Neuro-Cell Molecular Research

Case Report

Neuro-Cell Mol Res 2026;3(1):31-35

Combined Use of an MTA-Supported Apical Barrier and Warm Obturation in Maxillary Incisors with Large Periapical Lesions: A Case Report

Hazal Faiz Arslanparcasi[1*], Mehmet Ali Arslanparcasi[2]

[1]Department of Endodontics, Faculty of Dentistry, Harran University, Sanliurfa, Türkiye
[2]Department of Dental Prosthesis Technology, Faculty of Vocational School of Health Services, Harran University, Sanliurfa, Türkiye

***Corresponding Author:**
Hazal Faiz Arslanparcasi
Department of Endodontics, Faculty of Dentistry, Harran University, Sanliurfa, Türkiye
Email:
hazalarslanparcasi@harran.edu.tr
ORCID ID: 0009-0002-3172-6966

DOI: 10.66588/NCMR.v3i1.5

Received: 15 January 2026
Accepted: 10 April 2026
Published: 30 April 2026

The author(s) - Available online at
www.neurocellmolres.com.tr

ABSTRACT

This case report presents the clinical and radiographic findings of endodontic management performed with an apical barrier technique using mineral trioxide aggregate (MTA) followed by warm gutta-percha obturation in maxillary anterior teeth presenting with extensive periapical pathology. A 28-year-old medically healthy individual reported discomfort in the anterior maxillary region. Radiographic assessment revealed large periapical radiolucencies associated with the left central and lateral incisors, both of which were diagnosed with pulpal necrosis. After thorough chemomechanical preparation and intracanal medication, an MTA apical plug was established, and the root canals were subsequently obturated using a warm obturation method. Clinical and radiographic evaluations at 3 and 9 months demonstrated the absence of symptoms and a significant regression of the periapical lesions. The findings of this single case suggest that the combined use of an MTA apical barrier and warm obturation may be a clinically useful treatment option for necrotic anterior teeth with large periapical lesions; however, broader conclusions is warranted through larger controlled clinical studies.

Keywords: MTA, Periapical lesion, Apical barrier, Warm obturation

Cite this article as: Faiz Arslanparcasi H, Arslanparcasi MA. Combined Use of an MTA-Supported Apical Barrier and Warm Obturation in Maxillary Incisors with Large Periapical Lesions: A Case Report. Neuro-Cell Mol Res. 2026;3(1):31-35. doi:10.66588/NCMR.v3i1.5

INTRODUCTION

Periapical lesions develop as a consequence of microbial infection or persistent irritation originating from the root canal system and result in inflammatory reactions accompanied by resorption of the surrounding periapical bone [1]. These lesions are typically observed as radiolucent areas on radiographic examination and may present with clinical symptoms or remain asymptomatic. The primary objective of effective endodontic treatment is to promote periapical tissue healing by achieving adequate disinfection of the root canal system and long-term apical sealing [2].

In cases associated with large periapical lesions, anatomical alterations in the apical region and the presence of bone loss may compromise apical control when conventional obturation techniques are used [3]. Consequently, treatment approaches aimed at creating a controlled and biocompatible apical barrier have gained increasing attention. Inadequate apical sealing, in particular, has been identified as a major contributor to endodontic treatment failure due to apical microleakage [4].

In necrotic anterior teeth associated with extensive periapical lesions, the absence of an adequate apical constriction, together with apical bone destruction and irregular root-end anatomy, may complicate the control of obturation materials during treatment. Under such conditions, conventional filling techniques may increase the risk of inadequate apical sealing or extrusion of filling materials beyond the apex. For this reason, establishing an artificial apical barrier with a biocompatible material such as MTA may facilitate controlled obturation and improve apical sealing. Subsequently, warm gutta-percha techniques may further enhance the three-dimensional adaptation of the filling material to the canal walls, which is particularly advantageous in anatomically compromised cases [5].

MTA has been widely used as an apical barrier material because of its favorable biological and physical properties, such as high biocompatibility, ability to set in moist conditions, low solubility, and its potential to induce hard tissue formation [6]. The application of warm gutta-percha obturation techniques after the placement of an MTA apical barrier allows improved three-dimensional adaptation of the filling material within the root canal system, which may reduce apical leakage and contribute to long-term treatment success [7].

The present case report describes the clinical and radiographic outcomes of endodontic treatment performed using a warm obturation technique following the placement of an MTA apical barrier in maxillary anterior teeth associated with large periapical lesions, with the aim of illustrating the clinical applicability of this combined approach in a challenging treatment scenario.

