Misdiagnosed Case Management of Dens Invaginatus Using Cone Beam Computed Tomography- A Case Report

Abstract:
Dens invaginatus (DI) is a developmental malformation that poses diagnostic difficulties in the clinical context. For the diagnosis of complex root canal system including DI clinician must have a thorough knowledge of root canal anatomy and be aware of its anatomic diversities. Early diagnosis and preventive treatment measures can reduce the future need for endodontic treatment. Three-dimensional images obtained with Cone Beam Computed Tomography (CBCT) are invaluable in the diagnosis of the extent of this anomaly and the appropriate treatment planning. This report describes the successful management of a misdiagnosed case of Oehler's Type II DI in permanent maxillary lateral incisors were the general dentist fails to identify and diagnose the anomaly.

Key-words: Dens invaginatus, dental anomaly, misdiagnosed case

Introduction:

The intricacies and variations of the root canal system present a continuous challenge to endodontic diagnosis, treatment, and prognosis. Maxillary lateral incisors have a variety of shapes resulting in diagnostic and treatment challenges and one such anomaly is Dens invaginatus (DI). DI is a developmental malformation resembling the appearance of a “tooth within a tooth”. It presents a wide variety of morphological variations affecting the tooth crown, root, or both.[1] Properly identifying and diagnosing any anatomic malformations is crucial to managing it.

DI is usually detected during routine radiographic evaluation.[2] It may be symmetric or asymmetric and occur either unilaterally or bilaterally.[3-6] The invagination shape may varying from a narrow and undilated fissure to a tear-shape loop pointing towards the main body of the pulp.[6,7] Radiographically the invagination may appear as a radiolucent pocket surrounded by a radiopaque border of equal density to the enamel and extending from the crown toward the root canal.[8] It may be completely separate from the pulp like a pseudocanal and manifested as a deep enamel-lined fissure with its own opening into the periodontal ligament. In such cases, pulp sensibility tests can remain normal despite the presence of a periapical radiolucent lesion associated with the psuedocanal.[1]

The presumed aetiology of DI has been related either to focal growth retardation or focal growth stimulation, or to localized external pressure in certain areas of the tooth bud.[10] The condition may affect in any deciduous or permanent tooth. The

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reported prevalence of DI in permanent dentition varies from 0.17% to 26.1%.[11] Maxillary lateral incisors are the most frequently affected.[12]

This case report describes Oehler's Type II DI in permanent maxillary lateral incisor with periapical lesion managed successfully with a nonsurgical endodontic therapy with Cone Beam Computed Tomography (CBCT).

Case Report:

A 16 year old female patient reported to the Department of Conservative Dentistry and Endodontics, Royal dental college, Kerala with a chief complaint of pain on upper right front tooth region over the past 6 months. Pain aggrevated on taking hot food and on mastication. Patient also reported a history of root canal treatment on the same tooth one year back because of pain and swelling.

On clinical examination, the right maxillary lateral incisor (tooth #12) appeared to have alteration in palatal surface morphology suggestive of attempted endodontic access cavity. The temporary restoration within the access cavity had been missing. There was no discoloration of the crown. The tooth had mild tenderness on percussion. The mucosa and the underlying alveolar bone were not tender to palpation. Gingival probing depths and tooth mobility were within physiologic limits. The tooth did not respond to electric and thermal pulp sensibility tests whilst the contralateral and adjacent teeth responded within normal limits.

The Intra Oral Periapical Radiograph (IOPAR) of tooth # 12 showed a mature lateral incisor with a sac shape radioopacity invaginating to the coronal third of root canal. The tooth # 22 also showed a mesial radiolucent invagination, limited to dental crown. (Figure:1 IOPAR of tooth # 12 and 22). From clinical and radiographic findings a diagnosis of DI were made on tooth # 12 and tooth # 22. To assess the type, communication and depth of invagination CBCT imaging was performed. The CBCT images showed that invagination did not appear to communicate with the pulp. Based on the clinical, radiographic and sensitivity test a diagnosis of previously initiated endodontic therapy associated with DI type II and symptomatic apical periodontitis was made on tooth # 12 (Figure 2: CBCT images of tooth # 12 -Axial, Coronal, Sagittal).

The tooth # 12 was anesthetized with 2% lidocaine hydrochloride 1:100,000 epinephrine and isolated using a rubber dam. The main canal (primary canal) and invagination orifice were located. (Figure 3: Intraoral photograph of invagination orifice, Figure 4: Invagination located with k file). A radiograph with files in the root canals was taken. The working length was established and recorded. (Figure 5: IOPAR of working length of primary canal and invagination orifice). The canal system was debrided thoroughly and prepared by the step-back technique to size 40 k file (primary canal) and to size 25 k file (invagination). (Figure 6:IOPAR of master cone of primary canal and invagination orifice). Copious irrigation with 3% sodium hypochlorite solution was carried out throughout the procedure. After drying the root canals with absorbent points, the DI and primary root canal were obturated by lateral condensation using gutta-percha and AH plus sealer (Figure7: Obturation of primary canal and invagination orifice). The postendodontic restoration was done using universal composite resin. Prophylactic composite restoration was done on tooth # 22.

Discussion;

Clinically, early diagnosis of DI is important for a better prognosis. A deep foramen caecum on the palatal or occlusal surface of the tooth is the entrance of the invagination.[13,14] The formation of a palatal groove sometimes results from a cingulum bifurcation. A specific crown morphology like barrel-shaped or cone-shaped teeth or dilated crown may indicate the existence of DI. Although variations in crown morphology alone do not determine the presence of DI, the initial diagnosis is often made according to crown morphology.

