CASE REPORT

“Conservative Bonded Restoration (An Alternative to Full Coverage Crown): A Case Report on Endocrown

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ABSTRACT

Background: The restoration of endodontically treated tooth (ETT) with substantial loss of the tooth structure is challenging as it carries a higher chance of biomechanical failure than vital tooth in restorative dentistry. Post combined with complete coverage restoration is a well-established technique to save such teeth from fracture, but it does not follow the minimal invasive principles of adhesive dentistry.

Case description: This case report describes the management of endodontically treated mandibular premolar with lithium disilicate glass-ceramic endocrown (Emax).

Conclusion: Endocrown is a feasible option for the restoration of extensively damaged posterior tooth after endodontic treatment. Since posterior teeth are vulnerable to tooth loss, endocrown, which is a single partial restoration, can be regarded as replacing a single crown with intraradicular retention.

Keywords: Case report, Endocrown, Endodontically treated tooth, Lithium disilicate glass-ceramic, Monoblock, Post-endodontic restoration.

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BACKGROUND

Clinical success of an endodontically treated tooth is determined by post-endodontic restoration. Post-endodontic restoration will maintain and protect the existing tooth structure, while restoring esthetics, form, and function satisfactorily. The goal is to achieve minimally invasive preparation to restore endodontically treated tooth with optimum tissue preservation.¹

Cast posts and cores have been the standard for many years and are still used by some clinicians. Generally, during in vitro tests² and clinical studies,³ they do not perform other types of posts. As they require two appointments, temporization, and a laboratory fee, they have fallen out of favor. Perhaps, the biggest drawback is in areas that require an esthetic temporary restoration for cast posts and cores. Moreover, the evolution of adhesive philosophy in dentistry and the high bonding efficiency obtained by modern adhesive systems have slowly changed the precept of “devitalized tooth should be restored with post, core, and crown.”⁴

Recently, adhesive indirect partial coverage restorations have gained popularity over full-ceramic crowns. Conservative treatments such as inlays, overlays, and endocrowns minimize the amount of tooth structure removed while maximizing the remaining amount of intact tooth structure. The endocrown technique was introduced by Bindl and Mörmann. Endocrowns have many benefits over posts and cores and crowns as they are easier to prepare and apply and require lesser clinical time and visits. Esthetic properties are also excellent.⁵ Moreover, they can also minimize the penetration of microorganisms from the coronal to the apical portion, thereby improving the clinical effectiveness of endodontic treatment.⁶ Endocrown is a good alternative to full crown in cases with endodontically treated tooth with short crown height but with sufficient tissue available for adhesion and stability.^{7,8}

CASE DESCRIPTION

A 57-year-old female patient reported to the department with a chief complaint of pain in relation to lower right back tooth region. Patient gave a history of intermittent, dull aching type of pain, on

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intake of cold foods, which subsided on the removal of stimulus. She also gave a history of food lodgment. Her medical history was noncontributory. Clinical examination revealed a moderate destruction of coronal tooth structure involving the distal aspect of mandibular second premolar (Fig. 1). An IOPA radiograph in relation to 45 revealed coronal radiolucency involving enamel, dentin, and pulp in the distal aspect correlated with deep caries involving pulp with no abnormality at the periapex (Fig. 2). So a decision was taken to proceed with endodontic management on 45, followed by post-endodontic restoration. Various post-endodontic treatment options were considered. Since the tooth structure remaining was not sufficient to retain the core, an extra retentive mechanism had to be taken from the pulp chamber. This condition is better satisfied with endocrown compared to onlay or overlay.⁹ Based on the patient's demands, a conservative post-endodontic management with a lithium disilicate endocrown (Emax) was suggested and planned.

Clinical Procedure for All-ceramic Lithium Disilicate Endocrown

Access opening was initiated on the very same day with determination of working length and biomechanical preparation done up to F1 (ProTaper Universal) with copious irrigation. The canal was obturated with single-cone technique using AH Plus sealer

Fig. 1: Preoperative clinical view of 45

Fig. 3: Obturation done on 45

Fig. 2: Preoperative radiographic view of 45

Fig. 4: Preparation of central retention cavity

(Dentsply, DeTrey GmbH, Konstanz, Germany). Extra space was checked for accessory cones using a spreader of size 15. According to Holland et al.,¹⁰ the single-cone technique showed less marginal leakage than the lateral condensation technique and produced a greater percentage of gutta-percha than lateral condensation (Fig. 3). A minimal occlusal reduction of 1.5–2 mm with a central retention cavity of depth 5 mm inside the pulp chamber was prepared with slight divergent walls using #169L coarse diamond burs (Fig. 4). Supragingival margin preparation with 90° shoulder finish lines (without bevels)¹¹ and complete proximal separation were given. Proximal finish lines were extended from gingival to the contact area, and final polishing was done with #8862 fine diamond points (Figs 5 and 6).¹²

Impression was taken with putty and light-body polyvinyl siloxane material (3M ESPE) using a double-mix single-stage technique and sent to the laboratory (Figs 7 to 9). Self-cured resin temporary crown was cemented using a temporary cement without eugenol (Temp-Bond NE).¹²