Case Presentation

A systemically healthy 28-year-old patient was admitted to our clinic with pain localized to the left anterior region of the maxilla, affecting the maxillary left central and lateral incisors (teeth 21 and 22). Clinical evaluation demonstrated sensitivity to percussion in both teeth, while neither cold testing nor electric pulp testing elicited a response.

Radiographic evaluation revealed extensive periapical radiolucencies surrounding the apical areas of both teeth (**Figure 1**). In light of the clinical findings, negative vitality test results, and radiographic evidence, endodontic treatment was deemed necessary for the involved teeth. Given the extent of the periapical lesions and the requirement for a reliable long-term apical seal, a treatment protocol consisting of apical barrier formation using MTA followed by warm obturation was planned. The patient was fully informed about the proposed treatment, and written informed consent was obtained for both the clinical procedures and the use of clinical and radiographic data for publication purposes.

Figure 1. *Preoperative periapical radiograph showing extensive periapical radiolucent lesions associated with the maxillary left central and lateral incisors (teeth 21 and 22), involving the apical regions of both teeth.*

Treatment Procedure

After administration of local anesthesia to maintain patient comfort, the operative area was isolated with a rubber dam. Access cavities were prepared, and the working lengths were established using an electronic apex locator and subsequently verified by radiographic examination.

Removal of necrotic pulp remnants and infected dentin was

carried out using appropriate hand instruments in combination with rotary files. Throughout canal instrumentation, irrigation was performed with 5.25% sodium hypochlorite (NaOCl) (Microvem, Istanbul, Turkey), followed by distilled water after each file change. Irrigating solutions were delivered using double-sided, vented irrigation needles (Fanta Dental, Istanbul, Turkey). To improve the effectiveness of irrigation, the solutions were activated with a sonic activation device, EDDY (VDW, Munich, Germany), which was used to enhance irrigant penetration into canal irregularities and the apical region and to improve debris removal compared with conventional syringe irrigation alone.

Following completion of the irrigation procedures, the root canals were dried using sterile paper points (ProTaper Ultimate Conform Fit Paper Points, Dentsply Maillefer, Ballaigues, Switzerland), and calcium hydroxide paste (Imcryl, Izmir, Turkey) was applied as an intracanal medicament. The access cavities were then temporarily sealed with a provisional restorative material, Cavit G (ESPE, Seefeld, Germany), and the patient was scheduled for a follow-up appointment after 15 days.

At the subsequent visit, conducted 15 days later, the patient reported no symptoms. The temporary restoration and calcium hydroxide dressing were removed, and the final irrigation regimen was carried out using 17% EDTA, 5.25% sodium hypochlorite, and distilled water. Sonic activation was again employed to enhance irrigation effectiveness, after which the canals were dried with sterile paper points.

An apical plug of MTA with an approximate thickness of 4 mm MTA Angelus (Londrina, Brazil) was then placed in the apical region using an MTA delivery system MAP System (Dentsply Sirona, USA). To facilitate proper hydration and setting of the MTA, a moist sterile cotton pellet was positioned within the canal, and the access cavity was temporarily sealed. The patient was recalled after one week.

At the one-week follow-up appointment, complete setting of the MTA apical barrier was confirmed. The remaining canal space was subsequently obturated using a three-dimensional thermoplastic injectable gutta-percha technique (Woodpecker Fast Fill, Woodpecker Medical Instrument Co., Ltd., Guilin, China) in combination with a resin-based sealer, AH Plus (Dentsply DeTrey, Konstanz, Germany). Final restoration of the access cavity was performed with an A2-shade composite resin material (Tokuyama, Tokyo, Japan).

Follow-up and Evaluation

At the 3-month follow-up, clinical examination revealed that the patient was completely asymptomatic. Radiographic evaluation demonstrated a marked reduction in the size of the periapical radiolucent areas, indicating evident signs of healing (**Figure 2**).

Figure 2. *Periapical radiographic image at the 3-month follow-up.*

At the 9-month follow-up, radiographic assessment showed a further and pronounced regression of the periapical radiolucent lesions, with ongoing bone regeneration and continued periapical healing (**Figure 3**).

