Case Report

Restoration of Badly Mutilated Posterior Teeth using Richmond Crown: A Case Report

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ABSTRACT: Restoration of endodontically treated grossly destructed teeth is one of the biggest challenges in restorative and prosthetic dentistry. It is generally agreed that the successful treatment of these teeth with pulpal disease depends not only on good endodontic therapy, but also on good prosthetic reconstruction of the tooth after the endodontic therapy is complete. Often, we come across an endodontically treated tooth with little or no clinical crown in routine clinical cases. In such cases, additional retention and support of the restoration are difficult to achieve. Richmond crown (post-core & crown as a single unit) give this additional amount of retention & support & proves to be very promising in long term. A case report is discussed here where structurally compromised; endodontically treated, posterior teeth were restored using the Richmond crown.

Keywords: Cast post; Endodontic; Restorations; Richmond crown; Teeth; Therapy.

INTRODUCTION

The goal of restorative dentistry and endodontics is to retain the natural teeth with maximal function and pleasing aesthetics.[1] It is generally agreed that the successful treatment of a badly broken tooth with pulpal disease depends not only on endodontic therapy but also on good prosthetic reconstruction of the tooth following endodontic therapy.[2] The primary purpose of a post is to retain a core in a tooth that has lost its coronal structure extensively.[3,4] Endodontically treated teeth are more prone to fractures than the vital teeth. Fracture occurrence is more in posterior teeth than anterior teeth as the masticatory forces are higher and teeth are weaker.[5]

It is a challenging clinical situation to restore excessively damaged tooth especially when there is inadequate coronal structure to provide retention and resistance for crown restoration. There are many techniques of restoring a badly broken molar tooth after successful endodontic treatment which should be complemented by a sound coronal restoration. This should ideally meet the requirements of function and aesthetics. There are two main categories of post: custom-fabricated and prefabricated. The first system involves with the cast dowel and core that closely reproduces the morphology of the root canal space. In the second system adhesive materials and techniques are used for the intraradicular cementation of prefabricated systems.[6,7]

Wherever remaining crown structure is insufficient to retain full coverage crown then post and core is necessary means to increase retention and resistance form of tooth.[3,8] 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.[9-12] 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.

Ferrule plays a very important role as it primarily provides resistance to tooth & retention to core & crown. In badly broken teeth, obtaining ferrule for both core & crown is not possible & so Richmond crown is one of the best treatment modality. The Richmond crown was introduced in 1878 and incorporated a threaded tube in the canal with a screw retained crown. It was later modified to eliminate the threaded tube and was redesigned as a one piece dowel and crown.

In the late 19th century, the “Richmond crown,” a single-piece post-retained crown with porcelain facing, was engineered to function as a bridge retainer. Richmond crown is not post and core system but it is

customized, castable post and crown system as both are single unit and casted together. It is easier to make cast metal restorations with the aid of posts for retention and lasting service. However, whenever possible the metal can be camouflaged by veneering with tooth-colored restorations.[13,14,15] In this article, a case report have been discussed along with fabrication technique of Richmond crown.

CASE REPORT

A 38 years old male patient reported to the Department of Prosthodontics with a chief complaint of repeated dislodgement of crown i.r.t lower right back tooth region. On intra oral examination, tooth 45 was found to be root canal treated and the available crown height was inadequate for the retention of crown (Fig 1). The centric occlusion was presented with deep bite and less overjet could be a prime cause for prosthetic failure. Intra oral periapical radiograph revealed that the tooth 45 was not periodontally involved and there was no periapical pathology associated. It also revealed that tooth 45 had a straight root canal with well condensed obturation. 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 the tooth esthetically. Since the available crown height and inter-arch space was inadequate for the fabrication of crown, hence it was decided to do Richmond crowns as it can be better option instead of prefabricated posts and conventional PFM (porcelain fused metal) crown.

Figure 1 (a&b): Preoperative photographs.

Clinical procedure:

Post space preparation: Using peeso reamer, the remaining cement/ weak dentine layer was removed taking care not to disturb the apical seal. The undercuts within the canal were blocked with glass ionomer cement and using H-file, the walls of the canal are smoothened in order to seat the casting and resist torque, a slot is prepared near the orifice region.

Crown structure preparaton: carious dentine was first removed and then the remaining crown is prepared following the guidelines for porcelain fused to metal crown keeping the finish line sub-gingivally.

Indirect method to record post space: In the prepared post space, first petrolatum jelly was applied. Then a J-shaped pin is prepared such that the pin fits loosely in the canal space to the prepared length. The canal was filled with the impression material (light body) and a suitable lentulo-spiral was made to rotate within the filled canal space followed by the insertion of pin (coated with tray adhesive). The impression of the arch was then made using the multiple mix technique. Once set, the impression was removed along with the J pin thereby giving the impression of the canal as well. (Fig 2).

Figure 2: Final impression with J pin placed on 45.

The obtained impression was poured with die stone, followed by making wax pattern (Fig3) and casting of the wax pattern (Fig 4).

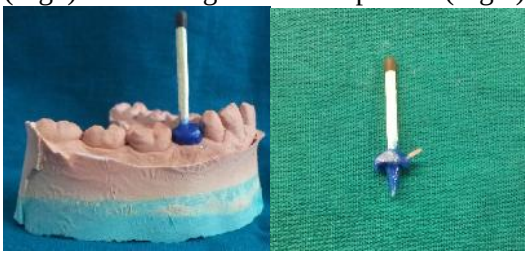

Figure 3: Master cast with wax pattern on 45.

