Endocrown: An Alternative Modality to Resort Extensively Damaged Molars: A Case Report

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Abstract

Teeth that undergo root canal therapy require some form of restoration to enable them to be functional again. Minimally invasive preparation to preserve maximum amount of tooth structure is considered to be the standard goal for restoring teeth. Endocrowns represent a simple, conservative, and esthetic alternative to conventional crowns. It is a one – piece restoration, usually indicated in cases with decreased crown height. These restorations are self-cleansing, prevent interferences with periodontal tissues due to the supragingival margins, maintain natural contact and increase longevity of the tooth. The rationale of this technique is to use the surface area available in the pulp chamber to achieve stability and retention through adhesive techniques. In this case report, a severely damaged mandibular molar was restored using an all ceramic Endocrown which served as a conservative and esthetic restorative alternative to full coverage crown.

Keywords: Endocrown, Post endodontic restoration, Severely damaged tooth, Endodontically treated teeth

Introduction

Restoration of teeth with extensive coronal destruction remains a clinical challenge [1]. When a tooth is endodontically treated, a considerable amount of tooth structure is already lost due to trauma or caries in addition to the central destruction created for the endodontic access. This usually leaves the tooth with insufficient sound tooth structure to support a casted restoration. Also, there are increased chances of tooth fracture under masticatory forces [2].

Post endodontic restorations mechanically stabilize the tooth – restoration complex in endodontically treated teeth [1]. They should preserve and protect the existing tooth structure, while satisfactorily restoring esthetics, form, and function. The goal is to have minimally invasive preparations with maximal tissue conservation for the favourable long term prognosis in such cases [3].

Various treatment modalities available for restoring endodontically treated teeth include direct composite restorations, cuspal coverage with onlays and overlays, full coverage crowns, post and core supported crown and endocrown. Endocrown is a good alternative in cases with endodontically treated teeth with short clinical height but sufficient tissue available for adhesion and stability when compared to post and core followed by full coverage restorations [3]. The term "Endocrown" was coined by Bindl and Mormann in 1999. These restorations are anchored to the internal portion of the pulp chamber thus obtaining macromechanical retention provided by the pulpal walls and micro mechanical retention provided by adhesive cements [1].

The purpose of this paper is to present a clinical case in which an extensively damaged mandibular molar with short clinical crown height and deep pulp chamber was restored conservatively using endocrown.

Case Report

A 35 year old female patient reported to Sudha Rustagi College of Dental Sciences and Research, Faridabad, Haryana with a chief complaint of decayed tooth in the lower right back region of the jaw since 6 months. The medical history was non-contributory. Radiographic and clinical examinations were performed initially, and an extensive dental caries involving pulp with widening of periodontal ligament space was seen in the right mandibular second molar. Various treatment options were explained to the patient including root canal treatment, extraction and replacement with implants or fixed partial dentures but the patient was keen to save the tooth hence, the tooth was treated endodontically *(Figure 1)*. The patient had an acceptable oral hygiene and a favorable occlusion. Endocrown restoration was recommended because of the amount of remaining tooth structure and the thickness of the walls. It was decided to restore the tooth with an endocrown fabricated from lithium disilicate ceramic (IPS e.Max CAD).

The preparation for the endocrown is different from the conventional complete crown. This monolithic, ceramic adhesive restoration requires specific preparation to be suitable for the required biomechanical needs. It is aimed at achieving an overall reduction in the height of the occlusal surface of at least 2 mm in the axial direction and to get a cervical margin or "cervical sidewalk" in the form of a butt joint. The cervical margin has to be supragingival and enamel walls less than 2 mm have to be eliminated. Axial preparation was done by removing undercuts from the access cavity using a tapered bur. Cervical margin was kept supragingival. The depth of the access cavity was kept as 4 mm.

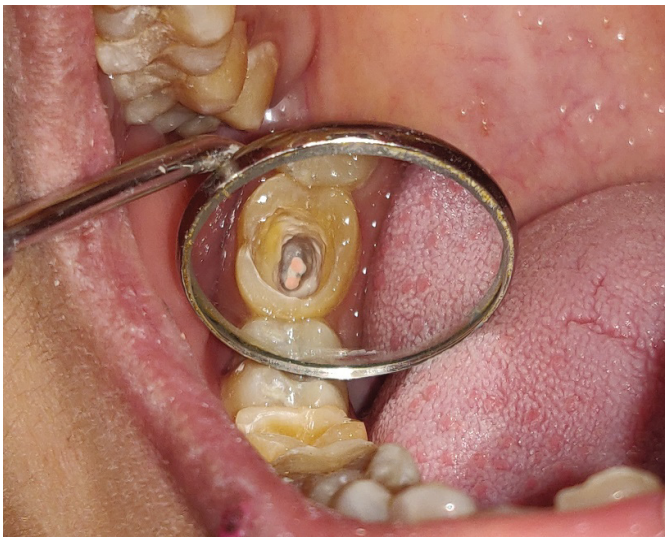

Figure 1. *Pulp chamber after obturation.*

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The preparation was terminated with lining the root canal entrances with glass ionomer cement to protect the orifice of the canal *(Figures 2 and 3)*. The impression of the tooth was taken using polyvinyl siloxane impression material with putty wash technique. After visualization and analysis of the quality of the impression, the ceramic shade was selected and the impression was sent to the laboratory for fabrication of the restoration *(Figure 4)*.

