IEJ
Iranian Endodontic Journal

Endodontic Management of a Taurodontic Mandibular Second Premolar with Five Canals: A Case Report

Abbasali Khademi [a], **Mahsa Chamlanian Esfahani** [b*]

[a] Department of Endodontics, Dental Research Center, Dental Research Institute, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran; [b] Dental Students Research Committee, Department of Endodontics, Isfahan University of Medical Sciences, Isfahan, Iran

Article Type: **Case Report**

Received: 10 Mar 2026
Accepted: 19 Apr 2026
Published: 06 May 2026
Doi: *10.22037/iej.v21i1.51661*

Corresponding author: Mahsa Chamlanian Esfahani, Dental Students Research Committee, Department of Endodontics, Isfahan University of Medical Sciences, Isfahan, Iran.

E-mail: chamlanian@dnt.mui.ac.ir

Abstract

This case report presents the endodontic management of a hypertaurodontic mandibular second premolar with five root canals, a rare and complex anatomical variation. A 12-year-old male patient presented with a previously treated tooth (history of pulpotomy) with symptomatic apical periodontitis and necrotic pulp. Initial periapical radiographs suggested taurodontism, but cone-beam computed tomography (CBCT) revealed the presence of five canals merging into four distinct apices. Under CBCT guidance, all canals were negotiated, cleaned, and shaped. An apical barrier was created with bioceramic material, followed by obturation using warm vertical condensation with resin-based sealer. At the six-month follow-up, the tooth was asymptomatic and radiographically satisfactory. This case highlights the diagnostic indispensability of CBCT in detecting intricate root canal configurations in taurodontic teeth and outlines a structured clinical protocol for managing such challenging anatomies.

Keywords: Root Canal Anatomy; Cone-Beam Computed Tomography; Taurodontism

Introduction

Taurodontism is a morphological variation in tooth form resulting from the failure of apical invagination of Hertwig's epithelial root sheath . It is characterized by an elongated pulp chamber, apical displacement of the pulp chamber floor, and shortened root canals [1]. The reported prevalence of taurodontism ranges from less than 0.1% to 48% [2, 3]. In addition, taurodontism is recognized as a dental manifestation associated with several syndromes, including Klinefelter syndrome, Smith–Magenis syndrome, and Down syndrome [4]. According to the classification proposed by Shifman and Chananel [5], the teeth are divided into three categories based on the degree of apical displacement of the pulp chamber floor: hypotaurodontism, mesotaurodontism, and hypertaurodontism. The root canal anatomy of mandibular premolars typically consists of a single canal; however, the presence of multiple root canals represents a rare and clinically significant anatomical variation [2]. Due to the complexity of the dental phenotype of premolar teeth with taurodontism, the likelihood of endodontic treatment failure may be higher than in teeth without this feature so because of the limited number of reports describing mandibular premolars with five canals, documentation of such cases may enhance clinicians' awareness when managing challenging anatomies and emphasize the diagnostic value of adjunctive imaging modalities such as cone-beam computed tomography (CBCT). This case report is approved by the local Ethics Committee (IR.MUI.DHMT.REC.1404.222).

Case Presentation

A 12-year-old male patient was referred to the Department of Endodontics, Isfahan School of Dentistry, with the chief complaint of pain during mastication in the posterior right mandibular region. Clinical examination revealed the tenderness of the second premolar on percussion, while no swelling or sinus tract was observed, and the patient had a history of pulpotomy on this tooth due to caries within the last

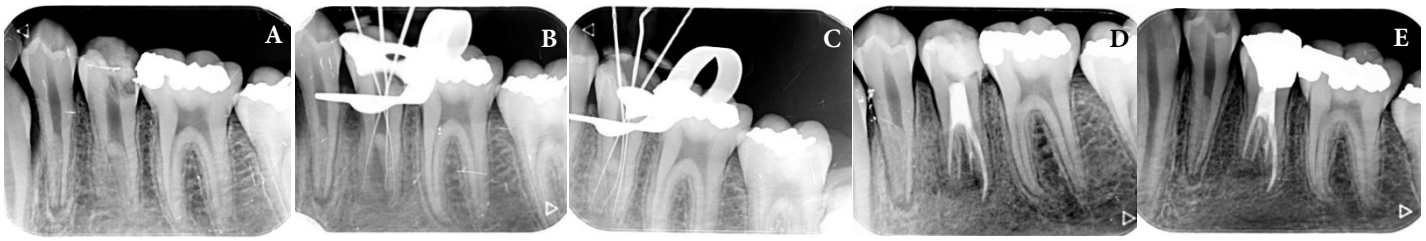

Figure 1. Periapical radiographs: *A*) Preoperative; B & C) Working length determination, (D) Final radiograph, (E) 6-month follow-up

