Case Report

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Nonsurgical Endodontic Treatment of Type II Dens Invaginatus Associated with Periapical Lesion in Maxillary Lateral Incisor: Two Years Follow-Up

Sanjeev Kunhappan[1*] Shruti Sial[2] Kishore Kumar Saraf[3] Neerja Kunhappan[4]

[1]Reader, Department of Conservative Dentistry and Endodontics, Government Dental College, Raipur, Chhattisgarh, India.
[2]Reader, Department of Conservative Dentistry and Endodontics, Government Dental College, Raipur, Chhattisgarh, India.
[3]Professor, Department of Conservative Dentistry and Endodontics, Government Dental College, Raipur, Chhattisgarh, India.
[4]Lecturer, Department of Pedodontology, Government Dental College, Raipur, Chhattisgarh, India.

ABSTRACT

Background: Dens invaginatus is a developmental anomaly that affects permanent maxillary lateral incisors, central incisors and premolars and results in an enamel-lined cavity intruding into the crown or root before the mineralization phase. It is usually in the form of a deep fissure or pit on the lingual surfaces of anterior teeth. Radiographic examination reveals an in folding of enamel and dentin which may extend deep into the pulp cavity, root and even the root apex. In such cases, communication between the invagination and the pulp causes pulp necrosis, periapical inflammation and cessation of root formation. The present case reports the nonsurgical root canal treatment of a case of type II dens in dentin in 18 years old female patient undergoing orthodontic treatment, where the invagination extended beyond the cement-enamel junction in maxillary lateral incisor with a large periradicular lesion.

Keywords: Dens invaginatus, mineral trioxide aggregate, nonsurgical endodontic treatment, periapical lesion.

INTRODUCTION

Dens invaginatus or "dens in dente" is a rare malformation of teeth resulting from the invagination of the tooth crown before mineralization occurs. This anomaly was first detected in a whale's tooth by Ploquet in 1794 and much later in 1856 Socrates identified it in human tooth.[1] Many terms have since been coined to describe the anomaly as, "Development of a tooth within other", "Dens in Dente", "Dilated composite odontome", "Gestant anomaly", "Dentinoid in dente", "Telescopic tooth".[2, 3] Hallet had suggested the use of term "Dens Invaginatus" as the enamel gets located centrally and the dentine peripherally in the invagination.

Aetiologic factors responsible for the development of dens in dente include stimulation and subsequent proliferation and ingrowth of cells of the enamel organ into the dental papilla; retardation of a focal group of cells with those surrounding continuing to proliferate normally during the dental development; external factors like trauma and infection and also genetic factors.[3] Crown of the affected teeth may have normal morphology or can show unusual forms such as a greater buccolingual dimension, peg-shaped form, barrel-shaped form, conical shapes and talon cusps.[4]

The frequency of dens invaginatus is reported to be 0.04-10%. Its prevalence is the highest in permanent lateral incisors, central incisors, premolars, canines and molars, in a descending order. It occurs more commonly in maxilla than in mandible and in permanent rather than deciduous teeth.[5]

Oehlers classified dens invaginatus into three categories according to the depth of penetration

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*Correspondence Dr. Sanjeev Kunhappan.
Department of Conservative Dentistry and Endodontics, Government Dental College, Raipur, Chhattisgarh, India.
Email: Not Disclosed

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Fig 1: Pre-operative Radiograph.

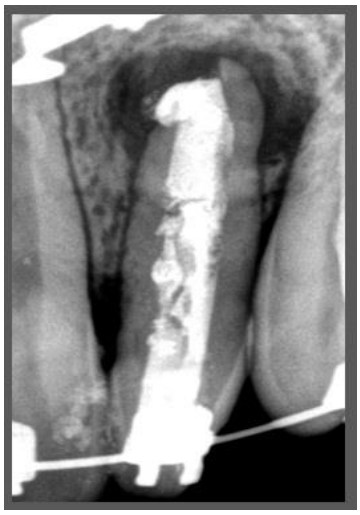

Fig 2: Radiograph showing MTA obturation.

Fig 3: Follow-up radiograph of three months.