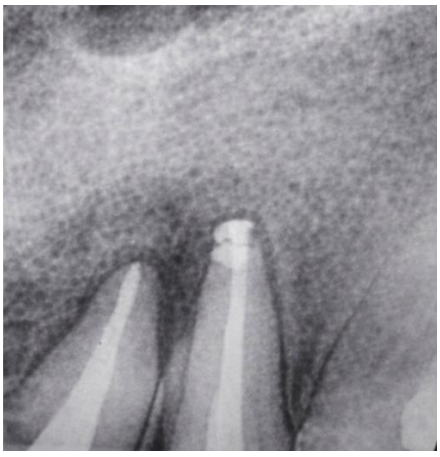

Figure 3. *Periapical radiographic image at the 9-month follow-up.*

DISCUSSION

Managing teeth with extensive periapical lesions poses considerable clinical challenges, particularly in achieving thorough canal disinfection and a reliable long-term apical seal. Structural alterations in the apical region, including bone loss and irregular apical anatomy, may limit the effectiveness of conventional obturation techniques and adversely affect treatment outcomes [8]. Therefore, treatment approaches that focus on the creation of a controlled and biocompatible apical barrier have increasingly been favored.

In this case report, the clinical and radiographic outcomes of endodontic therapy combining an MTA apical barrier with a warm obturation technique were assessed in maxillary anterior teeth exhibiting large periapical radiolucencies. The absence of clinical symptoms, together with radiographic evidence of healing during follow-up, indicates that this combined approach was effective in promoting periapical tissue recovery.

MTA remains a material of choice for apical barrier formation due to its high biocompatibility, capacity to set in moist conditions, and ability to establish an effective apical seal [9]. Its bioactive properties further stimulate hard tissue formation and support periapical healing. In the present case, the MTA apical barrier provided a well-defined apical stop, enabling safe and predictable completion of three-dimensional root canal obturation.

Thorough canal disinfection is a key factor influencing the success of endodontic treatment, particularly in cases involving large periapical lesions. In the present case, the irrigation protocol was enhanced using sonic activation to improve the penetration of irrigating solutions into canal irregularities and the apical region. Previous research has suggested that sonic irrigation may provide superior removal of intracanal debris and reduction of microbial load compared to conventional irrigation techniques [10].

After establishing the apical barrier, the use of warm gutta-percha techniques enables three-dimensional obturation of the root canal system, promoting improved adaptation of the filling material to the canal walls. Thermoplastic obturation methods have been reported to minimize apical microleakage and support more predictable long-term treatment outcomes [11]. In this case, the use of a warm obturation technique in combination with an MTA apical barrier allowed for a controlled and sealed filling of the root canal system.

The reduction of periapical radiolucencies and the ongoing bone healing observed in follow-up radiographs indicate the short and medium-term success of the treatment protocol. Nonetheless, since this report describes a single case, the generalizability of the results is limited. Another limitation of the present case report is that radiographic healing was evaluated qualitatively on periapical radiographs rather than through quantitative measurements, CBCT-based assessment, or a standardized scoring system such as the periapical index. Although routine radiographic follow-up demonstrated progressive lesion regression, the absence of objective quantitative assessment limits the precision of healing evaluation and should be considered when interpreting the findings [12].

In similar clinical situations, different treatment strategies may also be considered depending on the stage of root development, apical morphology, and treatment objectives [13]. Regenerative endodontic procedures may be considered particularly in immature teeth when continuation of root development is desired, whereas apical barrier approaches are aimed at establishing apical control in teeth with compromised apical anatomy. In the present case, because the involved teeth were necrotic maxillary anterior teeth associated with extensive periapical lesions and requiring a controlled apical stop for predictable obturation, the use of an MTA apical barrier followed by warm obturation was considered a practical and clinically appropriate treatment strategy.

Although the 3 and 9-month follow-up findings were clinically favorable and radiographically consistent with healing, the 9-month evaluation should be regarded as a medium-term outcome rather than definitive evidence of long-term success. Periapical healing may continue over longer periods, particularly in teeth with extensive lesions, and long-term clinical and radiographic follow-up remains necessary to confirm the stability of healing.

CONCLUSION

This case report demonstrates the clinical and radiographic outcomes of combining an MTA apical barrier with a warm gutta-percha obturation technique in maxillary incisors with necrotic pulps associated with large periapical lesions. The resolution of symptoms and the marked reduction of periapical radiolucent areas observed after treatment support the effectiveness of this combined approach. The biocompatibility and apical sealing ability of MTA, together with the three-dimensional obturation advantage of warm filling techniques, contributed to achieving a predictable and safe treatment outcome in teeth with extensive periapical lesions. Nevertheless, as these findings are based on a single case report, further controlled clinical studies with larger sample sizes and long-term follow-up are required to confirm the generalizability of this treatment approach.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

Disclosure

The authors have reported no conflicts of interest in preparing and publishing this article.

Ethics committee approval

Informed Consent: Consent form was filled out by all participants.

Funding

The authors have no funding to disclose.

Referee Evaluation Process

Externally peer-reviewed

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