

CASE REPORT

Endodontic management of taurodontic teeth: A case series

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Key Clinical Message

This paper illustrated successful endodontic non-surgical (re)treatments of molars and premolar with different taurodontic classifications and accompanied anomalies like C-shape and extra root canals in otherwise healthy patients. Magnification with illumination besides active irrigation with NaOCl were the most helpful items in managing these cases.

KEYWORDS

anatomic variation, molar, premolar, root canal therapy, taurodontism

1 | INTRODUCTION

Taurodontism is a dental anomaly with apical migration of pulp chamber floor resulting in an elongated pulp chamber with short bi/trifurcated root canals and no cemento-enamel junction constriction.¹ It can occur in primary or permanent dentition, unilaterally or bilaterally, and can be syndromic or non-syndromic. The anomaly is seen mostly in molars, especially second molars, but there are also reports of taurodontic premolars and anterior teeth in the literature.¹⁻³ The exact etiology is unknown but it is assumed that a failure in the invagination of Hertwig's epithelial sheath might be the reason.⁴ Taurodontism can be accompanied with other anomalies associated with Hertwig's epithelial sheath abnormalities like C-shape configuration of root canal system or extra root canals^{2,5-7} which makes the endodontic management more challenging. The purpose of

this report is to represent the endodontic management of taurodontic teeth with different configurations.

2 | CASE PRESENTATION

2.1 | Case 1 (a mesotaurodontic first molar)

2.1.1 | Case history/examination

A 12-year-old systemically healthy male patient was admitted in the endodontics department of Mashhad university of medical sciences with a chief complaint of pain in the left posterior region of his lower jaw. Clinical examination, revealed a deep and extensive carious lesion in left mandibular first molar with no pain on pulpoperiapical tests. In radiographic examination a mesotaurodontic

Ali Chamani and Vahid Azizi should be considered joint first author.

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molar (TI = 30–40) with possible C-shaped anatomy was observed (Figure 1A).

2.1.2 | Methods (differential diagnosis, investigations, and treatment)

With the diagnosis of chronic irreversible pulpitis and chronic apical periodontitis, the patient was scheduled for a root canal treatment. After mandibular nerve block with 2% lidocaine and epinephrine 1:100,000 (Daroupakhsh, Tehran, Iran), the tooth was isolated with rubber dam and an access cavity was achieved with high-speed diamond round bur number 2 (Jota AG, Rüthi, Switzerland) and continuous water spray under a dental operating microscope (Zumax Medical Co., Suzhou New District, China). The orifices were negotiated with #8 and #10K-files (Mani Inc., Utsunomiya, Japan). Working length was determined as 21 mm for mesial and distal canals by an electronic apex locator (Dempex, DEM Ltd., Barnstaple, Devon, England), which was confirmed radiographically (Figure 1B). Cleaning and shaping were completed by crown-down technique with M3 rotary files (UDG, Changzhou, China) up to size 20/04 under active copious irrigation with 5.25% sodium hypochlorite and normal saline, alternately. After taking cone-fitting confirmation radiograph (Figure 1C), all canals were dried with sterile paper points

(META, Chugbuk, South Korea) and obturated with gutta-percha (META, Chugbuk, South Korea) and AH plus sealer (Dentsply DeTrey, Konstanz, Germany) using warm vertical technique by FastFill warm obturator (Fast Fill Obturation System, Eighteenth, china). Finally, Cavit (Cavisol, Tehran, Iran) was applied as a temporary restoration (Figure 1D) and the patient was referred to the department of esthetic and restorative for permanent restoration.

2.1.3 | Conclusion and results (outcome and follow-up)

A follow-up visit was conducted 10 months later. Patient was clinically and radiographically asymptomatic (Figure 1E).

2.2 | Case 2 (a mesotaurodontic first molar)

2.2.1 | Case history/examination

A 43-year-old systemically healthy female patient was referred to the endodontics department of Mashhad university of medical sciences with a chief complaint of pain on chewing in the left posterior region of her maxillary arch.

