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CASE REPORT

Endodontic treatment of type II dens invaginatus with a large periradicular lesion: A case report

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Abstract

Dens invaginatus (DI) is an odontogenic anomaly caused by folding of enamel and dentin into pulp chamber during odontogenesis before calcification process. This is a condition that is most commonly exhibited as protrusion of a tubercle from lingual surface of anterior teeth. Management of DI varies from simple prophylactic restoration to conventional endodontic treatment or extraction which can be affected by the type of invagination, function, esthetics, and morphology of the root canal. This is the report of successful conventional endodontic treatment of a tooth affected with dens ivaginatus with a big lesion in a 30-year-old patient which was confirmed by cone beam computed tomography. Twelve months follow-up using clinical and radiographic examinations showed good apical sealing and decrease in size of periapical lesion.

Keywords: Dens invaginatus, dental anomaly, endodontic treatment, periapical lesion

Introduction

Dens invaginatus (DI) is a developmental malformation caused by folding of dental papilla during tooth development before biological mineralization occurs.[1] Dens in dente is a generally used term and DI is the most preferred term for this dental abnormally as it clarifies the centrally and peripherally location of enamel and dentin, respectively.[2] The exact etiology of DI is still controversial.[3] The suggested etiologies of this developmental abnormally are attributed to invagination of a part of the inner enamel epithelium, growth pressure of dental arch, focal growth retardation, localized external pressure, distortion of the enamel organ, infections, and genetic factors.[2,3] It commonly is found in maxillary permanent lateral incisors, followed by the maxillary central incisors, premolars, canines, and less often in the molars.[4] This is thought that undesirable position of maxillary lateral incisor and being the last anterior tooth to calcify is the important reasons.[2] Several authors have proposed classifications systems for DI; however, most specialists have consensus over Ohler's classification system for DI. This system classifies the invaginations based on the length of invagination axially and the degree of communication with periodontal ligament or the peri-radicular tissue.[5]

- Type I: The invagination is surrounded by a blind sac in dental crown and not continuing beyond the cementoenamel junction.
- Type II: The invagination goes through the cementoenamel junction, surrounded by blind sac, and can communicate with pulp.
- Type III: The invagination extends to the interim of the root, forming an extra-apical, or lateral foramen with usually no communication with pulp.
- Type I and II are considered as incomplete invagination and type III is classified as complete invagination with the incidence of 79%, 15%, and 5%, respectively. This malformation usually is diagnosed in the age of 16–40 years.[4]

Crown morphology of an affected teeth can be varied from normal to unusual forms such as greater dimension buccolingually, peg-shaped form, conical shapes, and barrel shaped form.[3] The typical clinical sign which can lead to find DI is a deep foramen cecum.[2,3]

Adequate information about the root canal anatomy is mandatory for a successful root canal treatment.[6] Cone-beam computed tomography (CBCT) is an ideal diagnostic tool which enables dentists to make correct diagnosis, treatment planning, and follow-up; nevertheless, conventional radiography has remained the foundation of imaging in endodontics.[4] CBCT provides a detailed three-dimensional view of teeth, maxillofacial area, and relation among anatomical structures comparing the two-dimensional images, which provided by conventional intraoral periapical radiographs.[6]

The treatments of DI vary from preventive and restorative procedures to no surgical and surgical endodontic treatments.[4] Early diagnosis of DI is essential to apply the preventive measures to control the carries progression and to prevent the pulp involvement.[3] A pulpal involvement of a tooth with DI may occur as it starts to erupt. Pulpitis and necrotic pulp are the prevalent findings in teeth with DI.[7] Carries can easily develop inside the invagination because the enamel lining is thin and in close contact with pulp chamber.[3] Furthermore, the accessory canals should not be underestimated.[4]

The present case shows a type II DI involving a maxillary left lateral with a large chronic preapical lesion treated with non-surgical endodontic treatment.

Case Report

A 30-year-old female patient referred to Endodontic Department of Shahed University, Tehran, Iran, with the chief complaint of pain on tooth 22. Clinical and radiographic examinations were performed. Intraoral examination showed a sinus tract in associated with tooth 22 and tenderness to vertical percussion. The affected tooth revealed a cusp-like prominent cingulum with a deep and slightly colored pit on the palatal aspect [Figure 1]. Radiographic examination showed an abnormal crown and root canal morphology, the large diffuse periapical radiolucency, and type II DI according to Oelhers' classification [Figure 2]. Furthermore, the diagnosis of type II DI with necrotic pulp and chronic apical periodontitis was confirmed by CBCT [Figure 3].

Access cavity was made under local anesthesia with Lidocaine with 1:100,000 epinephrine (Daroupaksh, Tehram, Iran) and rubber dam isolation. The working length determination was done with electronic apex locator (Raypex 5, VDW GmbH, Munich, Germany) and confirmed radiographically with a K file #30 [Figure 4]. However, some area of invagination through coronal third of root was not prepared and instrumented accurately. The invagination was removed by a round bur carefully. Canal preparation was done with K-files up to 40# (Mani, Tochigi, Japan) and was frequently irrigated with copious 2.5% NAOCL. Then, the root canal was dried and calcium hydroxide was dressed as intracanal medicament for 2 weeks. A wet cotton pellet was placed in the access cavity and restored with temporary restorative material (Cavit™ G, 3M ESPE, Germany).

