Endodontic Management of Unusual Case of Type II Dens Invaginatus – A Case Report

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ABSTRACT: A thorough knowledge of the normal anatomy of the root canal system as well as the possible aberrancies is imperative for success of endodontic therapy. The challenge lies in diagnosing these conditions properly, complete debridement of the root canal system, and 3-dimensional sealing of the same. Morphological dental anomalies of the maxillary lateral incisors are relatively common. Endodontic treatment for teeth that exhibit the dental anomaly, dens invaginatus, can be difficult due to the bizarre anatomy and relative inaccessibility of the diseased pulp tissue. Dens invaginatus is a developmental malformation of teeth. Affected teeth show a deep infolding of enamel and dentine starting from the foramen caecum or even the tip of the cusps and which may extend deep into the root. The malformation shows a broad spectrum of morphologic variations and frequently results in early pulp necrosis. Dens invaginatus is a critical condition for endodontic treatment once it frequently presents a complex internal anatomy and might be associated with incomplete root and apical development. Therefore every effort must be made to identify and diagnose the variation. This article presents an Unusual case of Endodontic Management of maxillary left lateral incisor with Type II Dens Invaginatus.

Keywords: Dens invaginatus, Endodontic management, Maxillary lateral incisors, Root canal anatomy.

I. INTRODUCTION

Anatomic variations of the root canal system are a commonly occurring phenomenon. Conditions like developmental tooth disturbances pose a challenge to the clinician in diagnosis as well as treatment because of its complex crown and root canal morphology. One such rare developmental anomaly of teeth is dens invaginatus, which results from the invagination of the enamel organ into the dental papilla before calcification has occurred [1]. The presumed etiology of this phenomenon has been related to focal growth retardation, growth pressure of the dental arch, localized external pressure in certain areas of the tooth bud, infection, and trauma. Its prevalence ranges from 0.04%–10%, with the maxillary lateral incisors being the most commonly affected and less frequently the central incisors. Because of the radiographic appearance that gives the appearance of the tooth within a tooth, dens invaginatus is also referred to as dens in dente. It is also called invaginated odontome, dilated composite odontome, and dents telescope [2]. Ehlers [3] classified dens invaginatus into 3 types on the basis of severity [“Fig. 1”]: type I, an enamel-lined minor form occurring within the confines of the crown not extending beyond the cement-enamel junction; type II, an enamel-lined form that invades the root but remains confined as a blind sac and might or might not communicate with the pulp; and type III, a form that penetrates through the root perforating at the apical area, showing a second foramen in the
apical or in the periodontal area. The clinical appearance of dens invaginatus varies considerably. The crown of affected teeth can be of normal morphology but can also be associated with unusual forms like greater labiobulgar diameter, peg-shaped, barrel-shaped, and conical and talons cusp. A deep foramen caecum might be the first clinical sign indicating the presence of an invaginated tooth [2]. Frequently structural defects exist in the depth of the invaginations; these deep invaginations are difficult to access and clean [3]. As a consequence, there is development of caries and subsequent necrosis of the dental pulp, as well as abscess and cyst formation [4]. If these teeth have open root apices, they present an additional challenge in controlling the apical extent of the root filling and in restoring the apical part [5]. Therefore, early diagnosis and treatment of such cases are important in preventing pulp infection via the invagination. Such complex root canal anatomies have been conventionally diagnosed by radiographs, which provide sufficient information to the clinician. These modalities, however, do not provide detailed information concerning the 3-dimensional image, which would help the clinician in making a confirmatory diagnosis and determining the treatment plan before undertaking the actual treatment plan [4].

Dens invaginatus may require treatment that can range from less invasive procedures to a combination of complementary therapies (Hu’ Ismann 1997) associated with advanced technical resources for diagnosis and treatment planning (Alani & Bishop 2008, Reddy et al. 2008). Depending on degree of malformation and the presence of clinical symptoms, there are different treatment modalities. Even without symptoms, dental treatment of dens invaginatus is considered necessary because access of irritants to the invagination might result in immediate or eventual contact with the dental pulp. If prophylactic and restorative treatment is not possible, conventional root canal treatment is the method of choice [8]. In case of pulp involvement, root canal treatment has been recommended with high success rates (Rotstein et al. 1987, Szajkis & Kaufman 1993). Depending on the type and degree of malformation, endodontic therapy might be confined to the invagination, thus preserving the vitality of the pulp [8]. The removal of dens invaginatus and subsequent root canal treatment have also been described (9). Endodontic surgery is the treatment modality indicated when root canal treatment fails, or when root canal treatment or retreatment is impossible or would not achieve better results. It is also indicated for cases of severe forms of dens invaginatus. In other cases, combined treatment may be necessary, that is, root canal treatment followed by endodontic surgery.[6]

