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(CASE REPORT)

Efficient Management of Necrotic Mandibular Molar Using Single-Visit Endodontics and Endocrown: A Case Report

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Abstract

Introduction: Single visit endodontic treatment has become a practical and efficient approach, especially for patients seeking faster and more convenient dental care. This method reduces chair time, minimizes the risk of inter-appointment contamination, and improves overall patient satisfaction. In cases involving lower molars with extensive coronal damage, immediate restoration is essential to prevent reinfection and restore function. Endocrowns offer a conservative restorative option by utilizing the pulp chamber for retention, eliminating the need for post placement, reducing the risk of root fracture, providing a durable, esthetic, and time-efficient solution for structurally compromised posterior teeth.

Description of Case: A 21-year-old female presented with a symptomatic, cariously exposed mandibular first molar, which caused throbbing pain, especially at night. This tooth was diagnosed with pulpal necrosis and normal apical tissues. Endodontic therapy was performed in a single visit then restored with a lithium disilicate endocrown one week later, following adhesive bonding protocols and proper surface conditioning. The final restoration was evaluated clinically and radiographically.

Discussion: Recent evidence supports single-visit endodontics as a safe and effective option when proper disinfection protocols and case selection are followed. Endocrowns preserve remaining tooth structure while achieving high fracture resistance, especially when bonded using dual-cure resin cement. The combination of both techniques minimizes clinical time and maximizes long-term success.

Conclusion: This case illustrates that combining single-visit endodontic treatment with lithium disilicate endocrown restoration provides a conservative, efficient, and durable treatment strategy for nonvital posterior teeth.

Keywords: Single-Visit Endodontics; Lithium Disilicate Endocrown; Adhesive Restorative Dentistry; Minimally Invasive Treatment

1. Introduction

Single visit endodontics (SVE) are increasingly favored as its more cost-effective care. The rise in popularity of single visit endodontic has been also facilitated by advances in endodontic technologies. The decision to perform root canal therapy in a single or multiple visits depends on various clinical factors, such as the presence of pulpal infection and preoperative pain, which may influence treatment outcomes [1]. This method involves complete debridement, disinfection, and obturation of the root canal in one appointment. Although historically debated, recent systematic reviews suggest that SVE and multiple-visit protocols yield comparable outcomes in terms of success rate, postoperative pain, and radiographic healing [2,3].

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Indications for SVE include uncomplicated vital teeth, physically or medically compromised patients, selected nonvital cases, particularly those presenting with a sinus tract, [3,4]. Single visit endodontics may become a treatment option in cases with no significant pretreatment complications, such as severe periapical pathology or complex canal anatomy, where rubber dam isolation and sodium hypochlorite irrigation are feasible [5]. Contraindications to SVE include complex canal anatomy (e.g., calcified or curved roots), acute abscess with pus, persistent exudate or bleeding , limited mouth opening, TMJ disorders, symptomatic nonvital teeth without sinus tract, and large periapical lesions (>5 mm)[4]. As these condition may increase the risk of postoperative complications, such as pain or failure, based on very low-certainty evidence from 47 studies with 5805 participants[5] .

Advancements in single-visit endodontics, including nickel-titanium rotary systems, surgical microscopes, and CBCT, enhance precision and efficiency. Activated irrigation with sodium hypochlorite, EDTA, and chlorhexidine, aided by ultrasonics, ensures thorough disinfection [4]. Electronic apex locators minimize apical extrusion risks and obturation technique with newer generation of calcium silicate based sealer, that could enhance the overall results of single visit endodontics [6]. A randomized clinical study evaluated single-visit root canal treatment in 100 patients with asymptomatic single-rooted teeth and apical periodontitis. After 24 months, 72 patients showed significant improvements in bone density ($p<0.01$), with approximately one-third achieving clinical healing based on Periapical Index scores. Single-visit endodontics demonstrated effective periapical healing, comparable to standard multi-visit outcomes [7]. The clinical outcomes of single-visit endodontic procedures are influenced by effective microbial control, case complexity and preoperative conditions, especially post-endodontic restoration significantly impact long-term success[8].

Endodontically treated tooth long term survival rates is determined by post-endodontic restoration, because it will maintain and protect the existing tooth structure, while restoring esthetics, form, and function satisfactorily [9]. Post-retained restorations possess several disadvantages such as weakening of the tooth structure, root fractures, or in its application in narrow and calcified canals [10]. The paradigm has shift from post retained restoration to adhesive indirect full restoration, such as overlay and endocrown.

The term endocrown was first found by Bindl and Mörmann in the year 1999, and termed it as “ceramic monoblock technique. This monoblock concept is minimally invasive dentistry which acquires macromechanical retention from the floor and walls of the pulp chamber and also micromechanical retention from its adhesive cementation [10]. This clinical case report aims to highlight the effectiveness of single-visit endodontics in achieving successful treatment outcomes, while examining the restoration of a posterior tooth with a conservative and esthetic endocrown as a post-endodontic restoration, emphasizing its indications and applications.

