ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 03 | March - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ENDOCROWN: A MONOBLOCK CONCEPT WITH DOUBLE RETENTION (A CASE REPORT)

Endodontics

Dr. Swapnil Pawar* Sr. Lecturer, Department of Conservative Dentistry & Endodontics, Yogita Dental College and Hospital, Khed *Corresponding Author

Dr. Gayatri Landge Tutor, Department of Oral and Maxillofacial Surgery, Yogita Dental College and Hospital, Khed .

ABSTRACT

Teeth that undergo root canal treatment require some form of restoration to enable them to be functional again. The standard goal for restoring teeth is to preserve maximum amount of tooth structure thus minimally invasive preparation should be considered. It is important to understand the indications of such treatment. The following case report demonstrated the use of Endocrown to restore a damaged tooth structure. Low cost, short preparation time, ease of preparation & application, minimal chair time, adhesion to tooth structure and aesthetic properties compared to conventional crowns are the advantages of endocrown. It differs from traditional dental crowns in that it is placed within the tooth as well, rather than only covering the entire tooth structure. In this case paper, the indication of such treatment along with the operative procedure is inscribed. A case of endodontically treated right mandibular 1st molar requiring post endodontic management treated with Endocrown is presented.

KEYWORDS

Endocrown, Endodontically treated tooth, Lithium disilicate glass-ceramic, Monoblock concept, Post-endodontic restoration

INTRODUCTION

The restorative treatment of endodontically treated teeth with extensive coronal destruction, causes a great deal in aesthetic and functional recovery.(1) The choice of post endodontic restoration varies depending on the extent of the coronal destruction of the tooth structure varying from a direct restorative procedures such as amalgam, glass-ionomer cement, and composite resins to indirect procedures such as metal and ceramic inlays, onlays and post-retained full-coverage crowns etc.(2) In endodontically treated posterior teeth, due to their morphological structure and the increased occlusal loads cuspal coverage is needed. The choice of restoration of tooth can be decided according to the coronal structure loss, where occlusal destruction of tooth structure need core build up and a crown. (3)

Appropriate surface and coronal structure are limited for adhesion when more than half of the coronal tooth structure is missing. In this case, post-core restoration is mandatory to increase the resistance of tooth against the fracture. (4) The association of post and core, performed when indicated with the correct technique, presents satisfactory long-term results. However, the limitations to the use of intraradicular posts, such as the root anatomy, presence of dilacerations and short roots, reduction in the strength of the tooth, the complexity of treatment in some cases, high cost and doubts with regard to cementation material, have lead clinicians to seek other alternatives.

The term endocrown was coined by Bindl and Mörmann in the year 1999, however, its initial literature existence dates back to 1995 by Pssiss, who termed it as “ceramic monoblock technique(5,6) The introduction of Endocrown embarks the concept of minimally invasive dentistry which acquires micromechanical retention from the floor and walls of the pulp chamber keeping as much as possible enamel for improved adhesion (7) It is a monolithic ceramic bonded restoration with a supragingival butt joint.. The endocrown involves the pulp chamber only. The pulpal chamber floor saddle form, shape and cavity warrants stability and retention. No need for further preparation. (8) Endo crowns are indicated in Endodontically treated teeth with suitable pulp chamber depth. On the other hand, Endocrown is contraindicated in cases with a short and narrow pulp chamber, if adhesion is not certain and if there is a very little tooth structure remaining. (9)

However; Endocrown presented several advantages over traditional methods. It is easier to fabricate and time effective with great aesthetic properties. (3) It has been proven that it has least micro leakage thus improves the clinical success of endodontic treatment. Moreover, they show a great advantage in cases where posts are contraindicated due to short or narrow canals. The present paper reports the case of endodontically treated mandibular molar rehabilitation with an extensive coronal destruction but adequate pulp chamber depth.

Case Report

An 18-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 of jaw since 10 days. On clinical and radiographical examination, a diagnosis of symptomatic irreversible pulpitis was made and root canal therapy was suggested as treatment plan. After the informed consent, the treatment was initiated.

