

Revisiting the Richmond Crown: Posterior Rehabilitation of a Grossly Compromised Mandibular First Molar with Limited Occlusal Clearance: A Case Report

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Abstract:

Background: Rehabilitation of extensively damaged endodontically treated posterior teeth requires careful selection of the definitive restoration based on the remaining tooth structure, available restorative space and patient-related factors. Although endocrowns have emerged as a conservative treatment option for posterior teeth, they are not universally applicable.

Case presentation: A 17-year-old female presented with a grossly compromised mandibular right first molar following endodontic treatment. Owing to extensive coronal destruction, limited interocclusal clearance, minimal residual coronal tooth structure and the patient's preference for an economical treatment option, a custom-cast full-metal Richmond crown was selected instead of an adhesive endocrown.

Results: The Richmond crown demonstrated satisfactory clinical function, marginal adaptation and radiographic findings at one-year follow-up, with no evidence of failure or periapical pathology.

Conclusion: Successful rehabilitation of endodontically treated posterior teeth depends on individualized treatment planning rather than a single restorative approach. The Richmond crown remains a predictable and cost-effective treatment option in carefully selected clinical situations where contemporary adhesive restorations are contraindicated.

Key Word: Endodontically treated tooth; Interocclusal clearance; Mandibular first molar; Richmond crown; Restoration selection.

Date of Submission: 13-08-2026

Date of Acceptance: 26-08-2026

I. Introduction

Rehabilitation of endodontically treated teeth with extensive coronal destruction remains a restorative challenge. The selection of a definitive restoration depends on multiple factors, including the amount of remaining tooth structure, ferrule, functional demands, interocclusal clearance, and economic considerations. Although adhesive restorations, particularly endocrowns, have gained widespread acceptance owing to advances in adhesive dentistry, they are not suitable for every clinical situation.¹⁻³

The Richmond crown, introduced more than a century ago, is a single-piece custom-cast restoration that combines the post, core, and crown into a monoblock design.⁴ Although it has largely been replaced by fiber post-supported restorations and adhesive techniques, it continues to be a valuable treatment option in carefully selected cases with extensive coronal destruction, limited restorative space, and minimal remaining tooth structure.

This case report describes the successful rehabilitation of a grossly compromised mandibular first molar with limited interocclusal clearance using a custom-cast Richmond crown. It highlights the importance of individualized restoration selection and demonstrates that conventional restorative approaches may still provide predictable clinical outcomes when selected appropriately.

II. Case Presentation

A 17-year-old female presented to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain in the lower right posterior region. The patient had no relevant medical or dental history.

Clinical examination revealed extensive coronal destruction of the mandibular right first molar (tooth 46), with only the mesial wall and marginal ridge remaining. All cusps were lost, the ferrule was approximately 1 mm, and the available interocclusal clearance was less than 2 mm. The tooth was tender on percussion, with no swelling or tenderness on palpation. Periodontal examination revealed normal probing depths without mobility or furcation involvement (Figure 1A). Pulp sensibility testing using Endo-Frost cold spray (Coltene/Whaledent AG,

Altstätten, Switzerland) elicited an exaggerated and lingering response, while the tooth responded positively to the electric pulp test.

Periapical radiographic examination demonstrated a normal periodontal ligament space and surrounding periapical bone, with no evidence of periapical pathology. Based on the patient's history, clinical examination, positive pulp sensibility tests, and radiographic findings, a diagnosis of symptomatic irreversible pulpitis with normal apical tissues was established, and nonsurgical root canal treatment was planned.

Following rubber dam isolation, conventional access cavity preparation was performed. Working length was established using an electronic apex locator and confirmed radiographically. Biomechanical preparation was completed using the Woodpecker rotary file system to a master apical size of 25 with a 0.04 taper. Irrigation was performed with 3% sodium hypochlorite throughout instrumentation, followed by a final rinse with 17% EDTA. The canals were obturated using a single-cone technique with matching gutta-percha cones and Grossman sealer (Figure 1B).

