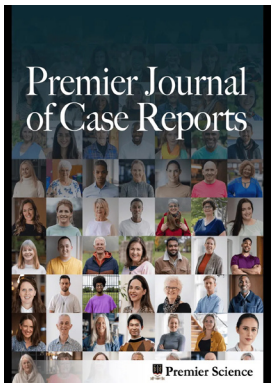

Endodontic Treatment Followed by Direct Class II Composite Restoration: A Case Report

Hashir Ather

ABSTRACT

Managing posterior teeth presenting with pulpal involvement and proximal caries is of great challenge. It requires a treatment approach which can restore biologic function of the tooth to a great extent. This case report presents the endodontic treatment and direct Class II Composite restoration of tooth #24 in a 29-year-old patient who presented with deep carious involvement and sensitivity to thermal stimuli. On radiographic examination, it was revealed that the tooth presented with irreversible pulpitis with periapical involvement. This condition of tooth concluded that a root canal treatment is mandatory to ensure tooth integrity.

For better treatment outcome, a stepwise clinical protocol was mandatory. This involved access preparation, biomechanical cleaning and shaping, and obturation with gutta-percha was performed under rubber dam isolation. Following successful endodontic therapy, the proximal defect was restored using a direct Class II Composite resin technique. This was done to achieve both functional integrity and anatomical contour of the tooth. An optimal obturation and coronal sealing was confirmed on postoperative radiographs.

A follow-up of 6 months was advised to the patient. This follow up would demonstrate resolution of symptoms, radiographic periapical healing and satisfactory functional outcomes.

Keywords: NITI rotary instrumentation, Sodium hypochlorite–EDTA irrigation, Lateral condensation obturation, Direct nanohybrid composite restoration, Coronal seal integrity

BIO CARE, Multan, Pakistan

Correspondence to:
Hashir Ather,
hashirather2002@gmail.com

Additional material is published online only. To view please visit the journal online.

Cite this as: Hashir A. Endodontic Treatment Followed by Direct Class II Composite Restoration: A Case Report. Premier Journal of Case Reports 2026;6:100013

DOI: https://doi.org/10.70389/PJCR.100013

Peer Review

Received: 23 August 2025

Last revised: 20 December 2025

Accepted: 22 December 2025

Version accepted: 4

Published: 19 February 2026

Ethical approval: N/a

Consent: Informed consent provided

Funding: N/a

Conflicts of interest: N/a

Author contribution:
Hashir Ather – Conceptualization, Writing – original draft, review and editing

Guarantor: Hashir Ather

Provenance and peer-review: Unsolicited and externally peer-reviewed

Data availability statement: All relevant data are included within this manuscript. Additional data or materials are available from the corresponding author upon reasonable request

Introduction

The maxillary premolar teeth play an important role in not only providing functional support to the upper arch but also it helps in maintaining the alignment of the arch to a great extent.[1,2] Loss of integrity of such teeth due to deep proximal caries or pulpal involvement presents clinicians with dual challenge of preserving the vitality of teeth.[3] Furthermore, in cases of pulpal involvement, long term success of root canal treatment is based on the adequate coronal seal, through appropriate restoration.[4] Along with adequate coronal seal, thorough cleaning and shaping of the root canal system, effective obturation is also mandatory to prevent microbial recontamination.[5] Without effective obturation, an adequate root canal seal is not maintained, which increases chances of re endodontic treatment.

Class II caries lesions, affecting proximal surfaces of teeth demands a restoration that can be adhered to the prepared cavity walls. Composite restorations have always been preferred for such restorations, as they match the aesthetics of the teeth along with that, it also provides functional support to the teeth.[6] Such restoration can provide durability to the tooth structure and aids in longevity of the tooth. However, this restoration can only be practical, if placed with proper technique and by use of a matrix system, which fits well with the contour of the teeth.

This case report presents the management of a left maxillary first premolar (#24), that required root canal treatment, followed by a direct class II composite restoration. The case highlights the integration of endodontic principles with restorative dentistry, for successful functional rehabilitation of a posterior tooth.

Methods

This case report was documented and was conducted with the patient's informed consent for both participation and publication, following SCARE 2025 guidelines.[7] Institutional policies were followed, and ethical approval was not required for this single case study.

Case Presentation

A 29-year-old female patient reported to the department of operative dentistry with the chief complaint of pain and food impaction in the upper left premolar region for past 1 month. The patient reported that the tooth is sensitive to hot and cold stimuli initially. However, with time, the pain became spontaneous and lingering over the last few days. The patient reported with no history of trauma. Apart from the tooth pain, the patient reported to medical or dental illness.

