-modified glass-ionomer cement. Preparation included a butt joint margin and a central retentive cavity using a coarse grit diamond-coated bur, which had a depth of 4 mm from the pulp chamber roof to the intracoronal cavosurface margin. Appropriate reduction of the buccal and lingual walls was done with a WR-13 bur so as to achieve an interocclusal clearance of 2 mm [Figure 2]. Extracoronally, the finish lines were placed supragingivally. The undercuts in the cavity were blocked using conventional resin composites. Before any intervention, selection of shade was done which led to A3 shade selection. An impression was made using polyvinyl siloxane impression using the putty wash technique, which was sent to the laboratory for the fabrication of prosthesis. A provisional acrylic resin restoration was made and cemented using temporary cement. On receiving the prosthesis, try-in was done where the marginal integrity and the shade of the restoration were checked before cementation. The intaglio surface of the prosthesis was etched with 10% hydrofluoric acid for 30 s, rinsed with water, and dried with oil-free air syringe. Next, a coat of silane application was done for a minute. Rubber dam isolation was done on the prepared tooth surface and was etched with 37% phosphoric acid for 20 s and rinsed with water and dried with cotton. A total-etch dual-cure resin luting cement was applied on the intaglio surface of the endocrown and was adhesively cemented onto the prepared tooth surface. Light curing was done for 3 s which facilitated any excess cement removal, followed by curing for 40 s on all the surfaces. No occlusal discrepancy was noted, and radiographic examination revealed proper marginal adaptation.

Case report 2

A 22-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of swelling in the lower left back tooth region. An extraoral swelling was seen, and clinically, a deep class 1 carious lesion with a draining sinus tract and an intraoral swelling was noted. Following clinical and radiographical examination, a diagnosis of pulpal necrosis with chronic apical abscess was made and root canal therapy was initiated. Based on the amount of remaining tooth structure and thickness of the walls, a post endodontic restoration of lithium disilicate ceramic endocrown was decided. A2

shade was chosen, and the preparation and cementation procedure was performed similar to the earlier case report.

Discussion

A proper clinical planning and decision-making is necessary for the clinical success of the post endodontic restoration of grossly destructed tooth structure. The indications of endocrown would include molars exhibiting large coronal destruction and having short, dilacerated, or fragile roots, whereas its contraindications would be patients exhibiting parafunctional habits, when the pulpal chamber depth is lesser than 3 mm, cervical margin is lesser than 2 mm and in cases where proper isolation and adhesion cannot be assured.^[8-10]

Due to its minimal and ease of preparation, endocrowns offer a more advantageous option as compared to conventional and post- and core-retained restorations. Several factors can be attributed to this positive outcome, as in terms of its preparation technique, occlusal thickness, and elastic moduli. The presence of a “ferrule” can be seen in a conventional crown preparation for its retentiveness, however, it also involves the removal of sound enamel and dentin for its preparation, which would be critical for proper bonding. This factor is negated in the ferrule-less preparation of endocrowns.^[11] The fracture resistance of any prosthesis is essential for its long-term durability and is proportional to its occlusal thickness. The thickness in conventional restorations varies between 1.5 and 2 mm, whereas it goes up to 3–6 mm in endocrowns, thus offering greater occlusal stress loading.^[12] Post-retained fabricated prosthesis is prepared with materials of different elastic moduli as seen in glass- or metal-reinforced fibers for post and ceramic/composite for core.^[13] Due to this, several interfaces would exist between dentin, luting cement, and the restorative material, causing stiffness mismatch. Endocrowns embark upon its monoblock nature, thus offering greater stress loading.^[14] The difference between post- and core-retained full crown and endocrown is summarized in Table 1.^[10]

The type of tooth subjected to post endodontic restoration of an endocrown also plays a critical factor. Bindl *et al.* stated that the clinical failure rate of endocrowns in premolars is 31%, owing to its smaller surface area for adhesion.^[15] However, Belleflamme *et al.* contradicted this view, stating that the fabrication of endocrown is a reliable approach for restoring both molars and premolars,

Table 1: Tabular comparison of preference of endocrown over post-core/ conventional crown restoration

