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RESEARCH ARTICLE

ENDO CROWN: AN APPROACH FOR RESTORING ENDODONTICALLY TREATED RIGHT MANDIBULAR FIRST MOLARS WITH LARGE CORONAL DESTRUCTION- A CASE REPORT

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Abstract

Rehabilitation of endodontically treated molar still a challenge. After endodontic management of extensively carious molars, they have decreased mechanical characteristics. They became fragile and that is in relation with the removal of pulp and adjacent dentin tissues. Endocrown which is a single partial restoration could be measured as a good alternative for restoring molars having large coronal destruction and presenting endodontic treatment complications. We discuss the indication and use of endocrown to substitute single crowns with intraradicular retention and to present a clinical case report of an endocrown-type restoration, made-up from lithium disilicate ceramic (IPS e.Max CAD) in a mandibular first molar with widespread coronal destruction.

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Introduction:-

Rehabilitation of endodontically treated teeth with wide coronal destruction is challenging for most dentists. Biomechanical principles of retention and resistance are weakening to the tooth. The existing biomechanical changes because of root canal therapy and the degree of lost dental tissue led clinicians to alternative restorative treatment. [1].

For the restoration of endodontically treated teeth grossly damaged by dental caries or fractures, a root perforation and thinning of the root canal walls due to over preparation might happen after using intraradicular posts [2].

The limitations to the use of intraradicular posts, for example calcified root canals, narrow canals, or a fracture of an instrument, have led dentists to think of other replacements, as the usage of endo crowns, an epoxy resin endodontic crown. The complete glass ceramic Endo Crown was proposed in 1997 by Bindl and Mörmann as an auxiliary to the full post-and-core-supported crown [3].

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Endo Crown is a one-piece ceramic structure fixed to the internal walls of the pulp chamber and on the cavity margins to advance macro mechanical retention and the use of adhesive cementation would also improve micro retention [4].

The aim of the present paper is to present a clinical case, in which an aesthetic and conservative posterior endocrown was used to restore a right mandibular first molar that presented endodontic treatment and extensive coronal destruction. We will deliberate through this work the indication and the use of endocrown [5].

Case Report

A 23-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, NPDCH, Visnagar, Gujarat, India, for treatment of tooth #46. He suffered from major coronal destruction and needed to have his first molar restored. Medical history was non-contributory. Radiographic and clinical examinations were performed initially and a nonvital tooth (46) was identified with caries (Figures 1). Tooth was treated endodontically. The patient had a satisfactory oral hygiene and a favourable occlusion.

Figure 1:- Clinical condition of Mandibular right first molar #46.



Figure 2:- Relationship of crown height in occlusion with the antagonist tooth.



The prosthetic decision was to restore tooth (46) with an endo crown made-up from lithium disilicate ceramic (IPS e.Max CAD). The preparation for the endocrown is different from the conservative whole crown. Monolithic, ceramic adhesive restoration requires specific preparation techniques to be appropriate for biomechanical needs.

This is achieved by an overall reduction in the height of the occlusal surface of tooth by 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 removed. Differences in levels between the various parts of the cervical margin should be linked by a slope of no more than 60° to seepage a staircase effect. We used a cylindrical-conical diamond bur apprehended parallel to the occlusal plane, to decrease the occlusal surface. Then we used a diamond wheel bur to control the orientation of the reduction and to assurance a flat surface thanks to its shape. We used a cylindrical-conical diamond bur with a total occlusal convergence of 8° to create continuity between the coronal pulp chamber and endodontic access cavity. The bur was positioned along the long axis of the tooth; the preparation was done without too much pressure and without moving the pulpal floor. The molar after preparation (Figure 3).



Figure 3:- The molar after preparation.

We ended the preparation with lining the root canal entrances with glass ionomer cement to protect the orifice of the canal (Figure 4).



Figure 4:- Coating the root canal entrances with glass ionomercement.

After assessing the entire cavity and the interocclusal space, the impression of the tooth was taken by double impression technique with additional silicone. After visualization and analysis of the excellence of the impression, we designated the ceramic shade and sent the impression to the laboratory. The endo crown was made-up in the laboratory using CAD-CAM technology and was positioned on the master cast. (Figure 5)



Figure 5:- Feature of the endo crown.