Considering the extensive loss of coronal tooth structure, minimal ferrule, limited interocclusal clearance, and the patient's preference for an economical definitive restoration, a Richmond crown was selected. The distobuccal canal was chosen for post placement because it provided the largest and straightest canal path while preserving the integrity of the remaining root structure.

Post space was prepared using Peeso reamers, preserving approximately 4 mm of apical gutta-percha (Figure 1C). A direct post pattern was fabricated by adapting inlay wax around a K-file within the prepared canal. A pickup impression was made using a putty-light body addition silicone impression material to accurately record the post pattern together with the prepared tooth (Figure 1D).

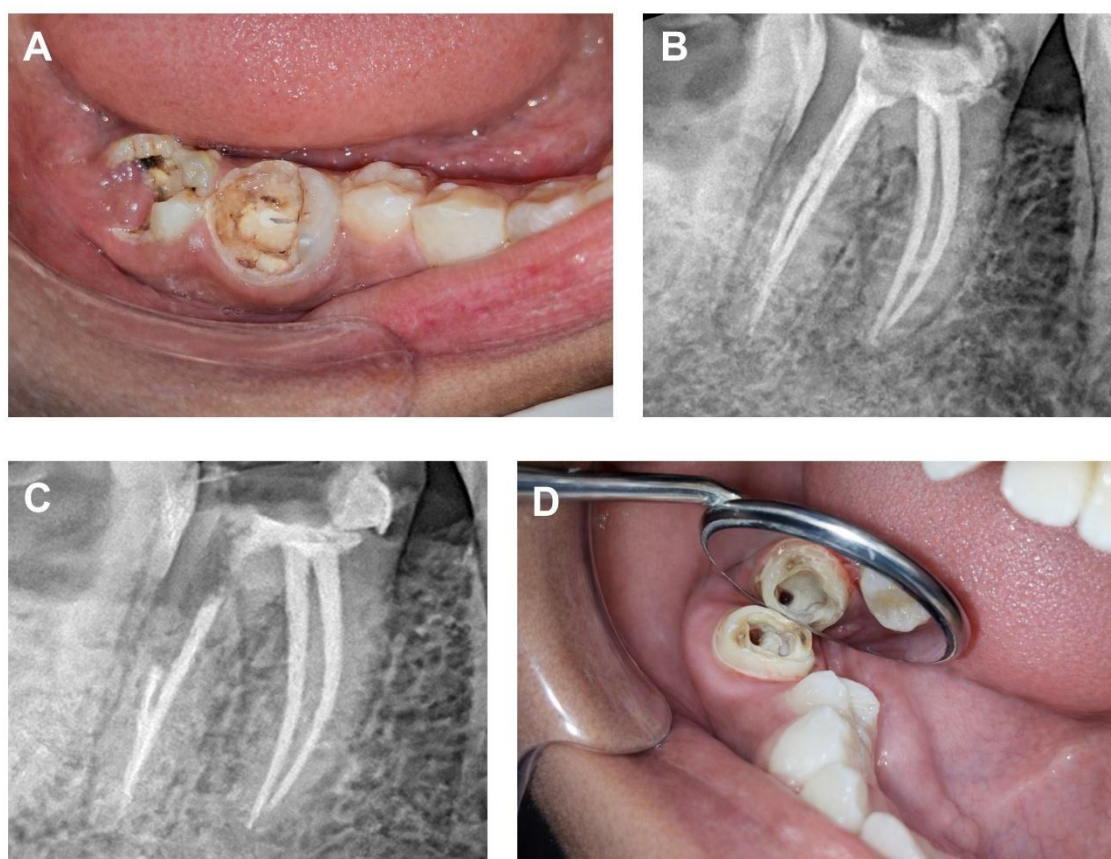


Figure 1. Clinical and radiographic sequence of diagnosis, endodontic treatment, and post space preparation. (A) Preoperative clinical photograph showing extensive coronal destruction of the mandibular right first molar (tooth 46). (B) Post-obturation periapical radiograph following nonsurgical root canal treatment. (C) Periapical radiograph showing post space preparation with approximately 4 mm of apical gutta-percha preserved. (D) Occlusal view of the tooth following post space preparation, demonstrating the remaining coronal tooth structure prior to fabrication of the definitive Richmond crown.

