Case Report

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RICHMOND CROWN: A LOST STATE OF ART

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ABSTRACT:

Endodontically treated teeth with the loss of coronal tooth structure when left untreated for a long period may cause supraeruption, drifting, tipping, and rotation of adjacent and opposing teeth. This may be challenging to the clinician, when fabricating a crown because of inadequate interocclusal space. Tooth with less remaining crown height is indicated for post and core followed by crown to restore normal anatomy, function and esthetics. Patients with reduced interocclusal clearance and having very steep incisal guidance are most difficult to manage. Richmond crown is a feasible approach for such cases that can be performed with very less incisal clearance to accommodate post, core and crown thickness. In this article diagnosis, treatment planning for such case has been discussed along with fabrication technique of Richmond crown.

Key words: Richmond crown, Cast post, endodontic restorations, overjet, tooth facture.

INTRODUCTION:

Present era of dentistry is focusing on conservation of natural tooth and since old ages endodontic dentistry is playing major role in restoring tooth function and after which prosthetic dentistry brings its function and esthetics back.[1,2] Wherever remaining crown structure is insufficient to retain full coverage crown then post and core is required to increase retention and resistance form of tooth.[3,4] However post and core procedure can give rise to complications such as dislodgement of assembly, fracture of post/root, loss of restorative seal and periodontal injury.[5-8]Such situations further get complicated when there is deep bite with no/very less overjet in anterior teeth; as oblique forces are maximum and core reduction should be adequate to provide indicated thickness for ceramic/metal ceramic crown to achieve desirable esthetics. Richmond crown is best indicated solution in such conditions. In this article, a case report has been discussed along with fabrication technique of Richmond crown.

CASE DETAIL:

14 years-old female patient reported with complain of pain over front teeth in upper jaw. History revealed episode of trauma one year back with maxillary right central incisor fracture. Clinical examination

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showed Ellis Class-III fracture and discoloration along with pain and tenderness with maxillary right central incisor. (Fig.1)Radiographic examination revealed straight root canal with periapical radiolucency around 11.

An occlusal model analysis was done to assess the amount of space available for the post endodontic restoration to restore the tooth to function and found very less overjet to restore tooth esthetically so Richmond Crown was planned for this much indicated case.

After completion of the endodontic procedure following steps were followed for restoring this case:-

Post space preparation: Post space was prepared with Peeso reamer to remove remaining cement/weak dentine layer (care was taken not to disturb apical seal). Undercut areas within the canal were blocked with glass ionomer cement and preparation part was ended with the use of H-file (circumferentially) to smoothen the walls of the post space. A slot or cloverleaf was prepared near the orifice region which aids in the seating of the casting and also resists torque.

Crown structure preparation: Firstly, remaining crown structure was prepared circumferentially for metal ceramic crown with shoulder finish line buccally and chamfer on palatally. Incisal edge was then given with crown ferrule effect for better retention.

Post and core fabrication (Direct method): Pattern resin was flown in thin consistency inside canal and used bur was used for axial support for post and core. Post was removed from canal and checked for defects and deficient areas. Thin pattern resin was added in required areas and reinserted till setting. Core structure was build-up along with full coverage extension all over prepared crown. (Fig. 2)

Crown fabrication: Prepared post and core with coping assembly was casted in base metal alloy and after finishing metal trial was done to check fitting.(Fig. 3) Finish line was adjusted to equigingival and checked for ceramic clearance. Ceramic build up was carried out and final prosthesis was checked for fit and occlusion. Assembly was cemented in situ with glass ionomer cement used in luting consistency. (Fig. 4)The case was followed for 12 months in which no root fracture, no loosening or dislodgement of post, and no secondary caries were recorded.