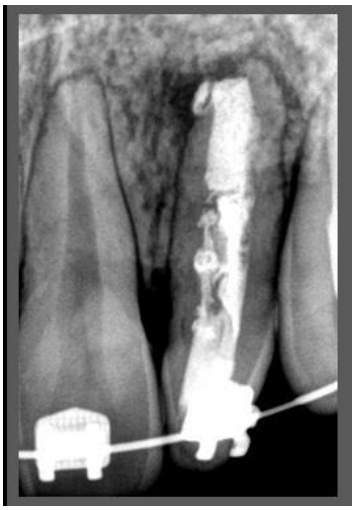

Fig 4: Follow-up radiograph of six months.

Fig 5: Follow-up radiograph of one year.

Fig 6: Follow-up radiograph of two years.

and communication with the periodontal ligament or periapical tissue. Type I cases are those in which the invagination is lined by enamel and ends as a blind sac within the confines of the crown. In type II, the enamel-lined invagination extends apically beyond the external cement-enamel junction ending as a blind sac and never reaching the periapical tissues. It may or may not communicate with pulp tissue. In type III, the invagination forms a second foramen in the apical area or ends somewhere in the periodontal ligament. It does not communicate with the pulp. Enamel can be found throughout the invagination and sometimes cementum may be observed in the invagination.[6]

As this area poses difficulty in cleaning, so caries develops soon with a subsequent pulp necrosis and apical pathosis. Sometimes the infected invagination may cause early necrosis of the pulp tissue before the completion of root development with resultant open apical foramen in the root. The treatment modalities of dens in dente range from conservative restorative procedures to nonsurgical root canal therapy, endodontic surgery, intentional replantation or extraction.[7] The complex anatomy of a dens invaginatus may compromise instrumentation, disinfection and obturation of the root canals.

This article presents a case of dens in dente with periapical lesion of maxillary left central incisor which was successfully treated with nonsurgical endodontic approach.

CASE REPORT

A 19-year-old female reported with pain and sensitivity to hot and cold on upper left anterior region. There was no history of oro-facial trauma, no contributory family or medical history but was undergoing orthodontic treatment for past 18 months. Extraoral examination revealed no significant findings. On intra-oral examination peg shaped tooth #22 with a discolored lingual pit was noted. The tooth responded positively to vertical percussion while thermal and electrical pulp vitality tests elicited a negative response. The periapical radiograph revealed complex anatomy of tooth #22 with an open root apex and extensive area of associated periapical radiolucency **(Figure-1)**. Inside the root area of tooth #22, a tooth-like structure, encompassing its own beaded radiolucency was noted. Based on clinical examination and radiographic findings a definitive diagnosis of Dens in Dente, Type II with chronic periapical abscess and open apex in tooth #22 was made.

Conservative treatment plan with nonsurgical endodontic management of dens in dente was made and discussed with patient. As the patient was wearing orthodontic appliance, isolation with rubber dam was not advisable and hence isolation was carried out with sterilized cotton rolls. After access cavity preparation pulp chamber was carefully debrided with a curette and copious sodium hypochlorite irrigation. A narrow dens cavity opening was identified adjacent to the primary root canal. There was no communication between the two canals. Dens invaginatus was left intact, preserving the intercanal septa and keeping the invaginatus portion and the original canal separate. Working length was established radiographically and was confirmed with an apex locator (Root ZX II, J Morita, USA). Both the canals were instrumented circumferentially using K-files size #40–60. Canals were irrigated by using copious amount of warm 2.5% NaOCl and saline and activated by passive ultrasonic activation technique (Satelec P5 Newtron® ultrasonic, Acteon, France) at low power. Triple antibiotic paste was then placed as intracanal medicament and access cavity sealed with Cavit G (3M ESPE; Germany) for three weeks.

During the next visit canals were chemo-mechanically prepared using K-files and 2.5% NaOCl solution. Final rinse of canals were done using 17% ethylene-di-amine-tetra acetic acid (EDTA), followed by 2.5% NaOCl and dried using sterile paper points. Both the canals were then completely obturated with mineral trioxide aggregate (Prevest Denpro, Jammu, India). Coronal cavity was sealed with composite filling material (Filtek Z250; 3M, St. Paul, MN) **(Figure-2)**. Regular follow ups were made at three months **(Figure-3)**, six months **(Figure-4)**, one year **(Figure-5)** and two years **(Figure-6)** during which the patient was asymptomatic and radiographs showed gradual trabecular reconstruction. Two years follow up radiograph revealed complete resolution of the periapical radiolucency.