Clinical Examination

It was observed on intraoral examination that the maxillary first pre molar i.e. tooth #24 exhibited a proximal carious lesion on the mesial surface. The extent of carious lesion was subgingival. The tooth was tender on percussion. A periodontal examination was also done. On probing, no pockets were revealed and mobility of the tooth was within physiological limits.

For confirming the pain, a cold test was performed. The patient was demonstrated the effect of cold test first. This was done by doing cold test on a healthy tooth. The cold test was then performed on the presented tooth. A lingering pain was observed, which indicated a diagnosis of irreversible pulpitis. However, for confirmation of diagnosis, a radiographic examination was mandatory.

Intraoral Findings

- The maxillary left first premolar (FDI #24/Universal #12) exhibited a deep mesial proximal carious lesion extending subgingivally.
- The tooth was tender on percussion, with no swelling or sinus tract.
- The gingival margin adjacent to the lesion was mildly inflamed but without pocket formation.

Table 1 | Periodontal examination of tooth #24

Parameter	Finding	Interpretation
Probing depths	≤3 mm circumferentially	Within normal limits
Gingival condition	Mild inflammation near mesial margin	Local irritation from caries
Mobility	Grade 0–I	Physiologic range
Furcation involvement	None	–

Table 2 | Pulp sensibility test findings of tooth #24

Test	Stimulus and Method	Response	Latency (s)	Duration (s)	EPT Reading[a]	Interpretation
Cold test	Endo-Ice (1,1,1,2-tetrafluoroethane) applied on cotton pellet to middle third of buccal surface	Moderate, sharp sensation	2	<1	—	Normal pulp sensibility
Electric pulp test (EPT)	Analytic Technology Pulp Tester with lip clip and conducting medium	Positive response	—	—	24	Vital pulp

[a]EPT readings recorded on a calibrated digital scale (0–80).

Table 3 | Periapical findings of tooth #24

Test	Result	Interpretation
Percussion	Positive	Periapical inflammation present
Palpation	Mild tenderness buccally	Confirms periapical involvement

- Adjacent and opposing teeth responded normally to pulp testing.

Periodontal Examination

The periodontal examination of tooth #24 are summarized in Table 1.

Pulp Sensibility Test

The pulp sensibility test findings of tooth #24 are summarized in Table 2.

Periapical Tests

The periapical findings of tooth #24 are summarized in Table 3.

Radiographic Examination

The patient was first advised for a pre operative peri apical radiograph. The pre operative periapical radiograph demonstrated that a deep proximal carious lesion is extended to the pulp chamber. The radiographic examination concluded the diagnosis of the tooth as irreversible pulpitis (Table 4, Figure 1).

A preoperative periapical radiograph revealed a deep carious lesion approximating the pulp chamber, with loss of lamina dura and widening of the periodontal ligament space at the periapical area of both roots.

Table 4 | Radiographic findings of tooth #24

Radiographic Parameter	Observation
Caries extent	Deep mesial lesion reaching pulp
Periapical status	Widened PDL space
Lamina dura	Slightly disrupted
Root resorption	Absent
Periapical Index Score	3–Consistent with periapical periodontitis

Table 5 | Diagnostic evaluation of tooth #24

Diagnostic Category	Tooth #24 (FDI/Universal #12)
Pulpal diagnosis	Symptomatic irreversible pulpitis
Periapical diagnosis	Symptomatic apical periodontitis

Final Standardized Diagnosis (AAE Terminology)

The diagnostic evaluation of tooth #24 are summarized in Table 5.

Treatment Plan

A treatment plan was made and was advised to the patient. The treatment plan included three visits, to ensure a quality treatment must be given to the patient. The treatment plan included:

1. Access opening of the tooth #24 (First visit)
2. Cleaning and shaping of root canal of tooth #24 (Second visit)
3. Root canal obturation (Third visit)
4. Direct Class II Composite restoration (Fourth visit)

Informed Consent

The patient was given a briefing regarding the procedure, benefits, risks and alternatives. Before beginning with the treatment, an informed consent was obtained in a written form, to ensure that patient's approval is in the favor of the treatment.

Access Opening of the Tooth #24 (First Visit)

The patient was provided a briefing on how the treatment would go. Following informed consent, local anesthesia (2% lidocaine with epinephrine 1:100,000) was administered. The techniques used for anesthesia administration was infiltrate and palatal nerve anesthesia. For palatal nerve, a topical anesthesia was also used, to ensure that the patient undergoes less pain.

Access Cavity Preparation

An access cavity was prepared, keeping in mind the anatomy of the tooth. The access opening requires the help of tooth anatomy and techniques, to ensure a straight-line access can be provided for the preparation of canals.

For access opening, a round bur (SS White®) attached to high-speed handpiece was used. The access cavity was prepared to the cementoenamel junction of the tooth. After that, a straight tapered bur (Komet®) was used to prepare the walls, for proper visualization of the canal orifices. An ovoid cavity was prepared, keeping in mind the buccal and palatal canal orifices of the tooth (Figure 2).

