Endodontic Management of Extensive Dens Invaginatus treated with a Novel Approach: A Case Report

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Abstract

Background: Endodontic treatment of teeth that exhibit the dental anomaly called "Dens Invaginatus" is quite challenging due to the operator's inaccessibility to the diseased pulp in the complex root anatomy. Surgical intervention and extraction are the common approaches to deal with this condition. This case report describes a type three dens invaginatus of maxillary lateral incisor with atypical root canal anatomy that was successfully treated by non – surgical endodontics.

Keywords: CBCT, Dens in dente, unusual anatomy

INTRODUCTION

Dens Invaginatus (DI) is a developmental anomaly resulting in a deepening or invagination of the enamel organ into the dental papilla prior to calcification of the dental tissues.[1] Hovland and Block estimated the incidence as 0.04% to 10%, possibly occurring in any tooth, affecting either deciduous or permanent dentition and commonly involving the upper lateral incisors (43% of all cases). Cases of bilateral and multiple occurrences have also been reported. This condition is also known as "Dens in Dente", "Dilated composite odontome" "Gestant odontoma", "Dentinoid in dente" or "Telescopic tooth". Hallet introduced the term Dens Invaginatus in order to clarify the point that enamel is located centrally and the dentine peripherally due to the invagination. Since then it has been a preferred term, although dens in dente is a more commonly used term.[2] It was described for the first time in 1794 by **Ploquet** who found this malformation in a whale's tooth. A dentist by the name of **Socrates** in 1856 was the first to report a dens in dente in human teeth. The etiology of dens invaginatus malformation is controversial and remains unclear. Over the last decades several theories have been proposed to explain the aetiology of dental coronal invaginations.[3,4] **Kronfeld** speculated that dens invaginatus is caused by a failure in growth of the internal dental epithelium while at the same time there is also a proliferation of the surrounding normal epithelium, producing a static area of engulfing. Most authors meanwhile consider Dens Invaginatus as a deep folding of the foramen coecum during tooth development which in some cases even may result in a second apical foramen. On the other hand, the invagination also may start from the incisal edge of the tooth. Genetic factors cannot be excluded. Most cases of dens invaginatus are detected after a routine

radiographic evaluation with a panoramic x-ray and confirmed with a periapical film.[5] Clinically, a morphologic alteration of the crown or a deep Foramen Coecum can serve as an indication for the diagnosis of dens invaginatus. Histological, fragile hypomineralized enamel is frequently seen at the site of the invagination; this condition facilitates the formation of dental caries and the penetration of microorganisms from the saliva directly into the pulp, leading to pulp necrosis and the development of a periradicular inflammatory process. Endodontic treatment of such teeth is challenging due to complex root canal anatomy and difficult access to the canals and the apices. The most commonly advocated treatment for such teeth has been the extraction of dens and the root canal treatment of the remaining tooth.[6] This report describes a case of unilateral type III Dens Invaginatus associated with the maxillary lateral incisor that was treated with a novel approach without extracting the Dens in dente.

CASE REPORT

A 27-year-old female reported with a chief complaint of swelling in the upper left front of the jaw. The patient described diffuse swelling in the left front of the cheek, which had resulted in elevation of the ala of her nose. On intraoral examination, a deep pit was observed on the labial surface of the permanent maxillary left lateral incisor with slight discoloration of the crown (Fig. 1A and 1B). The tooth responded positively to vertical percussion. Examination of a preoperative radiograph showed the presence of dens invaginatus of the maxillary left lateral incisor with an apical radiolucent area (Fig. 1C). A diagnosis of type III (Oehlers) Dens Invaginatus with dento-alveolar abscess was made. The patient had a noncontributory medical history. Cone Beam Computed Tomography (CBCT) scans were performed to precisely identify the root canal anatomy. Examination of the computed tomography scans revealed a complex anatomy of the tooth with multiple canals (Fig. 1D and 2A). Radiographically, one can observe an uncommon morphology of the crown and root, as well as the presence of periapical lesion**,** increasing size of the pulp chamber and root canal ending in two apices. A diagnosis of irreversible pulpitis with chronic apical abscess was made and decided to carry out nonsurgical root canal therapy. The treatment plan was explained to the patient and her consent obtained. After administering local anaesthesia (Lignox 2% A, Warren, Indoco) the tooth was isolated under rubber dam and access cavity prepared. Magnifying loops (Seiler) were used to help locate the canals. A No. 10 K-flex file (Dentsply, Maillefer) was inserted, and radiographs were obtained. The working length was determined with No. 15K file. (Fig. 2B), and the canals were cleaned and shaped with a No. 25K file using a standardized technique. As a result, the canal in the invagination was treated as a separate canal, and we performed root canal treatment. If the invaginations are minor, burring through the invagination reduces the chance of lateral perforation and, hence, the root canal treatment of such teeth can be carried out more easily.

