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## RESEARCH ARTICLE

### MANAGEMENT OF FRACTURED CENTRAL INCISOR WITH RICHMOND CROWN

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#### ABSTRACT

**Background:** 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. In the late 19th century, the "Richmond crown," a single-piece post-retained crown with porcelain facing, was introduced to function as a bridge retainer, it incorporated a threaded tube in the canal with a screw retained crown. **Objective:** Prosthetic rehabilitation of fractured central incisor following endodontics treatment. **Method:** Endodontic treatment of the fractured tooth followed by post space preparation and finally rehabilitating with Richmond Crown to make it esthetically pleasing. **Conclusion:** 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.

#### INTRODUCTION

The goal of restorative dentistry is to retain the natural teeth with maximal function and pleasing aesthetics. It is generally agreed that the successful treatment of a badly broken tooth 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 (Gogna *et al.*, 2009). Currently, an increased demand for clinically convenient post-and-core systems to replace lost tooth structure has provided the clinician with a plethora of simplified "one visit" post-and-core restorative options (Douglas *et al.*).

Restoration of damaged anterior teeth has long been a test of a clinician's skill due to the inherent demand for excellent esthetics. Endodontic ally treated anterior teeth often have extremely thin coronal tooth structure remaining after root canal therapy and preparation for crown. As such, they require a dowel and core to support the definitive restoration (Vinothkumar *et al.*, 2011). 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. Such situations further get complicated when there is deep bite with no/very less over jet 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 aesthetics. Richmond crown is best indicated solution in such conditions (Mishra *et al.*, 2015). In this article we have discuss a case report of restoration of a fractured central incisor by using Richmond Crowns after endodontic treatment.

#### CASE REPORT

19 years-old male patient reported to our institute with a chief complain of fractured crown in upper front region of the jaw. History revealed episode of road side accident 7 years back with maxillary right central incisor; for which endodontic treatment with was carried out along with composite build-up but patient experienced frequent dislodgement . Clinical examination showed fractured crown portion with asymptomatic remaining cervical third of 11(Fig 1). On future examination of centric occlusion was found that the patient had increase overjet. Radiographic examination oburated canal with no periapical changesaround 11.

An occlusal model analysis was done to assess the amount of space available for the post endodontic restoration. Richmond Crown was planned for this much indicated case for good aesthetics. Post space preparation was done i.r.t 11(Fig 2) followed by post space impression made with self-cure acrylic later a pickup impression was made with alginate impression material along with post in the place (Fig 3). Cast was poured with die stone, wax pattern fabricated and casting prepared (Fig 4). It was made sure that the ferrule was given while the preparation .After finishing try-in was done to check the fit and cementation done with resin cement (Fig 5). After cementation an over impression was made poured with die stone followed by shade selection for fabrication of the ceramic crown. Try-in followed by cementation the crown was done with GIC cement (Fig 6). Post insertion instructions were given and follow was done after 1 month. Satisfactory results were obtained.

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Fig. 1. Fractured occlusal third i.r.t 11



Fig. 2. Post space preparation done i.r.t 11



Fig. 3. Pick up impression by alginate



Fig. 4. Casting of the post



Fig. 5. Try in of the casting



Fig. 6. Final cementation of the ceramic crown

**DISCUSSION**

Restoration of teeth after endodontic treatment is becoming an integral part of restorative practice in dentistry. Proper restoration of endodontically treated teeth requires a sound knowledge of the endodontic, periodontal, restorative, and occlusal principles (Gogna *et al.*, 2009). 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. During the 1930s, the custom cast post-and-core was developed to replace the one-piece post crowns.<sup>2</sup> In 1989, Kwiatkowsky and Geller introduced the cast glass ceramic post and core in order to retain the color and translucency of pulpless teeth. This treatment modality achieved excellent esthetics but had poor strength and fracture toughness due to the brittle nature of glass ceramics. The zirconia ceramic materials introduced in the early 1990s are currently the strongest and toughest ceramics available for dental use (Vinothkumar *et al.*, 2011). Metal free crowns are predisposed to fracture whereas metal ceramic crowns tend 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 requires 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 (Mishra *et al.*, 2015). The Richmond crown was introduced in 1878 and had single piece post-retained crown with porcelain facing. Initially it was having a threaded tube in the canal with a screw retained crown, 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 requires excessive cutting both for crown and root. This 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. This two-step technique improved marginal adaptation and allowed for a variation in the path of insertion of the crown (Priyanka *et al.*, 2015). The most vulnerable tooth is the maxillary central incisor, which sustains approximately 80% of the dental injuries, followed by the maxillary lateral and the mandibular central and lateral incisors. A major predisposing factor in dental injuries is overjet of the maxillary incisors. The reported incidence varies from 26% to 92% of all traumatic injuries to the permanent

dentition (Deshpande *et al.*, 2016). 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 (Sangur *et al.*, 2016). Richmond crown 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 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 (Antariksha Dod, 2016). The operator should consider all pros and cons of all types of post and core systems as well as Richmond crown treatment modality and select a procedure that fulfills the needs of the case while maximizing retention and minimizing stress. Drawback of Richmond crown technique needs single path of insertion and withdrawal so more of tooth preparation is required. But in cases of loss of maximum tooth structure Richmond crown was definitely advised as there is no need for further tooth preparation. Conservation of the tooth should be always first preference than extraction followed by crown and bridge/implant treatment modality.

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