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Post Endodontic Restoration – Managing challenges for compromised tooth structure with endocrown

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ABSTRACT

Restoring endodontically treated teeth with severe coronal loss and limited interocclusal space is challenging. This case presents a mandibular second molar with extensive destruction, short clinical crown, and opposing supraeruption, managed with a lithium disilicate endocrown. After extraction of the adjacent impacted third molar, enameloplasty, and gingival recontouring, the tooth was conservatively prepared and restored with a digitally fabricated endocrown adhesively luted with resin cement. The restoration showed satisfactory fit, esthetics, and function, supporting endocrowns as a conservative and predictable option for compromised posterior teeth.

Keywords: Digital scan; endocrown; lithium disilicate; opposing supraerupted teeth; post endodontic restoration; severely damaged molar.

INTRODUCTION

Endodontically treated teeth frequently present with substantial tooth structure loss with additional removal during endodontic access preparation. The long-term prognosis of these teeth is closely linked to the quality of their post-endodontic restoration. Such restorations play a crucial role in preservation and stabilization of the tooth, restoring its aesthetics and function. Hence, the choice of restorative technique and materials are crucial for long term prognosis.

Varieties of post-endodontic restorations including direct restorations like amalgam and composite resins, and indirect restorations like inlays, onlays, crowns, post and core are available. The choice among these options depends on the clinical and radiographic condition of the tooth, as well as the functional and esthetic needs of the patient.[1]

However, the restoration of teeth with extensive coronal destruction and reduced interocclusal space presents significant clinical challenges. With adhesive strategies, there has been a paradigm shift towards restorations that utilize pulp chamber as an extension, thus integrating the crown and core as a single unit or monobloc.[2] This was the concept of the endocrown technique. The terminology "Endocrown" was coined by Bindl and Mormann in 1999. These restorations are anchored to the internal portion of the pulp chamber thus, obtaining macromechanical retention provided by the pulpal walls and micro mechanical retention attained using adhesive cementation.[3] More recently, digital technologies such as intraoral scanning and

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CAD/CAM systems have further enhanced the precision and efficiency of endocrown fabrication, making them a predictable option in complex restorative scenarios, despite requiring an initial learning curve.

This case report aims to present a clinical case involving an extensively damaged mandibular molar with a short clinical crown and supraerupted opposing teeth, which was conservatively restored using a lithium disilicate endocrown.

CASE REPORT

A 25-year-old patient presented to the Department of Prosthodontics, People's Dental College and Hospital for placement of crown after an endodontic treatment in her left lower back tooth region. The root canal treatment was completed 15 days back. During the first appointment, clinical and radiographic examinations were performed, diagnostic cast and pre-operative photographs were taken (Figure 1). The tooth was clinically asymptomatic. The radiograph showed no periapical pathology, a satisfactory apical seal, and adequate depth and width of the pulp chamber.

Additionally, a mesioangular impaction of the third molar was observed (Figure 1), for which extraction was advised. Patient was recalled after a month of healing period post extraction. After extraction of the mesioangular impacted third molar, gingival overgrowth on the distal aspect of the second molar was managed with gingettage. This ensured clear margins and optimal conditions for accurate impression-taking and restoration placement.

Evaluation of the diagnostic cast revealed a 1.5 mm supraeruption of distopalatal cusp of opposing tooth, which contributed to the reduced interocclusal space. To address this, enameloplasty was performed on the opposing tooth following established protocols for managing supraeruption.[4,5] This conservative approach ensured sufficient interocclusal clearance while preserving the structural integrity of the opposing tooth.

While a core buildup could have been considered, the preparation required for a conventional crown would have left no remaining tooth structure, making it an impractical solution. This prompted the decision to utilize the pulp chamber for additional retention. Additionally, the reduced interocclusal space further eliminated the feasibility of placing a post, supporting the selection of this conservative restorative approach.

After discussing various treatment options and material choices with the patient, a lithium disilicate endocrown was recommended as the preferred choice, and the treatment plan was finalized accordingly.

The temporary filling material (Cavit) was removed, and the access cavity was restored with flowable composite. A box-shaped cavity was prepared, ensuring the pulpal floor was flat and any undercuts were eliminated. The occlusal surface was reduced to create a flat and even base, maintaining at least 2 mm of material thickness for the endocrown.

The cervical margin was designed to be supragingival, and unsupported enamel walls less than 2 mm in thickness were removed. A tapered bur was used to smooth out the axial surfaces and eliminate undercuts. The final cavity depth was 4 mm, with no sharp edges or irregularities (Figure 2).

Intraoral scan was taken to achieve a precise digital capture of the preparation (Figure 3). The scanner was used to record all critical details, including the flat occlusal surface, box-shaped cavity, supragingival margins, and depth of the access cavity. The scanned impression was reviewed for accuracy before selecting the shade and sending the data to the laboratory for the fabrication of the restoration. In addition, intraoral photographs were taken to assist the laboratory in accurately matching the shade and staining to the adjacent teeth.