Locating Canal Orifices

An endodontic probe was used to identify the canals. Two canals i.e. Buccal and Palatal canal orifices were located.

DOI: https://doi.org/10.70389/PJCR.100013 | Premier Journal of Case Reports 2026;6:100013

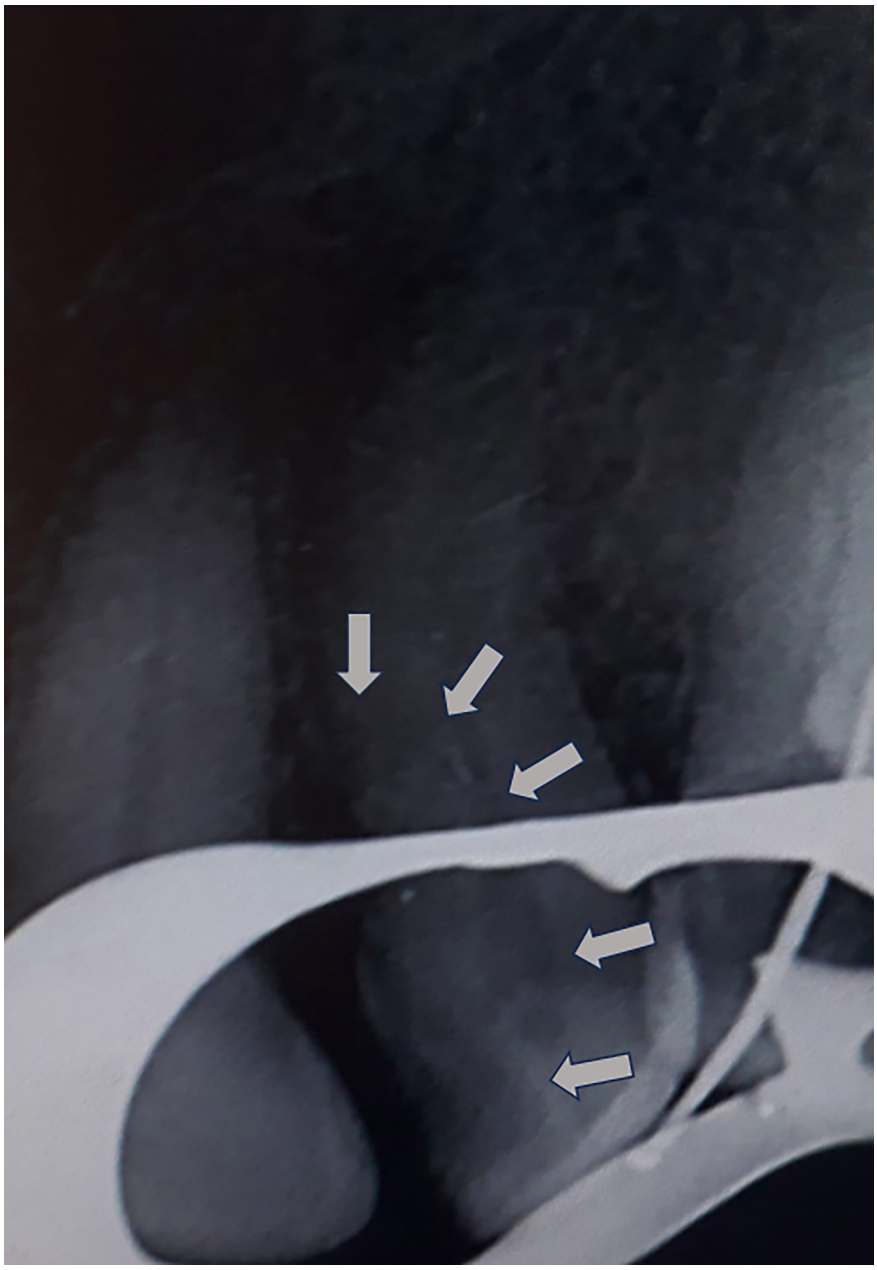

Fig 1 | Pre op periapical X ray. Arrows pointing out radiolucency which indicates caries extending to the pulp

Glide Path and Canal Patency

A glide path was established using stainless steel K-files #10 and #15 (Dentsply Maillefer, Switzerland) to facilitate smooth canal negotiation and maintain apical patency. Apical patency was confirmed by gently passing a #10 K-file 0.5 mm beyond the apical foramen after each rotary instrumentation sequence.

Working Length Determination

A #15 stainless steel K-file was introduced into each canal, and the working length was determined using an electronic apex locator (Root ZX II, J. Morita, Japan) and confirmed radiographically (Table 6).