Sometimes, the invagination must be treated as a separate root canal. In the present case, the invagination was left for two important reasons.

- The first reason was the invagination was thick and its removal would have weakened the tooth structure.
- The second reason was the inadequate length of bur and insufficient accessibility to the invagination.

Because of the enamel invagination, the dens invaginatus filling has a wide and bulky cavity, requiring an obturation with filling material. The three canals were finally obturated with a cold lateral compaction technique using a resin based sealer (Fig. 2C). As the patient could not afford full coverage crown the labial surface was restored with composite resin (Fig. 2D) to enhance the aesthetics.

DISCUSSION

Dens invaginatus has been defined as a defect in tooth development, characterized by invagination of the enamel organ before the calcification phase.[7] Several authors have proposed to classify the radiographic and clinical presentations of DI, however, Oehlers'(1957) classification appears to be

the most popular, due to its simple nomenclature and easy application.[4] He categorized invaginations into three classes determined by how far they extend radiographically from the crown into the root:

Type I: the invagination is minimal and enamel-lined; it is confined within the crown and does not extend beyond the level of the external amelo-cemental junction.

Type II: the invagination is enamel-lined and extends into the pulp chamber but remains within the root canal with no communication with the periodontal ligament.

Type III: the invagination extends through the root until the apical foramen and communicates with the periodontal ligament. Usually, there is no communication with the pulp.

Teeth with invagination are more susceptible to carious lesions as a consequence of the pulpal topography that serves as retention material, as well as structural defects at these areas, where the enamel is badly formed or is not present.[1] Numerous thin canals allow communication with the pulp, making it possible for microorganisms and their products to reach the pulp, leading to pulpal infection and necrosis, as in the present case. The gender predilection for DI i.e., male to female ratio is 1:1.7, with a slight female predilection. Our study co-related this finding, wherein we observed that the male to female ratio was 1:1.2, with female predilection.[8] Dens invaginatus is clinically significant due to the possibility of the pulp being affected. As pulpal involvement of teeth with coronal invaginations may occur shortly after tooth eruption, an early diagnosis is mandatory to instigate preventive treatment. Clinical examination may reveal a deep fissure or pit on the surface of an anterior tooth. Due to the tortuous lingual anatomy, it is possible for caries to develop inside the invagination without any clinically detectable lesion. Since the enamel lining is thin and in close proximity to the pulp chamber, a carious lesion could easily perforate the pulp chamber. Further, there are sometimes thin canals within the enamel of the dens invaginatus, forming a direct communication with the pulp. Hence pulpitis and necrotic pulps are often associated with this anomaly. The other reported sequelae of undiagnosed and untreated coronal invaginations are retention of neighboring teeth, displacement of teeth, cysts and internal resorption.[6] Early diagnosis of dens invaginatus is crucial and requires thorough clinical examination of all teeth, especially lateral incisors. The examination should check for the presence of palato-radicular groove and deep pits on the palatal surfaces of maxillary anterior teeth, particularly the lateral incisors.[9] The present condition can be seen as soon as the maxillary anterior teeth erupt in the oral cavity by the age of 7 to 10 years. The condition can be diagnosed based on clinical and radiographic findings. The invagination provides a place for bacterial growth and may endanger the integrity of the main canal. Early detection and sealing of the invagination's opening with acid-etch resin can effectively prevent these complications.

