

Non-surgical endodontic management of type IIIB dens invaginatus in central incisor with two root canals: A case report

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Key clinical message:

We described a type IIb dens invaginatus, its root canal treatment and results on 3- and 12-months visits. Despite its significant challenges, proper endodontic therapy in such cases can cause positive prognoses and successful outcome.

Keywords:

Dens Invaginatus, Root Canal Therapy, Dens in Dente, Cone-beam Computed Tomographic Imaging

1. Introduction

Dens invaginatus (DI), also known as dens in dente, invaginated odontoma, dilated composite odontoma, dentoid in dente¹, telescopic tooth and deluted compound odontoma² is caused by an infolding of the enamel organ into the dental papilla prior to the calcification of the tooth.³ The invagination may be limited to the pulp chamber or be extended to the root and even the apex.¹ The prevalence of this developmental anomaly ranges 0.3-10%.⁴ DI can affect any primary or permanent tooth.⁵ Maxillary lateral incisors are the most affected teeth.² The involvement of maxillary central incisors have been reported² and it may rarely occur in canines and posterior teeth, though.⁴ DI may occur simultaneously with supernumerary teeth, but this is not a common phenomenon.⁴ Although environmental and genetic etiological factors have been reported, there is no consensus on its etiology.⁴ Oehlers described 3 types of DI based on its apically extension⁵ according to their radiographic features⁶ which is the most commonly used.³ The invaginatus in type I is limited to the crown;¹ type II is defined as an invagination that goes beyond the cemento-enamel junction making a blind sac through the root, communicating with the dental pulp or not;³ type III is referred to the enamel lined infolding that penetrates through the root, opening an independent lateral (also called type IIIa) or apical (also named type IIIb)⁶ foramen eventually and usually with no pulpal communication.³

Increased risk of pulpal and periodontal diseases is associated with the progression of microorganism and their products through the coronal aspect of the invagination is the clinical significance of dens invaginatus.⁵ Although 2-dimensional images are used to diagnose DI,⁴ 3-dimensional radiographies including cone-beam computed tomography (CBCT) is recommended for managing severe types of DI.⁷ Several approaches for clinical management of different types of DI including restorative management, non-surgical root canal therapy, surgical treatment, intentional replacement or extraction have been described.⁸

In this case report, we described a non-surgical management of type IIIb DI occurred in maxillary central incisor with two root canals view in 2-dimensional radiography simultaneously with impacted supernumerary tooth.

2. Case presentation

An 18-year-old Iranian male was referred with the chief complaint of correcting the shape of his anterior tooth.

Medical history revealed that there was no history of systemic disease, medication and allergic reaction. The patient was categorized in ASA1 group with no evidence of hereditary dental anomalies and no history of dental trauma, sinus tract or swelling. No pain was reported in accordance with the mentioned tooth. The patient oral hygiene was fair.

Objective findings revealed normal extra oral exam, normal facial appearance, conical shaped tooth #8 and periodontium probing within a normal limit.

Clinical evaluation as reported in table 1, confirmed normal response of tooth no. #8 to percussion and palpation test with no response to cold, heat and electric pulp tests.

Periapical radiographic findings revealed periapical radiolucency with impacted supernumerary tooth and fully developed (dens invagination) tooth no. #8 (figure 1). Cone beam computed tomography (CBCT) was prescribed for treatment planning (figure 2).

According to the given medical and dental history, radiographic evaluation, objective findings and clinical evidences, diagnosis of type IIb dens invagination with chronic apical periodontitis in pulpless and infected tooth no. #8 was made.

Recommended treatment plan including nonsurgical root canal treatment and follow up and possible surgical intervention in the future and alternative treatment plan consist of orthodontic replacement supernumerary tooth or extraction and replacement with fixed prosthesis or implant were explained.

According to consultation with the senior orthodontist, extraction of the supernumerary tooth was suggested in accordance with its shape and position.

Treatment procedure for tooth no. #8 was done with 4 recall visits in 12 months.