Then we completed a try-in of the endo crown and tested occlusion, internal, and proximal adjustments. The internal surface of the endo crown was etched with 9 percent hydrofluoric acid, washed with water, and dried with an air syringe. A coat of a silane coupling agent was applied for 2 minute and dried. Rubber dam was used to attain proper isolation and then phosphoric acid was applied onto the tooth surface for 15 sec on dentin and 30 sec on enamel, then profusely washed and dried, applied with adhesive, and polymerized for 20 sec with light curing. A thin layer of a dual polymerizing resin was applied to the prosthetic endocrown and then was introduced into the tooth and polymerized at intervals of 5 seconds, making it easy to eliminate cement excesses. It was polymerized for 50 seconds on all surfaces. The crown was examined for any occlusal interfering using ceramic finishing instruments. (Figure 6)



Figures 6:- Try-in of the occlusion.

Discussion:-

The restorative treatment of molars with a large coronal destruction is a clinical challenge, requires careful planning [6].

That is why the dentist has to choose for the best treatment option to ensure an efficient treatment providing clinical longevity of molars. The endo crown is suitable for all molars, chiefly those with clinically little crowns, calcified root canals, or narrow canals. But it is not suggested if adhesion cannot be assured, if the pulpal chamber is less than 2 mm deep, or if the cervical margin is less than 2 mm wide for most of its circumference [7].

This has been shown to be a beneficial technique as the procedure is easy. It facilitates the steps of impression taking and protects the periodontium. The use of ceramic has the advantages of biocompatibility and biomimicry and its wear coefficient is close to that of the natural tooth [8].

The single interface of a one-piece restoration makes cohesion better. The objective of the preparation is to get an extensive and stable surface resisting the compressive stresses that are frequent in molars [9].

The prepared surface is parallel to the occlusal plane thus deliver stress resistance along the major axis of the tooth. The stress levels in teeth with endocrowns were lower than in teeth with crowns. Because of the development of adhesive cementation systems, the need for macroretentive preparation for crowns has decreased [10].

The pulpal chamber cavity also delivers retention and stability. Its trapezoidal shape in mandibular molars and triangular shape in maxillary molars increase the restoration's stability and additional preparation is not desirable. The saddle form of the pulpal floor increases solidity. The adhesive qualities of the bonding material, makes it nonessential to attempt further use of post-involving root canals. The root canals do not need any exact shape. They are not fragilized by the drilling and they will not obtain the stresses associated with the use of post [11].

The compressive stresses are concentrated, being spread over the cervical butt joint and the walls of the pulp chamber. Dartora et al. have evaluated the biomechanical behaviour of endodontically treated teeth restored using different extensions of endocrowns inside the pulp chamber and concluded that the greater extension of endocrowns provided improved mechanical performance. A 6 mm extension presented lower intensity and a better stress distribution pattern than a 2 mm extension which offered a low fracture resistance and a high possibility of rotating the piece when in function [12].

An in vitro study performed by Taha et al. was done to evaluate the effect of varying the margin designs on the fracture resistance of endodontically treated teeth restored with polymer-infiltrated ceramic endocrown restorations. The results presented that endocrowns with axial reduction and a shoulder finish line had higher mean fracture resistance values than endocrowns with butt margin design. [13]. It has been also shown that butt joint designs providing a stable surface that resists the compressive stresses because it is prepared parallel to the occlusal plane [14].

Biacchi and Basting compared the fracture strength of two types of full ceramic crowns: indirect conservative 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. Finite element study highlighted the role of endocrowns in stress distribution [15].

According to Schultheis et al., endocrown seems to be a more reliable other for posterior loadbearing teeth, a bilayer configuration is more susceptible to reduce load fracture failure [16].

As stated by Biacchi et al., endocrowns procure acceptable function and aesthetics and reserve the biomechanical integrity of nonvital posterior teeth. The restoration is described to be less exposed to the adverse effects of degradation of the hybrid layer [17].

Research linking equivalent stresses in molars restored with endocrowns as well as posts and cores during masticatory simulation using finite element analysis revealed that teeth restored by endocrowns are potentially more resilient to failure than those with FRC posts. This study also showed that under physiological loads, ceramic endocrowns ideally cemented in molars should not be deboned [18].

A systematic review done by Sedrez-Porto et al. has compared clinical (survival) and in vitro (fracture-strength) studies of endocrown restorations associated 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 conservative treatments [19].