With increasing reports of aberrant canal morphology along with technically improved clinical environment, the clinicians needs to be aware of this strange anatomy. This article describes the successful endodontic management of an Unusual case of maxillary lateral incisor with Type II Dens Invaginatus

II. CASE REPORT

A 20-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, with the chief complaint of pain in relation to the upper anterior teeth 1 month earlier, but at the time of examination there were no symptoms. The patient’s medical history was noncontributory. Intraoral soft tissue was free of pathologic signs. Examination of the dentition revealed proclamation of maxillary anterior teeth and missing right lateral incisor.”[figure 2”] There was decay or discoloration in relation to maxillary left lateral incisor. Intraoral examination revealed well delineated grooves with deep pit with 22. The tooth did not respond to a cold test or EPT, and the history of a previous trauma was negative. Periodontal probing was within normal limits. Radiographic examination with periapical radiographs revealed the appearance of enamel invagination into coronal portion of dens invaginatus but could not reveal the details of the type of dens. [“figure 3”]. For further accurate diagnosis, CBCT scans (Planmeca ) were taken, shows an inverted teardrop shaped radiolucency with a radiopaque border due to infolding of the enamel lining which appear more radiopaque seen in the maxillary lateral incisors suggestive of dens invaginatus. From these scans and 3-dimensional reconstruction, it was diagnosed as Oehlers type II dens invaginatus. [“figure 4”]. The diagnosis was irreversible pulpitis & Acute apical periodontitis in 22. Informed consent was obtained from the patient. Treatment of similar, previously reported cases has involved cleaning, shaping, and obturation of multiple, separate canal systems [9][10]

After isolation of tooth with rubber dam(Hygienic Dental Dam, Coltene Whaledent, Germany), Endodontic therapy was initiated with the aid of a dental-operating microscope at magnification of 5x,8x (opto ). Two separate pulpal entities were located[“figure5”]. A central component was contained in an apparently cylindrical mass of hard tissue. A second, larger volume of pulp tissue surrounded the central structure on the palatal aspect, extending laterally and labially (“Figure 6”). Removal of all pulp tissue was attempted. Microscopic inspection of the labial extensions of the canal system gave the clinical impression that the central anomalous structure was a separate entity from the root proper and that a minute fin of tissue entirely surrounded it (“Fig. 5”). Ultrasonic instrumentation (Obtura Spartan, Fenton, MO) was employed to disrupt and break away the central hard tissue from the canal. Complete removal of the central-anomalous structure was accomplished, allowing the total removal of pulp tissue. This resulted in the apical foramen being approximately
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3 mm in diameter. Working length of the 2 canals was established radiographically, and the canals were shaped to size 35 (Dentsply Maillefer, Ballaigues, Switzerland )["Fig. 7"], Copious irrigation was done with 3% H2O2(Merck Specialties, Mumbai, India) and 2% chlorhexidine (R4; Septodont, Saint-Maur-des-Fosses, France) during the cleaning and shaping procedure. Calcium hydroxide (ApexCal; Ivoclar Vivadent, Schaan, Liechtenstein) was used as an intracanal medicament, and tooth was restored temporarily with Coltosol F (Coltene Whaledent, Alstatten, Switzerland). The patient was recalled after 1 week.

In the next visit, rubber dam was placed as described above. The tooth was reaccessed calcium hydroxide dressing was flushed out using alternating irrigation with 3% NaOCl and 17% ethylenediaminetetraacetic acid (Glyde File Prep, Densply, France) to remove the smear layer . The canal was irrigated with final rinse of 2% chlorhexidine gluconate and was dried using paper points. Working length determined with radiograph and confirmed with help of apex locater ( Root ZX Mini J,Morita).["figure 7"] Cleaning & shaping done with Hybrid technique. The canal was dried, inspected microscopically, and coated with AH 26 + sealer & Obturation was accomplished with thermoplasticized gutta-percha by utilizing the Obtura II (EQ plus Spartan) to deliver the gutta-percha. The filling material was placed incrementally and vertically compacted to the level of the junction of the middle and cervical thirds of the canal. The access cavity was sealed with a light-cured, bonded composite ["figure8"] A light filter was attached to the dental-operating microscope to prevent premature polymerization of the restorative material . Patient was advised further orthodontic treatment for proclined maxillary anterior teeth.

Figure 1. Classification of Dens invaginatus, Oehlers (1957) class I, class II, class III.

Figure 2 Preoperative clinical photograph showing deep palatal pit with 12
Figure 3 Preoperative IOPA showing enamel invagination into coronal portion with 22

Figure 4 CBCT Images shows an inverted teardrop shaped radiolucency with a radiopaque border.

Figure 5 Access opening done under DOM (Opto.) at magnification of 5x.