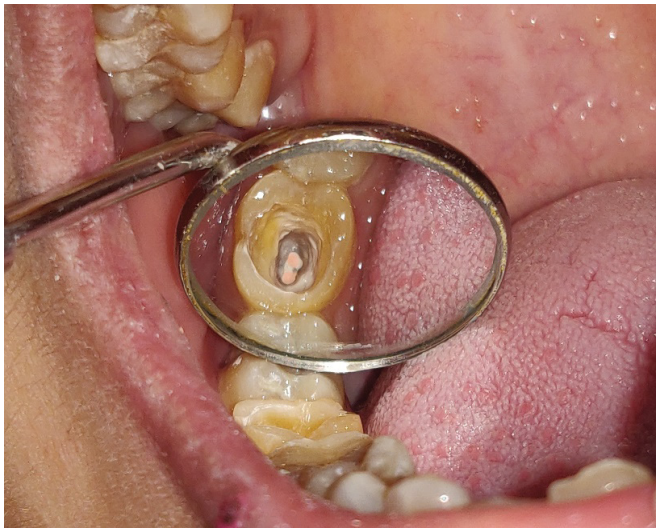

Figure 2. *Lining the root canal entrance with glass ionomer cement followed by occlusal and axial preparation.*

Figure 3. *Buccal view of occlusion preparation.*

Figure 4. *Impression recorded with polyvinyl siloxane impression material.*

In the following session, the restoration was tried in the patient's mouth and any occlusal interference was evaluated. Occlusal adjustments were done using ceramic finishing instruments. The internal surface of the endocrown was etched with hydrofluoric acid for 20 seconds *(Figures 5 and 6)*, rinsed with water, and dried with an air syringe. Next, a coat of a silane coupling agent was applied for 1 minute and dried *(Figure 7)*. Phosphoric acid was applied onto the tooth surface for 15 sec on dentin and 30 sec on enamel, then abundantly washed thoroughly and dried. The adhesive was applied in 2 coats and polymerized for 20 sec with light