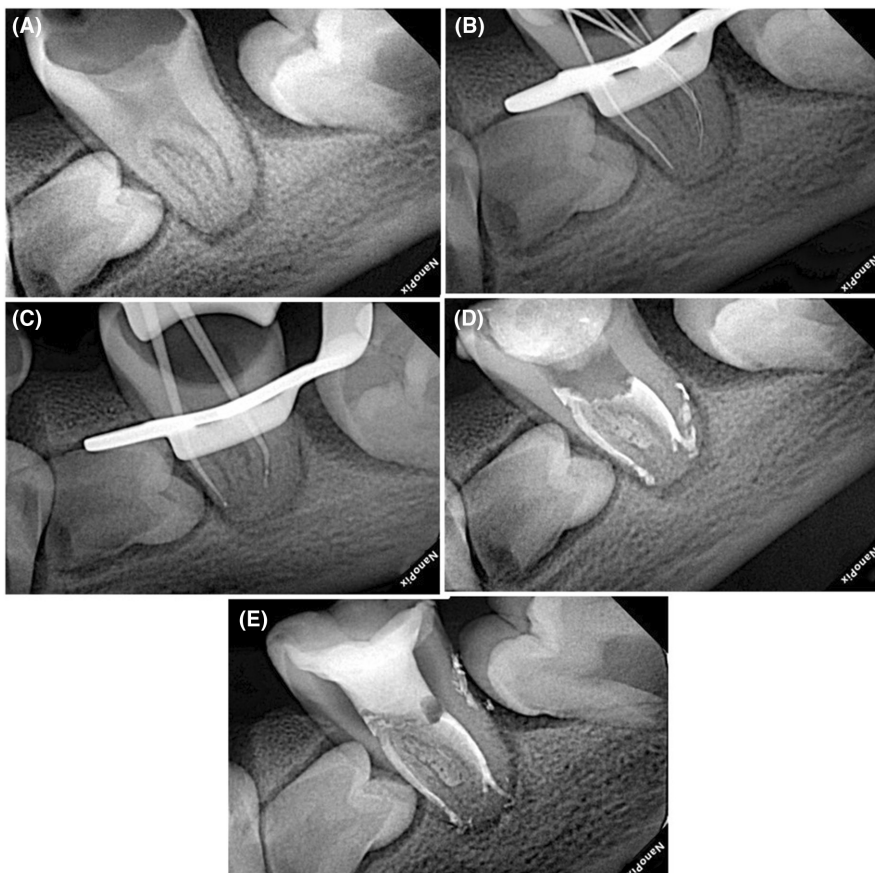


FIGURE 1 Radiographic evaluation of the instrumentation and obturation of #36 showing: (A) preoperative radiograph; (B) working length confirmation radiograph; (C) master-cone fit confirmation radiograph; (D) postoperative radiograph; (E) 10-month follow-up radiograph.

Clinical examination, revealed a left maxillary first molar with a defective amalgam restoration which was tender on percussion. Preoperative radiograph showed a mesotaurodontic anatomy (TI = 30–40) with a poor-quality root canal therapy (Figure 2A).

2.2.2 | Methods (differential diagnosis, investigations, and treatment)

A diagnosis of previous treatment with symptomatic apical periodontitis was made and the patient was scheduled for a non-surgical root canal retreatment. After a local anesthesia infiltration with 2% lidocaine and epinephrine 1:100,000 (Daroupakhsh, Tehran, Iran), the old restoration was removed with high-speed diamond round bur number 2 (Jota AG, Rüthi, Switzerland) and continuous water spray. The whole treatment process was undertaken under isolation with rubber dam and a dental operating microscope (Zumax Medical Co., Suzhou New District, China). Gutta-percha was removed with chloroform (Morvabon, Tehran, Iran), gates drills number 1, 2, 3 (Mani Inc., Utsunomiya, Japan) and M3 retreatment rotary files (UDG, Changzhou, China). Working length was determined as 16 mm for MB1 canal, 14 mm for MB2 canal, 19 mm for DB and P canals by an electronic apex