Figure 4: Metal casting on 45.

Metal trial was done, shade was selected and ceramic buildup was done (Fig 5). Bisque trial was done followed by glazing and the respective crown with post was cemented using glass ionomer cement

Figure 5: Final restoration placed on 45 with J pin.

This case was followed for a period of 15 months and there was no root fracture, no secondary caries and no post dislodgement.

DISCUSSION

As early as 1728, Pierre Fauchard described the use of "tenons," which were metal posts screwed into the roots of teeth to retain bridges. In the mid-1800s, wood replaced metal as the post material, and the "pivot crown," a wooden post fitted to an artificial crown and to the canal of the root, was popular among dentists.[16]

In the late 19th century, the "Richmond crown," a single-piece post-retained crown with a porcelain facing, was engineered to function as a bridge retainer. Richmond crown is not post and core system but it is customized, cast able post and crown system as both are single unit and casted together.[17,14,15,18] 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 anti-rotational effect. A major technical drawback of this design is excessive tooth preparation 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 in cases with steep incisal guidance. 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, eliminates cement layer between core and crown so reduces chances of cement failure. However certain disadvantages include; that it is time consuming, require multiple appointments, high cost, high modulus of elasticity than dentin (10 times greater than natural dentin)[19], less retentive than parallel-sided posts, and acts as a wedge during occlusal load transfer and if the ceramic part fractures, then it is difficult to retrieve which can finally lead to tooth fracture.

A single unit post-core crown restoration has various advantages over its multiple unit counterparts. When the post and core are two separate entities, flexion of the post under functional forces stresses the post core interface, resulting in separation of core due to permanent deformation of post.[20] Breakdown of core eventually results in caries or dislodgement of crown. The combined effects of thermal cycling, fatigue loading and aqueous environment test the bond between materials and cause breakdown of the materials over a period of time. Therefore, it is desirable to unite the post, core and crown in one material for long term stability.[21] By decreasing the number of interfaces between components, the single unit restoration helps to achieve a "monoblock effect".[22]

CONCLUSION: Richmond crown is a post and crown system which enables a grossly decayed tooth with very little crown height remaining to achieve an added retention and support. In situations where there is very less incisal clearance, Richmond crown is an option of choice to accommodate core, cement and crown thickness. Thus one must evaluate the cases carefully to choose Richmond crown as a treatment option.

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REFERENCES

1. Rosenstiel SF, Land MF, Fujimoto J. Contemporary fixed prosthodontics. 2nd ed. p. 238
2. Franklin S. Weine endodontic therapy. 6th ed. p. 553-61.
3. Bartlett SO. Construction of detached core crowns for pulpless teeth in only two sittings. J Am Dent Assoc 1968;77:843-845.
4. Cheung W. Properties of and important concepts in restoring the endodontically treated teeth. Dent Asia 2004. p. 40-74.
5. Tang W, Wu, Smales RJ. Identifing and reducing risks of potential fracture in endodontically treated teeth. J Endod 2010; 36 (Vol. 4): 609-617.
6. Saupe WA, Gluskin HA, Radke RA. A comparative study of fracture resistance between conventional dowel and cores and a resin reinforced dowel system in the intraradicular restoration of structurally compromised roots. Quintessence Int 1996: 27;483-491.
7. Pontius O, Hutter JW. Survival rate and fracture strength of incisors restored with different post and core systems and endodontically treated teeth incisors without coronoradicular reinforcement. J Endodon 2002;28:710-715.
8. 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.
9. Roberts DH. The failure of retainers in bridge prostheses. An analysis of 2,000 retainers. Br Dent J 1970;128:117-124.
10. Asmussen E, Peutzfeldt A, Heitmann T. Stiffness, elastic limit, and strength of newer types of endodontic posts. J Dent 1999;27:275-278.
11. Zuckerman GR. Practical considerations and technical procedures for post-retained restorations. J Prosthet Dent 1996;75:135-139.
12. 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.
13. Hudis SI, Goldstein GR. Restoration of endodontically treated teeth: a review of the literature. J Prosthet Dent 1986;55:33-38.
14. Fernandes AS, DessaiGS. Factors affecting the fracture resistance of post-core reconstructed teeth: a review. Int J Prosthodont 2001:14(4):355-363.
15. RupikaGogna, S Jagadish, K Shashikala, and BS Keshava Prasad. Restoration of badelybroken,endodontically treated posterior teeth. J Conserv Dent. 2009;12(3): 123–128.
16. 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.
17. Smith CT, Schuman N. Prefabricated post – and - core systems: an overview. Compend Contin Educ Dent 1998;19:1013-1020.
18. RupikaGogna, S Jagadish, K Shashikala, and BS Keshava Prasad. Restoration of badly broken, endodontically treated posterior teeth. J Conserv Dent 2009; 12(3): 123-128.
19. Freedman G. The carbon fibre post: metal-free, post-endodontic rehabilitation. Oral Health 1996;86:23-30.
20. Libman WJ, Nicholls JI. Load fatigue of teeth restored with cast posts and core and complete crowns. Int J Prosthodont 1995;8:155- 161.
21. Ahn SG, Sorensen JA. Comparison of mechanical properties of various post and core materials. J Korean Acad Prosthodon 2003;41:288-299.
22. Vinothkumar TS, Kandaswamy D, Channana P. CAD/CAM fabricated single unit all-ceramic post- core- crown restoration. J Conserv Dent 2011;14:86-89.

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