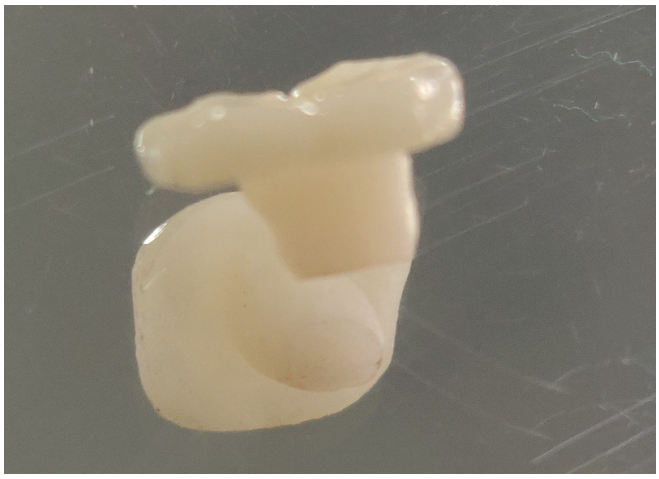

Figure 5. *Fabricated endocrown restoration.*

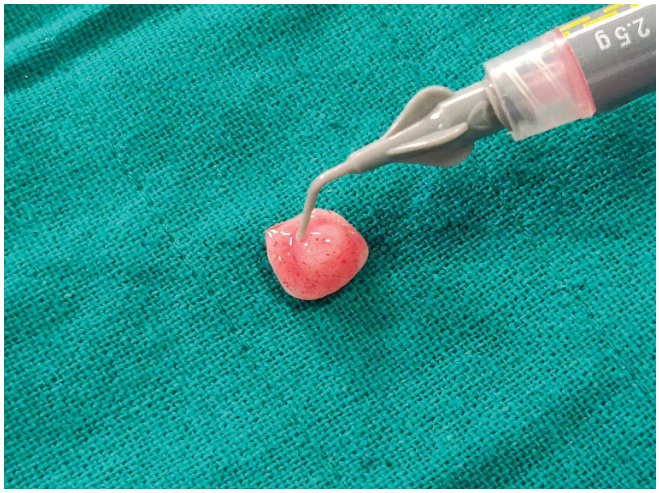

Figure 6. *Etching endocrown with hydrofluoric acid.*

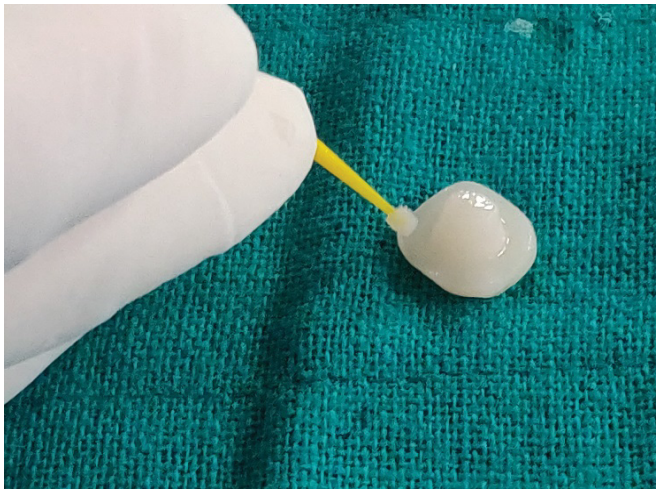

Figure 7. *Application of silane coupling agent.*

curing unit. A thin layer of a dual polymerizing resin was applied to the endocrown and then was inserted into the tooth and polymerized at intervals of 5 seconds, making it easy to remove the excess cement. After that, it was polymerized for

Figure 8. *Occlusal view of cemented endocrown.*

Figure 9. *Buccal view of cemented endocrown.*

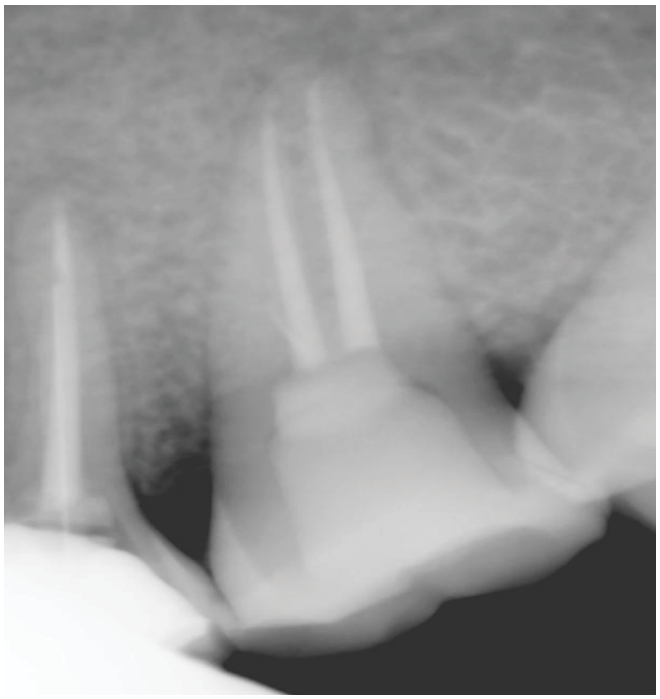

Figure 10. *Cemented endocrown.*

Figure 11. *18 month follow up clinical picture.*

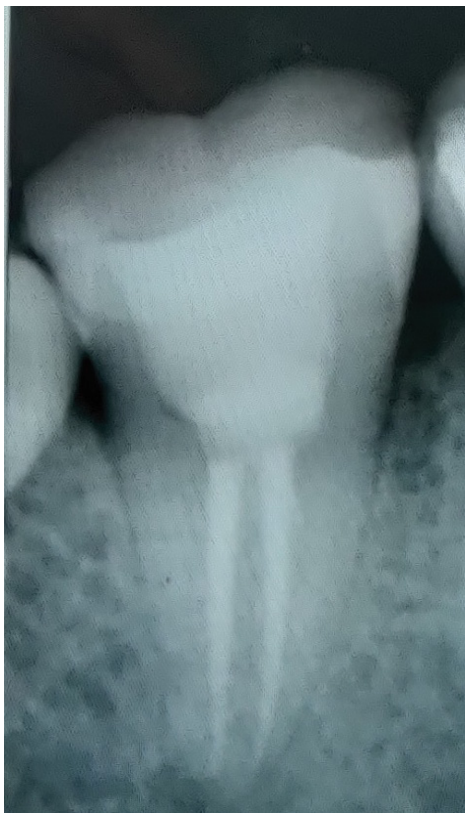

Figure 12. *18 month follow up radiograph.*

60 seconds on all surfaces. The final restoration is shown in *Figures 8 and 9*. The 18-month follow up in the present case of endocrown showed no esthetic and functional degradation on clinical and radiographic examination *(Figures 10-12)*.

