

Case Report

Managing fractured central incisor with RICHMOND CROWN –A Case report

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ABSTRACT

Most common encountered problems in dental practice is patients with fractured anterior tooth and having very steep incisal guidance. Such cases are restored endodontically when involved with pulp. Tooth with very less remaining crown height is indicated for post and core with crown over it to restore the normal anatomy, function and esthetics. Richmond crown is very much indicated in single tooth situations with very less incisal clearance to accommodate core and crown thickness or with very less remaining clinical crown. In this article diagnosis, treatment planning for the case has been discussed along with fabrication technique of Richmond crown.

INTRODUCTION

Dentistry since ages have always focus on preservation of what that remains. Since ages prosthetic dentistry has been playing an important role in restoring tooth function and bring back its esthetics. After endodontic treatment restoration of the tooth with crown is always recommended. Whenever crown structure remains insufficient to retain crown crown lengthening or post & core becomes necessary to obtain retention and resistance form of the tooth.¹ Failure of post and core can occur due to loss of restorative seal, dislodgment of assembly, fracture of post/root etc. In complicated situations where there is deepbite or no/veryless overjet oblique forces are maximum and core reduction cannot be done adequate to provide desirable thickness

for ceramic crown to achieve desirable esthetics.²

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 REPORT

23 years-old male patient reported to our institute with a chief complaint of fractured crown in upper front region of the jaw. History revealed episode of road side accident two years back with maxillary right central incisor; for which endodontic treatment with was carried out along with full coverage crown placement but patient experienced frequent dislodgement of crown. Clinical examination showed fractured crown portion with asymptomatic remaining cervical third of 11 (Fig - 1). On future examination of

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centric occlusion is was found that the patient had deep bite and less overjet which was thought to be the prime cause for prosthetic failure. Radiographic examination oburated canal with no periapical changes around 11. An occlusal model analysis was done to assess the amount of space available for the post endodontic restoration. As the patient had a deep bite very Richmond Crown was planned for this much indicated case for good aesthetics.

Clinical procedure: following procedures were carried out step by step to restore the teeth:-

- a) **Post space preparation:** post space was prepared with Peeso reamer to remove guttapercha upto onethird off roots length (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.
- b) **Crown structure preparation:** Firstly, remaining crown structure was prepared circumferentially for metal ceramic crown with shoulder finish line (sub-gingival) buccally and chamfer on palatally.
- c) **Post and core fabrication (InDirect method):**
Impression was taken of the post space with light body elastomeric material. Cast was poured and die cutting was done. Petrolatum jelly was applied all over the post space in the

cast. Cold cure acrylic resin was flown in thin consistency inside canal and tooth pick was used for axial support for post and core. Post was removed from canal and checked for defects and deficient areas. Thin crylic resin was added in required areas and reinserted till setting. Core structure was build-up along with full coverage extension all over prepared crown like wax pattern for metal coping of metal ceramic crown (Fig - 2).

- d) **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 with glass ionomer cement used in luting consistency (Fig - 4).

The case was followed for 6 months in which no root fracture, no loosening or dislodgement of post, and no secondary caries were recorded.

Discussion

Post and core treatment modalite has been in practice since ages with high success rate. 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.³ 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. Post and core procedure is most commonly used method for such cases.⁴ Several main causes of failure of post-



Fig 1. – Preoperative Photograpy



Fig 2 : Prepartion of pattern for post & core



Fig 3 : Metal Try In done



Fig 4 : Final Cementation done

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. Also, corrosion of metallic posts has been proposed as a cause of root fracture.

The Richmond crown was introduced in 1878 and was incorporated as singlepiece 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. 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.^{5,6} Design include casting of post and crown coping as single unit over which ceramic is fired and cemented inside 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 incises 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.

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.

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.⁷

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.

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