locator (Dempex, DEM Ltd., Barnstaple, Devon, England) and confirmed with radiography (Figure 2B). Root canals were chemomechanically prepared by crown-down technique with M3 rotary files (UDG, Changzhou, China) up to size 25/04 except for the MB2 canal which was shaped up to size 20/04 under copious irrigation with 5.25% sodium hypochlorite and normal saline, alternately. After taking cone-fitting confirmation radiograph (Figure 2C), all canals were dried with sterile paper points (META, Chugbuk, South Korea) and obturated with gutta-percha (META, Chugbuk, South Korea) and AH plus sealer (Dentsply DeTrey, Konstanz, Germany) using warm vertical technique by FastFill warm obturator (Fast Fill Obturation System, Eighteenth, china). Cavit (Cavisol, Tehran, Iran) was applied as a temporary restoration (Figure 2D) and the patient was referred to the department of prosthetics for permanent restoration.

2.2.3 | Conclusion and results (outcome and follow-up)

A follow-up visit was conducted 6 months later in which the patient reported no pain or discomfort. Clinical and radiographic examination (Figure 2E) showed an asymptomatic tooth with a successful endodontic retreatment.

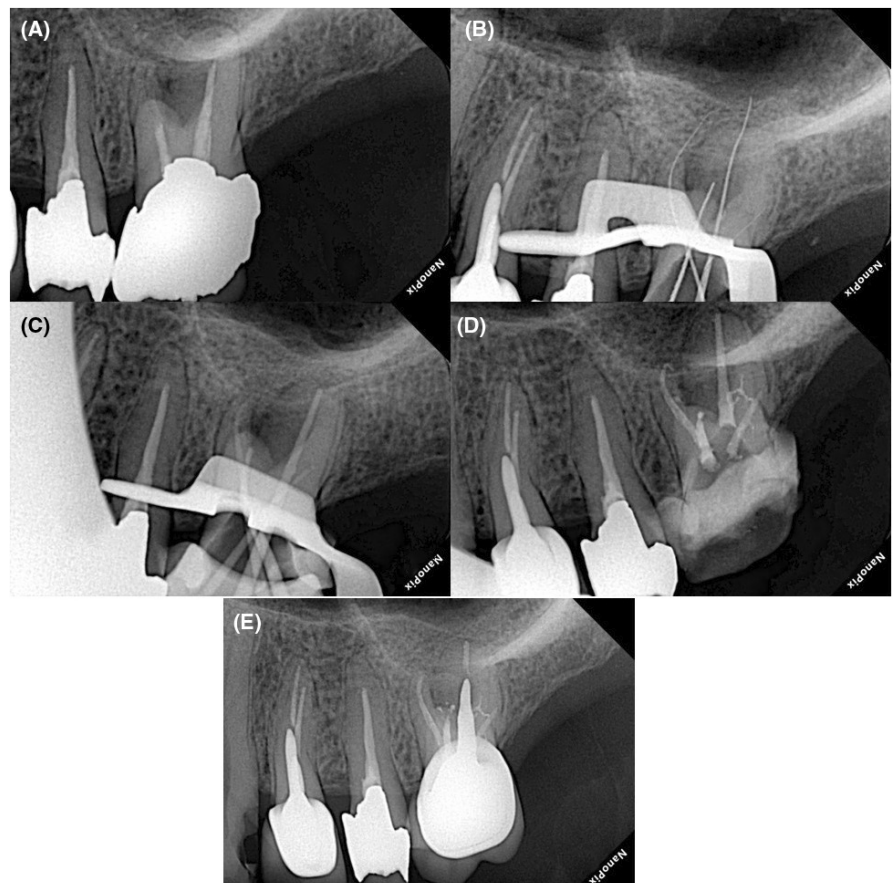


FIGURE 2 Radiographic evaluation of the instrumentation and obturation of #26 showing: (A) preoperative radiograph; (B) working length confirmation radiograph; (C) master-cone fit confirmation radiograph; (D) postoperative radiograph; (E) 6-month follow-up radiograph.

