

**Endocrown- A New Paradigm In Post Endodontic Restoration: A Case Series**

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**Abstract**

Root canal treatment is said to be completely successful when the tooth is restored and comes back to normal function. A tooth more complex restoration is required after endodontic treatment when compared to normal tooth restoration, because of factors such as extensive caries, post-treatment root canal dentin and even the economics condition of the patient. Endocrown is an alternative that can be used by a dentist in performing post endodontics restoration. It works on the monoblock (Single unit) Phenomenon has enhances the strength of the tooth structure along with the benefits of ceramic

restoration and can be planned as an alternative post and core restorations. Thus, the aim of this case series is different conservative posterior endocrowns i.e Porcelain-fused to metal, Zirconia and Lithium Disilicate planned to restore multi-rooted teeth that presented endodontic treatment and extensive coronal destruction.

**Keywords:** Endocrown, Root, Canal, Teeth.

**Introduction**

Endodontically treated teeth usually involves a considerable amount of tooth structure loss usually due to trauma or caries in addition to the central destruction

created by the endodontic access preparation. This usually makes the tooth left with insufficient sound tooth structure to support a casted restoration unaided. <sup>(1)</sup>

One of the limitations in post and core restorations is the actual removal from the radicular structure to place the post which might weaken the root and make it more susceptible to fracture. Also, another limitation to the use of intraradicular posts are calcified root canals, narrow canals, or a fracture of an instrument, have led dentists to think of other alternatives. <sup>(2)</sup> Bindl and Mörmann introduced a complete glass ceramic crown restoration in 1999 by as a substitute to the full post-and-core-supported crown; “endocrown” is a one-piece ceramic construction. <sup>(3)</sup>

Endo crowns presented several advantages over posts and cores and full coverage crowns, they are easier to prepare and apply and requires lesser clinical time and visits. Esthetic properties are also incomparable. Also, it adheres to the tooth structure on Monoblock Phenomenon. <sup>(4)</sup>

The purpose of the present paper is to present clinical cases, in which an esthetic and different conservative posterior endocrowns i.e. Porcelain-fused to metal, Zirconia and Lithium Disilicate to restore multi-rooted teeth that presented endodontic treatment and extensive coronal destruction.

### **Case 1**

A 36-year-old female was referred to the Department of Conservative Dentistry and Endodontics at M.A. Rangoonwala College of Dental Sciences and Research Centre, Pune . She suffered from major coronal destruction and needed to have her first maxillary 1<sup>st</sup> Right Molar restored due to previous incidence of caries and endodontic treatment. (Figure 1) The medical history was non contributory. Radiographic and clinical examinations were performed initially, to check the amount of remaining tooth structure and the apical status of the

previous endodontic treatment. The patient had an acceptable oral hygiene and a favourable occlusion after which an endocrown restoration was recommended because of the amount of remaining tooth structure and the thickness of the walls. The prosthetic decision was to restore tooth (16) with an endocrown fabricated from Porcelain- fused Metal after considerable research. The preparation for the endocrown is different from the conventional full coverage crown.

The aim was to achieving achieve 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 using a tapered bur included only removal of undercuts from the access cavity. Total occlusal convergence of 7° to create continuity between the coronal pulp chamber and endodontic access cavity. (Figure 2)

After the completion of tooth preparation impression was made with polyvinyl siloxane impression material of light and putty consistency using a double-mix single-stage technique. (Figure 3) The conventional casting technique was used for fabrication of the metal coping part of the endocrown on the master cast. The metal coping trial was done intra-orally to verify the fit. (Figure 4) The ceramic buildup was carried out with the layering technique incrementally. The gross occlusal discrepancies marked with the articulating paper strips and removed before cementation. The endocrown was cemented intraorally using GIC luting cement. (Figure 5 and 6) Post cementation radiographic view showed appropriate **seating of the crown.**

Figure 1: Pre-Operative



Figure 2: Endocrown Tooth Preparation



Figure 3: Double Mix Single Stage Putty Impression



Figure 4: Endocrown Metal Coping Trial



Figure 5: Interior surface of Endocrown



Figure 6: Post- Cementation of Endocrown



### Case 2

A 40-year-old male was referred to the Department of Conservative Dentistry and Endodontics at M.A.Rangoonwala College of Dental Sciences and Research Centre, Pune . He suffered from gross crown destruction and needed to have her first maxillary 1<sup>st</sup> left Molar restored. (Figure 7) Radiographic and clinical examinations were performed initially, to check the amount of remaining tooth structure and the apical status of the previous endodontic treatment. The patient's oral hygiene was acceptable and a favourable occlusion after which an endocrown restoration was recommended because of the amount of remaining tooth structure and the thickness of the walls. The prosthetic decision was to restore tooth (26) with an endocrown fabricated from monolithic zirconia.

Initially on clinical examination, gingival tissue was overlapping the distal tooth structure which was removed using diode laser. (Figure 8) After healing of the tissue was observed endocrown preparation was commenced along with shade selection.