DISCUSSION:

Endodontic treatment has been in practice since ages with high success rate but restorative part was not much understood previously. Whenever, a considerable amount of tooth structure is lost because of fracture/caries/secondary decay around previous restorations/during endodontic treatment, then remaining crown structure is not sufficient enough to retain large prosthetic crown.[9] In such cases special procedures are needed with objective to increase remaining crown length so that it manage arc of rotation under oblique forces (function) and there

are crown lengthening (either surgically or by orthodontic extrusion) or post placement with core build-up. Surgical crown lengthening is indicated whenever there is esthetic and cosmetic need but disadvantage is it reduces root length and requires surgery with long healing period. Orthodontic extrusion also reduces root length and is time consuming too. Post and core procedure is most commonly used method for such cases.[10] Several main causes of failure of post-retained restorations have been identified, including: recurrent caries, endodontic failure, periodontal disease, post dislodgement, cement failure, post-core separation, crown-core separation, loss of post retention, core fracture, loss of crown retention, post distortion, post fracture, tooth fracture, and root fracture.[5-8] Also, corrosion of metallic posts has been proposed as a cause of root fracture.[11] The concept of increasing remaining crown structure (core) and strengthening it by using retention from root (post) is not new. [12] In early 1700s, Fauchard inserted wooden dowels in root canal of tooth with the concept that over a period of time wood would absorb fluids and expand, resulting in enhancement of retention of post but excessive expansion was frequently causing root fractures.[13] Even endodontic treatment failure was very common in that era so development of new designs and material was very slow but in the 19th century metal posts came into existence over which porcelain crowns were screwed. A device developed by Clark in the mid-1800s was extremely practical for its time because it included a tube that allowed drainage from the apical area or the canal. The Richmond crown was introduced in 1878 and was incorporated as single piece post-retained crown with porcelain facing. Initially it was having a threaded tube in the canal with a screw retained crown, which was later modified to eliminate the threaded tube and was redesigned as a 1-piece cast dowel and crown. This design had major flaw of not considering different longitudinal axis of root and crown and soon it lost its popularity because of its technically incorrect design. As root and crown have different longitudinal axis and making them parallel require excessive cutting both for crown and root. These difficulties led to development of a post and core restoration as a separate entity with an artificial crown cemented over a core and remaining tooth structure.[13] This two-step technique improved marginal adaptation and allowed for a variation in the path of insertion of the crown.[12] In coarse of time till today, different designs/techniques/materials have been evolved; [9] however, no single system provides the perfect restorative solution for every clinical circumstance, and each situation requires an individual evaluation. Although in present time the simplified “one-visit” prefabricated post are most commonly used; yet custom posts have their own advantages and indications so are still in use. [10] Richmond crown [9,10,13,14] is not post and core system but it is customized, castable post and crown system as both are single unit and casted together. Design include casting of post and crown coping as single

unit over which ceramic is fired and cemented onside canal and over prepared crown structure having same path of insertion. Ferrule collar is incorporated to increase mechanical resistance, retention apart from providing antirotational effect. Major technical drawback of this design is excessive cutting in making two different axis parallel which results in weakening of tooth and also this design increases stresses at post apex causing root fracture. Few indications for Richmond crown are grossly decayed or badly broken single tooth where remaining crown height is very less and incases with steep incisal guidance (deep bite and very less overjet). As less cervical tooth structure subjected to flexion forces under function and this design provides more cervical stiffening than other post system and is needed to protect the crown margins and to resist leakage. Case selection is very important here. The bulk of the remaining tooth above the restorative margin should be at least 1.5mm to 2mm to achieve resistance form. Even cases with steep incisal guidance are also subjected to more flexion forces along with very limited space for restoration. Such tooth if given with post and core first over which crown is cemented, needs adequate thickness which is a limitation here. To compensate this inadequacy if core is made thin then it is weak and also presents sharp margins and edges acting as stress points for overlying crown. Metal free crowns are predisposed to fracture whereas metal ceramic crowns tends to be a bulky crown in giving required thickness for metal coping and ceramic over it resulting in compromised esthetics. Richmond crown is best possibility in both these conditions as less crown cutting is required to make two axis parallel in grossly decayed tooth and also it require less thickness for best esthetic results. The advantages of this design are custom fitting to the root configuration, little or no stress at cervical margin, high strength, availability of considerable space for ceramic firing and incisal clearance, eliminate cement layer between core and crown so reduces chances of cement failure. Although certain disadvantages are time consuming, more appointments for patient, high cost, high modulus of elasticity than dentine (10 times greater than natural dentin), less retentive than parallel-sided posts, and acts as a wedge during occlusal load transfer. If ceramic fractures then it is difficult to retrieve and can lead to tooth fracture. Such case should be managed using intraoral ceramic repairing kit. The clinician must judge every situation on its individual merits and select a procedure that fulfills the needs of the case while maximizing retention and minimizing stress. Although any number of post designs may be used in a clinical situation, success is dictated by the remaining tooth structure available after endodontic therapy.