2.3 | Case 3 (a hypertaurodontic second premolar)

2.3.1 | Case history/examination

A 39-year-old systemically healthy female patient was referred to the endodontics department of Mashhad university of medical sciences with a chief complaint of pain on chewing in the left posterior region of her mandible. In clinical examination, a restored left mandibular second premolar with defective margins which was tender on percussion and palpation was observed. Preoperative radiograph showed a hypertaurodontic anatomy (TI = 50) with a poor-quality root canal therapy (Figure 3A).

2.3.2 | Methods (differential diagnosis, investigations, and treatment)

A diagnosis of previous treatment with symptomatic apical periodontitis was made and the patient was scheduled for a non-surgical root canal retreatment. Local anesthesia was achieved by a mandibular nerve block with

2% lidocaine and epinephrine 1:100,000 (Daroupakhsh, Tehran, Iran). After isolation with rubber dam, the restoration was removed with high-speed diamond round bur number 2 (Jota AG, Rüthi, Switzerland) and continuous water spray under a dental operating microscope (Zumax Medical Co., Suzhou New District, China). Gutta-percha was removed with chloroform (Morvabon, Tehran, Iran), gates drills number 1, 2, 3 (Mani Inc., Utsunomiya, Japan) and M3 retreatment rotary files (UDG, Changzhou, China) and the root canals were negotiated with #8 and #10K-files (Mani Inc., Utsunomiya, Japan). Working length was determined as 20 mm for all three canals by an electronic apex locator (Dempex, DEM Ltd., Barnstaple, Devon, England). Root canals were prepared by crown-down technique with M3 rotary files (UDG, Changzhou, China) up to size 25/04 under copious irrigation with 5.25% sodium hypochlorite and normal saline, alternately. After taking cone-fitting confirmation radiograph (Figure 3B), all canals were dried with sterile paper points (META, Chugbuk, South Korea) and obturated with gutta-percha (META, Chugbuk, South Korea) and AH plus sealer (Dentsply DeTrey, Konstanz, Germany) using warm vertical technique by FastFill warm obturator (Fast

