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**Case Report**

# Zirconia crown restoration on endodontically treated first premolar: A case report

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***ABSTRACT***

***Background:*** *Endodontic treatment failure is frequently caused by insufficient coronal sealing or crown restorations. In the longterm, this reduces the dental prognosis. A widely used restoration material that has outstanding mechanical properties is zirconia.* ***Purpose:*** *This report's aim is to describe the management of zirconia crown restorations on first premolars after endodontic treatment.* ***Case:*** *A 54-year-old male patient complained of a lump in the upper right gum area and had a restoration done, but it frequently came off. The patient needs immediate treatment with a longer-lasting restoration.* ***Case Management:*** *Endodontic treatment was completed in a single visit, and a zirconia crown was used as a permanent restoration.* ***Conclusion:*** *Zirconia crown restorations on first premolars after endodontic treatment provide aesthetic and promising results.*

***Keywords:*** *Indirect Restoration, Zirconia Crown, Endodontic Treatment*

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## INTRODUCTION

The best restoration for teeth that have undergone endodontic treatment is still being debated.[1] Final restoration after root canal treatment plays an important role in the success of root canal treatment because coronal leaks can reduce the success rate of root canal treatment by up to 40%.[2] Material selection considerations and restoration design in endodontically treated teeth depend on the remaining tissue present, its relationship to the adjacent teeth, and contact with the antagonist teeth.[3]

Cheung in Lone argues that premolars with short crowns and narrower pulp chambers need to be restored with post-cores and full crowns in order to survive fracture.[4] Advances in dentistry have made it possible to adopt more conservative treatments that offer multiple methods of restoring teeth, both directly and indirectly.[5]

Zirconia is a popular material for indirect tooth-colored restorations on posterior teeth. These materials have characteristics in terms of functionality such as mechanical strength, physical strength, and aesthetics.[6] Zirconia has a better level of material resistance than composite resin materials, which can survive in 90% of conditions for more than 10 years.[7] This report's aim is to describe the management of zirconia crown restorations on first premolars after endodontic treatment.

## CASE

A man (54 years old) came to the RSKGMP Airlangga University Dental Conservation Specialist with complaints of a lump in the gum area of the upper right front tooth and wanted to be treated immediately. Previous history indicates

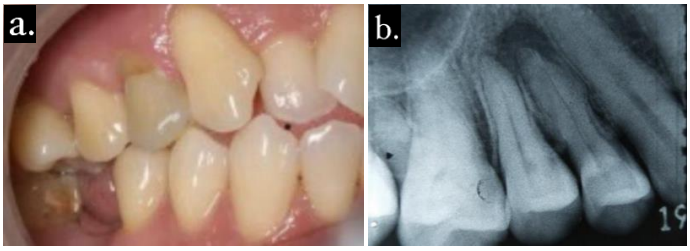


**Figure 1.** Pre-operative clinical photographs and radiographs.


**Figure 2.** Color determination of the crown using the shade guide.

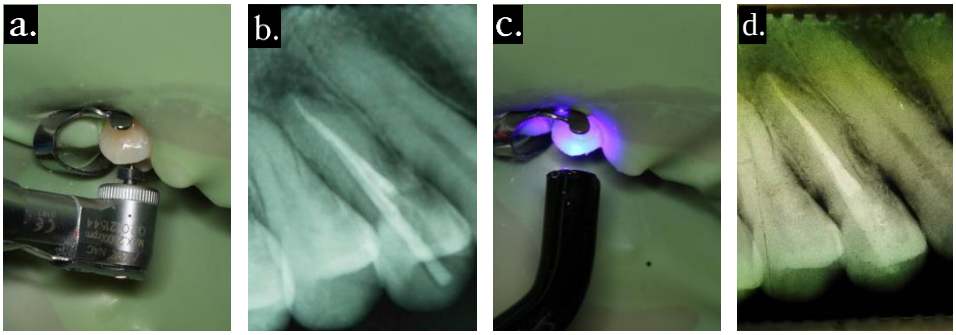


**Figure 3.** a. Gutta percha point reduction; b. Radiographic image of the fiber post placement trial; c. Fiber post insertion and core build-up; d. Periapical radiograph after fiber post cementation.

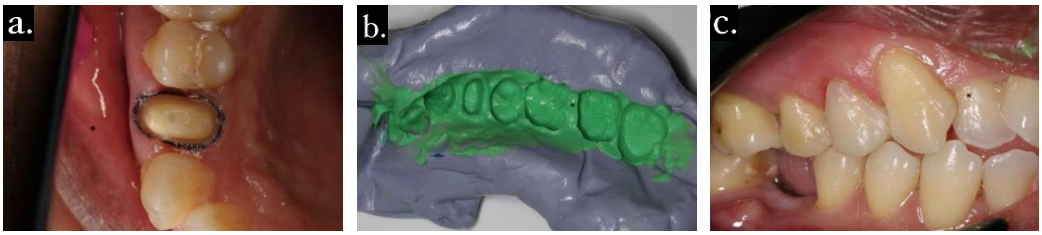


**Figure 4.** a. Occlusal view of crown preparation; b. Double-impression mold; c. Temporary crown insertion.


**Figure 5.** a. Occlusal view of zirconia crown; b. Cleaning teeth with brush and pumice; c. Zirconia crown insertion.

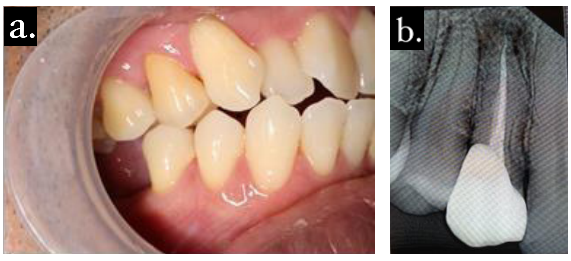


**Figure 6.** Post-operative image and post-operative radiograph image.

that the upper right front tooth had broken in the area near the gums and was often filled in several times. As a result, the patient is bothered by his appearance and desires a long-lasting restoration. About 2 weeks ago, the patient's gums were swollen, and lumps like boils appeared. The patient never felt any pain in his teeth. The patient also had no history of systemic hypertension, diabetes, cardiovascular disorders, or allergies.