After evaluating and approving the Exocad design provided by the laboratory, the resin trial was fabricated and assessed clinically for fit, contour, and integration (Figure 4). Following occlusal adjustments and the approval of the resin trial, body trial was subsequently sent from the laboratory for clinical evaluation. The body trial was performed to assess esthetics, contours, and overall fit (Figure 5). Upon approval, the restoration was returned to the laboratory for glazing and final staining.

On the day of cementation, intaglio surface of the endocrown was etched with 10% hydrofluoric acid for 20 seconds, rinsed, and dried (Figure 7). A coat of silane coupling agent was applied for 1 minute (Figure 8). The tooth surface was etched with 37% phosphoric acid for 15 seconds on dentin and 30 seconds on enamel and then washed and dried (Figure 9). The bonding agent was light-cured for 20 seconds, followed by application of dual-curing resin cement to the endocrown (Figure 10). The crown was bonded, tack-cured for 5 seconds, fully cured for 40 seconds, and excess cement was removed with final finishing (Figure 11).

Patient was recalled in 3 days following the insertion, clinical and radiographic evaluation was done. A subsequent follow-up was planned at a one-month interval to assess the long-term outcome. However, the patient did not report for the scheduled visit and upon later contact, was found to have moved abroad. This was acknowledged as a limitation of the present case report.