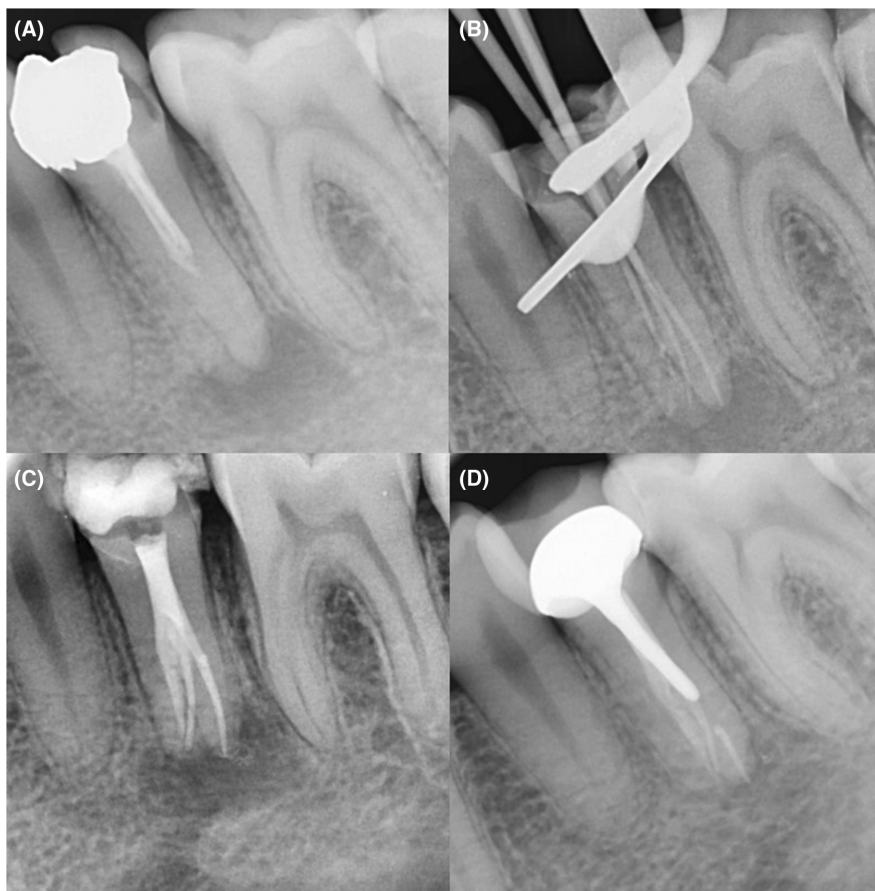


FIGURE 3 Radiographic evaluation of the instrumentation and obturation of #35 showing: (A) preoperative radiograph; (B) master-cone fit confirmation radiograph; (C) postoperative radiograph; (D) 6-month follow-up radiograph.

Fill Obturation System, Eighteeth, china). Cavit (Cavisol, Tehran, Iran) was applied as a temporary restoration (Figure 3C) and the patient was referred to the department of prosthetics for permanent restoration.

2.3.3 | Conclusion and results (outcome and follow-up)

At 6-month follow-up visit, the patient reported no pain or discomfort and was clinically and radiographically asymptomatic (Figure 3D).

3 | DISCUSSION

Taurodontism is defined by apical displacement of pulp chamber floor resulting in an elongated root trunk with shortened root canals.¹ Due to clinically normal shaped tooth crown, the taurodontism diagnosis is only through radiographic examination.³ Deeply located orifices, large pulp chamber and bulky pulpal tissue reduce the clinician's visibility, making the endodontic management very challenging. According to American Association of Endodontists (AAE) guidelines, root canal management of the taurodontic tooth is of moderate difficulty.⁸ It's probable etiology, which is Hertwig's epithelial root sheath invagination failure, increases the possibility of accompanying this anomaly with other anomalies related to Hertwig's epithelial root sheath abnormalities, such as C-shaped configuration of the root canal system and extra root(s)/root canal(s).^{9,10} This makes the endodontic management of a taurodontic tooth even more challenging. Parupalli et al.¹¹ suggested that the most difficult stage during root canal treatment of a taurodontic tooth is instrumentation. Deeply located root canal orifices and short root canals cause only the apical part of the instrument to be in contact with the canal walls. Inadequate instrumentation leads to incomplete cleaning and shaping followed by inadequate obturation and poor apical sealing which hinders long term treatment success. Magnification and illumination plus careful exploring the pulp chamber floor with a DG-16 explorer, troughing, dying and champagne test may be of in locating the orifices.^{11,12} Irrigation with NaOCl is beneficial not only in extirpation of bulky pulpal tissue in the chamber, but also for improving the cleaning process of the complex root canal system. Especially, when there are accompanied anomalies e.g., C-type anatomy. Because of the thin dentinal walls in such cases, it is recommended to focus more on debridement with cautious active irrigation with NaOCl rather than mechanical shaping in order

to avoid strip perforations and other iatrogenic accidents.^{6,13} As in the present study, the preparation size in the second mesiobuccal root canal in case number 3 and the C-shaped root canal system in case number 2 did not exceed the size of 20/04. In order to improve the 3D filling the complex root canal system of taurodontic teeth, thermomechanical obturation techniques are recommended.¹⁴ Warm vertical compaction followed by a proper restoration with adequate coronal seal would improve the treatment outcome. Also, combining this obturation technique with the application of mechanically activated bioceramic cements can facilitate better treatment results. Of course, it is better to heat bioceramic sealers at a low temperature in order to avoid modifying its setting time.¹⁵

AUTHOR CONTRIBUTIONS

Ali Chamani: Conceptualization; investigation; methodology; project administration; supervision; visualization.
Vahid Azizi: Conceptualization; investigation; methodology; project administration; supervision; visualization.
Sahar Karimpour: Writing – original draft; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors deny any conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that supports the findings of this study are available in the supplementary material of this article.

CONSENT

Written informed consents were obtained from the patients to publish this case series in accordance with the journal's patient consent policy.

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