A custom-cast nickel-chromium Richmond crown was fabricated and luted with conventional glass ionomer cement (GC Corporation, Tokyo, Japan).

Figure 2A and 2B illustrate the occlusal and intaglio views of the definitive restoration, while Figure 2C shows the immediate post-cementation periapical radiograph and Figure 2D demonstrates the immediate postoperative clinical view.

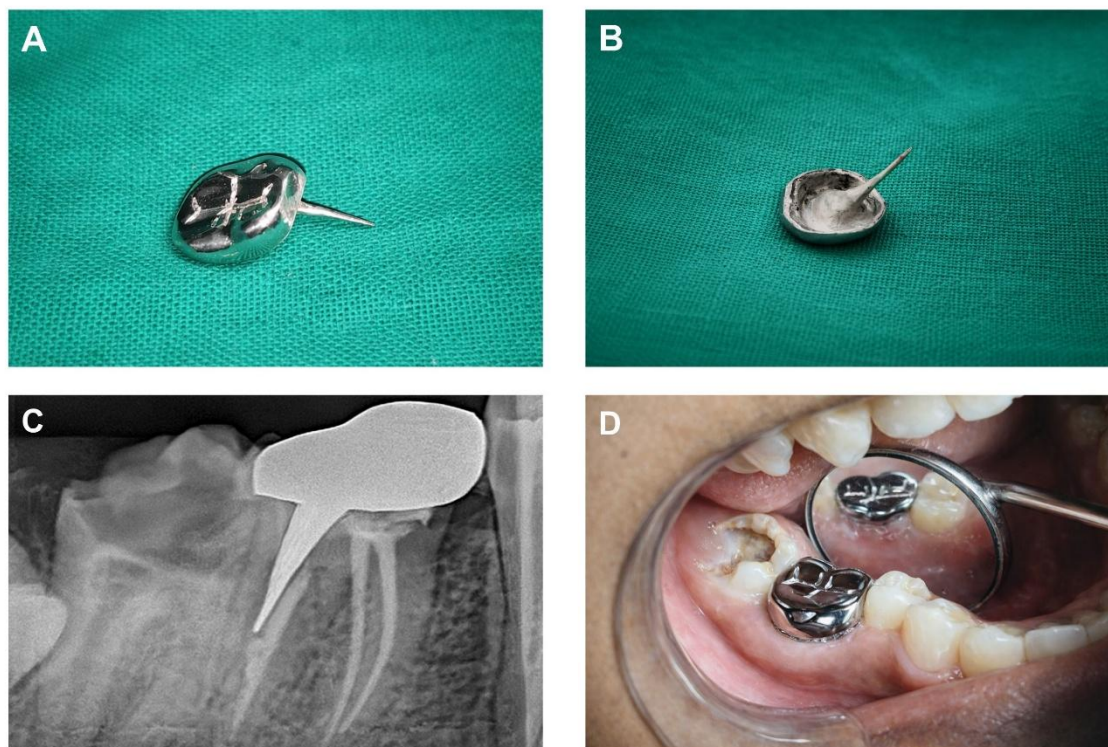


Figure 2. Definitive Richmond crown restoration.

(A) Occlusal view of the custom-cast Richmond crown.

(B) Intaglio view of the restoration demonstrating the integrated post, core, and crown design. (C) Immediate post-cementation periapical radiograph.

(D) Immediate postoperative clinical photograph following cementation of the definitive restoration.

