

POSTERIOR RICHMOND CROWN AS A MONOBLOCK POST-ENDODONTIC RESTORATION IN A SEVERELY COMPROMISED TOOTH: A CASE REPORT

Dr Mullakkara Alida^{1*}, Dr P. Sharath Kumar¹, Dr Champa C²,
Dr Mujahid Ahmed³, Dr Shadab Ahmed⁴,

^{1*}Postgraduate student, ²Professor & HOD, ³Professor, ⁴Reader, ⁵Reader,
Department of Conservative Dentistry & Endodontics

Abstract

Restoration of endodontically treated posterior teeth with extensive coronal destruction and minimal occlusal clearance presents a significant restorative challenge. Conventional post-core-crown systems often require additional reduction, which may further compromise the remaining tooth structure and increase the risk of mechanical failure. The Richmond crown, a single-unit cast post-retained crown, offers a conservative alternative by eliminating the post-core interface and providing a monoblock restoration. This case report describes the management of a grossly carious mandibular first molar in a 17-year-old female patient using a full metal posterior Richmond crown following endodontic therapy. The restoration was indicated due to severe coronal loss, minimal occlusal clearance, and the need for enhanced structural integrity. The prosthesis demonstrated satisfactory fit, function, and patient comfort, with no reported complications during the follow-up period. Posterior Richmond crowns remain a valuable yet underutilized option in carefully selected cases requiring durable post-endodontic rehabilitation.

Key words : Richmond crown, Posterior teeth, post-endodontic restoration, Monoblock restoration, grossly carious molar

Introduction

Preservation of natural dentition remains a primary objective of contemporary restorative dentistry. Although endodontic therapy demonstrates a high success rate, the long-term prognosis of an endodontically treated tooth largely depends on the quality of its post-endodontic restoration. Posterior teeth are particularly vulnerable to fracture following endodontic treatment due to extensive caries, access cavity preparation, and exposure to higher occlusal forces.¹

When the remaining coronal tooth structure is insufficient to retain a conventional full-coverage restoration, intraradicular retention becomes necessary. Traditional post-and-core systems have

been widely used; however, their clinical performance may be compromised by post dislodgement, core fracture, cement failure, and increased stress concentration at material interfaces.^{2,3} These challenges are further exacerbated in situations with reduced occlusal clearance, where adequate core and crown thickness cannot be achieved without excessive tooth reduction.

Address for Correspondence:

Dr. Mullakkara Alida

Department of Conservative Dentistry
and Endodontics, Sri Siddhartha Dental College
and Hospital, Karnataka, India
Phone (or Mobile) No.: +91954571766
Email: alida1511@gmail.com

The Richmond crown, introduced in the late nineteenth century, is a single-unit cast post-retained crown designed to function as a monoblock restoration.⁴ Although largely replaced by prefabricated post systems, it remains a viable option in select clinical scenarios, particularly when minimal interocclusal space and severe coronal destruction are present. This case report highlights the application of a posterior Richmond crown for the rehabilitation of a grossly carious mandibular molar.

The monoblock concept in restorative dentistry refers to a design in which the post, core, and crown function as a single unified structure with minimal or no intervening interfaces. This approach aims to improve stress distribution along the root structure and reduce the risk of mechanical or adhesive failure at material junctions. Richmond crowns inherently follow the monoblock principle, as the post and crown are fabricated as a single casting, thereby eliminating the post-core and core-crown interfaces. This design is particularly advantageous in teeth with severe coronal destruction and limited occlusal clearance, where conventional multi-component restorations may be biomechanically compromised.^{5,6}

Case Report

Patient Description and History

A 17-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain in the lower right posterior region of the jaw. Clinical examination revealed extensive carious destruction of the mandibular right first molar (tooth 46). The tooth was tender on percussion, and vitality testing elicited a positive response suggestive of pulpal involvement.

Clinical and Radiographic Examination

Intraoral examination showed severe loss of coronal tooth structure, with approximately 1–2

mm of tooth structure remaining circumferentially. Radiographic evaluation revealed deep caries involving the pulp with no evidence of periapical pathology. The periodontal status was satisfactory, and the tooth was deemed restorable.

Diagnosis and Treatment Planning

A diagnosis of symptomatic irreversible pulpitis was established. Root canal treatment followed by definitive prosthetic rehabilitation was planned. Due to minimal remaining coronal structure, limited occlusal clearance, and the risk of inadequate core thickness with a conventional post-core-crown system, a posterior Richmond crown was selected as the definitive restorative option.

Endodontic Procedure

Single-visit root canal therapy was performed under rubber dam isolation. Following biomechanical preparation and obturation, post space preparation was carried out, leaving approximately 5 mm of gutta-percha apically to maintain an adequate seal.

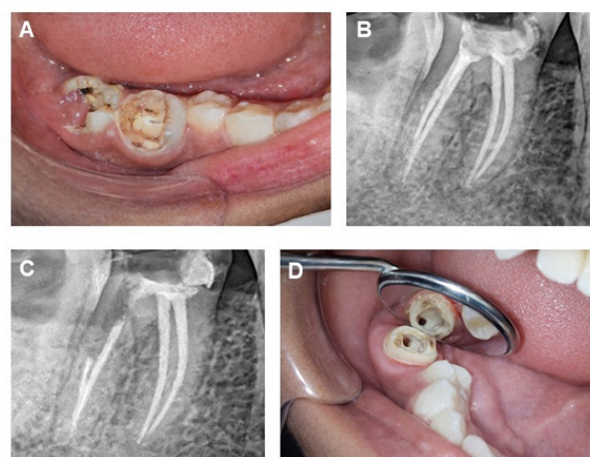


Figure 1: Pre-operative findings, endodontic treatment, and post space preparation. (A) Pre-operative intraoral photograph showing grossly carious mandibular first molar (tooth 46) with extensive coronal destruction. **(B)** Post-obturation intraoral radiograph showing satisfactory obturation of the root canals. **(C)** Radiograph depicting post space preparation with preservation of approximately 5 mm of apical gutta-percha. **(D)** Clinical photograph showing prepared post space following endodontic treatment.