On completion of the endodontic treatment therapy, the all remaining dimensions of tooth structure were measured where an inter-occlusal clearance of 1.5 mm, a pulp chamber depth of 4 mm, and a cervical margin of 2 mm was seen. (Figure 1a and 1b) According to the amount of remaining tooth structure and thickness of the walls, a post endodontic restoration with lithium di-silicate ceramic endocrown was decided. The orifices of canals were sealed using resin modified glass ionomer cement (Fuji II LC GC ASIA). 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 intra-coronal cavosurface margin. Appropriate reduction of the buccal and lingual walls was done so as to gain an interocclusal clearance of 2 mm extra coronally, the finish line was placed supragingivally. (Figure 2) The undercuts in the cavity were blocked using conventional resin composites. Before any intervention, selection of shade was done. An impression was made using polyvinyl siloxane impression (Aquasil LV, Putty/Light Body, Dentsply, Germany) using the putty wash technique (Figure 3), which was sent to the laboratory for the fabrication of prosthesis.

Figure1a Pre-Operative

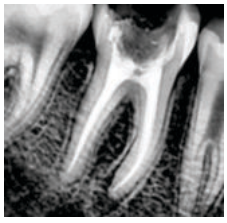

Figure 1b - IOPA

Figure 2- Preparation

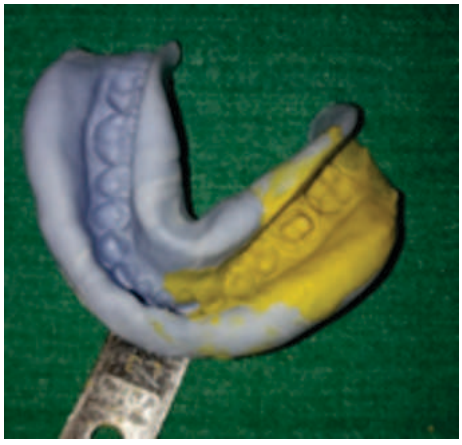

Figure 3- Impression

Figure 4a- Cad image

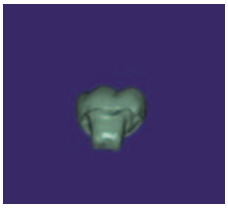

Figure 4b- Cad image

Figure 5- Endocrown

Figure 6-Cementation

In the laboratory, image was scanned from the cast and dye cut was prepared (Figure 4a, 4b) and milling of endocrown was done with CEREC Zirconia block (Dentsply Sirona, India) (Figure 5). 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. After that coat of silane application was done for a minute. Isolation was done on the prepared tooth surface and was etched with 37% phosphoric acid for 20 s and rinsed with water and dried. 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 adaption. (Figure 6)

DISCUSSION

The choice of post endodontic restoration is based on the location of tooth and the amount of the remaining tooth structure. An anterior tooth having limited access opening and sufficient tooth structure can be restored with a direct composite restoration and a grossly destructed tooth may need a crown. (10)

If the remaining tooth structure is not enough to retain the core, an extra retentive mechanism has to be applied to retain the core structure, in such cases a post or dowel must be placed. The posts are of two types, prefabricated posts with a direct core and 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 benefits in the retention of the restoration. On the other hand, removal of the radicular structure to place the post might weaken the strength of root and reduces its resistance to fracture. Also, the presence of a post causes difficulty in future endodontic re-treatment if required. (4) Chang et al. compared the fracture resistance and failure modes of CEREC endocrowns with the conventional post-core supported conventional crowns on maxillary premolars. It is concluded that the CEREC endocrowns showed a higher fracture resistance than conventional crowns, but regarding failure modes, no significant difference was found between the two groups. (11)

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. (12)

Endocrown was strongly indicated in mandibular molar which faces great amount of occlusal stresses.