The working length was determined using an electronic apex locator (Root ZX II®, J. Morita) and verified radiographically (Figure 3).

Placement of Cavit

A cavit is a temporary restoration placed to ensure functional integrity of the tooth is maintained. In this case, Cavit™ (3M ESPE) was placed after placing a small piece of cotton, to ensure the restoration fits well and to prevent any contamination.

Cleaning and Shaping of Root Canal of Tooth #24 (Second Visit)

Need of Multiple Visits

The treatment was performed in multiple visits on patient's time schedule. This was done to ensure that the patient satisfaction is achieved to a great extent.

Fig 2 | Access cavity design (ovoid) shown by arrows

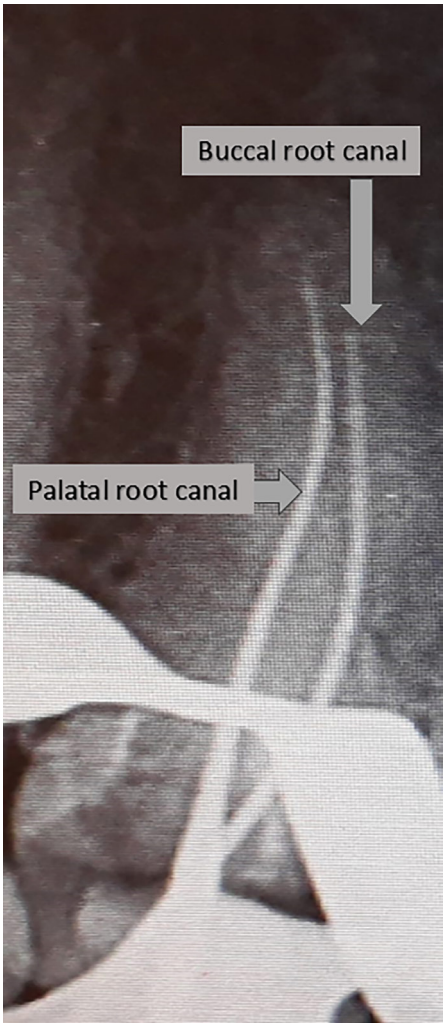

Fig 3 | Working Length determination. Arrows indicating working lengths of buccal canal (24 mm) and palatal canal (25mm)

Table 6 | Working length determination of tooth#24

Canal	Working Length (mm)	Verification Method
Buccal	24 mm	Apex locator + radiograph
Palatal	25 mm	Apex locator + radiograph

Removal of Cavit

The cavit placed in first visit was removed to start cleaning and shaping of canals.

Cleaning and Shaping

Canals were prepared using the crown-down technique with ProTaper Universal® NiTi rotary system (Dentsply Sirona) up to size 35/0.04 taper. This technique was done to ensure a tapered canal is obtained, which increases chances of adequate root canal seal during obturation (Table 7).

Irrigation

Irrigation was performed with 2.5% sodium hypochlorite (NaOCl) using a 30-gauge side-vented needle placed 1–2 mm short of the working length. A total of 10 mL NaOCl per canal was used during instrumentation, with a minimum contact time of 60 s per cycle, and activated using passive ultrasonic irrigation (Irrisafe) in three cycles of 20 s.

Smear layer removal was achieved with 17% ethylenediaminetetraacetic acid EDTA (5 mL per canal, 60 s contact), activated ultrasonically for 20 s, followed by a final flush of 5 mL NaOCl per canal (NaOCl–EDTA–NaOCl sequence). A saline rinse (5 mL per canal) was used before drying.

At the subsequent visit, calcium hydroxide was removed using rotary instrumentation (#35/0.04) at

DOI: https://doi.org/10.70389/PJCR.100013 | Premier Journal of Case Reports 2026;6:100013

Table 7 | List of files used for cleaning and shaping of canals of tooth #24

Instrument	Taper	Tip Size	Purpose
SX	Variable	–	Coronal flaring
S1	0.02	#17	Initial shaping
S2	0.04	#20	Middle-third shaping
F1	0.06	#20	Apical preparation (initial)
F2	0.08	#25	Enlargement and tapering
F3	0.09	#30	Final shaping
Manual K-file	–	#35/0.04	Apical refinement and verification

