

## CASE REPORT

### Endocrown: A Mono-Block Porcelain Technique

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#### ABSTRACT:

The restoration of endodontically treated teeth (ETT) is a topic that is extensively studied and yet remains controversial from many perspectives. Restoration of ETT with extensive coronal loss follows a strict protocol as suitable surface and coronal structure are limited for adhesion. Hence, the prognosis becomes a bit questionable. Its at this point that a clinician question whether its better to preserve the tooth or extract and go for an implant. The purpose of this study is to introduce another modality for treatment i.e. Endocrown by studying two cases with minimal tooth structure in which endocrown was favoured over traditional post and core and crown.

**Key words:** Endocrown, Monoblock, Porcelain, Endodontically treated teeth.

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#### INTRODUCTION

The restoration of endodontically treated teeth (ETT) is a topic that is extensively studied and yet remains controversial from many perspectives. Several classic studies have proposed that the dentin in endodontically treated teeth is substantially different than dentin in teeth with "vital" pulps.<sup>1-3</sup> It was thought that the dentin in endodontically treated teeth was more brittle because of water loss<sup>1</sup> and loss of collagen cross-linking.<sup>3</sup> However, more recent studies<sup>4,5</sup> dispute this finding. In 1991, Huang et al. studied the physical and mechanical properties of dentin specimens isolated from teeth with and without endodontic treatment at different levels of hydration. They concluded that neither dehydration nor endodontic treatment caused degradation of the physical or mechanical properties of dentin.<sup>4</sup> Sedgley and Messer tested the biomechanical properties of dentin from 23 endodontically treated teeth with an average of 10 year of post treatment. They compared them to their contralateral "vital" pairs. Aside from a slight difference in hardness, the properties were comparable. The study did not support the conclusion that ETT are more brittle.<sup>5</sup>

These and other studies support the interpretation that it is the loss of structural integrity associated with the access preparation, rather than changes in the dentin, that lead to a higher occurrence of fractures in endodontically treated teeth compared with "vital"

teeth.<sup>6</sup> Access preparations result in increased cuspal deflection during function<sup>7,8</sup> and increase the possibility of cusp fracture and microleakage at the margins of restorations. In most endodontically treated teeth, caries or existing restorations accounts for missing tooth structure, too. Randow and Glantz reported that teeth have a protective feedback mechanism that is lost when the pulp is removed, which also may contribute to tooth fracture.<sup>9</sup> Fennis et al. studied more than 46,000 patients from insurance claims and reported significantly more fractures in teeth with endodontic treatment. Its correct to conclude that these studies indicate that restorations which enhances structural integrity would be expected to increase the prognosis of endodontically treated teeth exposed to large masticatory loading forces.<sup>10</sup> In this case report we will be seeing one modality of restoration of endodontically treated tooth, i.e. an endocrown.

#### CASE 1

A 24 year old male patient came to the Dental OPD with a grossly decayed tooth structure in association of #47 (involving all the coronal cusp) and sensitivity to hot and cold. After a radiographic examination, we could observe a coronal radiolucency approximating the pulpal chamber.

The tooth #47 was Anaesthetized by Inferior Alveolar Nerve Block using 4% Articaine with 1:100000

Epinephrine (Septanest, Septodont, France). A Class II (DO) access was done by Access Bur (Strauss & Co) under water spray as coolant and glide path was established via a No. K 10 file (M-Access, Dentsply Maillefers, Switzerland). Working Length was established by Radiograph.

Biomechanical Preparation(B.M.P) is done by Step Back Technique. Sx of the Protaper NiTi system

(Dentsply Tulsa) was used for shaping the cervical third of the root canal. The middle and apical third was shaped via V<sub>TAPER</sub> system (S.S White, Lakewood, NJ) upto 25/0.04. After use of each file, canal is irrigated with 1 ml of 3% Sodium Hypochlorite (Hyposol, Prevest DenPro). A Calcium Hydroxide based intracanal medicament was placed and temporary restoration was given.

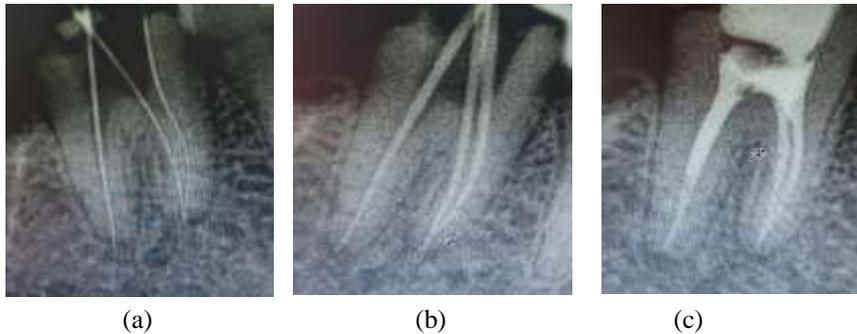


Fig.1. Radiograph showing Working Length (a), Master cone (b) and Obturation (c) of tooth no. #47.

