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Rehabilitation of a Grossly Mutilated Tooth Using A Cad-Cam Fabricated Zirconia Endocrown: A Case Report

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Abstract
Restoration of endodontically treated teeth with extensive coronal loss remains a clinical challenge due to reduced structural support and altered biomechanical behavior. Conventional post-and-core restorations, although widely practiced, may require additional removal of radicular dentin and increase the risk of root fracture. Endocrowns have been proposed as a conservative alternative that utilizes the pulp chamber for retention while relying on adhesive bonding for stability.
This case report describes the rehabilitation of a severely compromised mandibular first molar restored using a CAD-CAM fabricated endocrown. The clinical protocol, preparation design, digital workflow, and cementation procedure are discussed. Clinical evaluation demonstrated satisfactory marginal adaptation, functional efficiency, and esthetic integration during follow-up. The case report describes the use of CAD-CAM endocrowns as a minimally invasive and predictable restorative option for extensively damaged posterior teeth.
Keywords: *Endocrown, CAD-CAM, adhesive dentistry, endodontically treated tooth, conservative rehabilitation*

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I. INTRODUCTION

The clinical success of an endodontically treated tooth is determined by post-endodontic restoration. Endodontically treated posterior teeth frequently present with significant loss of coronal tooth structure, making their rehabilitation complex.[1,2] Traditionally, placement of an intraradicular post followed by a core build-up and full-coverage crown has been recommended to enhance retention and resistance.[3] However, preparation of post space involves removal of additional dentin from the root canal, which may weaken the tooth and predispose it to fracture.[3,4]

Additionally sometimes there is reduced remaining clinical crown height of the abutment, which prevents post and core build-up and crown fabrication.[1,2]

The concept of the endocrown was introduced as a conservative restorative approach that eliminates the need for post placement.[5,6] Retention is achieved through engagement of the pulp chamber combined with adhesive bonding to enamel and dentin. This design preserves remaining tooth structure and reduces operative complexity.[6,9]

Advances in digital dentistry have further improved the predictability of indirect restorations. CAD-CAM technology allows accurate digital impressions, controlled restoration design, and precise fabrication, contributing to improved marginal adaptation and clinical outcomes.[7,8] The present report describes the management of a grossly mutilated mandibular molar restored with a CAD-CAM fabricated endocrown.

Indications

- Endodontically treated posterior teeth with severe coronal loss[1,2]
- Teeth with short clinical crowns or limited ferrule[1,9]
- Molars with wide pulp chambers[5,6]
- Cases where post placement may compromise root integrity[3,4]
- Need for conservative restorative treatment[6,9]

Contraindications

- Shallow pulp chamber depth[1,9]
- Inadequate enamel for adhesive bonding[9,10]
- Subgingival margins preventing isolation[1,9]
- Compromised bonding conditions[10,11]
- Severe parafunctional habits (relative contraindication)[1,9]

II. CASE REPORT

A 21-year-old female patient presented with difficulty in mastication on the lower right posterior region. Medical history was non-contributory, and no contraindications to dental treatment were identified. Intraoral examination revealed a previously endodontically treated mandibular right first molar (46) with extensive destruction of coronal tooth structure (Fig 1). The remaining tooth structure was mainly confined to the cervical region with circumferential axial walls present. Periodontal health was satisfactory, and no mobility was detected.

Figure1. Intra Oral Photograph

Radiographic examination demonstrated adequate root canal obturation without evidence of periapical pathology.

Treatment plan

Based on clinical and radiographic evaluation, the following factors supported selection of an endocrown restoration:

- Adequate pulp chamber depth
- Presence of cervical enamel margins suitable for bonding
- Favorable occlusal relationship
- Requirement for a conservative restorative approach

A CAD-CAM fabricated endocrown was therefore planned.

Clinical procedure

A. Tooth preparation (fig. 2)

- ❖ Caries removal performed where required.
- ❖ Occlusal reduction of approximately 2 mm was achieved.
- ❖ A circumferential butt-joint margin was prepared at the cervical level.
- ❖ The pulp chamber was cleaned and shaped to provide internal retention.
- ❖ Divergence of 6–8 degrees was maintained.
- ❖ No post-space preparation was done.

