CASE REPORT

Nonsurgical management of type II dens invaginatus with cone beam computed tomography: A rare case

Neslihan Yilmaz Cirakoglu,[1] Ersan Cicek[2]

Abstract

Dens invaginatus is a progressive abnormality resulting from invagination of the crown or root before calcification. This case report presents nonsurgical endodontic treatment and nine-year follow-up results of a right maxillary canine tooth with type II dens invaginatus. A 40-year-old female patient was referred to the clinic for treatment of her maxillary right canine tooth. The invagination was managed on a two-visit appointment. On the first visit, the invagination area, which was disconnected, was completely removed from the root canal. The invagination area was instrumented, and the root canal was dressed with calcium hydroxide. At the second appointment, apexification was done using mineral trioxide aggregate compacted to the apical 3mm. Finally, the invaginated area and the root canal were obturated with a warm vertical compaction technique. At a nine-year follow-up, the invaginated tooth was asymptomatic, and the periradicular lesion showed satisfactory healing radiographically.

Keywords: Apical plug, Cone-beam computed tomography, Dens in dente, Dens invaginatus, Non-surgical endodontic treatment.

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Introduction

Dens invaginatus is a progressive abnormality that occurs in vagination of the crown and/or root before hard tissue calcification has formed. Dens in dente, dentoid dente, tooth inclusion, and invaginated odontoma are the other terms used to describe the abnormality.[1] It is said that the frequency of dens invaginatus is between 0.04% and 10%. Approximately 42% of all occurrences are seen in the permanent maxillary lateral incisors and a few in the central incisors; it also arises from the posterior teeth extending from the occlusal pit.[2,3] It is also thought that the anomaly could be symmetrical. Forty-three percent of occurrence of invaginated tooth bilaterally is a common outcome. It is generally rare to find in the mandible.[4] Multiple occurrences of dens invaginatus cases have been reported in the literature; besides that, it may be present along with other malformations containing microdontia, taurodontism, dentinogenesis imperfecta, and gemination.[5]

The aetiology of dens invaginatus is not clear; Hülsmann reported many hypotheses that have been discoursed to describe the phases of coronal invagination: central failure of development of the inner enamel epithelium, malformation of the enamel, growth compulsion of the dental arch, accelerated and destructive multiplication of the inner enamel epithelium, the fusion of two tooth germs, infection, and trauma.[1]

The most accepted and frequently used classification of dens invagination is the one introduced by Oehlers, who classified it in three types according to the depth of invagination. Type I is the mildest form; the invagination is confined within the crown and does not extend beyond the cementoenamel junction (CEJ). In type II, the invagination invades above the CEJ, connecting to the pulp; however, there is no connection with the periodontal ligament (PDL). In type III, the invagination penetrates through the root and PDL. Invagination allows access of irritants into the pulp space through a thin hypo-mineralised enamel and dentin layer. This irritant penetration leads to pulp necrosis, internal resorption abscess or cyst formation, or tooth displacement.[6]

Management of teeth with dens invaginatus can be complicated due to anatomical variations. To succeed in endodontic treatment, the dentist must identify, debride and sterilise the whole root canal system. Various treatment options have been used for dens invaginatus, for instance, preventive sealing of the invagination to avoid contamination of pulp by microorganisms, root canal treatment of the invagination and the main canal, endodontic surgery (apical curettage and retrograde filling), a combination of non-surgical and surgical methods, retreatment, intentional replantation or extraction.[7]

The present case report aims to describe the nonsurgical endodontic management with successful prognosis of a

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necrotic tooth with a periapical radiolucent lesion containing type II dens invaginatus with a nine-year follow-up.

Case Report

A 40-year-old female patient with no medical history was referred to the Faculty of Dentistry, Department of Endodontics, Zonguldak, Turkey, in August 2012, with severe complaints in her maxillary right canine tooth. The patient complained of tooth-related pain and swelling episodes during the previous two weeks. The patient had no trauma history. Extra-oral examination demonstrated that soft tissue had normal structures. On intraoral examination, loss of 16, 26, 36, 41, 46, 47 teeth, presence of poly-diastema between teeth, mobility in tooth 31, and presence of enamel hypoplasia of buccal surface of upper and lower anterior teeth were observed. Also, intraoral clinical examination demonstrated swelling over the maxillary right canine tooth, and the crown of the tooth was higher than the contralateral tooth. The invaginated tooth was tender to palpation and percussion that exhibited no mobility. The tooth was devital according to the pulp vitality test (Electric Pulp Vitality Tester; Parkell, Farmingdale, NY, USA) and thermal vitality test (Endo Ice; Coltene Whaldent Inc, Cuyahoga Falls, OH). The probing test depths were within normal limits for the canine tooth. On radiographic examination, the periapical radiograph presented an atypical root canal morphology, and an invagination area consisting of dentine and pulp in the form of expansion was observed in the root canal system. In addition, a pronounced radiolucent lesion, root resorption, and open apex were also detected (Figure-1a). Also, cone-beam computed tomography sections were taken to determine the exact diagnosis and lesion borders (Figure-2a-2d). After analysing the sections, it was determined that the patient had type III dens invaginatus in the canine tooth.

