

## Non surgical management of type II dens invaginatus with open apex: A case report

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### Abstract

Dens invaginatus is a rare malformation of teeth with a large variation in tooth morphology. Maxillary lateral incisors are the most commonly affected teeth. This article demonstrates management of maxillary central incisor with type II dens invaginatus (DI) with open apex and periapical lesion. Calcium hydroxide was used as intracanal medicament for apexification followed by obturation with guttapercha. CBCT (Cone Beam Computed Tomography) was used for diagnosis and treatment planning. One year follow up shows good periapical healing.

**Keywords:** Dens Invaginatus, Calcium Hydroxide, Cone Beam Computed Tomography.

### Introduction

Dens invaginatus is a developmental anomaly of teeth most commonly affecting the maxillary lateral incisors. It is also seen in maxillary central incisors and premolars.<sup>1</sup> It occurs due to invagination of the enamel organ into the dental papilla before calcification. It may appear as a small lingual pit in the cingulum to broad frank tracts visually or radiographically.<sup>1</sup> There is increased risk of caries, pulpal pathosis and periodontal inflammation in dens invaginatus cases.<sup>2</sup> The varied anatomy also complicates the root canal treatment.<sup>3,4</sup>

The anomaly of dens invaginatus was first described by Ploquet in 1794 in whale's tooth. It was first described in human's tooth by a dentist named Socrates in 1856.<sup>5</sup> The incidence of dens invaginatus has been reported to be in a range of 0.04% and 10%.<sup>5</sup>

Oehlers (1957)<sup>6</sup> gave the most popular classification for dens invaginatus. This system categorizes invaginations into three classes as determined by how far they extend radiographically from the crown into the root as follows:<sup>2-3,6</sup>

**Type I:** The invagination is minimal and enamel-lined, it is confined within the crown of the tooth 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 IIIA:** The invagination extends through the root and communicates laterally with the periodontal ligament space through a pseudo-foramen. There is usually no communication with the pulp, which lies compressed within the root.

**Type IIIB:** The invagination extends through the root and communicates with the periodontal ligament at the apical foramen. There is usually no communication with the pulp.

Different treatment modalities have been described for dens invaginatus related to the degree of complexity of its anatomy and type of classification. They include nonsurgical endodontic treatment, endodontic surgery,

intentional replantation, regenerative endodontics and extraction. This case report describes successful management of Oehlers type II dens invagination by non surgical root canal treatment and calcium hydroxide induced apexification.

### Case Report

An 18 year old male patient reported to the department with a chief complaint of dull aching pain in upper front tooth region. There was no previous significant medical history. There was history of trauma few years back. On clinical examination, discoloration and fracture was seen with tooth #11 (Fig.1 A & B). The tooth was non tender on percussion. Draining sinus was seen in relation to #11(Fig.1 A). Enamel fracture (WHO classification 873.60) was seen with #21.

Intraoral periapical radiograph showed inverted pear shaped radiolucency extending beyond the cemento-enamel junction in the crowns with #11 and #21 (Fig.2 A). Also incomplete root development with open apex and periapical radiolucency with #11 was noted (Fig.2 A). Sinus tracing confirmed #11 to be the offending tooth (Fig.2 B). On thermal and electric (Analytic Technology, Redmond, WA) pulp sensibility testing, no response was seen with #11. Other adjacent teeth showed normal response.

A CBCT scan was advised to confirm the diagnosis and know the complex anatomy of the dens and extent of periapical lesion. CBCT (PlanmecaPromax 3D-MID CBCT Machine, Finland) confirmed an invagination extending beyond the CEJ as a blind sac. There was no communication with the main canal and periodontal ligament. Loss of lamina dura and periapical radiolucency was seen with #11 with incompletely formed apex. There was absence of buccal cortical plate with #11. (Fig.3 A & B) The final diagnosis reached was Oehlers type II dens invaginatus with pulp necrosis and chronic periapical abscess with #11.

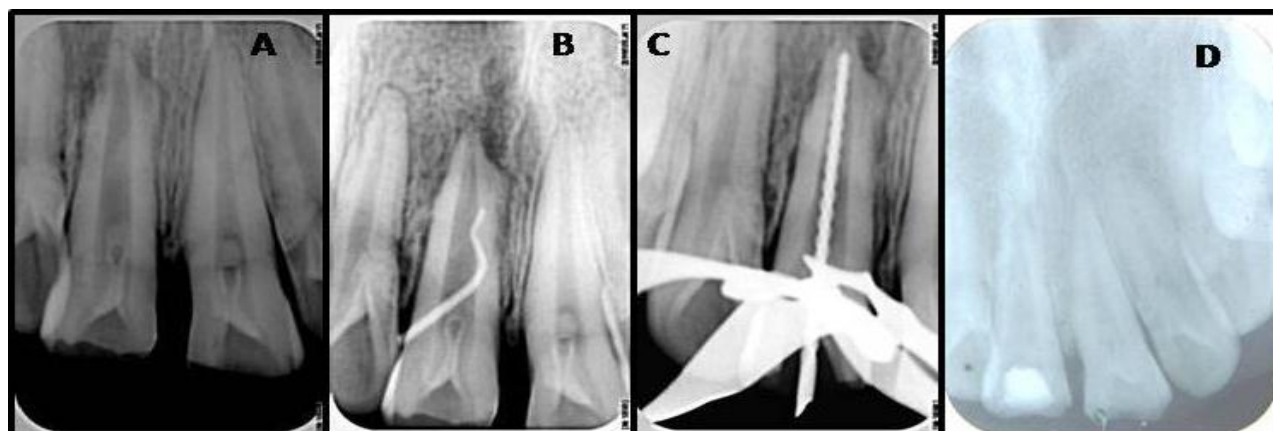
After discussing with the patient and his parent nonsurgical endodontic treatment and MTA apexification followed by crown was the final treatment plan decided. Composite restoration was advised with #21.