The medicament is removed via excessive irrigation with saline and 20 No. H file (Mani Inc, Togichi, Japan). The canal is flushed with 1ml of 3% Sodium Hypochlorite (Hyposol, Prevest DenPro) and manually agitated with 25/.04 GP point for 1 min. Obturation of the prepared canal was done using 25/.04 GP cone (Meta BioMed Co Ltd, Korea) and AH Plus sealer (Dentsply Tulsa, Konstanz, Germany) using single cone technique. A GIC base (Ketac Molar, 3M ESPE) was placed over the obturation and using VITA shade guide, an A2 shade was determined.

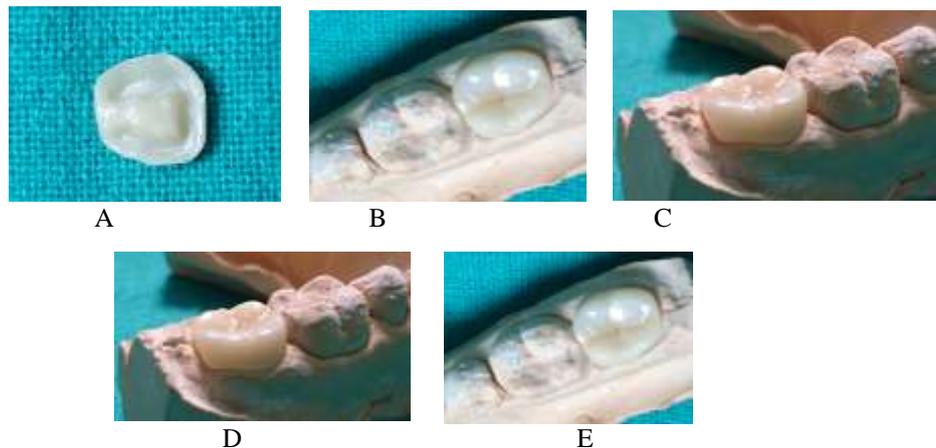


Fig.2. Prepared Monolithic Endocrown (A-E)

Crown preparation was done of the both intracoronal and extracoronal aspect. Impression was taken by the DOUBLE IMPRESSION TECHNIQUE. In the first stage, heavy consistency addition silicone (Express, 3M ESPE, Saint Paul, USA) was used. For the second stage impression, the light paste (3M ESPE, Saint Paul, USA) was applied (after manual mixing of catalyst and base paste) directly onto the tooth. The impression was sent to EPICA DENTAL LABS for fabrication of Monolithic Zirconia Crown of shade A2.

Cementation of the crown was accomplished using Panavia F2.0 (Kuraray Noritake Dental Inc, Japan), a Dual cure Dental adhesive system according to manufacturer's instruction.



Fig.3. Cemented Monolithic Endocrown.

## CASE 2

A 27 year old male patient came to the Dental OPD with a restored tooth structure in association of #36 that is sensitive to hot and cold. After a radiographic examination, we could observe a coronal radio-opacity along with radicular radio-opacity suggestive of Root canal treated tooth.

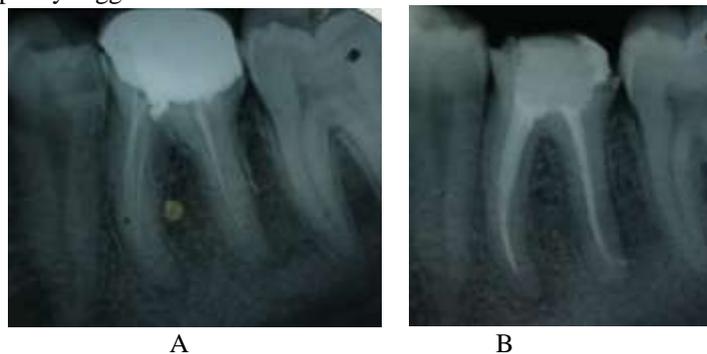


Fig.4. Pre-operative (A) and Postendodontic (B) radiograph of #36 showing retreatment of the tooth.

An access cavity was prepared by Access Bur (Srauss & Co) under water spray as coolant by removing the post-endodontic composite restoration. The gutta percha was removed with 25 No. H-file (M-Access, Dentsply Maillefers, Switzerland). Biomechanical preparation is carried till ProTaper F1 (Dentsply Tulsa) using the manufacturer's instruction. The canal is irrigated with 1ml 3% Sodium Hypochlorite (Hyposol, Prevest DenPro) in between each instrument change. A Calcium Hydroxide based intracanal medicament was placed and temporary restoration was given for 14 days.

