Endocrowns : Prosthetic Reinforce -ment in Endodontics(Review)

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Abstract

The ideal restoration of endodontically treated teeth (ETT) has been widely and controversially discussed in the literature. Prevention of healthy dental structure is essential to help mechanical stabilization of tooth-restoration integrity, increase the amount of suitable surfaces for adhesion and thus positively affect the long-term success. ETT are affected by a higher risk of biomechanical failure than vital teeth. With the development of adhesive systems, the need for post-core restorations is also reduced. Especially for restoration of excessively damaged ETT, endocrowns have been used as an alternative to the conventional post-core and fixed partial dentures. Compared to conventional methods, good aesthetics, better mechanical performance, and less cost and clinic time are the advantages of endocrowns.

Keywords: Endocrown; adhesive restoration; endodontically treated teeth.

Introduction

The restoration of endodontically treated teeth (ETT) is a topic that has been widely and controversially discussed in the dental literatüre , and clinical opinions on this subject have been based on rather empirical philosophies due to the weak link between available scientific data and inconclusive clinical studies. ETT carry a higher risk of biomechanical failure than vital teeth, and are a common problem in restorative dentistry related to the fractures occuring in such teeth.

Changes Occuring in Endodontically Treated Teeth:

The primary reason for reduction in stiffness and fracture resistance of ETT is the loss of structural integrity associated with caries, trauma and extensive cavity preparation, rather than dehydration or physical changes in dentin . Type of restorative materials used and an appropriate restoration that conserves tooth structure are the factors affecting the longevity of endodontic treatment. Quality and integrity of the remaining tooth structure should be preserved carefully in terms of providing a solid base required for restoration and increasing the structural strength of the restored tooth.

Biomechanical principles indicate that the structural strength of a tooth depends on the quantity and intrinsic strength of hard tissues and the integrity of the anatomic form. Variations in tissue quality following endodontic treatment proved to have a negligible influence on tooth biomechanical behavior. Mechanically, a conservative endodontic access cavity has been found to minimally affect the fracture resistance of a tooth. Another issue is the impairment of neurosensory feedback related to the loss of pulpal tissue, which might reduce the protection of the ETT during mastication.

Restoration of Endodontically Treated Teeth:

Although there are a number of studies on ETT, treatment planning and the choice of material for the restoration are still controversial, and some criteria must particularly be considered. The remaining coronal tooth structure and functional requirements are important factors to be considered in deciding the treatment planning

Minimal Loss of Coronal Structure:

Minimal loss of coronal structure usually relates to teeth that have had little or no restoration but require root canal therapy. The remaining tooth structure, despite endodontic treatment, should present only minimal strength loss compared to a vital tooth, providing no horizontal or vertical crack is present; actually, the endodontic access cavity and minimal enlargement of the pulp chamber are considered not to significantly affect tooth biomechanics. The clinicians suggest treating such teeth with only adhesive restoration filling the access cavity and pulpal chamber. The choice of material should be limited to composite resins, in combination with an effective adhesive system, following the total bonding concept . The only contraindication to such a conservative approach is the case of patients with parafunctions, group guidance and step cuspal inclination, which may require compelete occlusal coverage.

Endocrown Restoration:

The true breakthrough in the restoration of endodontically treated teeth was the introduction of adhesion, propelled by the development of effective dentin adhesives. The chief advantage of adhesive restorations is that microretentive elements are no longer mandatory as long as enough surface is available. With this approach, the insertion of radicular posts has become the exception rather than the rule when applying conventional restorative techniques. In fact, minimally invasive preparations, with maximal tissue conservation, are now considered 'the gold standard' for restoring ETT. By following this rationale, endocrowns are applied as a prosthetic option in restoration of endodontically treated incisors, premolars and molars with excessive tooth loss. Pissis was the forerunner of the endocrown technique and has described it as the 'mono-block porcelain technique'. In 1999, the endocrown was described for the first time by Bindle and Mormann as adhesive endodontic crowns and characterized as total porcelain crowns fixed to endodontically treated posterior teeth. These crowns would be anchored to the internal portion of the pulp chamber and on the cavity margins, so micro mechanical retention is provided by the pulpal walls, and micro mechanical retention is obtained by the use of adhesive cementation.

This method is particularly indicated in cases in which there is excessive loss of tissue of the crown, inter proximal space is limited and traditional rehabilitation with post and crown is not possible because of inadequate ceramic thickness. Compared to conventional crowns, endocrowns are easy to apply and require a short clinical time. Low cost, short preparation time, ease of application, minimal chair time and aesthetic properties are the advantages of end crowns. In addition, endo crowns are also an alternative in teeth with short or atresic clinical crowns, calcified, curved or short root canals that make post application impossible. In a study of 3D Finite Element Analysis of molars restored with endo crowns and posts during masticatory simulation, teeth restored by endo crowns were potentially more resistant to failure than those with fiber reinforced posts

Preparation Technique for Endo crowns:

The endo crowns preparation consists of a circumferential 1.0-1.2 mm depth butt margin and a central retention cavity inside the pulp chamber, constructs both the crown and core as a single unit monoblock structure, and does not take support from the root canals. The suggested dimensions are a 3 mm diameter cylindrical pivot and a 5 mm depth fort the first maxillary premolars and a 5 mm diameter and a 5 mm depth for molars, but the precise dimensions for the preparation of central retention cavity were not clearly determined. The thickness of the ceramic occlusal portion


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of endocrowns is usually 3-7 mm. An in vitro study showed that the fracture resistance of ceramic crowns increases with increasing occlusal thickness. Mörmann et al reported that the fracture resistance of endocrowns with an occlusal thickness of 5.5 mm was two times higher than that of ceramic crowns with a classic preparation and an occlusal thickness of 1.5 mm.