At the one-year follow-up, the patient remained asymptomatic. Clinical and radiographic examination demonstrated satisfactory function and retention of the restoration, with no evidence of recurrent caries, loss of retention, or periapical pathology. A summary of the clinical course is presented in Table no. 1.

Table no.1. Timeline of Clinical Events

Clinical Stage	Event
Presentation	A 17-year-old female presented with pain in the mandibular right first molar (tooth 46).
Clinical examination	Extensive coronal destruction with only the mesial wall and marginal ridge remaining, minimal ferrule, and limited interocclusal clearance.
Diagnostic assessment	Endo-Frost cold test elicited an exaggerated lingering response, electric pulp test was positive, and periapical radiography revealed normal apical tissues. A diagnosis of symptomatic irreversible pulpitis with normal apical tissues was established.
Endodontic treatment	Nonsurgical root canal treatment was completed using rotary instrumentation, irrigation with 3% sodium hypochlorite and 17% EDTA, followed by obturation using the single-cone technique with Grossman sealer.
Post space preparation	Post space was prepared in the distobuccal canal while preserving approximately 4 mm of apical gutta-percha.

Definitive restoration	A custom-cast nickel-chromium Richmond crown was fabricated and cemented with conventional glass ionomer cement.
Follow-up	At the one-year review, the patient remained asymptomatic, and clinical and radiographic examinations demonstrated satisfactory function, restoration retention, and healthy periapical tissues.

III. Discussion

The restoration of endodontically treated teeth should be guided by the amount of remaining tooth structure rather than by a single restorative approach. Contemporary evidence recommends preserving tooth structure whenever possible and selecting the definitive restoration based on the remaining coronal tooth structure, ferrule, functional demands, and available restorative space.^{5,6}

Endocrowns have become an increasingly popular treatment option for extensively damaged posterior teeth because of their conservative preparation design, favorable biomechanical behavior, and encouraging clinical outcomes.^{2,3,7,8} However, successful endocrown restoration requires adequate pulp chamber depth, sufficient adhesive bonding surface, and appropriate interocclusal clearance. In the present case, extensive coronal destruction, minimal ferrule, and limited interocclusal clearance made an adhesive endocrown a less suitable restorative option.

The European Society of Endodontology recommends that restoration of root-filled teeth should be individualized according to the remaining tooth structure and clinical circumstances rather than following a universal restorative protocol.⁶ Similarly, Bhuva et al. emphasized that restoration selection should be based on structural preservation, ferrule, and long-term biomechanical considerations.⁵ These recommendations supported the selection of a Richmond crown in the present case.

The Richmond crown is a custom-cast single-unit restoration that combines the post, core, and crown into a monoblock design. Although it has largely been replaced by prefabricated fiber post systems and adhesive restorations, it remains a viable treatment option in selected clinical situations where conventional restorative approaches are limited.^{4,9} The single-piece design provides intimate adaptation to the prepared canal while eliminating the interface between the post and core.

In the present case, the distobuccal canal provided a favorable path of insertion for post placement while preserving the integrity of the remaining root structure. The custom-cast Richmond crown also addressed the limited interocclusal clearance without requiring additional restorative components, thereby providing a durable and economical definitive restoration.⁵

Although Richmond crowns are no longer routinely used in contemporary restorative practice, this case demonstrates that they remain a clinically relevant treatment option when restoration selection is guided by sound biomechanical principles, patient-specific considerations, and the available restorative space. Further clinical studies with larger sample sizes are required to evaluate the long-term outcomes of Richmond crowns in posterior teeth.

IV. Conclusion

Successful rehabilitation of grossly compromised endodontically treated posterior teeth requires individualized restoration selection based on the remaining tooth structure, restorative space, functional requirements, and patient-related factors. Although adhesive restorations have become the preferred treatment option in many clinical situations, this case demonstrates that the Richmond crown remains a predictable, economical, and clinically effective alternative when contemporary restorative approaches are contraindicated or impractical.

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