At first session, after local anesthesia with lidocaine2% and epinephrine 1/100000 (Persocaine-E; Darou Pakhsh; Iran) and access cavity preparation and the tooth isolation using rubber dam, access the mesial canal was done troughing the mesial part of the root by mueller bur (figure 3A). Working lengths was determined with an electronic apex locator and was confirmed radiographically. Root canals were prepared with hand K file (Mani; Japan) up to #40 and rotary file up to F3 (denco blue; China) simultaneously with passively ultrasonic irrigation using 5/25% sodium hypochlorite (NaOCl). Creamy Calcium hydroxide (Golchai; Iran) paste was placed to the canals with a lentulo spiral (Mani; Japan) for 10 days and access cavity was sealed with temporary restoration.

At the second session, tooth no. #8 was asymptomatic and no pain was reported. After local anesthesia with lidocaine2% and epinephrine 1/100000 (Persocaine-E; Darou Pakhsh; Iran), removal of temporary filling and isolation using rubber dam, intracanal medicament was removed by copious irrigation with NaOCl combined with hand instrumentation and a final rinse with ethylenediaminetetraacetic acid (EDTA) (EDTA; Morvabon; Iran). Obturation was carried out using mineral trioxide aggregates (MTA) (MTA Angelus; Brazil), gutta-percha and sealer (AH-26; Dentsply Sirona; Germany). MTA was used as a plug at the apical of distal canal and the rest of distal and mesial canals were obturated using gutta-percha and sealer with warm vertical obturating technique. Access cavity was sealed with resin modified glass ionomer (RMGI) (GC Fuji II LC; Japan) (figure 3B).

Recall visits were set to control the healing process. 3- and 12-month follow up evaluation revealed that the tooth no. #8 was asymptomatic and the periapical lesion was healed (figure 3C and 3D). It was permanently restored and supernumerary tooth was extracted.

3. Discussion

DI is a developmental anomaly with the most prevalence of affected maxillary lateral incisors.⁸ Although, affected canines, premolars, molars and maxillary central incisors have also been reported.⁸ This malformation

is classified into 3 groups⁶ and type III is more complicated compared to the others.⁹ A different treatment plan would be useful for each type of dens invagination.¹ Despite uncommon communication with the pulp in type III,⁹ pulpal disease or a periapical lesion has been reported in many cases.⁴ Thus, 3-dimensional radiography is essential to choose the best treatment plan.⁴

In the present case, type IIIb dens invaginatus with necrotic pulp and periapical lesion was diagnosed in the right maxillary central incisor using CBCT.

Non-surgical root canal therapy is the first line of clinical management in necrotic tooth affected with DI.² According to the root canal morphology complexity and varieties including unreachable fines and intracanal communications, complex endodontic considerations, eradication of necrotic tissue using proper chemical and mechanical procedures for cleaning, shaping and obturation is mandatory in DI cases.¹ Thus, the clinician should be well-informed regarding various techniques and materials.⁵ Although, the effect of mechanical and chemical root canal preparation on the reduction of the number of microbial organisms is significant, the use of a dressing between treatment sessions including calcium hydroxide as a popular and well-known intracanal medicament is mandatory to eliminate intracanal residual pathogens.¹⁰ Despite of its advantages, calcium hydroxide has negative effect on the sealing qualities during obturation.¹⁰ Thus, copious irrigation using NaOCl and EDTA prior to obturation is recommended to conquer the adverse effect of residual intracanal calcium hydroxide on the root canal filling.¹⁰ Moreover, for nonsurgical endodontic treatment of DI, the preferred approach is using MTA plug at the apical end and root canal obturation using lateral condensation or warm gutta-percha techniques.⁸ Various obturation materials including Biodentine, MTA and gutta-percha using different sealers have been suggested, though.²

In the present case, scrolling the axial view of the tooth in CBCT revealed that the space between two roots had no connection to the canals. Thus, it had not been sealed with bioceramic material. MTA-Angelus was used for this purpose due to its short setting of 15 minutes.¹¹

A successful clinical and radiographic outcome was reported in the present case. Asymptomatic tooth with healed periapical lesion was reported in 3-month recall session.

Despite its significant challenges, a proper endodontic therapy for DI cases may have positive long-term prognoses.¹

Conflict of interests

None

Declaration of patient consent

The patient has given his consent for his clinical information to be reported in the journal.