DISCUSSION

The case presented here was diagnosed as an Oehlers Type II invagination as the dens invaded the root without opening into the periapical area. Such teeth usually presents with an enlarged palatal cingulum, conical morphology, barrel-shaped or increased labio-lingual size without any clinical signs of malformation.[4] The presence of deep pits and complexity of anatomy make such teeth more susceptible to caries and eventual pulp involvement, periapical inflammation and the cessation of root formation. Special endodontic techniques may be required to treat such teeth when presenting with pulpal involvement.

Depending on the morphology of the involved tooth and severity of infection various treatment modalities are advocated including preventive sealing or restoration of the invagination, root canal treatment with or without endodontic apical surgery, regenerative endodontics, intentional replantation and extraction.[7] In open apex case, the treatment should also be aimed at inducing root completion by the use of chemicals including calcium hydroxide pastes and mineral trioxide aggregate barriers.[8] In some cases isolated endodontic treatment of the invagination has been found sufficient to maintain vitality of main pulp canal. However this treatment option was not possible in the present case as there was a large periradicular lesion in association with the tooth. Surgical intervention is usually indicated in cases when (i) nonsurgical root canal treatment fails, (ii) the complex anatomy of canals do not allow access for biomechanical preparation, (iii) tooth with wide open apex requiring apexification.[9]

The first hurdle in endodontic treatment of such cases is the access cavity preparation. Invagination was left intact in this case as it was thick walled and its removal would have weakened the tooth structure. The main canal and the invagination were treated as two different canals. The root canal debridement of the invagination is also difficult because of the narrow access and unpredictable canal shape. Activation of irrigating solution by direct or indirect ultrasonic devices has proved to be more efficient in approaching and cleaning the complex anatomy of canals.[10] In this case indirect ultrasonic activation was performed by P5 Newtron device.

Mechanical preparation alone may not be sufficient to achieve asepsis in the complex anatomy of the canal so the role of intracanal medicament should not be underestimated. Calcium hydroxide as intracanal medicament demands long time for effective action and has been shown to promote root fractures or allow re-infection between treatment sessions.[11] Moreover bacteria associated with persistent apical infections buffer the high pH produced by calcium hydroxide. The use of triple antibiotic paste consisting of ciprofloxacin, metronidazole and minocycline as intra canal medicament has been advocated due to its bactericidal properties. In the present case, the use of triple antibiotic paste showed remarkable reduction in the symptoms.

Earlier, calcium hydroxide was commonly used for apexification in open apex cases.[12] But bacteria in inaccessible areas of the canal system often could not be removed by instrumentation, irrigation and disinfection with calcium hydroxide in immature teeth with periapical periodontitis and thus failing the apexification.[13] As the case presented with an open apex the treatment was aimed not only to hermetically seal the canals but also to achieve apexification.

Closure of the open apex was planned by one-step apexification using MTA plug at the root end. Studies have shown that filling of the entire canal with MTA enhances root strength and fracture resistance.[14] Considering these property both the dens cavity and the main canal were completely obturated with MTA with aim to reinforce the root strength and prevent root fracture after endodontic therapy. The use of MTA root-end filling material was also preferred because of its high biocompatibility, stimulation of hard tissue formation and superior sealing ability. Due to alkaline pH it creates an ideal antibacterial environment for healing. Torabinejad et al. suggested that MTA results in the regeneration of periapical tissues associated with cementogenesis.[15]

Different treatment protocols of cases of dens have shown different healing times. In the present case a reduction of the size of the periapical lesion was

noticed after 1 year but showed complete healing in two years.

CONCLUSION

Dens invaginatus is a dental anomaly of embryological origin showing a broad spectrum of morphologic variations. Early diagnosis and preventive measures are helpful to prevent complications in dens invaginatus cases. Endodontic treatment of such teeth is complicated because of the complex root canal anatomy. Successful treatment depends on the proper understanding and knowledge of the variations in the canal configuration of such teeth. In the present case, type II dens in dente presenting with periapical pathology and open apex was successfully treated by orthograde MTA obturation cum apexification at the same time. The septa of dens cavity was preserved and both the canal and the dens canal were obturated separately with the aim to prevent root fracture. The periapical lesion showed complete resolution in follow up radiographs after two years.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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