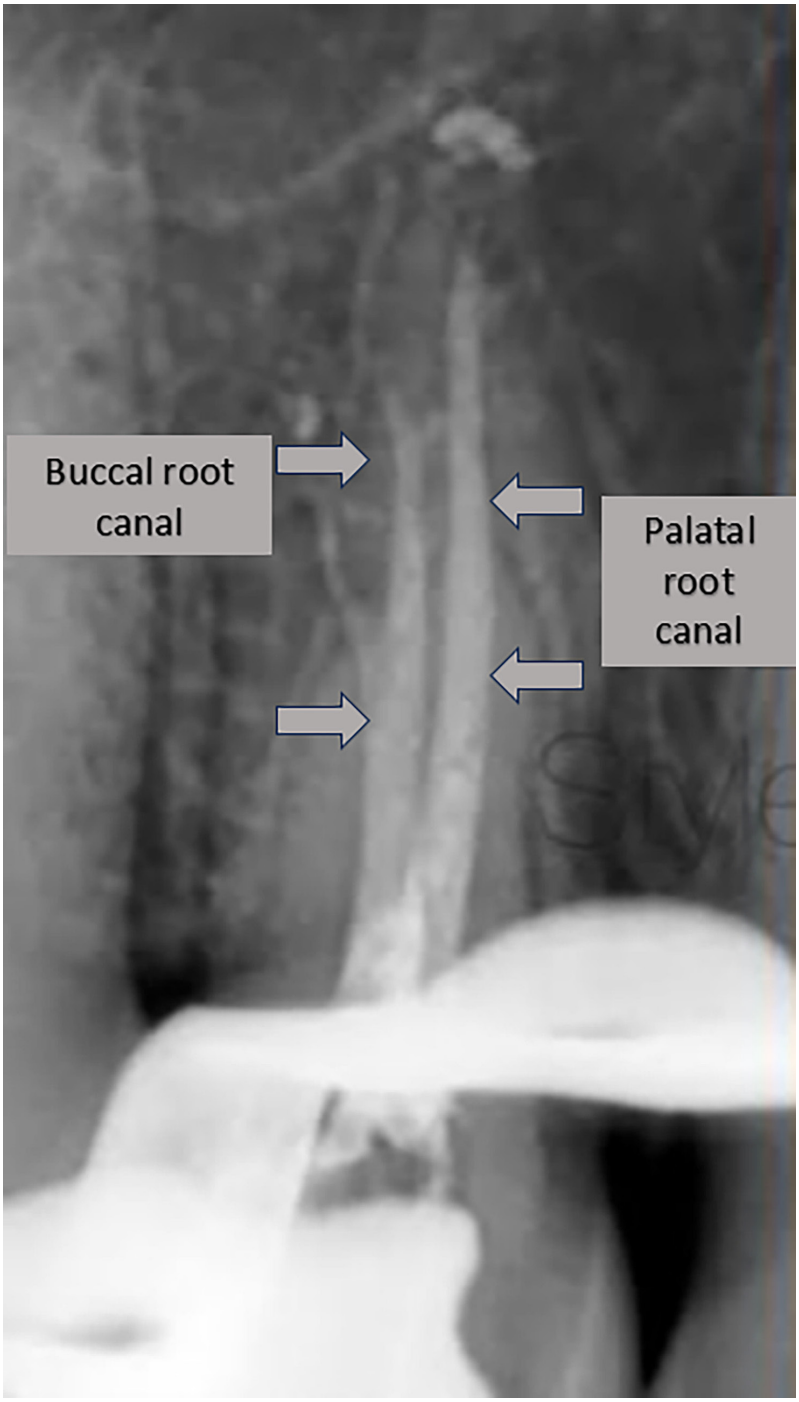

Fig 4 | Root canal obturation of tooth #24

working length with 10 mL NaOCl per canal, followed by 5 mL EDTA activated for 20 s, and a final saline flush.

Placement of Cavit

After cleaning and shaping, cavit was placed again to avoid any contamination.

Root Canal Obturation (Third Visit)

Removal of Cavit

The cavit placed in second visit was removed to begin obturation.

Obturation

The canals were dried with paper points. After drying the canals, obturation was performed. The technique used was lateral condensation technique. This technique was done with gutta-percha points (Dentsply Maillefer) and AH Plus® sealer (Dentsply DeTrey) (Figure 4).

Temporary and Coronal Sealing

A 2-mm-thick Fuji IX® (GC Corporation) glass ionomer base was placed immediately after obturation as a temporary coronal seal until the definitive composite restoration was performed in the following appointment. The patient was advised the fourth visit after 1 week, to ensure relief of symptoms.

Direct Class II Composite Restoration (Fourth Visit)

After 1 week, the patient presented with relief of symptoms. The temporary restoration was removed to begin the fourth visit.

Placement of Sectional Matrix

A sectional matrix band was placed with proper wedging to achieve proximal contour (Table 8).

Etching of Walls

37% phosphoric acid was used as an etchant and was washed and dried off after 15 s (Table 9).

Bonding Agent

A bonding agent was then used on the cavity walls. The bonding agent was slightly air dried and was light cured for 20 s.

Placement of Composite Resin

Composite resin (nanohybrid composite) was placed in increments. The technique used was oblique layering technique. This was done to minimize polymerization shrinkage. Each increment was light cured for 20 s (Table 10).