Figure 2.Tooth Preparation irt. 46

B. Digital Impression

Gingival retraction was achieved using a retraction cord to clearly expose the finish line. An intraoral scanner was used to obtain a digital impression (Fig. 3). Shade selection was completed, and a provisional restoration was provided.

Figure 3. Intraoral Scanning Irt. Upper And Lower Jaw

C. CAD-CAM Fabrication

The restoration was digitally designed using CAD software and subsequently milled using CAD-CAM technology to achieve appropriate anatomy and internal adaptation (Fig. 4)

Figure 4. Final Prosthesis

D. Bonding Procedure

The internal surface of the restoration was conditioned according to manufacturer recommendations prior to bonding.

- Tooth surface was etched with 37% phosphoric acid.
- A universal adhesive was applied.
- Dual-cure resin cement was used for luting.
- Excess cement was removed and final light curing completed (Fig. 5).
- Occlusion was checked and adjusted (Fig. 6).

Figure 5. Prosthesis Cementation

Figure 6.Occlusal Adjustment

III. RESULTS

Immediate postoperative evaluation showed:

- Excellent marginal adaptation
- Proper proximal contacts
- Stable occlusion
- Good esthetics

At 6-month follow-up, the restoration remained clinically satisfactory with no signs of debonding, fracture, or marginal discoloration.

IV. DISCUSSION

Endocrowns have gained popularity as an alternative to conventional post-retained restorations, particularly for molars with extensive coronal destruction.[12,13] By avoiding post placement, preservation of radicular dentin is achieved, thereby reducing the risk of root fracture.[3,4] The monolithic design allows functional stresses to be distributed more evenly along the tooth structure.[7,8]

Successful outcomes depend largely on appropriate case selection, adequate bonding substrate, and proper occlusal management.[1,6] The use of CAD-CAM technology further enhances restoration accuracy and reproducibility while simplifying laboratory procedures.[7,8] Digital workflows also contribute to improved marginal fit and reduced clinical chairside time.[8,14]

V. CONCLUSION

CAD-CAM fabricated endocrowns provide a conservative and effective method for restoring endodontically treated posterior teeth with extensive structural loss. Proper case selection, sound preparation principles, and adherence to adhesive protocols are essential for achieving predictable clinical outcomes.

CLINICAL SIGNIFICANCE

Endocrowns preserve radicular dentin, eliminate the need for intraradicular posts, and offer a simplified yet reliable restorative solution for the rehabilitation of grossly mutilated posterior teeth.

SUMMARY

This case report describes the rehabilitation of a grossly mutilated endodontically treated mandibular first molar using a CAD-CAM fabricated zirconia endocrown. Restoration of teeth with extensive coronal destruction remains a clinical challenge because conventional post-and-core systems often require additional removal of radicular dentin, thereby increasing the risk of root fracture. Endocrowns offer a conservative alternative by utilizing the pulp chamber for macromechanical retention combined with adhesive bonding.

A 21-year-old female patient presented with difficulty in mastication associated with a previously treated mandibular right first molar exhibiting severe coronal loss. Clinical and radiographic examination revealed adequate root canal obturation, satisfactory periodontal health, sufficient pulp chamber depth, and favorable bonding substrate. Based on these findings, a CAD-CAM zirconia endocrown was planned.

Tooth preparation involved a circumferential butt-joint margin, occlusal reduction of approximately 2 mm, and preservation of radicular dentin without post-space preparation. A digital impression was obtained using an intraoral scanner, and the restoration was designed and milled through CAD-CAM technology. Adhesive cementation was performed using dual-cure resin cement following appropriate surface conditioning and bonding protocols.

Immediate postoperative evaluation demonstrated satisfactory marginal adaptation, stable occlusion, proper proximal contacts, and acceptable esthetics. At 6-month follow-up, the restoration remained clinically successful without debonding, fracture, or marginal discoloration.

The report highlights the clinical effectiveness of CAD-CAM fabricated endocrowns as a minimally invasive and predictable restorative option for extensively damaged posterior teeth. Proper case selection, adherence to adhesive protocols, and sound preparation principles are essential for long-term success.

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