CONCLUSION:

Although implant popularity is increasing by each passing day, yet post and core has its own importance in restoring grossly decayed or badly broken teeth as it require less time/cost and provide better

esthetic results. There are many post-and-core materials/ techniques available to the clinician for a variety of clinical procedures and thus each clinical situation should be evaluated on an individual basis. Richmond crown is very much indicated in situations with very less incisal clearance to accommodate core+cement+crown thickness.

REFERENCES:

1. Rosenstiel SF, Land MF and Fujimoto J. Contemporary Fixed Prosthodontics. 3rd ed. St. Louis: Mosby, Inc.;2001:380-416.
2. Vârlan C, Dimitriu B, Vârlan V, Bodnar D, Suciu I. Current opinions concerning the restoration of endodontically treated teeth: Basic principles. J Med Life 2009;2:165-72.
3. Bartlett SO. Construction of detached core crowns for pulpless teeth in only two sittings. J Am Dent Assoc. 1968;77:843–5.
4. Assif D, Bitenski A, Pilo R, et al. Effect of post design on resistance to fracture of endodontically treated teeth with complete crowns. J Prosthet Dent. 1993;69:36-40.
5. Roberts DH. The failure of retainers in bridge prostheses. An analysis of 2,000 retainers. Br Dent J. 1970;128:117-124.
6. Asmussen E, Peutzfeldt A, Heitmann T. Stiffness, elastic limit, and strength of newer types of endodontic posts. J Dent. 1999;27:275-278.
7. Zuckerman GR. Practical considerations and technical procedures for post-retained restorations. J Prosthet Dent. 1996;75:135-139.
8. Sirimai S, Riis DN, Morgano SM. An in vitro study of the fracture resistance and the incidence of vertical root fracture of pulpless teeth restored with six post-and-core systems. J Prosthet Dent. 1999;81:262-269.
9. Hudis SI, Goldstein GR. Restoration of endodontically treated teeth: a review of the literature. J Prosthet Dent. 1986;55:33-38.
10. Fernandes AS, Dessai GS. Factors affecting the fracture resistance of post-core reconstructed teeth: a review. Int J Prosthodont. 2001 Jul-Aug;14(4):355-63.
11. Purton DG, Payne JA. Comparison of carbon fiber and stainless steel root canal posts. Quintessence Int. 1996;27:93-97.
12. Smith CT, Schuman NJ, Wasson W. Biomechanical criteria for evaluating prefabricated post-and-core systems: a guide for the restorative dentist. Quintessence Int. 1998;29:305-312.
13. Smith CT, Schuman N. Prefabricated post-and-core systems: an overview. Compend Contin Educ Dent. 1998;19:1013-1020.
14. Rupika G, Jagadish S, Shashikala K, and Keshava PS. Restoration of badly broken, endodontically treated posterior teeth. J Conserv Dent. 2009 Jul-Sep; 12(3): 123–128.

FIGURES:

Figure 1: Pre-operative view

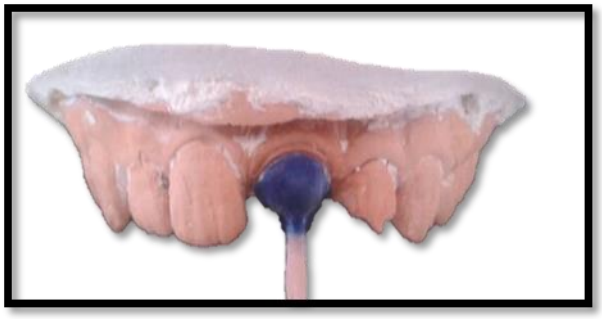

Figure 2: Preparation of pattern

Figure 3: Metal tryin

Figure 4: Final crown prosthesis