Treatment of the invagination was completed in two appointments. At the first appointment, after application of local anaesthesia and isolation under a rubber dam, endodontic access was performed through the invagination area with a round diamond bur. After the access cavity, direct entry to the canal space was not performed as the invagination area consisted of calcified hard tissue. Therefore, preparations were made from the mesial and distal sides of the calcified hard tissue with ultrasonic tips (NSK, Tochigi, Japan) using a dental operating microscope (Carl Zeiss Jena GmbH, Zeiss Group, Jena, Germany). Thus, the invagination area which was disconnected was completely removed from the root canal. Working length was established with an electronic apex finder (Root ZX mini; J Morita Co, Kyoto, Japan) and a radiograph. The invagination area was prepared with Ni-Ti K-files and ProTaper Next (Dentsply Maillefer, Ballaigues, Switzerland) X3 instrument. The root canal irrigation was performed using 2.5% sodium hypochlorite during the preparation. After the final irrigation, the root canal was dried using appropriately sized paper points and dressed with a medicament containing calcium hydroxide (Calasept, Nordiska Dental, Angelholm, Sweden). Temporary filling material (Cavit W, 3M Espe, Seefeld, Germany) was used to fill the access cavity.

Two weeks later, the tooth was asymptomatic. Final irrigation was performed with NaOCI, EDTA, and CHX and dried with paper points. Apexification was performed using white mineral trioxide aggregate (ProRoot MTA, Dentsply Tulsa, Tulsa, OK), compacted to the apical 3mm (Figure-1b). The obturation of the coronal part of MTA and invaginated area were managed with gutta-percha by using the warm vertical compaction technique (System B, SybronEndo, Orange, CA) and AH Plus sealer (AH Plus, Dentsply, De Trey, UK) (Figure-1c). Finally, the restoration of the tooth was performed with dual-cured cement containing glass ionomer followed by composite filling material (Filtek Z 250, 3M ESPE, Seefeld, Germany).

Figure-1: a) Pre-operative periapical radiography. b) Apexification of the root canal with MTA which was compacted in the apical 3mm. c) Complete obturation of the root canal and invaginated area by using the warm vertical compaction technique. d) Periapical radiography was taken at nine-year follow-up.