Finishing and Polishing

Finishing and contouring were done using Sof-Lex™ discs and strips (3M ESPE) in descending grit sequence (medium → fine → superfine) to reproduce anatomical contour and luster. A final polish was achieved using Enhance® polishing cups (Dentsply Sirona) at low speed under light pressure.

Table 8 | List of sectional matrix components that provided aid in achieving proximal contour of tooth #24

Component	Brand	Function
Sectional band	Garrison®	Defines proximal contour
Separation ring	Garrison®	Ensures tight proximal contact
Wooden wedge	Palodent® (Dentsply Sirona)	Adapts band to gingival margin and controls overhang

Table 9 | Etchant and adhesives used in restoration of tooth #24

Step	Material	Brand/Manufacturer	Classification/Details	Application Parameters
Etchant	37% Phosphoric acid gel	Scotchbond™ Etchant (3M ESPE)	Total-etch type	Applied for 15 s on enamel, 10 s on dentin; rinsed for 5 s and gently air-dried
Adhesive	Universal adhesive	Scotchbond™ Universal (3M ESPE)	Universal, MDP-containing, ethanol-based	Selective-enamel-etch strategy; actively rubbed for 20 s; air-thinned 5 s; light-cured 20 s

Table 10 | Materials used for restoration of tooth #24

Parameter	Details
Composite type	Nanohybrid resin composite
Brand	Filtek™ Z350 XT (3M ESPE)
Shade	A2 Body
Placement technique	Oblique incremental layering, ≤2 mm per increment
Light-curing unit	BluePhase® G2 (Ivoclar Vivadent)
Irradiance	1,200 mW/cm² (checked with radiometer)
Curing time per increment	20 s
Light tip distance	≤1 cm perpendicular to surface
Oxygen-inhibition management	Surface covered with glycerin gel and re-cured for 10 s to eliminate oxygen-inhibition layer

Table 11 | Parameters which verified the success of restoration

Parameter	Method	Result
Occlusion	Articulating paper (40 µm, Bausch®)	Even contacts; no high points
Proximal contact	Dental floss and tactile evaluation	Satisfactory floss snap; no overhangs
Radiographic verification	Postoperative bitewing radiograph	Confirmed intact marginal adaptation and tight proximal contact

Occlusal and Proximal Verification

The parameters which verified the success of restoration are summarized in Table 11.

Postoperative Results

For confirmation, a postoperative radiograph was done. The post operative radiograph confirmed a satisfactory obturation and restoration with a good coronal seal. The patient reported no post operative discomfort. A follow up of 6 months was advised for better prognosis. The tooth remained asymptomatic on follow up. On follow up, it was also observed that the restoration was intact (Table 12 and Figure 5).

Discussion

Endodontic and restorative disciplines are required to successfully manage carious and compromised tooth. In this case, the clinical and radiographic examination concluded that the tooth #24 exhibits a deep class II carious lesion with pulpal involvement.

Significance of Endodontic Therapy

In order to eliminate pulpal and periapical infection, root canal treatment is of prime priority. Along with that, this treatment also preserves the natural tooth, thereby preventing extraction of the tooth. In this case, NiTi rotary instruments were used for cleaning and shaping of canals. The use of such instruments facilitated effective canal debridement.[7] Along with that irrigation was done with sodium hypochlorite and EDTA. This ensured microbial reduction and smear layer removal.

Use of gutta-percha and resin sealer was done in obturation. This provided a three-dimensional seal, which was critical for periapical healing. It is also confirmed by the literatures around the globe, that success of endodontic treatment mainly depends on the quality of obturation and the integrity of coronal restoration.[8]

Role of Coronal Seal

Many re endodontic treatment arises with one concern. The concern is regarding poor coronal seal in the previous treatment. Coronal leakage is a prime leading cause for endodontic failure.[9] Immediate restoration post obturation aids in preventing bacterial ingress. The composite resin restoration in this case aided in providing a strong coronal seal. This was critical to maintain integrity of tooth and excellent treatment outcomes.

Composite in Class II Restorations

Use of composite in class II restoration was done to attain proper coronal seal. Along with that composite also aids providing shade matching and helps in achieving natural proximal contact.[10] The use of incremental layering technique, aids in minimizing polymerization shrinkage stress. Along with that it also reduces marginal gaps and ensures long term success. The use of a sectional matrix band was done to make sure that an adequate proximal contour and contact point restoration is achieved.

Limitations

This case report represents a single-patient observation; therefore, its findings cannot be generalized. Longer follow-up and comparative clinical trials are necessary to validate these outcomes. Additionally, minor variations in operator skill and patient-specific oral hygiene may influence the long-term prognosis.