If no radiographic signs of pulp necrosis are present and no communication exists between the invagination and root canal, a pulp sensivity test should be performed and followed by a adequate filling of the invagination with a suitable restorative materials. Root canal treatment is indicated when the invagination has a separate apical or lateral foramen, as in the present case report.In some situations, burring through the invagination to reach the apical foramen may be possible. When minor forms of invaginations are eliminated, root canal treatment typically will not present further problems.[10]

CONCLUSION

Dens invaginatus can be recognized before the eruption of the tooth from periapical radiographs. So these teeth should be treated prophylactically as soon as possible after tooth eruption. Early diagnosis and intervention can definitely prevent pulpal necrosis and the potential loss of tooth. The nonsurgical endodontic management of the complex root canal morphology of these teeth is a successful alternative to the more invasive surgical intervention. Operator skill in locating these abnormal courses of the root

canals will eliminate the procedural errors which could occur while searching for the canal in its normal position. Knowledge about such unexpected variations in root canal anatomy and its immediate conservative treatment is the key to the successful management of the anomalies of tooth.

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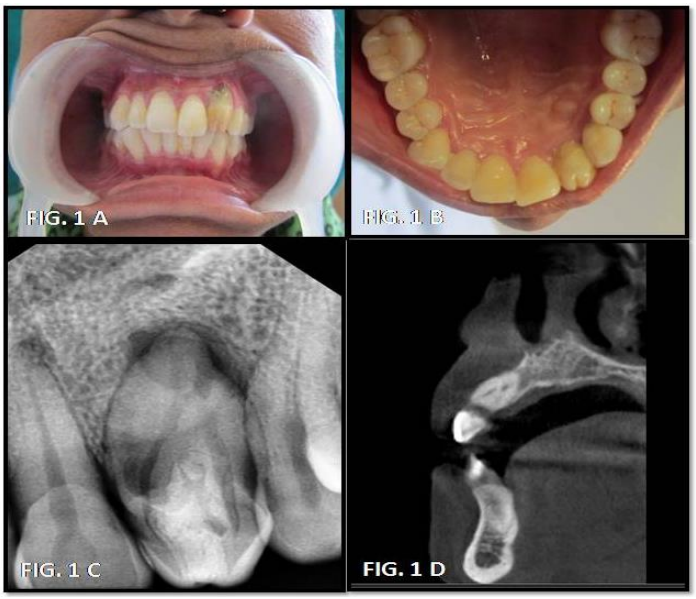

Fig.1 A Pre operative intra oral frontal view of left maxillary lateral incisor. Note the perforation in the cervical third of labial surface.

Fig.1 B Pre-operative occlusal view.

Fig.1 C Pre operative intraoral periapical radiograph. Note the well-defined type III dens invaginatus with the canal morphology.

Fig.1 D Pre operative CBCT (Sagittal section).

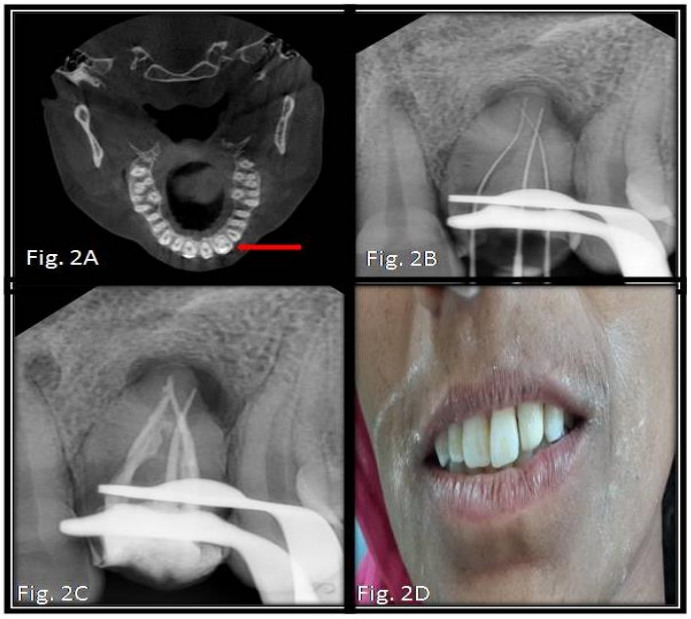

Fig.2 A Pre operative CBCT (Axial section). Note the three coronal orifices
Fig.2 B Working Length Radiograph. All three canals are negotiated to the apex.
Fig.2 C Post Obturation radiograph.
Fig.2 D Post operative frontal view after restoring the defect with resin-based composite.