Figure 6 Complete removal of the central-anomalous structure
III. DISCUSSION

Until not long ago, to be involved with a case of Dens invaginatus was considered a rare event. Today, however, probably because of a greater understanding of the problem and an increased number of screenings, it is no longer so rare to come upon an invagination. The clinical case described here represents an anomaly that lies outside traditional cases. Dens invaginatus is undoubtedly an endodontic challenge, especially because of the complex root canal morphology and because of the difficulty accessing the regular and invaginated canals. Such cases always pose a challenge to the clinician in diagnosis as well as in treatment. Inability to locate, debride, and obturate complex root canal spaces will lead to failure in some cases. Because of the inherent limitations of the radiographs, they could not reveal the details of the type and extent of the dens invaginatus; CBCT was used for diagnosis in the present case.

The major advantage of CBCT is the elimination of the superimposition of anatomic structures and view CBCT images in the proximal and axial planes. The benefits of CT scans were that they gave a sharp, focused, and 3-dimensional view of the invaginatus; the type and the extent were also clearly evident from the scans. These advantages make us to reach upto final diagnosis of type II Dens invaginatus. The present case reports the presence of an Oehler's type II dens invaginatus in the maxillary right lateral incisor, this was confirmed from the CBCT scans. This case was a challenge for root canal treatment, requiring knowledge and clinical experience. However, clinically the invagination did not communicate with the pulp, but the microscopic communications or the dentinal tubule communications would have made the primary canal necrotic. Probably the early necrosis of the pulp, likely caused by the microscopic communications between the...
dens and the pulp Several treatment options for dens invaginatus have been reported, including preventive restorative treatment, root canal treatment, combined root canal treatment and surgical treatment, intentional replantation, and extraction [11]. The difficulties of treatment in such cases are closely related to the complexity, the type, and extent of invagination. Dens Invaginatus can be diagnosed in routine dental examinations associated with asymptomatic periradicular radiolucency. Teeth with invaginations are more susceptible to caries, because deep pits and irregularities act as a place for microorganism colonization and substrate stagnation. Minor invaginations are frequently associated with healthy teeth.

The use of the dental-operating microscope and ultrasonic instrumentation has provided new capabilities for visualizing and dealing with anomalies, such as the one encountered in the present case. The ultrasonic removal of such an entity from the confines of a root canal is a technique that is sensitive to the size, location, and accessibility of the anomalous structure and the pulp recesses. It is the opinion of the authors that some forms of severe dens invaginatus can be treated with conventional techniques if the microscopic procedure described here is used. The presence of a single canal between the two apexes made the selective instrumentation of the regular apex fairly difficult; the procedure was performed under the operating microscope This should increase the success rate for nonsurgical treatment of this unusual condition. Utilization of AH Plus sealer along with gutta-percha has been shown to have better apical sealing ability and adaptation to dentin [12]. This type of treatment has provided satisfactory clinical and radiographic outcomes. The development and availability of newer sophisticated diagnostic aids make it easier to diagnose such cases. All the increasing amount of information on the morphologic, radiographic, clinical, and treatment aspects of a Dens invaginatus may be used by the clinician to implement the preventive measures to preserve the vital systems of the tooth and its integrity. When the patient could be suffering from acute pain and/or abscesses but has no history of trauma or clinical evidence of caries or restorations, the presence of invagination should be suspected and any available diagnostic tool should be used. Lack of proper knowledge of root canal morphology, proper instrumentation and irrigation protocol, missed canal, various anatomical variations & poor quality of obturation can act as nidus of infection which ultimately leads to unfavorable endodontic treatment in dental anomalies like dens invaginatus[14]. Early diagnosis of dens invaginatus that is in communication with the oral cavity and the periapical area radiographically should be endodontically treated to avoid future problems such as formation of periapical abscess.

IV. CONCLUSION

Due to the high incidence of developmental anomalies involving maxillary lateral incisors, these teeth should be thoroughly investigated to avoid the risk of developing pulpal and periapical pathologies. The developmental anomalies thus established should be strictly monitored from time to time. Diagnostic information directly influences clinical decisions and the treatment outcomes. Dental operating microscope provides the clinician with superior lighting and magnification. Ability to treat cases that previously may have been deemed untreatable or resulted in a compromised prognosis. This huge shift in clinical accuracy from low magnification “tactile-driven” endodontics to DOM “vision-based” endodontics is bringing a revolution to the field of endodontics with greater success rate. The use of CBCT contributed to determine the actual extension of the apical periodontitis associated with a maxillary right lateral incisor with type II dens invaginatus and provided more details of the internal anatomy of this developmental dental anomaly. Newer improved diagnostic aids as Dental operating microscope ,CBCT, that are more quicker, easier and precise diagnostic means will help in a proper diagnosis, treatment plan and increase the long term success of treatment.

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