

Case Report

Esthetic Rehabilitation with Richmond Crowns- A Case Report

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ABSTRACT:

Richmond Crown as an eponym for a post-retained crown made for an endodontically treated tooth that uses a porcelain facing. In this article a case report has been discussed along with the fabrication technique of a Richmond Crown.

Key words: Esthetic Rehabilitation, Richmond Crowns.

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INTRODUCTION

The Glossary of Prosthodontic terms defines Richmond Crown as an eponym for a post-retained crown made for an endodontically treated tooth that uses a porcelain facing. It was named after C.M. Richmond, an American Dentist, who pioneered the technique in 1878.¹

Restoration of endodontically treated teeth has always been a challenge in dentistry as usually a considerable amount of tooth structure has been lost because of caries, the placement of previous restorations, and the endodontic treatment. This loss of tooth structure complicates subsequent restoration and increases the likelihood of fracture during function. If the coronal structures are largely intact and loading is favourable, as on anterior teeth that are farther from the fulcrum than are molars, a simple filling can be placed in the access cavity. However, if a substantial amount of coronal structure is missing, a cast post and core restoration is indicated instead.²

In cases indicated for cast post cores which are complicated with deep bite and a markedly reduced overjet it becomes extremely difficult to place a prosthetic crown. It is in these cases that a one-piece cast dowel-core-crown restoration called the Richmond crown is indicated. Since it is a one piece cast dowel-core-crown it eliminates the need for additional space required for a crown thus proving to be a boon in cases with deep bite and reduced overjet in which interocclusal space is compromised.³

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. 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-coloured restorations to create a functionally as well as esthetically acceptable outcome.⁴

A ferrule is a metal ring or cap intended for strengthening. A dental ferrule is an encircling band of cast metal around the coronal surface of the tooth. It has been proposed that the use of a ferrule as part of the core or artificial crown may be of benefit in reinforcing root-filled teeth. A protective, or 'ferrule effect' could occur owing to the ferrule resisting stresses such as functional lever forces, the wedging effect of tapered posts and the lateral forces exerted during the post insertion. According to various studies 1.5 mm should be the minimum ferrule length when restoring a root-filled maxillary central incisor with a post- and core-retained crown.⁵

In this article a case report has been discussed along with the fabrication technique of a Richmond Crown.

CASE REPORT

A 45 year old lady was referred to the Department of Prosthodontics, HP Government Dental College with the Chief Complaint of broken upper front teeth.

History and Examination

History revealed that the patient had been rehabilitated with crowns on the Maxillary Anterior teeth (12-22) following endodontic therapy

On examination, teeth numbered 12,11,21,22 (FDI Dental Numbering system) were grossly carious and a considerable amount of tooth structure had been lost. (Fig. 1,2)

IOPA radiographs taken showed that the teeth in question had been endodontically treated.

Study models were fabricated and occlusal analysis showed that there was a deep bite with reduced overjet present.

Treatment Plan

The patient was presented with the option of dental implants which she refused due to financial constraints, she also refused the option of extraction followed by a R.P.D.

Due to the deep bite and the reduced overjet present it was decided to rehabilitate the patient with Richmond crowns in relation and 11,21 and 22 and a conventional PFM crown after core build up in 12.

The Procedure

Residual Crown Structure Preparation

Firstly, remaining crown structure was prepared circumferentially for metal ceramic crown with shoulder finish line buccally and chamfer finish line palatally on all the affected teeth maintaining a minimum of 2 mm of ferrule.

Post Space Preparation

Post space was prepared in 11,21 and 22 keeping at least 5mm of apical Gutta Percha with the help of Peeso Reamers.

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, within the canal, which aids in the seating of the casting and also resists torque. Simultaneously 22 was restored with a dual cured composite and prepared for a crown.

Impressions

Pinjet Posts (Angelus) were tried in the canals and care was taken to ensure that they fit passively.

After applying Tray Adhesive (Coltene) to the Pinjet Posts and allowing it to dry, light body addition silicone (Affinis, Coltene) was introduced in the canals with the help of a hand held lentulospiral. The pinjet Posts were placed in the canals and light body syringed all around the tooth preparation.

Simultaneously Putty (Affinis, Coltene) was mixed and loaded in a Metallic stock tray and an impression was made using the one stage putty wash technique (Figure 3)

Post Core Pattern fabrication (Indirect technique)

After pouring the cast and subsequent die preparation Petrolatum jelly was applied all over the post space in the cast. Pattern Resin (GC Inc) was flown in thin consistency inside the canals and Pinjet posts were used again for axial support for the post and core. Post was removed from canal and checked for defects and deficient areas. Inlay wax was added in required areas and reinserted till setting. Core structure was build-up along with full coverage extension all over the prepared crown similar to a wax pattern for metal coping of metal ceramic crowns. (Figure 4)

Casting and Metal try in

The resultant patterns were casted in Nickel Chromium alloy and subsequent Metal trial was conducted to evaluate the fit. (Figure 5,6,7)

Ceramic Veneering and Cementation

After the metal trial, the copings on the facial surface were layered with ceramic and the crowns after adjustment were luted with Glass Ionomer cement. (Fig. 8,9,10)

The patient was very satisfied with the final outcome and the case was followed for 6 months in which no root fracture, no loosening or dislodgement of post, and no secondary caries were recorded.



Figure 1



Figure 2

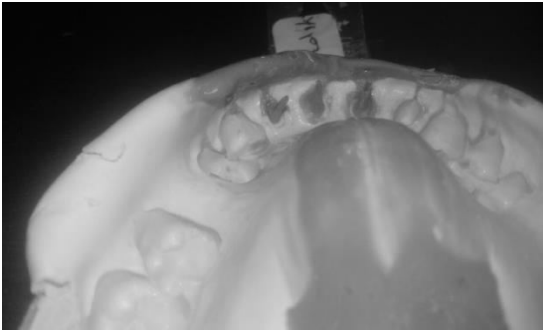


Figure 3



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9



Figure 10

DISCUSSION

Post and core treatment modality 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.^{3,6}

In such cases special procedures are needed with the objective to increase remaining crown length so that it is able to manage the arc of rotation under oblique forces (function). These procedures include 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.

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. Also, corrosion of metallic posts has been proposed as a cause of root fracture.⁷

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. Richmond crown is not a post and core system but it is a customized, castable post and crown system as both are single unit and casted together.^{4,8}

One-piece restoration is indicated for the management of mutilated tooth requiring post-core restorations where there is reduced occlusal clearance. A single-unit post-core-crown restoration has various advantages over two or three units components. When the post and core are two separate parts; different coefficients of thermal expansion of the various components of post crown restoration may have a harmful effect on the bonds between the tooth-post-core-cement-crown complex. In addition, flexion of the post under functional forces stresses the post-core interface, resulting in separation of the core due to permanent deformation of post. By decreasing the number of interfaces between components, the single unit restoration helps to achieve a monoblock effect.⁸

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 (deep bite and very less overjet).

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), 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.⁹

For more esthetic outcomes a CAD/CAM fabricated Zirconia prosthesis may also be used.¹⁰

CONCLUSION

A technique first pioneered in 1878 was used in 2018 (a gap of 140 years) to restore the smile of this particular patient. Although implants are very much in vogue these days, they are not the only solution and alternatives should always be considered and presented to the patient. The clinician must judge every situation on its individual merits and select a procedure that fulfils the needs of the case keeping in mind the needs of the patient. It is important for the clinician to be updated with the recent advances in his field to be able to serve his patient better.

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