The introduction and evolution of effective dentine bonding agents was paradigm shift in the restoration of endodontically treated teeth which minimizes the use of radicular post as long as there is sufficient surface area available for micro mechanical retention. According to this rationale, endocrown is applied as a prosthetic option in restoration of endodontically treated teeth. (13) In an in vivo study, Bindl and Mörmann found that 19 adhesively bonded CEREC endocrowns (4 premolars and 15 molars) in 13 patients functioned satisfactorily for 28 months, and only one endocrown failed because of recurrent caries. (5)

In 1995, Pissis introduced a novel technique that developed porcelain core/crown unit as a single unit. This technique was then called as monoblock technique which advocate to replace the traditional metal post and core. In 1999, Bindle and Mörmann introduced the Endocrown technique. (4) These crowns would be retained to the internal surface of the pulp chamber and on the cavity margins which provides macromechanical retention by the pulpal walls, and micromechanical retention is obtained by the use of adhesive cementation. This method is particularly indicated in cases where there is excessive loss of crown structure, interproximal space is limited and replacement with post and core is not possible because of limited ceramic thickness. (14). Low cost, short preparation time, easy application, minimal chair time and aesthetic properties as compared to conventional crowns are some advantages of endocrowns. (15) In addition, endocrowns are also an alternative in teeth with short or atresic clinical crowns, calcified, curved or short root canals which makes post application impossible. In a study of 3D Finite Element Analysis of molars restored with endocrowns and posts during masticatory simulation, they concluded that teeth restored with endocrowns were potentially more resistant to failure compare to teeth with fibre reinforced posts. (3)

Minimally invasive preparation, with maximal tissue conservation, is now considered as gold standard for restoring endodontically treated tooth. The concept of an endocrown is based on the same rationale

which included the circular supragingival/equigingival butt-joint margin and central retention cavity. The cervical sidewall is the foundation such restoration, the objective of which is to establish a wide, uniform, steady surface resistant to compressive stress. The saddle form of the pulpal floor warrants stability and retention.

Literature clearly illustrate that the choice of prosthesis for restoring an endodontically treated teeth is a difficult 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 decides reinforcement of the remaining healthy dental tissues, which can impart harmony to tooth-restoration complex. In today's era of aesthetic and adhesive dentistry, endocrown serves as a conservative and feasible alternative to conventional post and core crowns as it preserves root tissues and limits its preparation to internal preparation of the pulp chamber. (16)

The adhesive restorations can minimize the infiltration of microorganisms from the coronal to the apical part and increase the clinical success rate of the endodontic treatment. Moreover, they show a great advantage in cases where posts are contraindicated due to short or narrow canals. (4) Many materials have been recommended for fabrication of endocrowns such as feldspathic porcelain, glass ceramic, hybrid composite resin, and recent computer-aided design/ computer-aided manufacturing all-ceramic blocks. (16) Ceramic restorations can be made in the laboratory or using CAD/CAM systems by processing the feldspathic ceramic blocks. (17) Industrially optimized feldspathic ceramics are used in CAD/CAM systems and when compared to dental ceramic materials processed in the laboratory, they have better fracture resistance and structural homogeneity. The preparation is acceptable for the conservative and modern preparation design. Furthermore, the restoration can be complete in a single session, and good marginal fit and aesthetics are achieved. (3) The success and longevity of endocrowns also dependent on various other factors, such as operator skill, proper preparation techniques, adequate selection of most appropriate ceramic material, also the choice of bonding material. In some situations, endocrown has been decline as a treatment option because of the lack of adhesive bonding and patient's economical factor, as the main criteria. (18)

A systematic review by Sedrez-Porto et al stated 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 concluded that endocrowns may perform similarly or better than the conventional treatments. (19) Mandibular molars are undergone to greater masticatory forces and unfavourable stresses. Therefore, the higher compressive strength combined with lower stress levels acting on tooth made endocrown restoration a suitable option in the present case.