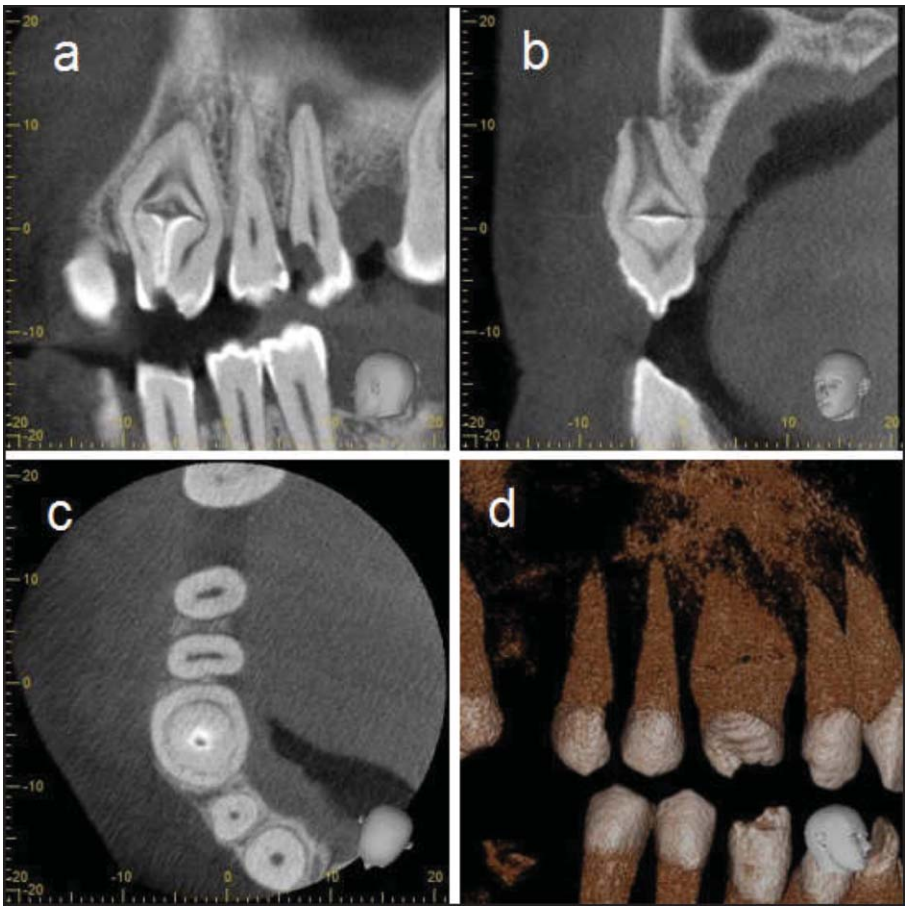

Figure-2: a-d) Cone-beam computed tomography sections.

The tooth was asymptomatic at a six-month follow-up. A further follow-up appointment was carried out at nine years. The patient was asymptomatic, and the periradicular lesion showed satisfactory healing radiographically at this follow-up (Figure-1d).

Discussion

Teeth with dens invaginatus have many pits with defective or even absent enamel that cause the colonisation of microorganisms and predisposition to the development of caries and pulp association, which ultimately requires endodontic treatment.[2] In the present report, the upper maxillary canine tooth has a pit-associated dens invaginatus on its palatinal surface. Also, all of the patient's teeth had hypo-mineralised enamels. This condition might have facilitated to penetrate the irritants and microorganisms.

Dens invaginatus may occur in more than two teeth or bilaterally.[4] However, in the present case, the anomaly was unilateral.

This abnormality is incidentally diagnosed in radiography in most cases, so it is commonly seen with necrotic pulp without any significant signs and symptoms. In this case, likewise, the tooth with invagination did not have any caries but had pulpal necrosis. Therefore, the early diagnosis of dens invaginatus and treatment are necessary to prevent further pathology due to pulpal necrosis.[8]

Treatment of invaginated teeth and a periapical pathology might require different treatment plans according to the variations in root canal anatomy and difficulties. For effective endodontic therapy it is necessary to accomplish elimination of all microorganisms and their products from the canal system, subsequent to its filling, using a biocompatible ingredient. It is known that teeth with dens invaginatus show multiple canal configurations with holes, concavities, intra-canal connections, unreachable fins, apical branchings, and other areas that instruments cannot access.[9] Therefore, the clinician should be an expert at different kinds of methods and choose the most suitable one for the elimination of necrotic remnants and microorganisms.

Different anatomical structures of type II dens invaginatus complicate the management of endodontic therapy. Also, the invaginatus, which is usually inside the pulp cavity and the pulp tissue completely surrounding it, can complicate the cleaning of the main root canal. Therefore, invagination is usually removed to facilitate disinfection, apexification, and filling of the root canal system.[10] In the present case report, apexification in a single visit was planned after removing the invaginated part of the root canal. Also, due to its well-built, decisive, and enduring antimicrobial effect, calcium hydroxide was used as a temporary canal medicament.

Open apices, the width of the root canal, and invaginated space complicate conventional endodontic treatment because of thin dentinal walls that are prone to root fracture. One-visit apexification permitted hermetic obturation of the root canal used due to the advantages compared to conventional apexification, such as short treatment periods, hindering the risk of re-infection of the root canal system between appointments, and disadvantages of long-term calcium hydroxide

application due to the effect on root fracture.[8] Thus, a barrier at the apex was created by a retrograde plug with MTA. Obturation of the entire root canal with MTA was not preferred as it would reduce the fracture resistance of the root. Instead, the remnant of the root canal was filled with warm vertical compaction because warm gutta-percha with resin sealer is efficient in filling the root canal system irregularities in teeth with dens invaginatus.

Consequently, the clinicians should be aware of the eventuality of the represented modified invagination if a diagnostic radiograph of an ordinarily single-rooted tooth with clinically doubtful invagination suggests the existence of two roots separated by a wide inter radicular area. Well-timed preventive treatment by obstructing the aperture and follow-up or initial endodontic treatment restricted to the coronal passage of the invagination is critical to preserve pulp vitality. However, endodontic treatment should be considered before surgical procedure and extraction when progressive inflammation progresses to the pulp, and the pulp loses its vitality.

Conclusion

Due to the encouraging findings on the 9-year follow-up with successful prognosis based on clinical and radiographic evaluation, it can be concluded that nonsurgical endodontic treatment (combined single visit apexification with MTA and warm obturation technique) is sufficient for the management of teeth with dens invaginatus and open apex.

Consent: Consent for publication of the case, was obtained from the patient.

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