Justification for Direct Class II Composite (No Cuspal Coverage)

A direct Class II composite restoration was selected instead of cuspal coverage because the tooth met

DOI: https://doi.org/10.70389/PJCR.100013 | Premier Journal of Case Reports 2026;6:100013

Fig 5 | Six-month follow-up periapical

Table 12 | Six-month follow-up findings (AAE diagnostic terminology)

Assessment Domain	Six-Month Follow-Up Finding
Pulpal diagnosis (AAE)	Normal pulp
Apical diagnosis (AAE)	Normal apical tissues
Spontaneous pain	Absent
Pain on mastication	Absent
Thermal sensitivity	Absent
Functional status	Fully functional, asymptomatic
Pain intensity (VAS)	0/10
Restoration status	Intact with satisfactory marginal adaptation

established biomechanical and clinical criteria for intracoronal restoration:

- Remaining tooth structure: All cusps were intact with ≥2.0 mm residual cuspal thickness and ≥3 sound axial walls, indicating adequate fracture resistance without the need for cuspal reinforcement. No undermined cusps were present.
- Crack assessment: Careful inspection under magnification and transillumination revealed no craze lines or crack propagation extending into dentin.
- Occlusal considerations: The tooth was not a primary occlusal contact in lateral excursions, and the patient reported no parafunctional habits (e.g., bruxism), reducing functional loading risk.
- Ferrule and proximal extension: The proximal box remained supragingival, with preservation of marginal ridge height and no circumferential loss of tooth structure that would mandate cuspal coverage.
- Isolation and margin management: Adequate rubber dam isolation was achievable. Where the proximal margin approached the CEJ, deep margin elevation (DME) was feasible and performed to relocate the margin supragingivally, enabling predictable adhesive bonding.
- Evidence-based minimally invasive approach: Current literature supports intracoronal composite restorations in posterior teeth with preserved cuspal integrity, demonstrating favorable survival and avoiding unnecessary removal of sound tooth structure associated with cuspal coverage restorations.

The choice of a direct Class II nanohybrid composite restoration for this endodontically treated premolar was based on the preservation of sufficient tooth structure and the ability to achieve reliable isolation. Studies indicate that when cuspal integrity remains, bonded direct restorations can perform satisfactorily, while cuspal coverage is mainly indicated in cases with extensive coronal loss or heavy occlusal stress.[1,3] Achieving an immediate and durable coronal seal is critical for endodontic success, as the quality of the restoration strongly influences long-term periapical healing.[11]

The subgingival mesial margin was managed using a standardized DME protocol to reposition the margin coronally and allow predictable adhesive procedures without compromising periodontal health.[12] Following rubber dam isolation, pre-wedging was performed to achieve slight tooth separation and protect the gingival tissues.

A sectional matrix system was carefully adapted to the proximal box to obtain an effective cervical seal and proper proximal contour. Hemostasis and crevicular fluid control were achieved through atraumatic isolation and matrix adaptation, without aggressive gingival retraction or chemical hemostatic agents, thereby preserving periodontal tissues.

The enamel margins were selectively etched, and a universal adhesive was applied according to the manufacturer's instructions to both enamel and dentin. A low-viscosity (flowable) composite was placed in a controlled increment of approximately 1.5–2.0 mm to elevate the cervical margin to a supragingival position and was light cured adequately.

After curing, the elevated margin was refined and inspected to ensure a smooth, well-adapted interface. Periodontal health was maintained by avoiding overhangs, achieving a polishable supragingival margin, and ensuring the final restoration remained cleansable and biologically compatible.

Sonic irrigant activation (EndoActivator®) was employed to enhance NaOCl penetration and smear-layer removal, supported by systematic reviews confirming improved disinfection compared to conventional irrigation.[13] The selective enamel-etch approach using a universal adhesive (Scotchbond™ Universal) optimized enamel bonding while maintaining dentin integrity; meta-analyses report favorable clinical performance of universal adhesives with this strategy.[14,15]

Overall, the case demonstrates that when isolation is achievable and tooth structure is adequate, a conservative bonded composite can provide functional and esthetic success comparable to more invasive cuspal-coverage restorations, provided that adhesive and coronal-seal principles are meticulously followed.

Conclusion

The management of tooth #24 in this case demonstrated a synergy between endodontic therapy and adhesive restorative dentistry. Root canal treatment was done to ensure that infection is eliminated effectively. Along with that this treatment also preserved the natural tooth, thereby eliminating the need for extraction of the tooth. For long term sealing of the root canal system, obturation was done. Coronal seal was attained by direct class II composite restoration.

Several key principles were highlighted in this case. These include, thorough cleaning and shaping, effective obturation and placement of a durable coronal seal. Direct composite restoration, in this case, was placed with proper adhesive protocols and matrix system. This was done to attain coronal seal, which was of prime importance in attaining tooth integrity.