Altier et al. evaluated the fracture resistance of three different endocrowns made of lithium disilicate ceramic and two different indirect resin composites and concluded that lithium disilicate ceramic endocrowns exhibited higher fracture strength than the indirect composite groups. It has been shown that endocrowns made of lithium disilicate-

based ceramics are measured among the best restorative materials because of their adhesive properties; they promoted micromechanical interlocking with resin cement [20].

In vitro study accomplished by Gresnigt et al. evaluated the consequence of axial and lateral forces on the strength of endocrowns made of Metastable Lithium Disilicate and multiphase resin composite. It has been concluded that under axial loading, both Metastable Lithium Disilicate and multiphase resin composite used as endocrown material existing similar fracture strength but under lateral forces, the latter exhibited suggestively lower results. Tribst et al. evaluated the effect of a restorative material type on the biomechanical behaviour of endocrown restorations and concluded that Leucite presents a well stress distribution and it can be an auspicious alternative to lithium disilicate for the manufacture of endo crown restorations. Study conducted by Skalskyi et al. compared the fracture resistance of different restorative materials used in dental endocrown restorations. It has demonstrated that the mechanical behaviour of Zirconium dioxide in the tooth restorations altered [21].

The zirconium dioxide endocrowns cracked subsequent to crack propagation in the tooth. It has been also shown that the use of metal ceramic as endocrown material may deliver the lowest risk of failure during clinical use and had the highest fracture strength [22].

A study done by Darwish et al. showed that endodontically treated maxillary premolars restored with resin nanoceramic endocrowns obtainable better internal adaptation associated to those restored with lithium disilicate endocrowns and that endocrown preparation with smaller axial wall divergence ("6" degree) if better internal fit [23].

In a recent study, Zoidis et al. proposed polyetheretherketone (PEEK) as a substitute framework material for endocrown restorations. They demonstrated that the elastic modulus of the polyetheretherketone framework (5 GPa) veneered with indirect composite resin could dampen the occlusal forces defensive tooth structures better than ceramic materials. But further long-term clinical indication is required. CAD-CAM system, with a projected success of 90.5% for molars and 75% for premolars in 58 patients [24].

According to Belleflamme et al., even in the presence of widespread coronal tissue loss or occlusal risk factors, for example bruxism or unfavourable occlusal relationships, endo crowns could be a dependable approach to restore severely damaged molars and premolars [25].

Conclusion:-

The preparation for endocrowns is modest and can be achieved quickly. Root canals are not engaged in the process and the procedure is not as much of a traumatic as other preparations. The supragingival position of the cervical margin protects the marginal periodontium, enables impression taking, and conserves the solid substance of the remaining tooth. Forces are discrete over the cervical butt joint and axial walls, thus governing the load on the pulpal floor. The endocrown signifies a very hopeful treatment alternative for endodontically treated molars, it allows preserving of tooth structure, it is compatible with goal slightly invasive dentistry, and it is satisfactory for the concept of biointegration. It is a conservative method for mechanical and aesthetic restoration of nonvital posterior teeth. This type of reconstruction, which is still unusual, should be more extensively known and practised.

Conflicts Of Interest

The author has no conflicts of interest.

References:-

- [1]. Morgano SM, Rodrigues AH, Sabrosa CE. Restoration of endodontically treated teeth. Dental Clinics. 2004 Apr 1;48(2):397-416.
- [2]. Alkhafaji AM, Valizadeh S. Endocrown Restorations on Endodontically Treated Premolars Teeth: A Review. Annals of the Romanian Society for Cell Biology. 2021 Aug 1;25(6):18606-14.
- [3]. Jasrotia A, Sharma N. Retreatment in Endodontics: A nightmare for endodontist. Dentomed publication house; 2021 Oct 28.
- [4]. Haralur SB, Alamreyy AA, Alshehri SA, Alzahrani DS, Alfarsi M. Effect of different preparation designs and all ceramic materials on fracture strength of molar endocrowns. Journal of Applied Biomaterials & Functional Materials. 2020 Nov;18:2280800020947329.