Fig. 5: Tooth preparation with supragingival margins—buccal view

Fig. 6: Microscopic view of finish lines

Fig. 9: Fabricated endocrown on cast

Fig. 7: Impression taken in polyvinyl siloxane

Fig. 10: Try-in of endocrown

Fig. 8: Fabricated endocrown

Adequate isolation was achieved using rubber dam, and after try-in of the endocrown (Fig. 10), 5% hydrofluoric acid (Ivoclar Vivadent) was used to etch the inner surface of the endocrown for 20 seconds (Fig. 11) and then rinsed with water for 20 seconds. After air-drying, Monobond S (Ivoclar Vivadent) was applied on etched surface of ceramic in two coats (Fig. 12). Meanwhile, the prepared tooth was etched with 37% phosphoric acid (Ivoclar Vivadent) (Fig. 13) for 15 seconds, rinsed, and dried, followed by the application of a dual-cure bonding agent (Excite F DSC, Ivoclar Vivadent) (Fig. 14). A thin coat of a dual-polymerizing resin (Variolink N, Ivoclar Vivadent) (Fig. 15) was applied to the treated surface of the endocrown, placed over the treated tooth, and tack-cured for 5 seconds to remove the excess cement, followed by final curing for 60 seconds on all surfaces (Fig. 16). Finishing of the margin was done with finishing burs (yellow band Burs, Mani) (Figs 17 to 19). Clinical and radiographic follow-up of 1 year has shown well-maintained esthetics, polish, and marginal integrity of the endocrown (Fig. 20).

Fig. 11: Etching the intaglio surface of endocrown with 5% hydrofluoric acid

Fig. 14: Application of dual-cure bonding agent

Fig. 12: Application of Monobond S on etched ceramic

Fig. 15: Placement of resin cement

Fig. 13: Etching of the prepared tooth with 37% H₃PO₄

Fig. 16: Light curing

Fig. 17: Cemented endocrown—buccal view

Fig. 20: One-year review

Fig. 18: Cemented endocrown—occlusal view

Fig. 19: Cemented endocrown—lingual view

DISCUSSION

A successful clinical outcome of endodontically treated tooth depends on adequate root canal treatment as well as on the proper restorative treatment done afterward. Multiple treatment options are involved in the restoration of endodontically treated tooth and represent a challenging task for clinicians. Various improvements in adhesive techniques, composite resin materials, fiber posts, and indirect ceramic materials have led to recent changes in the methods available for restoring endodontically treated tooth. Adhesive indirect partial coverage restoration maintains the biomechanical integrity of the compromised structure of nonvital posterior tooth.¹³ According to Nagasiri and Chitmongkolsuk's study, greater remaining tooth structure means greater longevity for the tooth.¹⁴

Advantages of the conservative bonded techniques are as follows:¹⁵

- Bioeconomy of dental tissues,
- Bioeconomy of periodontal tissues,
- Reinforcing of healthy residual dental tissues, and
- Esthetic, ergonomic, and economic advantages.

The concept of endocrown was described in 1999 by Bindl and Mörmann⁶ to limit the use of root anchorages. Endocrown allows performing a more conservative, faster, and less expensive dental treatment. With the advent of adhesive dentistry, teeth with substantial coronal destruction can be restored by doing endocrown without using posts and by taking extension of the pulp chamber as a retentive resource.^{16–18} They are based on “monoblock porcelain technique,”⁵ where the pulpal walls provide macromechanical retention, and micromechanical retention is imparted by the use of adhesive cementation.¹⁹

In the present case report, endocrown was chosen as the preferred post-endodontic restoration. Endocrowns are a reliable restoration for damaged premolars and molars, according to Belleflamme et al., even in the presence of extensive coronal tissue loss or occlusal risk factors, such as bruxism or unfavorable occlusal relationships.²⁰ The stress concentrations in teeth with endocrowns are also lower than in teeth with prosthetic crowns.²¹ A 5-mm-deep retention cavity was prepared inside the pulp chamber. This is in accordance with the study by Dartora et al.,²² where he concluded that a 5-mm extension posed

lower intensity and a better stress distribution pattern than a 1-mm extension, which presented a low resistance to fracture and a high probability of rotating the piece when in function.

In the present case report, tooth preparation was done to provide parallel axial walls in order to improve stress resistance at tooth long axis, while the pulp chamber provided retention and stability.²³ According to Taha et al.,²⁴ endocrowns with axial reduction and a shoulder finish line had higher mean fracture resistance values compared to endocrowns with butt margin designs. The lithium disilicate-reinforced ceramic used in the present case has been recognized as one of the best restorative materials for the fabrication of endocrowns. In comparison with endodontically treated teeth restored with crown and intracanal retainer, lithium disilicate endocrowns have exhibited stronger bonding to tooth structure and higher compressive strength as a result of less interfaces between the various restorative alternatives, according to a study conducted by Biacchi and Basting.¹⁹

The 1-year follow-up in this case of endocrown showed no esthetic and functional degradation on clinical as well as radiographic examination. These results are in agreement with the previous studies.^{25,26}

Thus, the success and longevity of endocrown depend on several factors like case selection, tooth preparation, selection of the most appropriate ceramic options, and the selection of bonding material.²⁷

CONCLUSION

Endocrowns have been a feasible alternative to traditional posts and cores. Better esthetics and mechanical efficiency, low cost, and short clinical time compared to conventional methods are the advantages of endocrowns, which can be used successfully for restorations of teeth with short clinical crowns.

CLINICAL SIGNIFICANCE

The endocrown fits perfectly with the principle of biointegration and can serve as the most conservative and esthetic alternative for the restoration of nonvital posterior tooth.

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