A class V cavity on tooth 14, discoloration, percussion, and bite test (-), and a fistula in the gingival region of tooth 14, were discovered during clinical examination. A cavity test (-) and a needle test that reacted were used to determine the vitality of tooth 14. Radiographic examination showed a diffusely bordered radiolucent appearance at the apical level of tooth 14 (Figure 1). The tooth was then diagnosed with pulpal necrosis accompanied by a chronic apical abscess on tooth 14.

## CASE MANAGEMENT

On the first visit, the patient was given KIE, DHE, and informed consent forms. After that, a one-time root canal treatment was performed. Subsequent visits are planned for post-placement and crown preparation. The patient was instructed to gargle with povidone-iodine 1% for 30 seconds. adjustment of tooth color using a shade guide (2M3) (Figure 2).

The rubber dam was installed to isolate the work area, and the temporary filling was removed. The selection of pre-fabricated post sizes was carried out based on a template adapted to X-rays. Gutta percha point reduction and fiber post preparation with a gates gliden drill and a 17 mm calibration drill (Figure 3a). Try on the fiber post and confirm the radiological photo (Figure 3b). Fiber post insertion was carried out with dual-cured resin cement, and core buildup was made using composite build-up and light curing (Figure 3c). Radiographic confirmation of the insertion of the prefabricated post was performed (Figure 3d).

Gingival management was carried out using a retraction cord, followed by crown preparation with a deep chamfer preparation design, with 0.7 mm wall removal and 1.5 mm occlusal removal, and final subgingival preparation using a round end tapper fissure diamond bur (Figure 4a). Maxillary impressions were made with double impression elastomeric materials (Figure 4b) and antagonistic impressions with irreversible hydrocolloid (alginate) impression materials. The bite registration was made using polyvinyl siloxane and continued with the manufacture of a temporary crown (Figure 4c).

The next visit was to try on a fixed crown, check occlusion, articulation, and adaptation to the surrounding tissue (Figure 5a). The rubber dam was placed before the teeth were cleaned with a brush and pumice (Figure 5b). Surface treatment of the zirconia crown was carried out followed by cementation using self-adhesive resin cement (Figure 5c).

The next visit was scheduled. Subjective and objective examinations were carried out. The results of the examination showed that the patient was satisfied with the results of the treatment; there were no subjective complaints, negative percussion, or palpation; the crown was in good condition; there was no food retention at the contact point or restoration margins; and the surrounding gingiva was normal (Figure 6).

## DISCUSSION

The term "success" of endodontic treatment can be seen from various perspectives. Dentists see the clinical success of endodontic treatment when the treatment is completed without any complaints (asymptomatic) and the teeth are able to function again. This can be achieved with accurate diagnosis, disinfection, instrumentation, and restoration procedures (coronal and apical sealing) for rehabilitation management.[8] Nurulaqmar-Iwani (2020) states that poor restorations are the most common cause of endodontic failure.[1] Poor coronal and apical seals allow microorganisms and toxins from the oral flora to penetrate through the root canal system into the periapical tissues.[9]

The use of this type of restoration on teeth after endodontic treatment must pay attention to the indications and remaining tooth tissue. The ideal restoration is one that protects the missing occlusal surface or cusp.[10] The patient in this case stated that he has a history of restorations on his teeth, but they often fall off, so the patient expects restorations with a longer shelf life. The longevity of restorations depends on many factors, including the materials used, the type of restorative procedure, patient parameters, operator variables, and local factors. In 75-80% of cases, indirect crown restorations last up to 10 years, with 88% zirconia material lasting more than 5 years.[11]

Zirconia has become a popular indirect restoration material in the last few decades. Zirconia (ZrO2) is a heterogeneous, highly resistant, polycrystalline ceramic with favorable mechanical properties (toughness: 5–10 MPam, flexural strength: 500–1200 MPa, Young's modulus: 210 GPa) and good optical characteristics (Zarone et al., 2019). Zirconia has better mechanical properties than other ceramics, such as alumina, glass ceramics, and lithium disilicate; is aesthetically superior and usable in the anterior, premolar, and molar areas; and has good marginal adaptation.[12]

The absence of a glass matrix composition in zirconia means that zirconia cannot be conditioned by conventional acid etching techniques. Surface treatment aimed at obtaining good bonding has been reported in several publications. The combination of mechanical and chemical surface treatments on zirconia crowns is proven to offer the best results.[13]

The cementation material used in this case is self-adhesive resin cement. Self-adhesive resin cement has been used for almost 20 years. Self-adhesive resin cement aims to facilitate conventional resin cement pretreatment,

prevent saliva and blood contamination during complicated resin cement installation operations, reduce operator errors, shorten patient sitting time, and reduce maintenance burden.[14] The use of this material is expected to create a monoblock bond that extends the service life of the restoration.[15]

The conclusion that can be drawn from this case is that the use of zirconia crown restorations on first premolars after endodontic treatment provides aesthetic and satisfactory results. Zirconia crown restorations provide coronal sealing and adequate marginal adaptation so as to increase treatment success. This was concluded from the post-evaluation results, where there were no subjective complaints, negative percussion and palpation, no food retention at the point of contact and restoration margins, and the gingiva was around normal.

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