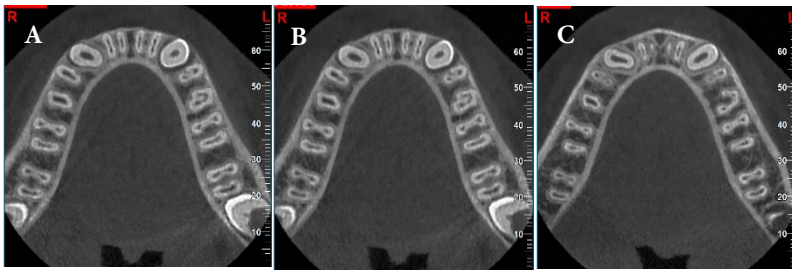

Figure 2. Axial sections; *A)* Presence of four orifices in the pulp chamber floor; *B*) Buccal canal bifurcation resulting in five canals; *C*) Presence of four apical foramina

3 months. Pulp vitality tests, including cold, heat, and electric pulp testing, were performed, and the tooth showed no response to any of the tests. Based on clinical findings, the periapical diagnosis was acute apical periodontitis. Periapical radiographic examination demonstrated features consistent with taurodontism, raising suspicion of a complex root canal system and the possible presence of multiple canals (Fig. 1A). For a more detailed anatomical assessment, a CBCT was performed, which confirmed the presence of five root canals extending to four separate apices. Four orifices, mesial, buccal, distal, and lingual, were identified. The buccal canal is divided into two canals, mesiobuccal and distobuccal, below the orifice, which eventually merge again and terminate at a single apex (Fig. 2).

At the first endodontic treatment session, local anesthesia was achieved using 2% lidocaine with 1:100,000 epinephrine (Daroupakhsh, Tehran, Iran), followed by rubber dam isolation and access cavity preparation. The radicular pulp was partially necrotic. The information about the location of the canal orifices was taken from the CBCT images before the operation, and the canals were searched by the tactile sense intraoperatively. After the canals negotiation with #10 K- file (Mani, Japan), Working length determination was performed using an electronic apex locator (E-pex, Eighteeth, China) and radiographically confirmed for canals with open apices (mesiobuccal, distobuccal, and lingual canals) (Figs. 1B & 1C). Canal instrumentation was carried out using K- files (#45, # 40, #35) for lingual canal and (#40, #35, #30) for other canals in crown-down technique, followed by the rotary system with a file # 35 /4% (Perfect, China) for the lingual canal and a file #30/4% (Perfect, China) for the remaining canals. It was avoided to use the rotary files with a large taper to minimize dentin elimination. Active irrigation with ultra- X (Eighteeth, China) was performed using 5.25% sodium hypochlorite (Nik Darman, Tehran, Iran), and final irrigation with 17% EDTA (Nik Darman, Tehran, Iran) was used to remove the smear layer. Subsequently, the canals were flushed with saline, and calcium hydroxide (Morvabon, Tehran) was placed as an intracanal medicament for two weeks to achieve antibacterial effect and removal of the residual organic components within the canals without affecting apical seal [6].

At the second visit, following final irrigation and drying of the canals, cold ceramic (Sarin, Yazd, Iran) was applied to create a secure apical barrier for canals with open apices and as the obturating material for other canals to create a monobloc [7] extending from the apices to the furcation area. Because extra-radicular tissue fluids might not provide sufficient moisture for proper setting of the bioceramic material in canals with closed apices (particularly given the increased height of the material filling), a moist cotton pellet was placed over the material to ensure adequate setting, and the access cavity was temporarily sealed with Cavit. However, this is a deviation from current standards. In the subsequent session, performed 24 hours later, obturation coronal to the furcation was completed using the thermoplastic technique (Fastfill, Eighteeth, China) with AH-26 resin-based sealer (Dentsply Sirona, Germany). The access cavity was temporarily sealed with Cavit (Cavisol, Tehran, Iran) (Fig. 1D).