CONCLUSION

Endocrown is now observed a highly recommended restorative option for restoring endodontically treated teeth. It preserves the tooth structure and has several mechanical and aesthetic advantages. It's indicated in posterior teeth and manifest 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.

REFERENCES

1. Menezes-Silva R, Espinoza CA, Atta MT, de Lima Navarro MF, Ishikiriama SK, Mondelli RF. Endocrown: a conservative approach. Brazilian Dental Science. 2016 Jul 7;19(2):121-31.
2. Mannocci F, Cowie J. Restoration of endodontically treatedteeth. Br Dent J 2014; 216:341-6.
3. Sevimli G, Cengiz S, Oruc MS. Endocrowns: review. Journal of Istanbul University Faculty of Dentistry. 2015; 49(2):57-63.
4. Elagra M. Endocrown preparation. Int J Appl Dent Sci. 2019;5(1):253-6.
5. Bindl A, Mormann WH. Clinical evaluation of adhesively placed cerec endo-crowns after 2 years: preliminary results. J Adhes Dent. 1999 Autumn;1(3):255-65.
6. Göhring TN, Peters OA. Restoration of endodontically treated teeth without posts. Am J Dent. 2003 Oct;16(5):313-7.)
7. Biacchi GR, Mello B, Basting RT. The endocrown: An alternative approach for restoring extensively damaged molars. J Esthet Restor Dent 2013; 25:383-90.)
8. The Endocrown: A Different Type of All-Ceramic Reconstruction for Molars. Michel Fages, DDS, phd; Bertrand Bennasar, DDS. J Can Dent Assoc. 2013; 79: d140
9. Debbabi I, Nouira Z, Saafi J, Harzallah B, Cherif M. "ENDOCROWN": A Reliable Alternative to Restorate RCT Molar! – Two Case Reports. Adv Dent & Oral Health. 2018; 9(5):555774. DOI: 10.19080/ADOH.2018.09.555774. 004
10. Tandan M, Madaan D, Sachdeva A. Endocrown: An Alternative Modality to Resort Extensively Damaged Molars: A Case Report. OHDM - Vol. 20 - No. 3 - March, 2021
11. Chang CY KJ, Lin YS, Chang YH. Fracture resistance and failure modes of CEREC endocrowns and conventional post and core-supported CEREC crowns. J Dent Sci 2009;4(3):110-117.
12. Biacchi GR, Basting RT. Comparison of fracture strength of endocrowns and glass fiber post-retained conventional crowns.Operative Dentistry. 2012; 37: 130-136.
13. Van Meerbeek B, Perdigao J, Lambrechts P, Vanherle G. The clinical performance of adhesives. J Dent 1998;26(1):1-20
14. Dietschi D, Duc O, Krejci I, Sadan A. Biomechanical considerations for the restoration of endodontically treated teeth: A systematic review of the literature, part ii (evaluation of fatigue behavior, interfaces, and in vivo studies). Quintessence Int 2008;39(2):117-129.
15. Oswal N, Chandak M, Oswal R, Saoji M. Management of Endodontically Treated Teeth with Endocrown. Journal of Datta Meghe Institute of Medical Sciences University. 2018; 13: 60-2.)
16. Jedynakiewicz NM, Martin N. Cerec: Science, research, and clinical application. Compend Contin Educ Dent 2001;22(6 Suppl):7-13
17. Vinola SM, Balasubramanian S, Mahalaxmi S. "ENDOCROWN"—An Effective Viable Esthetic Option for Expurgated Endodontically treated Teeth: Two Case Reports. Journal of Operative Dentistry & Endodontics. 2015 Aug 1;2(2):97-102.
18. Sedrez-Porto JA, da Rosa WL, da Silva AF, Münchow EA, Pereira-Cenci T. Endocrown restorations: A systematic review and meta-analysis. Journal of dentistry. 2016 Sep 1; 52:8-14.
19. Nayak M, Jose A. Endcrown: an option for rehabilitation of badly mutilated tooth: A case report. International Journal of Applied Dental Science. 2020; 6:30-3.