2. Description of Case

A 21-year-old female patient presented at Airlangga University Dental Hospital with a chief complaint of a cavity and intermittent nocturnal pain in tooth 36, previously managed with a temporary filling and analgesics at a private clinic two weeks prior. Clinical examination revealed a non-vital tooth with deep caries perforating the pulp chamber, normal periapical tissues on radiographic assessment, and no systemic health issues or drug allergies. The treatment plan involved single-visit endodontics followed by a lithium disilicate endocrown restoration to ensure conservative and esthetic restoration.

Figure 1 Preclinical condition before treatment

The procedure commenced with patient preparation, including a 30-second rinse with 1% povidone-iodine and rubber dam isolation. The temporary filling was removed using a scaler, followed by caries excavation and access opening. Root canal negotiation was performed with a C-Pilot #08 and #10 (VDW®STERILE C-PILOT® Files), with working lengths determined using an apex locator (MB: 19 mm, ML: 19.5 mm, DB: 19 mm, DL: 19.5 mm). A macro glide path was established with a ProGlider rotary file (Dentsply Sirona), and root canal preparation was completed using the crown-down pressureless technique with ProTaper Gold (Dentsply Sirona) files up to F2 (25/08) on all canals.

Irrigation technique involved sequential use of 2.5% sodium hypochlorite (NaOCl) after each file change, activated by sonic agitation (NSK TiMax S970, with Eddy tip) to enhance debris removal, followed by sterile water rinse and recapitulation with K-File #10. Final irrigation consisted of 2.5% NaOCl, sterile water, 17% EDTA to remove the smear layer, and a final sterile water rinse, all activated by sonic agitation.

Canals were dried using endo suction and paper points. Obturation technique employed the single-cone technique with F2 gutta-percha (25/08) and bioceramic sealer (Ceraseal; Metabiomed), confirmed radiographically. A temporary filling was placed, and the patient was scheduled for follow-up.

Figure 2 Obturation radiograph

One week later, the temporary filling was removed, and gutta-percha was reduced 3 mm below the orifice using a heated plugger. A self-etch adhesive (Single Bond Universal Adhesive; 3M ESPE) was applied to the orifice, air-thinned, and light-cured. The orifice seal obtained with bulkfill flowable resin composite (3M™ Filtek™ Bulk Fill Flowable Restorative) followed by fiber reinforced composite (EverX Posterior; GC) to create a flat pulp chamber floor.

At first, the reduction of the occlusal surface of the tooth (1.5-2mm) was carried out using a diamond wheel orienting it parallel to the occlusal surface. Using a round end diamond bur at high speed, the cervical margins were levelled in chamfer shaped maintaining a 1.5 mm thickness uniformly with the remaining coronal tooth structure under a constant cooling system throughout the procedure. The bur was aligned with the tooth's long axis, aiming to maintain a 7–10° occlusal convergence, ensuring a smooth transition between the prepared coronal pulp chamber and access cavity with an approximate depth of 3 mm. The walls and margins of the preparation then finished with fine finishing diamond bur.

Figure 3 Endocrown tooth preparation

Gingival management is obtained with size 00 gingival retraction cord (Ultracord, Dent One Inc, USA), it was placed within the gingival sulcus. Impressions of the working model were taken with heavy body putty (3M™ Express™ 2 Heavy Body VPS Impression Material; 3M ESPE) and light body polyvinyl siloxane (3M™ Imprint™ 4 VPS Impression Material (3M ESPE, Germany) with two step technique impression to acquired well precision margin and working model.

Irreversible hydrocolloid for antagonist side. Bite registration of the patient obtained with bite registration polyvinyl siloxane (3M™ Express™ VPS Bite Registration Material). A temporary bis-acryl resin crown was placed, and a lithium disilicate endocrown was fabricated.

At the next visit, the temporary crown was removed. Adequate isolation was achieved using rubber dam, then endocrown was tried in with try in paste (G-CEM Try in Paste; GC), evaluating occlusion, proximal contacts, color, anatomy, and marginal adaptation. Once the adjustment had been verified, the endocrown was cemented using dual cured adhesive resin cement (G-CEM Link Force; GC).

Preparation of the restoration done by etching the intaglio surface of the prosthesis with 10% hydrofluoric acid for 30 s, rinsed with water, and dried with oil-free air syringe. The intaglio surface was then applied with silane-based primer (G-Multi Primer; GC) for a minute The tooth surface was cleaned with a rotary brush and pumice, followed by application of self-etch adhesive (G Premio Bond; GC), brushed thoroughly for 10 seconds, and dried with maximum air pressure fo 5 seconds, then light cured for 10 seconds (LED 700mW/cm^2). The endocrown was cemented with dual-cure adhesive resin cement, and tack cured for 2 seconds for an easier excess cement removal. Light cure each surface or margin fo 20 seconds (LED 700mW/cm^2). After the cement set, occlusion, marginal adaptation, and proximal contacts were verified.