In a clinical study, Bindl and Mormann evaluated the performance of 208 endocrowns cemented to premolars and molars, and observed that the premolars presented more failures than the molars because of the adhesion loss on these teeth.Loss of adhesion of endocrowns on premolars is suggested to be due to the surface of adhesive bonding was smaller than the one on molars, and the greater ratio of the prepared tooth structure to the overall crown might have caused a higher leverage for premolars than for molar.

Cementation:

To date, resin cements composed of Bis-GMA or UDMA resin matrix and inorganic filler particules are the most popular types of cements. When compared to conventional cements, with superior mechanical and aesthetic properties, resin cements have an increasing use in cementation of ceramic, metal and composite indirect restorations. Usually eugenol-containing root canal sealers are believed to inhibit the polymerization of resin cements. This problem may be overcome by cleaning of the root canal walls and acid etching. Cleaning all of the gutta percha and eugenol-containing root canal sealer in the canal is difficult without removing dental tissue. Debris on the rough surfaces of the root canal prevents the adequate roughen of dentin and polymerization of resin cement. However, in an in vitro study, it has been reported that eugenol-containing pastes do not have a negative effect on the bond strength of resins.

Lin et al. evaluated the risk of failure for an endodontically treated premolar with MOD preparation and three different CEREC ceramic restoration configurations. Ceramic restorations were cemented adhesively by composite resin cement, and simulations were performed based on three 3D infinite element models designed with CEREC ceramic inlay, endo crown and conventional crown restorations.

Results indicated that the stress values on the enamel, dentin and luting cement for endocrown restorations were the lowest ones among the values for inlay and conventional crown restorations. For normal biting, Weibull analysis showed that failure probability was 95%, 2% and 2% for the inlay, endo crown and conventional crown restorations, respectively. Both light- and dual-polymerizable luting resins can be adequately polymerized when they are used for luting thick indirect endo crown restorations

Conclusion:

Endo crowns have been used as an alternative to conventional post-core and fixed partial dentures in restoration of ETT with extensive coronal tissue loss.

Compared to traditional methods, better aesthetics and mechanical performance, low cost and short clinical time are the advantages of endo crowns.

References:

1. Robbins JW. Restoration of the endodontically treated tooth. Dent Clin North Am 2002;46(2):367-384.
2. 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.
3. Morgano SM, Hashem AF, Fotoohi K, Rose L. A nationwide survey of contemporary philosophies and techniques of restoring endodontically treated teeth. J Prosthet Dent 1994;72(3):259-267.
4. Zarone F, Sorrentino R, Apicella D, Valentino B, Ferrari M, Aversa R, Apicella A. Evaluation of the biomechanical behavior of maxillary central incisors restored by means of endocrowns compared to a natural tooth: A 3d static linear __nite elements analysis. Dent Mater 2006;22(11):1035-1044.
5. Chang CY KJ, Lin YS, Chang YH. Fracture resistance and failure modes of CEREC endo-crowns and conventional post and core-supported CEREC crowns. J Dent Sci 2009;4(3):110-117.
6. Ferrari M, Vichi A, Mannocci F, Mason PN. Retrospective study of the clinical performance of fiber posts. Am J Dent 2000;13(Spec No):9B-13B.
7. Assif D, Nissan J, Gafni Y, Gordon M. Assessment of the resistance to fracture of endodontically treated molars restored with amalgam. J Prosthet Dent 2003;89(5):462-465.
8. Johnson JK, Schwartz NL, Blackwell RT. Evaluation and restoration of endodontically treated posterior teeth. J Am Dent Assoc 1976;93(3):597-605.
9. Linn J, Messer HH. Effect of restorative procedures on the strength of endodontically treated molars. J Endod 1994;20(10):479-485.
10. Lander E, Dietschi D. Endo crowns: A clinical report. Quintessence Int 2008;39(2):99-106.
11. Reeh ES, Douglas WH, Messer HH. Stiffness of endodontically-treated teeth related to restoration technique. J Dent Res 1989;68(11):1540-1544.
12. Oliveira Fde C, Denehy GE, Boyer DB. Fracture resistance of endodontically prepared teeth using various restorative materials. Am Dent Assoc 1987;115(1):57-60
13. Faria AC, Rodrigues RC, de Almeida Antunes RP, de Mattos Mda G, Ribeiro RF. Endodontically treated teeth: Characteristics and considerations to restore them. J Prosthodont Res 2011;55(2):69-74.
14. Papa J, Cain C, Messer HH. Moisture content of vital vs endodontically treated teeth. Endod Dent Traumatol 1994;10(2):91-93.
15. Trope M, Ray HL, Jr. Resistance to fracture of endodontically treated roots. Oral Surg Oral Med Oral Pathol 1992;73(1):99-102.
16. Krejci I, Stavridakis M. New perspectives on dentin adhesion--differing methods of bonding. Pract Periodontics Aesthet Dent 2000;12(8):727-732.
17. Dietschi D, Sprea__co R. Current clinical concepts for adhesive cementation of tooth-colored posterior restorations. Pract Periodontics Aesthet Dent 1998;10(1):47-54.
18. Cathro PR, Chandler NP, Hood JA. Impact resistance of crowned endodontically treated central incisors with internal composite cores. Endod Dent Traumatol 1996;12(3):124-128.
19. Sorensen JA, Engelman MJ. Ferrule design and fracture resistance of endodontically treated teeth. J Prosthet Dent 1990;63(5):529-536