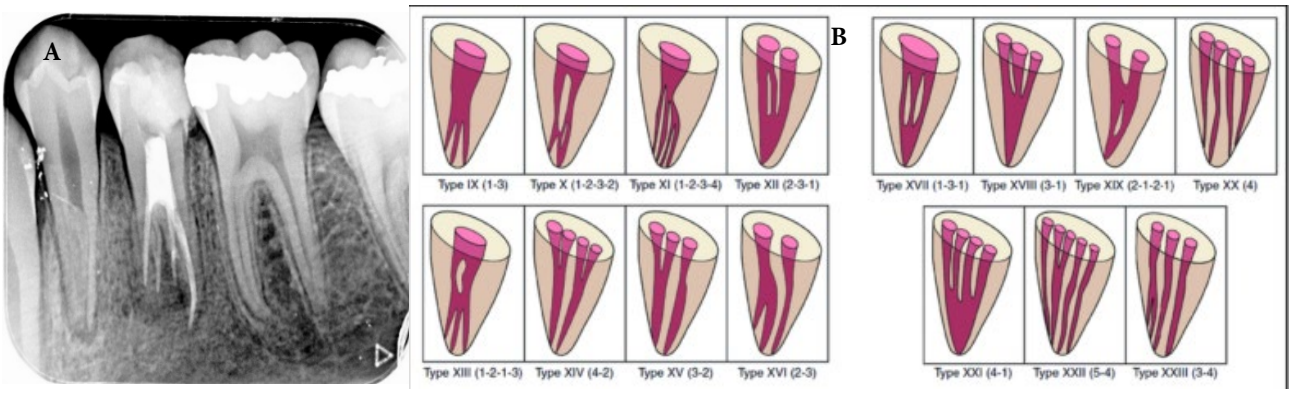

Figure 3. The similarity of final obturation; A) to the type XXII of Sert and Bayirli classification (B).

Discussion

The present case describes a mandibular second premolar with hypertaurodontism and an exceptionally complex root canal system consisting of five distinct root canals, a configuration that has scarcely been reported in the literature. Mandibular premolars are well known for their anatomical variability, with the first premolar exhibiting a higher incidence of aberrant canal morphology compared to the second premolar [8]. This rare configuration of five canals converging into four distinct apices as a modification of type XXII (Fig. 3)of Sert and Bayirli classification highlights the profound morphological challenges that taurodontism can impose, especially in non-molar teeth [9].

Identifying five root canals using periapical radiography is difficult, and the use of CBCT is essential for accurate diagnosis and confirmation of the number of canals [10]. Access cavity preparation poses a significant challenge in the endodontic management of a taurodontic tooth. The vitality of the tooth often results in excessive bleeding during access preparation, which can markedly compromise visibility. In addition, meticulous modification of the access cavity is crucial to allow proper visualization of all canal orifices [11]. The most difficult challenge in root canal treatment of a taurodontic tooth is canal preparation. Apically located orifices and short canals lead to only the apical part of the instrument being in contact with the canal walls. Subsequently, it may lead to inadequate instrumentation and affect the result [12]. Using a file with a large size or taper causes more dentin removal and increases the risk of strip perforation. This risk is exacerbated as the number of canals increases due to the reduced thickness of the root dentine. Active irrigation with NaOCl is useful for full pulp elimination [10]. Although some studies have recommended using intracanal medication for one week before one-step apexification, we kept it for two weeks because the patient's symptoms did not completely resolve within the first week [4]. Due to the anatomical complexity and to ensure three-dimensional sealing, the use of thermoplastic obturation or MTA filling is recommended [13]. In teeth with taurodontism, careful canal detection and preparation lead to success [14-18].

Conclusion

The treatment protocol, involving careful access cavity modification, thorough chemomechanical debridement, strategic apical barrier formation with bioceramic materials, and three-dimensional obturation, was associated with a favorable short-term outcome in this case (Fig. 1E). 6 months is short-term, and Long-term follow-up (2-4 years) is necessary to confirm definitive healing, especially given the complex anatomy and non-standard barrier technique. In summary, clinicians should maintain a high index of suspicion for aberrant canal morphology in taurodontic teeth. A thorough understanding of potential anatomical complexities, combined with the judicious use of advanced imaging and an adaptable, meticulous treatment strategy, is paramount for ensuring successful endodontic outcomes in these challenging cases.