The aim was to achieve 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 using a tapered bur included only removal of undercuts from the access cavity. Total occlusal convergence of  $7^\circ$  to create continuity between the coronal pulp chamber and endodontic access cavity. (Figure 9) After the completion of tooth preparation impression was made with polyvinyl siloxane impression material of light and putty consistency using a double-mix single-stage technique. (Figure 10) The zirconia was milled using CAD/CAM technique. After verifying the fit, the endocrown was cemented intraorally using resin luting cement. (Figure 11 and 12) The inner surface was etched with 10% hydrofluoric acid and was washed with water and dried. Silane coupling agent was applied for 1 min and dried. The tooth was etched for 10 seconds and washed and dried using blotting paper. Adhesive was applied and cured for 20 secs. Resin cement was placed on the inner surface and endocrown was cemented using light cure. The gross occlusal discrepancies were marked with the articulating paper strips and then removed before cementation. Post cementation radiographic view showed appropriate seating of the crown.

Figure 7: Pre-Operative



Figure 8: After gingivectomy with diode laser



Figure 9: Endocrown tooth Preparation





Figure 10: Double Mix Single Stage Putty Impression



Figure 11: Monolithic Zirconia Endocrown



Figure 12: Post Cementation



### Case 3

A 42-year-old female was referred to the Department of Conservative Dentistry and Endodontics at M.A.Rangoonwala College of Dental Sciences and

Research Centre, Pune . He suffered from major coronal destruction and needed to have her 1<sup>st</sup> Mandibular Right Molar restored. (Figure 13) Radiographic and clinical examinations were performed initially, to check the amount of remaining tooth structure and the apical status of the previous endodontic treatment. The patient had an acceptable oral hygiene and a favourable occlusion after which a to endocrown restoration was recommended because of the amount of remaining tooth structure and the thickness of the walls. The prosthetic decision was to restore tooth (46) with an endocrown fabricated from monolithic Lithium Disilicate (IPS E.Max).

Prior to commencement of preparation, shade selection was done. The aim was to achieve 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 using a tapered bur included only removal of undercuts from the access cavity. Total occlusal convergence of 7° to create continuity between the coronal pulp chamber and endodontic access cavity. (Figure 14) After the completion of tooth preparation impression was made with polyvinyl siloxane impression material of light and putty consistency using a double-mix single-stage technique. (Figure 15) The Lithium Disilicate was milled using CAD/CAM milling technique. After verifying the fit, the endocrown was cemented intraorally using resin luting cement. (Figure 16 and 17) The inner surface was etched with 10% hydrofluoric acid was washed with water and dried. Silane coupling agent was applied for 1 min and dried. The tooth was etched for 10 seconds and washed and dried using botting paper. Adhesive was applied and cured for 20 secs. Resin cement was applied on the inner surface and endocrown was cemented using

light cure. The gross occlusal discrepancies were marked with articulating paper strips and later removed before cementation. Post cementation radiographic view showed appropriate seating of the crown.

Figure 13: Pre-Operative



Figure 14: Endocrown Tooth Preparation



Figure 15: Double mix Single Stage impression



Figure 16: Monolithic Lithium Disilicate Endocrown



Figure 17: Post Cementation



### Discussion

The rationale behind Endocrown is that a monolithic ceramic bonded restoration with a supragingival butt joint keeping as much as possible enamel for improved adhesion. The endocrown will invade the pulp chamber only thus the remaining dentin of the root canal is not affected. The pulpal chamber shape and cavity warrants stability and retention. The objective of the preparation is to get a wide and stable surface resisting the compressive stresses that are frequent in molars. The prepared surface is parallel to the occlusal plane to provide stress resistance along the major axis of the tooth. The stress levels in teeth

with endocrowns were lower than in teeth with prosthetic crowns. <sup>(5,6)</sup>

Retention in endocrowns are achieved through the pulp chamber. Its trapezoidal shape in mandibular molars and triangular shape in maxillary molars increase the restoration's stability, and additional preparation is not needed. <sup>(7,8)</sup> The saddle form of the pulpal floor increases stability. This anatomy, along with the adhesive qualities of the bonding material, makes it unessential to attempt further use of post-involving root canals. <sup>(9)</sup>

In 2012, Biacchiet al compared the fracture strength of 2 types of full ceramic crowns: indirect conventional crowns retained by glass fibre posts and endocrowns. They came to the conclusion that endocrowns were more resistant to compressive forces than the first ones. <sup>(10)</sup>

Low cost, short preparation time, ease of application, minimal chair time and aesthetic properties are the advantages of endocrowns. <sup>(11)</sup>

Oswal et al 2018, reported a case of porcelain fused to metal crown of mandibular molars. They should exceptionally good alternative to conventional ceramic endocrown along with cost effectiveness. Thus, a porcelain fused to metal endocrown was planned in accordance to this study. <sup>(12)</sup>

### Conclusion

The endocrown represents a very hopeful treatment alternative for endodontically treated molars, it allows maintaining of tooth structure, it is compatible with minimally invasive dentistry, and it is adequate for the concept of biointegration. It is a conservative approach for mechanical and aesthetic restoration of nonvital posterior teeth. Thus, Endocrown can be an excellent alternative to post and core post endodontic restorations in the near future.

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