For observing prognosis of treatment, a 6 month follow up was advised. This follows up confirmed the success of treatment. Along with that it also ensured that symptoms are resolved completely. Radiographic periapical healing and intact restoration was also observed in this follow up.

The case there by reaffirmed that endodontic treatment with great precision when combined with modern restorative techniques ensures long term preservation of tooth. Furthermore, it also satisfies the patient, which is the primary goal of any dental professional.

Patient Perspective and Ethical Consideration

The patient was satisfied with the outcome of treatment and was relieved from food impaction. During mastication, patient was comfortable, which ensured success of the treatment. Written informed consent was taken from the patient for publication of this case report. Images attached in this case report were also done with consent of patient. Ethical approval was not required for this single-patient case report.

References

1 Scotti N, Eruli C, Comba A, Paolino DS, Alovisi M, Pasqualini D, et al. Longevity of class 2 direct restorations in root-filled teeth: a retrospective clinical study. J Dent. 2015;43(5):499–505. https://doi.org/10.1016/j.jdent.2015.02.006

2 Nothdurft FP, Seidel E, Gebhart F, Naumann M, Motter PJ, Pospiech PR. The fracture behavior of premolar teeth with class II cavities restored by both direct composite restorations and endodontic post systems. J Dent. 2008;36(6):444–9. https://doi.org/10.1016/j.jdent.2008.03.004

3 Lempel E, Lovász BV, Bihari E, Krajczár K, Jeges S, et al. Long-term clinical evaluation of direct resin composite restorations in vital vs. endodontically treated posterior teeth-retrospective study up to 13 years. Dent Mater. 2019;35(9):1308–18. https://doi.org/10.1016/j.dental.2019.06.002

4 Karaman E, Keskin B, Inan U. Three-year clinical evaluation of class II posterior composite restorations placed with different techniques and flowable composite linings in endodontically treated teeth. Clin Oral Invest. 2017;21(2):709–16. https://doi.org/10.1007/s00784-016-1940-y

5 Heintze SD, Rousson V. Clinical effectiveness of direct class II restorations-a meta-analysis. J Adhes Dent. 2012 ;14(5):407–31. http://doi.org/10.3290/j.jad.a28390

6 Cardenas AF, Siqueira FS, Davila-Sanchez A, Gomes GM, Reis A, Gomes JC. Four-year follow-up of a direct anatomical fiber post and esthetic procedures: a case report. Operat Dent. 2016;41(4):363–9. https://doi.org/10.2341/15-211-T

7 Kerwan A, Al-Jabir A, Mathew G, Sohrabi C, Rashid R, Franchi T, et al. Revised Surgical CAse REport (SCARE) guideline: an update for the age of Artificial Intelligence. Prem J Sci. 2025:10;100079. https://doi.org/10.70389/PJS.100079

8 Torres CR, Zanatta RF, Huhtala MF, Borges AB. Semidirect posterior composite restorations with a flexible die technique: a case series. J Am Dent Assoc. 2017;148(9):671–6. https://doi.org/10.1016/j.adaj.2017.02.032

9 Korkut B, Yanıkoğlu F, Günday M. Direct composite laminate veneers: three case reports. J Dent Res Dent Clin Dent Prospects. 2013;7(2):105. http://doi.org/10.5681/joddd.2013.019

10 Torres CR, Mailart MC, Crastechini É, Feitosa FA, Esteves SR, Di Nicoló R, et al. A randomized clinical trial of class II composite restorations using direct and semidirect techniques. Clin Oral Invest. 2020;24(2):1053–63. https://doi.org/10.1007/s00784-019-02999-6

11 Siokis V, Michailidis T, Kotsanos N. Tooth-coloured materials for class II restorations in primary molars: systematic review and meta-analysis. Eur Arch Paediatri Dent. 2021;22(6):1003–13. https://doi.org/10.1007/s40368-021-00632-3

12 Aldakheel A, et al. Deep margin elevation: current concepts and evidence-based considerations. Clin Oral Investig. 2022;26(12):7203–15.

13 Kumar RS, et al. Effectiveness of various irrigant activation techniques on NaOCl penetration and cleaning of lateral anatomies: a systematic review. Int Endod J. 2022;55(9):977–88.

14 Doshi K, et al. Clinical performance of universal adhesives: a systematic review and meta-analysis. Oper Dent. 2023;48(4):322–33.

15 Landy R, Widyastuti W, Wulansari S. Composite as a post-obturation restorative material on a non-vital tooth with endodontically treatment: a case report. In: Widyarman AS, Rizal MI, Roeslan MO, Marpaung CD, editors. Quality improvement in dental and medical knowledge, research, skills and ethics facing global challenges. London: CRC Press; 2024. p. 101–11.