The region was anesthetized with 2% lidocaine with 1:80,000 epinephrine. Access opening was done using Endo Access bur and Endo Z bur (DentsplyMaillefer; Tulsa, USA) under rubber dam isolation. H files were used to remove the invaginated part under microscope (Opto dental microscope, Opto DM PRO model). Working length was determined with the help of apex locator and radiograph (Fig.2 C). Biomechanical preparation was performed with hand K files. Irrigation was done with 2.5% sodium hypochlorite and 17% liquid EDTA using side vent needle followed by activation with endo-activator. Calcium hydroxide dressing was given (RC Cal; Prime Dental Products, Mumbai, India) (Fig.2 D). Patient was rescheduled after 2 weeks. Unfortunately the patient did not turn up for the next appointment due to personal reasons.

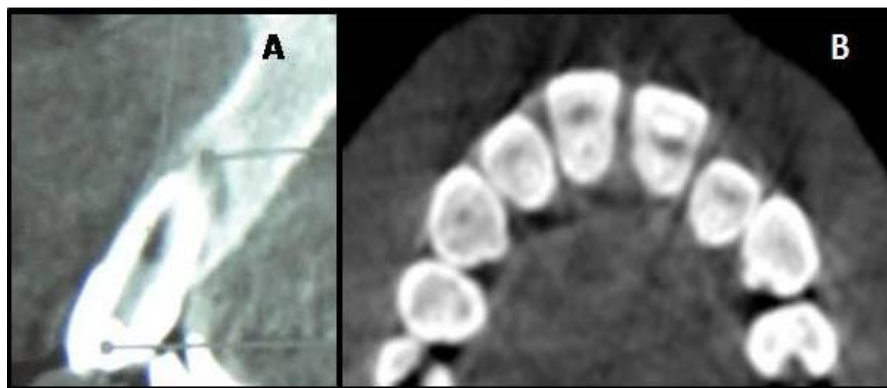
The patient returned after about 4 months. Clinical examination showed healing of the sinus tract (Fig.1 C). IOPA showed signs of periapical healing. After removal of coronal restoration calcium hydroxide was removed with the help of K files and citric acid. Fortunately apical barrier was detected with hand K files and GuttaPercha. A good apical tug back was noticed with guttapercha. Hence the treatment plan was changed to non surgical root canal treatment without MTA apexification. Obturation was done with gutta-percha and sealapex (Sybron Endo) sealer by cold lateral condensation followed by vertical compaction with warmed heat carriers (Fig.4 A). Twelve months follow-up radiograph showed healing of the periapical radiolucency (Fig.4 B).



**Fig. 1: Clinical pictures: (A) Discolored #11 with draining sinus. (B) Fractured #11 & #21 (C) Healed sinus with #11.**



**Fig. 2: Intraoral radiographs: (A) Preoperative, (B) Sinus tracing with GP point, (C) Working length determination (D) Calcium hydroxide dressing.**



**Fig. 3: CBCT images: (A) Sagittal view of the dens showing the invagination and the periapical lesion, (B) Axial section showing the invagination and the main canal**



**Fig. 4: (A) Immediate postoperative, (B) 12-month recall**

## Discussion

The prevalence of dens in dente in the Indian population was reported to be 0.4%.<sup>3</sup> Dens invaginatus in a maxillary central incisor is quite uncommon, and few cases have been reported in the literature during the last decade.

Dens invaginatus is a critical condition for endodontic treatment because of its complex root canal anatomy. Clinically it presents with a deep pit which acts as a site of bacterial growth.<sup>1,2</sup> Early diagnosis and intervention is extremely important in dens invaginatus to prevent pulpal involvement and peri-radicular pathosis.

Management of dens invaginatus may differ according to its type and anatomy. Conventional radiograph does not provide complete information about its type, anatomy, extent of periapical radiolucency. Hence CBCT was advised to arrive at correct diagnosis and execute a proper treatment plan.<sup>4,7</sup>

The current case was classified as Oehlers type II dens invaginatus because the invagination was extending beyond the CEJ without communication with the periodontal ligament. Trauma might be the cause of necrosis and incomplete root development in this case. Presence of dens invaginatus further complicated the treatment. As there was

periapical radiolucency and history of pus discharge, it was decided to use intracanal dressings.

In our case we had decided to go with MTA apexification as it takes shorter time to achieve apical barrier formation and promotes periodontal and cemental tissue regeneration. Calcium hydroxide is associated with variable treatment time and increased risk of root fracture.<sup>8</sup> But due to poor patient compliance, when the patient revisited already apical barrier had been formed. Generally practice is frequent changing of dressings in calcium hydroxide apexification. However, Felipe MC and Felipe WT *et al.*,<sup>9</sup> in a study conducted in dogs, observed that the formation of apical calcified tissue was more noticeable in the root canals when the paste had not been renewed. The authors suggested that the dressing should only be changed when the sealing had failed or when there is a flare-up.<sup>9,10</sup>

10% citric acid was used to remove residual calcium hydroxide at the second appointment because it is more effective in calcium hydroxide removal than EDTA and sodium hypochlorite.<sup>11</sup>

## Conclusion

In the present case, successful nonsurgical management of maxillary central incisor that had dens invaginatus was performed with a successful 1 year follow-up showing

periapical healing. With the advent of 3-dimensional imaging, dental operating microscope, ultrasonics, and MTA, it has become possible to save even complex dens invaginatus cases that were doomed to extraction previously.

**Conflict of Interest:** None.

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