Figure 4 Application of silane-based primer on intaglio of endocrown

Follow-up visits at one-week intervals confirmed no patient complaints, normal gingival health, and stable restoration. The successful outcome, supported by adequate healthy tooth structure, accessible root canals, and patient compliance, indicated a favorable prognosis for the single-visit endodontic treatment and endocrown restoration.

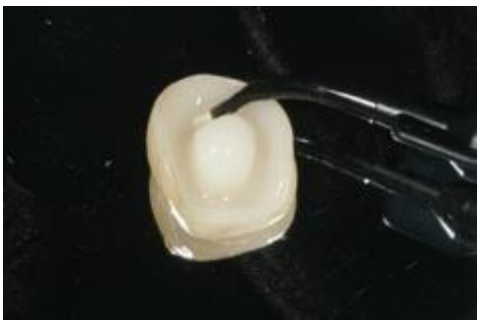

Figure 5 Cemented endocrown in occlusal view

3. Discussion

The case presented involves a single-visit endodontic treatment followed by an endocrown restoration for tooth 36 in a 21-year-old female patient with a chief complaint of a deep carious lesion and a history of spontaneous nocturnal pain. The diagnosis of pulp necrosis with normal apical tissues was confirmed through clinical and radiographic examinations, including negative responses to vitality tests and the absence of periapical radiolucency. The treatment protocol, encompassing single-visit endodontics with a crown-down pressureless technique, single-cone obturation, and an endocrown restoration, was executed successfully, resulting in a favorable prognosis. This discussion evaluates the clinical approach, its alignment with current endodontic and restorative principles, and the implications for clinical practice.

Single-visit endodontic treatment was chosen due to the absence of periapical pathology, low caries risk, and the patient's cooperative nature, which are critical factors for success in such protocols [6]. Studies have demonstrated that single-visit endodontics can achieve comparable outcomes to multiple-visit treatments in non-vital teeth without periapical lesions, provided meticulous cleaning, shaping, and obturation are performed[5]. The use of the crown-down pressureless technique with ProTaper Gold files facilitated efficient canal preparation while minimizing procedural errors such as ledge formation or apical transportation [11]. This ProTaper Gold system characterized by a convex triangular cross section and five finishing files (F1, F2, F3, F4 and F5) which have reduced cross sections with a U-shape in order to facilitate a higher degree of flexibility. According to the manufacturer, this design of the instrument also increases debris removal and flexibility in the working part of the file [11]. The incorporation of sonic agitation with 2.5% sodium hypochlorite (NaOCl) and 17% EDTA enhanced the disinfection and debris removal, aligning with recommendations for optimizing canal cleanliness [12].

The choice of a single-cone obturation technique with a bioceramic sealer was appropriate given its simplicity and effectiveness in achieving a hermetic seal. Bioceramic sealers offer excellent biocompatibility, dimensional stability, and the ability to promote periapical healing, which are advantageous in single-visit treatments[13]. Radiographic confirmation of the obturation quality, as evidenced by the absence of voids and proper adaptation of gutta-percha, further supports the efficacy of this approach.

Endocrowns are recommended for teeth with calcified canals, short clinical crowns, and a loss of coronal tooth structure. With advancements in adhesive dentistry, teeth with significant coronal damage can be restored using endocrowns, which eliminate the need for posts and utilize the pulp chamber for retention. These restorations rely on the "monoblock porcelain technique," where pulpal walls offer macromechanical retention, and adhesive cementation provides micromechanical retention [9]. Novel light-cured adhesive material, incorporating primers with 10-methacryloyloxydecyl dihydrogen phosphate (MDP) monomer, has been developed to combine with micromechanical retention for stronger chemical bonding [14].

In this study, endocrown fabricated using Lithium disilicate (LDS). LDS offering superior flexural and fracture resistance, excellent aesthetics, and the ability to be milled into endocrowns. Some research indicates LDS provides greater fracture resistance and more favorable (repairable) fractures compared to post-and-core restoration, while other studies find no significant difference [15]

The single-visit endodontic treatment and endocrown restoration for tooth 36 effectively combined modern techniques. The crown-down pressureless technique with ProTaper Gold files, sonic agitation, and bioceramic sealer ensured optimal canal preparation and obturation. The lithium disilicate (LDS) endocrown, supported by MDP-containing adhesive primers, provided durable, aesthetic restoration with strong retention. This case demonstrates the efficacy of chairside CAD-CAM technology and LDS material. Overall, this approach highlights a streamlined, patient-centered protocol for successful clinical outcomes.

4. Conclusion

Single-visit endodontics combined with a lithium disilicate endocrown offers an efficient and minimally invasive solution for restoring necrotic molars. Using crown-down preparation, sonic irrigation, bioceramic sealer, and CAD-CAM endocrown with MDP-based adhesive, this approach ensures durability and esthetics, making it suitable for similar cases.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this document.

Statement of informed consent

Informed consent was obtained from patient included in the study.

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