Generally, radiographic examination is more reliable in diagnosing DI. If the affected DI teeth have clinical symptoms of pulp or periapical disease, radiographic examination is routinely used to detect DI. However, not all affected teeth show clear clinical signs. Therefore, radiographs should be taken when teeth have an abnormal crown morphology to confirm whether DI exists. Patients who have been diagnosed with DI in one tooth should be highly suspected of DI in the contra lateral tooth.

Different diagnostic imaging techniques aid in the diagnosis and treatment planning of developmental anomalies. Three-dimensional images formed by CBCT is superior to two-dimensional radiographs in diagnosing DI because it provides detailed information on the internal root canal system of affected teeth. More recently, with the widespread use of three-dimensional imaging in endodontics, the diagnosis and management of complicated cases have become more efficient. CBCT is advanced in analyzing complex root canal systems with a relatively low radiation dose, less time requirement and high resolution and accuracy. However, the clinician should carefully weigh the advantages and disadvantages before using this technique in clinic.

In the present case, CBCT images were useful in assessing the true nature of the invagination, in particular, the relationship of the invagination with the primary root canal. That will help not only in definitive diagnosis but also in treatment planning. The locations of the primary root canal and the invagination, as assessed from CBCT scan images, helped in designing the access cavity, thus conserving the tooth structure.

Several classifications have been suggested to describe DI. The most commonly used was proposed by Oehlers (1957),[9] dividing it into 3 types according to the depth of penetration and communication with the periapical tissues or periodontal ligament. But Oehler's classification fails to explain the true extent and complexity of the invagination as it is based on the radiographic representation. Therefore, a classification for treatment protocol needs to be devised on the basis of advanced three-dimensional imaging.

Several treatment modalities have been described for DI, all related to the degree of anatomical complexity. The principle in selecting the treatment options is maintaining the vitality of pulp or preserving the tooth by the least invasive method. The treatment methods include preventive sealing of the invagination, root canal treatment, endodontic apical surgery, revascularisation and extraction. Endodontic treatment of such teeth is often complicated by unusual forms and location of invagination that complicate thorough debridement.

The present case was a type 2 DI in tooth # 12 in which invagination remains confined within the root as a blind sac, which may communicate with the pulp. However, in this case CBCT showed that invagination did not appear to communicate with the pulpand the pulp chamber appears to be narrowed from coronal to middle third of the tooth with a parallel invagination outlined by hyperdensity which was isodense with enamel having discontinuous hypodensity. Tooth # 22 was a type 1 DI with invagination confined in coronal portion which was treated by prophylactic composite restoration.

Early detection of DI should be based on a thorough clinical and radiographic evaluation. CBCT images are useful for diagnosis as well as treatment planning of DI. In the present case the general dentist might have overlooked the case and had started endodontic therapy without properly understanding the cause of pain. Ideally it should have been endodontically treated only the invaginated canal or sealing the invagination. Hence the clinician should have good knowledge about root canal anatomy and the possible variation to avoid such misdiagnosis and end up in incorrect treatment plan.

Figure 1: IOPAR of tooth #12 and 22

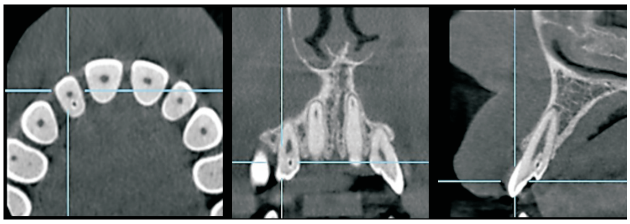

Figure 2 : CBCT images of tooth #12-Axial, Coronal, Sagittal view

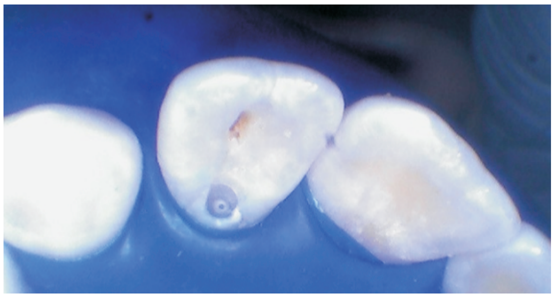

Figure 3 : Intraoral photograph of invagination orifice

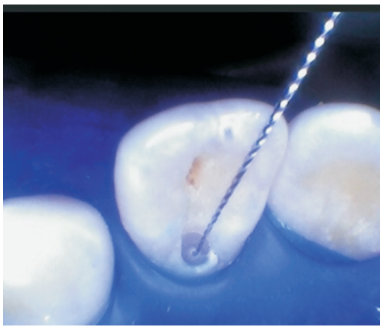

Figure 4:Invagination located with k file

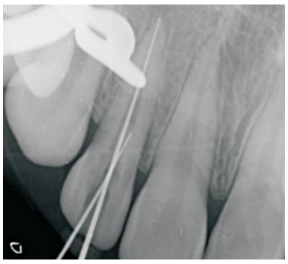

Figure 5: IOPAR of working length of primary canal and invagination orifice

Figure 6 : IOPAR of master cone of primary canal and invagination orifice

Figure 7 : Obturation of primary canal and invagination orifice

Conclusion:

The present case illustrates a misdiagnosed case of DI were the general dentist fails to identify and diagnose the anomaly of tooth no.12. The clinician should have good knowledge about radicular anatomy and the possible variation to avoid such misdiagnosis and end up in incorrect treatment plan. A final diagnosis should be made based on the correlation of the clinical findings, accurate radiographic interpretation and other investigation procedures.

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