



Endocrowns as a Restoration for Root Canal Treated Teeth : A Boon or Curse – A literature review

1. Dr Pranav Bhale , 2. Dr Vivekanad Jadhav , 3. Dr Babita Yeshwante , 4. Dr Shubha Chiniwar, 5. Dr Isha Gotmare.

1. Post graduate student , 2. Professor and PG guide , 3. Head of department , 4. Post graduate student , 5. Post graduate student.

ABSTRACT- There are many options to restore endodontically treated teeth. Root canal treated teeth are structurally compromised teeth . A less conventional approach to restore such teeth without a post is to give an endocrown. In post and core restoration there is intracanal retention which increases the risk of root fracture. Endocrown is a monoblock ceramic crown consisting of a circle of butt edges and a retainer located in the pulp chamber. Endocrowns uses the technique of adhesive cementation and they are more conservative as they derive retention from the pulp chamber. They can be fabricated by CAD CAM and stress distribution is also reasonable in such restorations . Materials used for endocrowns are glass ceramics , lithium disilicate and nanofilled composite resins. The advantages of an endocrown is that they are conservative, esthetically good , mechanically strong and cost effective.

KEYWORDS : Endocrowns, post and core restorations, ceramics , adhesion.

INTRODUCTION : The removal of caries with an airtor and access cavity preparation weakens the tooth structure which is why Root canal treated teeth are structurally compromised teeth. The remaining tooth structure in a root canal treated teeth will determine its survival. Many prosthetic treatment options are available after completion of root canal which involves full coverage crowns , endocrowns , post and core restorations ¹. One option to restore an endodontically treated tooth which has insufficient crown structure is post and core resotation but this type of restoration which has intracanal retention weakens the tooth structure and increases the risk of root fracture . This is an invasive type of restoration which can cause irreversible damage and also excludes the possibility of any further intervention. The advances in adhesive dentistry is challenging the post and crown concept .² Endocrowns are conservative coronal restorations that have been used to restore endodontically treated teeth with significant loss of coronal tooth structure. Pissis first described the concept of endocrowns in 1995, and Bindl and Mormann introduced the term endocrown in 1999. Endocrowns are monoblock

coronal restorations that are retained by pulp chamber and by bonding to remaining coronal structure³. The endocrowns can be manufactured by computer aided design. One more factor that determines the survival of endodontically treated tooth is the material used for restoration. Indirect restorations which involves Metal ceramics were gold standard for many years because they had high success rate compared to direct composite restorations. Glass ceramics which has high strength and esthetics and good adhesive properties are used for endocrowns⁴. Endocrowns are mostly seen in extensively damaged molars, or molars with short dilacerated roots, or when there is limited interocclusal space.

DISCUSSION : The long term success of root canal treated teeth depends on the amount of coronal tooth structure. Other factors which are important are fracture strength of material, its elastic modulus, properties of luting agents, thickness of restoration and preparation design. Resin bonded all ceramic restorations helps us to maintain the integrity of root canal treated teeth⁵. Adhesive technique ensures that there is no marginal leakage and reduces penetration of microorganisms, thus contributing in clinical success of endodontic treatment. High elastic modulus of few ceramic material can create more stresses at tooth to material interface.⁶ Endocrowns perform better when placed in posterior teeth simply because posterior teeth have larger pulp chambers⁷. An endocrown should be always made from a material which has low elastic modulus which is comparable with dentin so that occlusal forces are distributed properly which will improve the fracture resistance. The fracture resistance of teeth restored with endocrowns with different material was as high as 2675N.⁸ Nano ceramic resin performed better than lithium disilicate and feldspathic porcelain. The success of endocrown also depends on the ferrule effect. Presence of ferrule on molar of 1mm to 2mm increases the load to fracture of glass ceramic restorations⁹. Regardless of the ferrule height, highest stress values were observed under axial load. Endocrowns with butt joint margins has less marginal leakage as compared to shoulder finish line¹⁰. Whenever there is no ferrule, concave bevel on the peripheral enamel increases the enamel bonding and improves the mechanical behaviour of endocrowns¹¹. The tooth which is going to receive the endocrown should be isolated properly and all the bonding protocols are to be followed for the success of the resoration. In endocrowns the risk of debonding is always greater than the risk of fracture. It has been seen that the high elastic modulus of the restorative material prevents the stress from reaching the cement layer. The cement layer can be considered as the weakest link in such type of restorations. The chances of cohesive failure is always more than adhesive failure. Adhesive failure can occur during oblique loading because of increased intensity of stresses.⁴

In 2009, chia-yu-chang did a study on comparison of fracture resistance between CEREC endocrowns and conventional CEREC post and core and they concluded that CEREC endocrowns had better fracture resistance and is a better option for severely decayed teeth.¹²