Discussion

The choice of post endodontic restoration is influenced by the type of tooth; posterior or anterior, and the amount of the remaining tooth structure. Anterior teeth with a limited access opening and sufficient tooth structure can be just restored by a direct composite restoration but a structurally damaged tooth may need a crown. However, endodontically treated posterior teeth will always need cuspal coverage due to their morphological characteristics and the increased loads they are subjected to. A tooth with substantial coronal structure

loss will need core build up and a crown. However, if the remaining tooth structure is not sufficient to retain the core, an extra retentive mechanism has to be introduced. Traditionally to retain the core structure in such cases a post or dowel is placed. These posts can be prefabricated posts with a direct core or a one-piece custom-made post and core. Earlier, it was thought that the post and core reinforced the remaining tooth structure, but later studies have proved that post only aids in the retention of the restoration. On the contrary, removal of the radicular structure to place the post might weaken the root and make it more susceptible to fracture. Also, the presence of a post might preclude future endodontic re-treatment if required.

The introduction and the development of effective dentine bonding agents was a changing point in the restoration of endodontically treated teeth, which made the insertion of a radicular post a less favoured option as long as there is sufficient surface area available for micro mechanical retention. In 1995, Pissis presented a novel technique that utilized porcelain core/crown unit as a single unit. This technique was called as monobloc technique and was suggested to replace the traditional metal post and core. In 1999, Bindle and Mörmann introduced the Endocrown technique. It was described as an adhesive restoration with minimally invasive preparation which provides sufficient retention, stability and structural durability to the restoration [2].

Minimally invasive preparations, with maximal tissue conservation, are now considered the gold standard for restoring endodontically treated teeth. The endocrowns are based on the same rationale: the preparation consists of circular supragingival/equigingival butt-joint margin and central retention cavity. The internal portion of the cavity provides macromechanical retention while micromechanical retention is achieved by adhesive cementation. The cervical sidewalk is the foundation of this restoration, the objective of which is to accomplish a wide, uniform, steady surface resistant to compressive stress. The saddle form of the pulpal floor warrants stability and retention. Literature clearly depicts that the choice of prosthesis for restoring an endodontically treated teeth is a tough call to make and is principally directed by the voluminous amount of tooth structure remaining after the root canal therapy. A sound and long-term maintainable restoration dictates reinforcement of the remaining healthy dental tissues, which can impart harmony to tooth-restoration complex. In today's era of esthetic and adhesive dentistry, endocrown serves as a conservative and feasible alternative to conventional post and core crowns as it preserves root tissues and limits internal preparation of the pulp chamber to its anatomic shape [4].

They possess several advantages over conventional posts and cores and crowns they are easier to prepare and require less clinical time and appointments. Esthetic properties are equally good. Also, adhesive restorations can decrease the infiltration of microorganisms from the coronal to the apical part thus improving the clinical success of the endodontic treatment. Moreover, they show a great advantage in cases where posts are contraindicated due to short or narrow canals. However, Endocrowns are contraindicated in cases with short and narrow pulp chamber, if adhesion is not certain and if there is a very little tooth structure remaining [2].

Many different materials have been proposed for fabrication of endocrowns such as feldspathic porcelain, glass ceramic, hybrid composite resin, and recent computer-aided design/computer-aided manufacturing all-ceramic blocks [4]. The limitation for performing this procedure may be restricted to the ceramic material, which must be an acid etchable ceramic in order to obtain the bond to tooth preparation by means of an adhesive cementation system. Pressed or machined ceramics, especially those reinforced with lithium disilicate, appear to be the best option. They have high mechanical strength and provide restorations with an esthetic appearance very similar to that of tooth structure [5].

A study conducted by Biacchi et al showed that Endocrowns are more resistant to compressive forces than the conventional crowns retained by glass fibre posts [6]. A systematic review achieved by Sedrez-Porto et al has evaluated clinical (survival) and in vitro (fracture-strength) studies of endocrown restorations compared to conventional treatments using intraradicular posts, direct composite resin, or inlay/onlay restorations; it has been shown that endocrowns may perform similarly or better than the conventional treatments [7]. Mandibular molars are subjected to greater masticatory forces and unfavorable stresses. Hence the higher compressive strength combined with lower stress levels acting on tooth made endocrown restoration a suitable option in the present case [1].

Conclusion

Endocrowns are a feasible alternative to conventional post core and fixed partial dentures in restoration of endodontically treated teeth with extensive coronal tissue loss. It's indicated in posterior teeth and have shown better performance in molars than premolars.

Compared to traditional methods, better esthetics and mechanical performance, conservation of remaining tooth structure, low cost and short clinical time are the advantages of endocrowns and they can be successfully used for restoration of teeth with short clinical crowns.

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