Conventional post- and core-retained full coverage crown	Endocrown
Removes excessive radicular dentin for post space preparation	Does not require removal of radicular dentin
Requires preparation of ferrule – removal of sound enamel and dentin	Ferrule – less preparation – preservation of tooth structure
Occlusal thickness of prosthesis – 1.5-2 mm – less occlusal stress loading	Occlusal thickness of prosthesis – 3.0-7 mm – more occlusal stress loading
Several interfaces between dentin, luting cement, post material, core, and the final restoration – Stiffness mismatch	MONOBLOCK nature – greater occlusal stress loading

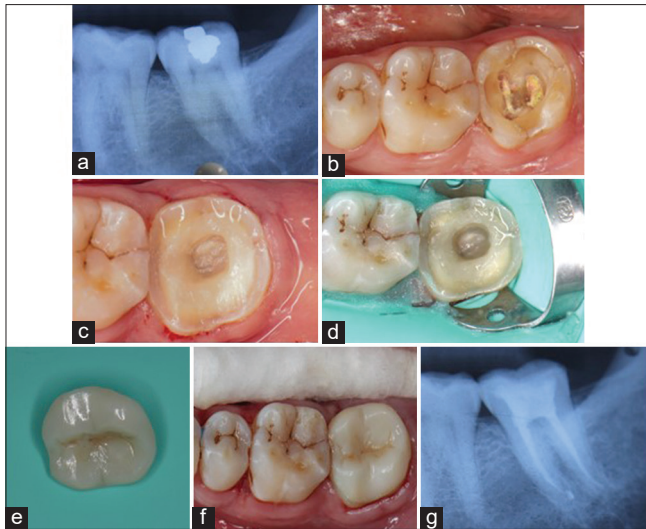


Figure 1: Case report 1: (a) Preoperative intraoral periapical, (b) completion of root canal treatment (RCT), (c) tooth preparation, (d) rubber dam isolation, (e) endocrown, (f) final cementation, (g) postoperative radiograph

despite the presence of extensive tooth structure loss or occlusal risk factors.^[16] According to a systematic review by Sedrez-Porto *et al.*, which evaluated the clinical survival rate and fracture strength of endocrowns as compared to conventional restorations using intraradicular posts, direct resin composites, and inlay/onlay restorations, it concluded that endocrowns cemented on molars performed similar or better than conventional restorations.^[17]

In this study, the fabricated endocrown is lithium disilicate ceramic-based material which presents an advantage over the other materials due to its esthetic, adhesive, and mechanical interlocking with resin cement. According to a study by Altier *et al.*, which compared the fracture resistance of three different endocrowns made of lithium disilicate ceramic and indirect resin composite, it concluded the higher fracture strength of lithium disilicate ceramic endocrown than indirect composites.^[18] However, a recent study by Tribst *et al.*, concluded that there was a better stress distribution of leucite and was a reliable alternative to lithium disilicate for the fabrication of endocrown.^[19]

Furthermore, a recent study by Zoidis *et al.* proposed the use of polyetheretherketone (PEEK) for the fabrication of endocrown. It showcased that the elastic moduli of PEEK along with indirect composite resin would offer better support to the tooth structure as compared to ceramic.^[20] However, further long-term clinical trials are required.

Conclusion

Endocrowns represent a pleasing alternative for the restoration of endodontically treated teeth bearing its goal of minimally invasive dentistry for its esthetic and mechanical restoration. However, more long-term clinical studies are needed to evaluate its success rate and establish it as a long-term fitting restorative option.

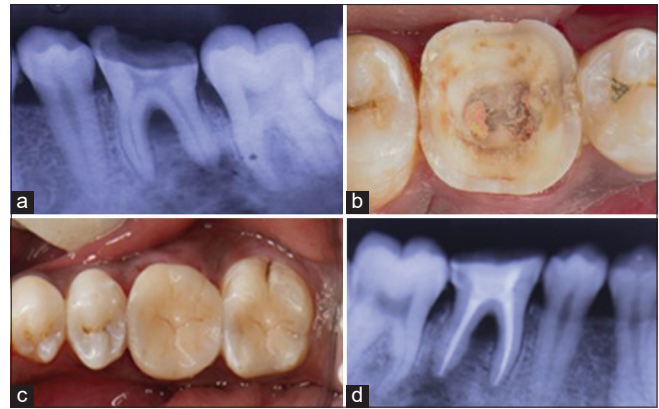


Figure 2: Case report 2: (a) Preoperative intraoral periapical, (b) completion of RCT, (c) final cementation, (d) postoperative radiograph

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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