Acknowledgment

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References

1. Martins JNR, da Costa RP, Anderson C, Quaresma SA, Corte-Real LSM, Monroe AD. Endodontic management of dens invaginatus Type IIIb: Case series. *Eur J Dent.* 2016;10(4):561-5.
2. Ghandi M, Ghorbani F, Jamshidi D. Nonsurgical management of a patient with multiple dens invaginatus affecting all maxillary incisors. *Saudi Endodontic Journal.* 2022;12(1):138-42.
3. Alkadi M, Almohareb R, Mansour S, Mehanny M, Alsadhan R. Assessment of dens invaginatus and its characteristics in maxillary anterior teeth using cone-beam computed tomography. *Sci Rep.* 2021;11(1):19727.
4. Zhu J, Wang X, Fang Y, Von den Hoff JW, Meng L. An update on the diagnosis and treatment of dens invaginatus. *Aust Dent J.* 2017;62(3):261-75.

5. Pradhan B, Gao Y, He L, Li J. Non-surgical Removal of Dens Invaginatus in Maxillary Lateral Incisor Using CBCT: Two-year Follow-up Case Report. *Open Med (Wars)*. 2019;14:767-71.
6. González-Mancilla S, Montero-Miralles P, Saúco-Márquez JJ, Areal-Quecuty V, Cabanillas-Balsera D, Segura-Egea JJ. Prevalence of Dens Invaginatus assessed by CBCT: Systematic Review and Meta-Analysis. *J Clin Exp Dent*. 2022;14(11):e959-e66.
7. Cho WC, Kim MS, Lee HS, Choi SC, Nam OH. Pulp revascularization of a severely malformed immature maxillary canine. *J Oral Sci*. 2016;58(2):295-8.
8. Yalcin TY, Bektaş Kayhan K, Yilmaz A, Göksel S, Ozcan İ, Helvacioğlu Yigit D. Prevalence, classification and dental treatment requirements of dens invaginatus by cone-beam computed tomography. *PeerJ*. 2022;10:e14450.
9. Mary NSGP, Sangavi T, Venkatesh A, Prakash V. Dens Invaginatus clinical diagnosis and management: A Review. *European Journal of Molecular & Clinical Medicine*. 2020;7(5):2020.
10. Raghu R, Pradeep G, Shetty A, Gautham PM, Puneetha PG, Reddy TV. Retrieval of calcium hydroxide intracanal medicament with three calcium chelators, ethylenediaminetetraacetic acid, citric acid, and chitosan from root canals: An in vitro cone beam computed tomography volumetric analysis. *J Conserv Dent*. 2017;20(1):25-9.
11. Hansen SW, Marshall JG, Sedgley CM. Comparison of intracanal EndoSequence Root Repair Material and ProRoot MTA to induce pH changes in simulated root resorption defects over 4 weeks in matched pairs of human teeth. *J Endod*. 2011;37(4):502-6.

Tooth number	Cold	Heat	Electric pulp test	Percussion	Palpation	Mobility
8	-	-	-	Normal	Normal	WNL ¹
7	5 sec ² +	4 sec +	4	Normal	Normal	WNL
9	3 sec +	7 sec +	4	Normal	Normal	WNL
10	4 sec +	4 sec +	3	Normal	Normal	WNL

¹ within normal limit

² second

Table 1: clinical evaluation of tooth no. #8 and three other teeth as control.

Figure Legends

Figure 1: Periapical radiography. Note the periapical radiolucency with impacted supernumerary tooth and fully developed (dens invagination) tooth no. #8.

Figure 2: CBCT radiographies revealed type IIIb DI and supernumerary impacted tooth. (A), sagittal aspect. (B), coronal view. (C), axial view.

Figure 3: 2-dimensional radiographies. (A), using mueller bur to access the mesial canal troughing the mesial part of the root; radiography was taken to ensure the correct path. (B), post-treatment radiography. (C), radiography at recall visit 3 months after treatment. (D), radiography at 12-month follow up visit. Note that no internal resorption or peri radicular lesion is visible.