Figure 1: *Pre-operative photograph*

Figure 2: *After final tooth preparation*

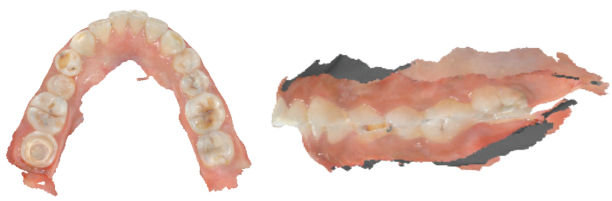

Figure 3: *Digital Impression recorded by intraoral scan*

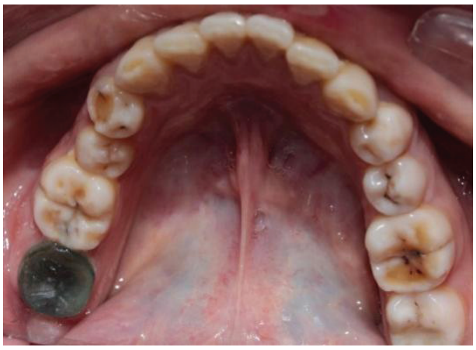

Figure 4: Resin Trial done

Figure 5: Body Trial done

Figure 6: Final Endocrown

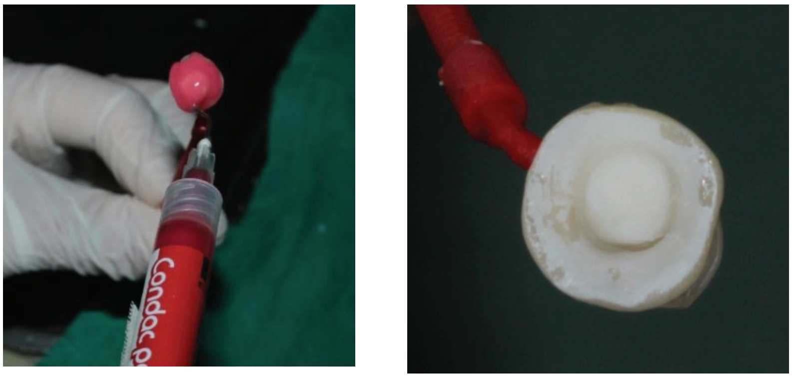

Figure 7: Etching Prosthesis with 10% HF acid and after washing

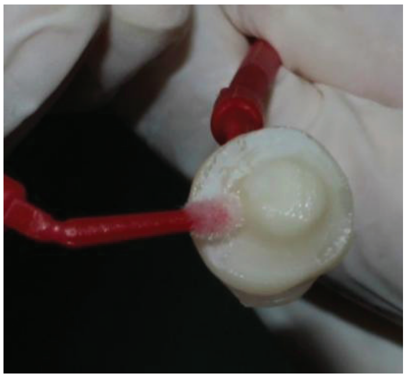

Figure 8: Applying silane coupling agent

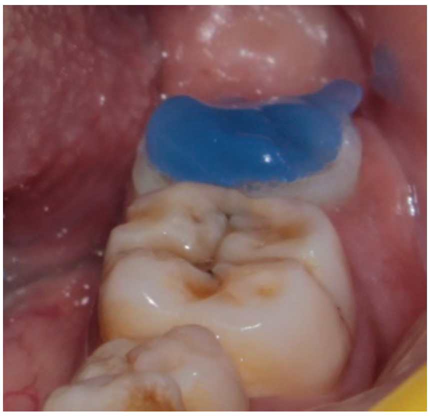

Figure 9: Etching the prepared tooth

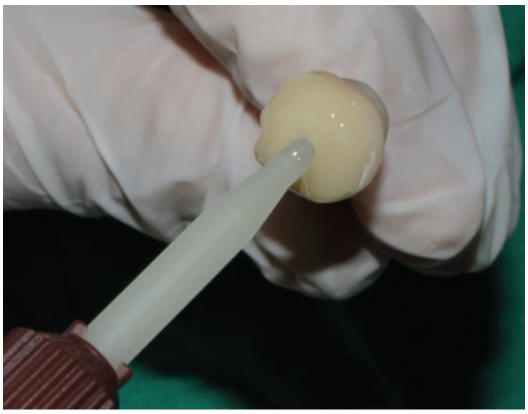

Figure 10: Applying resin cement to the prosthesis

Figure 11: *After final cementation*

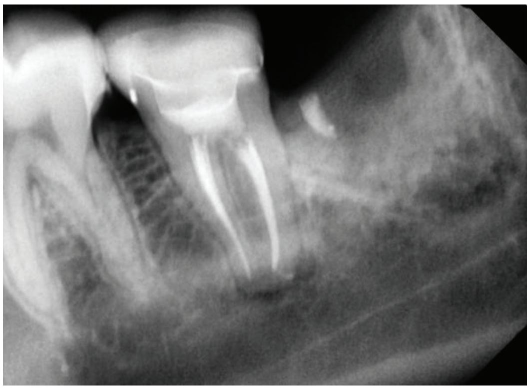

Figure 12: *Post operative radiograph*

DISCUSSION

Restoring endodontically treated teeth with significant coronal destruction is often challenging, particularly in cases with reduced interocclusal space or minimal remaining tooth structure. Conventional full-coverage restorations typically require extensive preparation, which can compromise the integrity of the residual dentin and heighten the risk of structural failure, especially in teeth with short clinical crowns.[6]

Endocrowns have emerged as a reliable alternative for restoring endodontically treated teeth with extensive crown loss, limited interocclusal space, or minimal remaining tooth structure. With leveraging advances in biomaterials and digital technologies, they offer conservative preparation, esthetic outcomes, and efficient treatment. The cervical sidewalk serves as the cornerstone of this restoration, aiming to create a broad, uniform, and stable surface capable of withstanding compressive forces.[3]

While metal endocrowns were used in earlier practices, lithium disilicate endocrowns have become preferred option due to their superior bonding, esthetics, and compressive strength with fewer restorative interfaces.[7] Studies, such as Biacchi et al[8] and a meta-analysis by Sedrez-Porto et al,[9] highlight their favorable force distribution and higher fracture resistance, supporting their use as a reliable, minimally invasive option for restoring endodontically treated molars.[2] A study on the biomechanical behavior of root canal treated teeth restored with endocrowns revealed that increasing the extension of the endocrown into the pulp chamber enhances mechanical performance, with a 5 mm extension showing lower stress intensity and more favorable stress distribution compared to a 1 mm extension. It was also found that both the material used and the amount of remaining tooth structure affect stress distribution. Therefore, preserving natural tooth tissue is recommended, and lithium disilicate ceramic endocrowns with higher modulus of elasticity demonstrated the most favorable outcomes.[10,11]

This case highlighted two additional challenges: supraeruption of the opposing tooth and the presence of an impacted third molar. Supraeruption was managed conservatively with enameloplasty to obtain adequate interocclusal clearance, aligning with recommendations by Craddock.[4,5] In this case, arbitrary enameloplasty was performed to address the 1.5 mm supraeruption, resulting in excessive enamel removal. However, real-time digital scanning during reduction could have further minimized the risk of over-reduction, underscoring the role of digital tools in enhancing precision.

The mesioangular impacted third molar was also extracted to prevent potential complications such as occlusal interference, periodontal compromise, or prosthetic failure of the adjacent tooth.[11] Radiographic evaluation and early intervention, including extraction of impacted third molars, are essential to prevent these issues and ensure the long-term success of prosthetic restorations.[12,13]

CONCLUSIONS

Lithium disilicate endocrowns provide a conservative, durable, and esthetic restorative option for endodontically treated molars with extensive coronal damage and limited interocclusal space. By preserving remaining tooth structure, endocrowns align with the principles of minimally invasive dentistry and offer predictable clinical success.

Incorporation of digital technologies enhances precision in preparation and restoration, improving outcomes. Careful case selection and management of occlusal factors, such as supraeruption, are essential for long-term success. This case demonstrates the effectiveness of endocrowns as a reliable alternative to conventional post-and-core restorations in complex clinical scenarios.

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