The medicament is removed via excessive irrigation with saline and 20 No. H file (Mani Inc, Togichi, Japan). The canal is flushed with 1ml of 3% Sodium Hypochlorite (Hyposol, Prevest DenPro) and manually agitated with 20/.06 GP point for 1 min. Obturation of the prepared canal was done using 20/.06 GP cone (Meta BioMed Co Ltd, Korea) and AH Plus sealer (Dentsply Tulsa, Konstanz, Germany) using single cone technique. A GIC base (Ketac Molar, 3M ESPE) was placed over the obturation and using VITA shade guide, an A2 shade was determined.



Fig.5. Porcelain Fused to Metal (PFM) endocrown.

Crown preparation was done of the both intracoronal and extracoronal aspect. Impression was taken by the DOUBLE IMPRESSION TECHNIQUE. In the first stage, heavy consistency addition silicone (Express, 3M ESPE, Saint Paul, USA) was used. For the second stage impression, the light paste (3M ESPE, Saint Paul, USA) was applied (after manual mixing of catalyst and base paste) directly onto the tooth. The impression was sent to DENTAL LABS for fabrication of Monolithic Porcelain Fused to Metal (PFM) of shade A2.



Fig.6. Panavia F2.0 Dental Adhesive System

Cementation of the crown was accomplished using Panavia F2.0 (Kuraray Noritake Dental Inc, Japan) , a Dual cure Dental adhesive system.

## DISCUSSION

Restoration of ETT with extensive coronal loss follows a strict protocol, with the fabrication of total crowns supported on post-cores. Initially, it was thought that this protocol provides better support for the remaining tooth structure, however, it has been observed that the use of intra-canal retainers only increased the retention of prosthetic crowns.<sup>11, 12</sup> The purpose of a post-core restoration is to stabilize the remaining coronal tooth structure and to replace missing coronal tissue.<sup>11, 13-16</sup> Their role of post in maintaining the core material is particularly relevant in posterior teeth, where masticatory loads are essentially compressive<sup>16</sup>, however, when loaded transversely, as in the case of incisors, the flexural behavior of posts should be carefully considered.<sup>17</sup>

When more than half of the coronal tissue is missing, suitable surface and coronal structure are limited for adhesion. Hence, a post-core restoration is significant to ensure a tooth-restoration continuum for strength and resistance to fracture. With the proper preparation design (maintaining 1.0-1.5 mm of the walls), remaining coronal tooth structure should provide stability against rotational forces. A ferrule effect is to be attained by extending restoration margins 1.5-2.0 mm below the foundation limits.<sup>18, 19</sup> Available scientific data and literature suggest the adhesive techniques for post and core fabrication.<sup>11</sup> Occlusal anatomy and mastication are usually restored with a full crown. But this option presents a higher biomechanical risk of failure directly related to the amount of missing tooth structure.<sup>20</sup> Many authors even discourage the use of posts due to various risks such as root perforation and weakness.<sup>11</sup>

Endocrown is a technique suitable for cases where there is great loss of tooth structure, small interproximal space and traditional rehabilitation with post and crown is not possible because of inadequate ceramic thickness.<sup>18</sup> This has been shown to be an advantageous technique because the procedure is easy and have a mechanical performance better when compared with conventional crowns, costs less because of the fewer number of steps involved, demands less clinical time and has good esthetic acceptance.

The principles that govern preparation for the endocrown follow the same pattern as the principles for preparations for indirect Inlay and Onlay restorations: slightly expulsive axial walls (10-12°), and a flat pulp chamber floor. To facilitate the subsequent steps of impression taking, adjustment and cementation, this option was taken to maintain a supragingival cervical termination.<sup>11, 21, 22</sup>

Pissis was the pioneer of the endocrown technique and described it as the 'mono-block porcelain technique'.<sup>23</sup> In 1999, Bindle and Mörmann described the endocrown for the first time as adhesive endodontic crowns and characterized it as total porcelain crowns fixed to endodontically treated posterior teeth.<sup>24</sup> These crowns are anchored to the internal portion of the pulp chamber and on the cavity

margins, so macro-mechanical retention is provided by the pulpal walls, and micro-mechanical retention is obtained by the use of adhesive cementation. This dual retention is particularly indicated in cases in which there is excessive loss of tissue of the crown, interproximal space is limited and traditional rehabilitation with post and crown is not possible because of inadequate ceramic thickness.<sup>25</sup> In addition, endocrowns are also indicated as an alternative in teeth with short or atresic clinical crowns, calcified, curved or short root canals that make post application impossible.<sup>12</sup>

Hence, to conclude, the correct indication of the restorative treatment is paramount for clinical success of restoration with adhesive endodontic crown. The advantage with endocrowns lies with that fact that it acquires both intra-coral and extra-coral mechanical retention without the involvement of thin root canals which allows for conservative preparation of the root canal and tooth material preservation. This along-with a precise impression taking with a good quality material and use of dual-cure cement further improves the clinical prognosis.

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