- [5]. Magaravalli SR, Yalamanchili SK, Rangaswamy P, Ramachandra S, Govindappa K. Reinstating the function of grossly mutilated Posterior teeth through endocrown. *IP Indian Journal of Conservative and Endodontics*. 2021 Mar 15;6(1):54-8.
- [6]. Zarow M, Ramirez- Sebastia A, Paolone G, de Ribot Porta J, Mora J, Espona J, Durán- Sindreu F, Roig M. A new classification system for the restoration of root filled teeth. *International endodontic journal*. 2018 Mar;51(3):318-34.
- [7]. Fages M, Bennasar B. The endocrown: a different type of all-ceramic reconstruction for molars. *J Can Dent Assoc*. 2013 Oct 29;79: d140.
- [8]. Habash A, Basoudan F, Alwayil H, Alrashed O, Ansari BA. Success Rate of Endo Crowns-Reported by Dental Practitioners in Riyadh City, Saudi Arabia.
- [9]. Allen EP, Bayne SC, Brodine AH, Cronin Jr RJ, Donovan TE, Kois JC, Summitt JB. Annual review of selected dental literature: report of the committee on scientific investigation of the American Academy of Restorative Dentistry. *The Journal of prosthetic dentistry*. 2002 Jul 1;88(1):60-88.
- [10]. Ghajghouj O, Taşar-Faruk S. Evaluation of fracture resistance and microleakage of endocrowns with different intracoronary depths and restorative materials luted with various resin cements. *Materials*. 2019 Jan;12(16):2528.
- [11]. Messing JJ, Ray GE. Endodontics. In *Operative Dental Surgery* 1982 (pp. 221-282). Palgrave, London.
- [12]. Al-Omiri MK, Mahmoud AA, Rayyan MR, Abu-Hammad O. Fracture resistance of teeth restored with post-retained restorations: an overview. *Journal of endodontics*. 2010 Sep 1;36(9):1439-49.
- [13]. Taha D, Spintzyk S, Schille C, Sabet A, Wahsh M, Salah T, Geis-Gerstorfer J. Fracture resistance and failure modes of polymer infiltrated ceramic endocrown restorations with variations in margin design and occlusal thickness. *Journal of prosthodontic research*. 2018;62(3):293-7.
- [14]. Krishnamurthy DM, Singh R, Puppala P, Mistry G. Endocrown: Reconstructing the molar. *International Journal of Applied Dental Sciences*. 2019(5 (4)):116.
- [15]. Patel PD, Thakkar P. Post endodontic restoration with novel endocrown approach: A case series. *J Res Adv Dent*. 2016;5: 129-36.
- [16]. da Cunha LF, Mondelli J, Auersvald CM, Gonzaga CC, Mondelli RF, Correr GM, Furuse AY. Endocrown with leucite-reinforced ceramic: case of restoration of endodontically treated teeth. *Case reports in dentistry*. 2015 Oct 18;2015.
- [17]. Amaral FL, Colucci V, PALMA- DIBB RG, Corona SA. Assessment of in vitro methods used to promote adhesive interface degradation: a critical review. *Journal of Aesthetic and Restorative Dentistry*. 2007 Dec;19(6):340-53.
- [18]. Dejak B, Młotkowski A. 3D-Finite element analysis of molars restored with endocrowns and posts during masticatory simulation. *Dental Materials*. 2013 Dec 1;29(12):e309-17.
- [19]. 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;52:814.
- [20]. Albelasy E, Hamama HH, Tsoi JK, Mahmoud SH. Fracture resistance of CAD/CAM occlusal veneers: A systematic review of laboratory study. *Journal of the Mechanical Behavior of Biomedical Materials*. 2020 Jul 6:103948.
- [21]. Vianna AL. Efeito da morfologia do preparocavitário e técnica restauradora indireta em molares. *Avaliação laboratorial e revisão sistemática da literatura*.
- [22]. Sevimli G, Cengiz S, Oruc MS. Endocrowns. *Journal of Istanbul University Faculty of Dentistry*. 2015;49(2):57.
- [23]. Darwish HA, Morsi TS, El Dimeery AG. Internal fit of lithium disilicate and resin nano-ceramic endocrowns with different preparation designs. *Future Dental Journal*. 2017 Dec 1;3(2):67-72.
- [24]. Zoidis P, Bakiri E, Polyzois G. Using modified polyetheretherketone (PEEK) as an alternative material for endocrown restorations: A short-term clinical report. *The Journal of prosthetic dentistry*. 2017 Mar 1;117(3):335-9.
- [25]. Belleflamme MM, Geerts SO, Louwette MM, Grenade CF, Vanheusden AJ, Mainjot AK. No post-no core approach to restore severely damaged posterior teeth: An up to 10-year retrospective study of documented endocrown cases. *Journal of Dentistry*. 2017 Aug 1;63:1-7.