On the second visit, the patient revealed no history of pain over the past 14 days, and there was no sign of sinus tract in associated with tooth 22. After anesthesia and applying rubber dam, all temporary filling material was removed. Root canal was rinsed several times by 2.5% NAOCL followed by a final rinse with 5 ml 17% EDTA and was dried by sterile paper points (Aria Dent, Tehran, Iran). The root space was filled with conventional 4% gutta-percha (Apadanatak, Tehran, Iran) by lateral condensation technique. All process of preparation and obturation of root canal was done under the dental operating microscope (OPMI pico, Carl Zeiss, Jena, Germany). The post-operative radiograph revealed that the invagination area

Figure 1: Intraoral picture

Figure 2: Initial radiograph

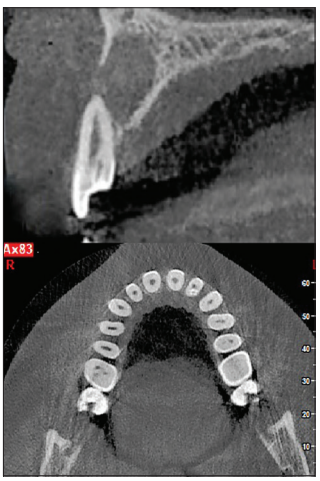

Figure 3: Cone-beam computed tomography (axial and sagittal views)

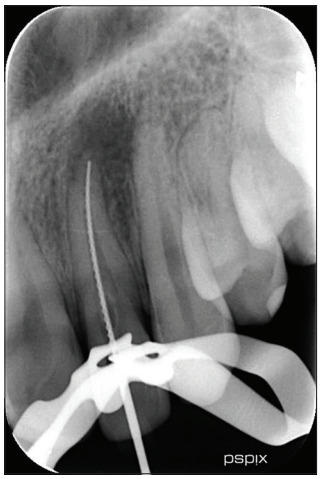

Figure 4: Working length

Figure 5: Post-operative radiograph

and apical region of root canal was filled and sealed accurately. [Figure 5] The access cavity was filled with composite. The healing of apical lesion was remarkable radiographically after 12 months, and the tooth was asymptomatic clinically [Figure 6].

Figure 6: Twelve-month follow-up radiograph

Discussion

The treatment of a necrotized tooth with DI is complicated and challenging because cleaning and disinfection of the inaccessible area of main root thoroughly are impossible.[8] Using copious irrigation by 2.5% sodium hypochlorite solution and calcium hydroxide dressing help to clean and disinfect irregularities not readily accessible by the endodontic instruments.[9] Sodium hypochlorite has been recommended as a solution of choice for irrigating root canal in the treatment of teeth with pulp necrosis with and without periapical lesion.[10] It shows a strong antimicrobial action in high concentrations due to the release of a large number of secondary chlorates, leading to greater tissue dissolution.[2] Among dressings for the endodontic treatment of teeth with chronic periapical lesions, calcium hydroxide is recommended due to its proven bactericidal effect.[9] Calcium hydroxide has a number of positive effects due to its highly alkaline pH such as anti-bacterial activity, motivation of the mineralized tissue formation, anti-endotoxin activity, and protein denaturation and hydrolysis.[4,5,9] The root canal space is alkalinized by dissociation of calcium hydroxide into calcium and hydroxyl ions, which is not appropriate for bacterial development and proliferation.[9]

Invagination in DI type II is not totally connected to the root canal walls though it is completely surrounded by the pulp tissue.[6] Thus, cleaning of the main root canal adequately is always challenging.[9] Some authors have suggested to remove the invagination by burs, ultrasonic tips, or files.[3,4,6] In contrast, some clinicians prefer to keep the invaginated tissue to prevent extra weakening of invaginated teeth.[10] In the present case, the invagination was removed by a round bur carefully to facilitate cleaning, shaping, and filling of the canal system. In our opinion, removing the invaginated tissue did not have dramatic influence on tooth structure. Furthermore, the dental microscope was used in the process of inspection, preparation, and obturation of root canal to achieve a perfect seal of the main canal and to prevent extra removal of tooth structure.

CBCT is a useful tool to manage the complex endodontic cases.[6] It helps clinicians to achieve the optimal outcome expected, particularly in the teeth with complex anatomy presenting pulp involvement.[4] CBCT can help endodontists to obtain many detailed information about root canals and anatomy of teeth which are not achieved in corresponding intraoral radiographs.[7] Using CBCT can overcome the limitations of two-dimensional radiology.[6] In the present case, the diagnosis of type II DI was confirmed by CBCT which enabled us to make accurate treatment plan.

The early diagnosis of DI is important to apply the prophylactic approaches to prevent pulpal and periapical complications of DI.[8] There are several options for treating

DI, including preventive sealing, restorative material, intentional replantation, regenerative endodontic, and extraction.[9]

Endodontic management of this case report was challenging not only due to big periapical lesion, but also due to the complexity of root anatomy. This case report was treated successfully with conventional endodontic treatment. A reduction of periapical lesion size was obvious after 1 year, but these cases should be monitored for more time.

Conclusion

DI with involvement of pulp is considered as complicated endodontic case with the complex root canal morphology. Using calcium hydroxide, copious irrigation by hypochlorite and using dental operation microscope can be beneficial which assure long-time prognosis. In the cases of DI type II, it is possible to carefully remove the invagination to facilitate cleaning, shaping, and filling of the canal system. Furthermore, CBCT is indispensable in the complex endodontic cases to achieve optimal outcomes.

Declaration of Patient Consent

The authors, hereby, declare that they have obtained all required patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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