In 2015, Abo-Elmagd A, studied influence of marginal preparation design on microleakage and marginal gap of endocrown cemented with adhesive resin cement. They concluded that endocrowns were superior compared to conventional crowns in vertical marginal gap and endocrown marginal design had no effect on vertical margin gap.¹³

In 2016, Dalloul R., did A Comparative Study of Marginal Fit between IPS e.max Press Crown and Endocrown after Cementation and concluded that marginal fit of endocrown is better and has a good chance of success when used for endodontically treated teeth. ¹⁴

In 2018, Roca et al published a study which stated that maxillary premolars restored with endocrowns with 2mm and 4mm endocores had same outcome in terms of marginal integrity and fatigue resistance when compared to conventional crowns. ¹⁵

CONCLUSION : The fracture resistance and stress concentration of endocrowns is comparable to conventional post and core restorations and had better results¹⁶. Posterior teeth restored with endocrowns have less risk of root fracture compared to post and core restorations. Endocrown preparation is more conservative in nature and it uses the concept of bonding. Clinical studies on long term success and retrieval of endocrowns in cases of re-treatment is still lacking.

References :

1. Stavropoulou AF, Koidis PT. A systematic review of single crowns on endodontically treated teeth. *Journal of dentistry*. 2007 Oct 1;35(10):761-7.
2. Govare N, Contrepolis M. Endocrowns: A systematic review. *The Journal of prosthetic dentistry*. 2020 Mar 1;123(3):411-8.
3. Al-Dabbagh RA. Survival and success of endocrowns: A systematic review and meta-analysis. *The Journal of prosthetic dentistry*. 2021 Mar 1;125(3):415-e1.
4. Tribst JP, Dal Piva AM, de Jager N, Bottino MA, de Kok P, Kleverlaan CJ. Full-Crown Versus Endocrown Approach: A 3D-Analysis of Both Restorations and the Effect of Ferrule and Restoration Material. *Journal of Prosthodontics*. 2021 Apr;30(4):335-44.
5. Hamdy A. Effect of full coverage, endocrowns, onlays, inlays restorations on fracture resistance of endodontically treated molars. *J Dent Oral Hyg*. 2015;5:2.
6. Otto T, Mörmann WH. Clinical performance of chairside CAD/CAM feldspathic ceramic posterior shoulder crowns and endocrowns up to 12 years. *Int J Comput Dent* 2015;18:147-61.
7. Roggendorf MJ, Kunzi B, Ebert J, Roggendorf HC, Frankenberger R, Reich SM. Seven-year clinical performance of CEREC-2 all-ceramic CAD/CAM restorations placed within deeply destroyed teeth. *Clin Oral Investig* 2012;16:1413-24.
8. Aktas G, Yerlikaya H, Akca K. Mechanical failure of endocrowns manufactured with different ceramic materials: an in vitro biomechanical study. *J Prosthodont* 2018;27:340-6.
9. Einhorn M, DuVall N, Wajdowicz M, et al: Preparation ferrule design effect on endocrown failure resistance. *J Prosthodont* 2019;28:e237-e242
10. Alnajeeli O, Gambarini G. Are the Endocrowns Better than the Conventional crowns as a Restoration of Posterior Endodontically Treated Teeth? A Systematic Review. *Smile Dental Journal*. 2019 Dec 1;14(4).
11. Veneziani M. Posterior indirect adhesive restorations: updated indications and the Morphology Driven Preparation Technique. *Int J Esthet Dent* 2017;12:204-30.

12. Chang CY, Kuo JS, Lin YS, Chang YH. Fracture resistance and failure modes of CEREC endo-crowns and conventional post and core-supported CEREC crowns. *Journal of Dental Sciences*. 2009 Sep 1;4(3):110-7.
13. Abo-Elmagd AA, Abdel-Aziz M. Influence of marginal preparation design on microleakage and marginal gap of endocrown cemented with adhesive resin cement. *Egypt Dent. J.* 2015 Oct;61:5481-9.
14. Dalloul R, Nassar JA, Al-Houri N. A comparative study of marginal fit between IPS e-MAX press crown and endocrown after cementation (In vitro). *Clinical Medicine and Diagnostics*. 2016;6(5):122-5.
15. Rocca GT, Daher R, Saratti CM, Sedlacek R, Suchy T, Feilzer AJ, Krejci I. Restoration of severely damaged endodontically treated premolars: The influence of the endo-core length on marginal integrity and fatigue resistance of lithium disilicate CAD-CAM ceramic endocrowns. *Journal of dentistry*. 2018 Jan 1;68:41-50.
16. Alomran W. Endocrowns: A review article. *Scholars Journal of Dental Sciences*. 2018;5(5):305-9.