Conflict of interest
None.

Funding support
None.

Authors' contributions
Conceptualization: MC; Methodology: MC; Writing-original draft preparation: MC; Writing-review and editing: AK; Supervision: AK. All authors read and approved the final manuscript.

References

1. Chamani A, Zarei M, Soltaninezhad P, Jamali SZ, Sadeghnezhad P. Endodontic Management of Hypertaurodontic Teeth: A Report of Three Cases. Iran Endod J. 2025;20(1):e12.
2. Mohammadi M, Zarei M. Endodontic Management of a Mandibular Second Premolar with Three Root Canals and Taurodontism: A Case Report. Iran Endod J. 2024;19(3):228-31.
3. Jamshidi D, Tofangchiha M, Jafari Pozve N, Mohammadpour M, Nouri B, Hosseinzadeh K. Prevalence of Taurodont Molars in a Selected Iranian Adult Population. Iran Endod J. 2017;12(3):282-7.
4. Chetty M, Roomaney IA, Beighton P. Taurodontism in dental genetics. BDJ Open. 2021;7(1):25.
5. Shifman A, Chanannel I. Prevalence of taurodontism found in radiographic dental examination of 1,200 young adult Israeli patients. Community Dent Oral Epidemiol. 1978;6(4):200-3.
6. Chauhan S, Chauhan R, Bhasin P, Sharaf BG. Present status and future directions: Apexification. World J Methodol. 2025;15(1):96923.
7. Machtou P, Ruddle C. Endodontic orthograde retreatment and management of mishaps. Dalam: Rostein I, Ingle JI Ingle's Endodontics. 2019;7:779-81.
8. Cleghorn BM, Christie WH, Dong CC. The root and root canal morphology of the human mandibular second premolar: a literature review. J Endod. 2007;33(9):1031-7.
9. Sert S, Bayirli GS. Evaluation of the root canal configurations of the mandibular and maxillary permanent teeth by gender in the Turkish population. J Endod. 2004;30(6):391-8.
10. Versiani MA, Martins J, Ordinola-Zapata R. Anatomical complexities affecting root canal preparation: a narrative review. Aust Dent J. 2023;68 Suppl 1:S5-s23.
11. Radwan A, Kim SG. Treatment of a hypertaurodontic maxillary second molar in a patient with 10 taurodonts: a case report. J Endod. 2014;40(1):140-4.
12. Parupalli K, Solomon RV, Karteek BS, Polasa S. Application of cone-beam computed tomography in the analysis and management of intricate internal anatomy of hyper- and mesotaurodontic teeth. J Conserv Dent. 2020;23(2):211-4.
13. Mathew AI, Lee SC, Rossi-Fedele G, Bogen G, Nagendrababu V, Ha WN. Comparative Evaluation of Mineral Trioxide Aggregate Obturation Using Four Different Techniques-A Laboratory Study. Materials (Basel). 2021;14(11).
14. Jayashankara C, Shivanna AK, Sridhara K, Kumar PS. Taurodontism: A dental rarity. J Oral Maxillofac Pathol. 2013;17(3):478.
15. Parolia A, Khosla M, Kundabala M. Endodontic management of hypo-, meso- and hypertaurodontism: case reports. Aust Endod J. 2012;38(1):36-41.
16. Simsek N, Keles A, Ocak MS. Endodontic treatment of hypertaurodontism with multiple bilateral taurodontism. J Conserv Dent. 2013;16(5):477-9.
17. Sahib AM, Ghabraei S. Endodontic Management of a Maxillary First Molar with Taurodontia and Two Palatal Canals: A Case Report. Iran Endod J. 2021;16(2):114-7.
18. Chamani A, Forghani M, Zarei M, Soltaninezhad P. Advanced Endodontic Techniques for Treating Root Perforation in a Hypertaurodont Molar: A Case Report. Iran Endod J. 2025;20(1):e14.

Please cite this paper as: Khademi A, Chamlanian Esfahani M. Endodontic Management of a Taurodontic Mandibular Second Premolar with Five Canals: A Case Report. Iran Endod J. 2026;21(1): e17. Doi: 10.22037/iej.v21i1.51661.