Richmond Crown Fabrication

Post space impression was recorded using an indirect technique. A K-file adapted with inlay wax was used to register the canal configuration, followed by a light-body and putty elastomeric impression. A full metal Richmond crown was fabricated using a nickel–chromium alloy. Metal try-in confirmed satisfactory adaptation, marginal integrity, and occlusal clearance.

Cementation and Outcome

The restoration was cemented using conventional luting glass ionomer cement. Minimal occlusal adjustments were required. The patient reported satisfactory comfort and function immediately after cementation. Telephonic follow-up over several months revealed no pain, discomfort, or functional disturbances.

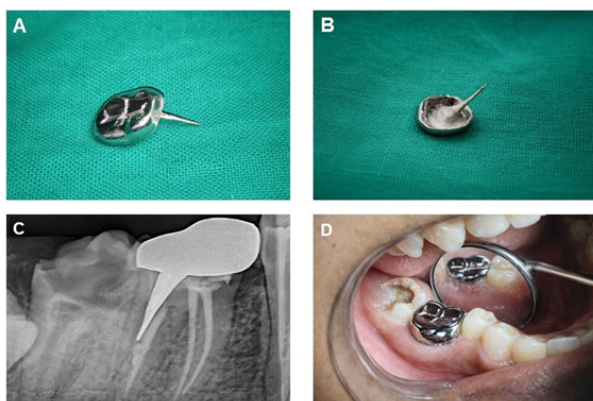


Figure 2: Prosthetic rehabilitation and final outcome using a posterior Richmond crown.

- (A) Extra-oral view of the fabricated full metal Richmond crown. (B) Undersurface view showing the integrated post and crown as a single-unit monoblock restoration. (C) Post-cementation intraoral periapical radiograph demonstrating satisfactory seating of the Richmond crown. (D) Post-operative intraoral photograph showing the cemented full metal Richmond crown in functional occlusion.

Discussion

Restoration of severely compromised posterior teeth requires careful consideration of biomechanical principles, remaining tooth structure, and occlusal demands. Endodontically treated molars are particularly susceptible to fracture due to loss of structural integrity and exposure to high masticatory forces.⁷ The presence

of a circumferential ferrule, even of minimal height, has been shown to significantly improve fracture resistance by reinforcing the remaining tooth structure and enhancing the biomechanical performance of post-retained restorations.^{1,8}

Conventional post–core–crown systems introduce multiple interfaces that may serve as potential sites for failure under functional loading. Cement failure, post-core separation, and core fracture have been frequently reported as causes of restoration failure.^{8,9} In cases with reduced occlusal clearance, achieving adequate core thickness without compromising crown strength becomes challenging.

The biomechanical advantage of the Richmond crown can be largely attributed to its monoblock configuration. In conventional restorations, the presence of multiple interfaces—post–cement–core–cement–crown—creates areas of stress concentration that predispose the restoration to failure under cyclic occlusal loading. In contrast, a monoblock restoration reduces these interfaces, allowing more uniform transmission of functional stresses along the long axis of the tooth. This stress-modulating effect is particularly beneficial in posterior teeth, where occlusal forces are higher and predominantly axial in nature.^{5,6,8,9}

In posterior teeth, occlusal forces are predominantly axial in nature, favoring restorations that transmit stresses along the long axis of the tooth, a biomechanical advantage inherent to the Richmond crown design.^{5,6}

Although prefabricated fiber post systems offer favorable elastic properties, their use in the present case was limited by minimal remaining coronal structure and restricted occlusal clearance. In such situations, the additional interfaces and reliance on adhesive bonding may compromise long-term stability when compared

to a monoblock cast restoration.^{8,10}

The Richmond crown addresses these concerns by combining the post, core, and crown into a single casting, thereby reducing interfacial failures and enhancing structural rigidity.⁵ The monoblock design distributes occlusal stresses more uniformly along the root and minimizes the risk of crown dislodgement. In posterior teeth, a full metal Richmond crown provides superior strength and wear resistance compared to metal-ceramic alternatives, making it particularly suitable for high-load bearing regions.⁶

Despite its advantages, the Richmond crown is technique-sensitive and requires precise case selection. Excessive modulus of elasticity and difficulty in retrieval are notable limitations.¹⁰ However, in the present case, the patient's young age, satisfactory periodontal support, minimal occlusal clearance, and severe coronal destruction justified its use as a conservative, tooth-preserving solution.

Conclusion

The posterior Richmond crown remains a valuable restorative option for endodontically treated teeth with extensive coronal destruction and limited occlusal clearance. Although largely replaced by prefabricated post systems, the Richmond crown continues to remain clinically relevant in carefully selected cases where contemporary restorative options may be biomechanically inadequate. When carefully planned and executed, it offers a durable monoblock restoration that preserves remaining tooth structure while providing satisfactory function and longevity. This case underscores the relevance of traditional restorative concepts in modern clinical practice when applied judiciously.

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