

# Endodontic Non-Surgical Management of Dens Invaginatus Type Two with Open Apex and Separate Root Sheath: A Case Report and Literature Review

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## Abstract

Dens invaginatus (DI) is a rare developmental anomaly with an unknown etiology and different complexity. It is classified into three types according to Oehler's classification 1957 based on the extent of invagination. This case involves an upper lateral tooth demonstrating Dens invaginatus type 2, an open apex, and a separate root sheath and diagnosis of necrotic pulp with symptomatic apical periodontitis. A cone beam computed tomography (CBCT) assessment was conducted prior to nonsurgical root canal treatment, which included apexification with bio ceramic material and internal bleaching to address both healing potential and aesthetics. The procedure was performed under an operating microscope, and a 6-month follow-up was conducted with both clinical and radiographic signs of healing.

**Keywords:** Dens invaginatus, Apexification, Cone Beam Computed Tomography (CBCT), Internal Bleaching, Incomplete Root.

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## INTRODUCTION

Dens invaginatus (DI) is a rare developmental anomaly of the enamel organ where the dental papilla infolds before calcification of the tooth [1]. During tooth development Dens invaginatus can occur in either the crown or the root and may extend to involve the pulp chamber and root canal. The prevalence resembles 0.04%–10% [2] and 7% in the Saudi population [3], where 10.9% demonstrate apical radiolucency [4], and occurs most frequently in the maxillary permanent lateral incisor [5].

Oehlers classified it into three types depending on the invagination extent, type 1 the invagination is limited to the crown, type 2 demonstrates an invasion that extends beyond the cemento-enamel junction without reaching the periodontal ligament and ends as a blind sac, type 3 the invagination extends into the root and communicate either laterally or apically with the periodontal ligament [2]. Teeth with DI are more prone to be affected by pulpal pathosis due to anatomical encouragement of contamination. Because the

microorganisms and the irritants get into the pulp through the invaginated area where dentin is covered only by a thin layer of enamel. Moreover, the infected invaginations may also lead to the early necrosis of pulp tissue before the completion of root development leaving the tooth with an open apex [6]. In this case, an open apex lateral incisor with a rare finding of a sperate radio opacity can resemble an apical sheath of a failed developing root apex.

## CASE HISTORY

A 27-year-old male Saudi patient, unaware of any medical condition was referred to the endodontic department at Prince Abdulrahman advanced dental institute for endodontic evaluation of a maxillary right lateral incisor. The patient reported pain on mastication with a complaint of crown discoloration. The patient mentioned that he had swelling related to tooth #12 a long time ago, but after he took antibiotics, it subsided. With clinical examination, tooth #12 had mild, dull localized pain that required stimulation to onset with a discolored crown with no sign of swelling or sinus tract and normal probing depth. Thermal and electrical pulp

tests elicited a negative response. There was a tenderness on palpation and percussion. Radiographic examination demonstrates an invaginated immature tooth with periapical radiolucency and the alveolar bone displays a

presence of mixed density mass beyond the apex. The CBCT evaluation showed the extent of the lesion that fenestrated the buccal bone with an apical radiopaque structure where it can resemble a separate root sheath.

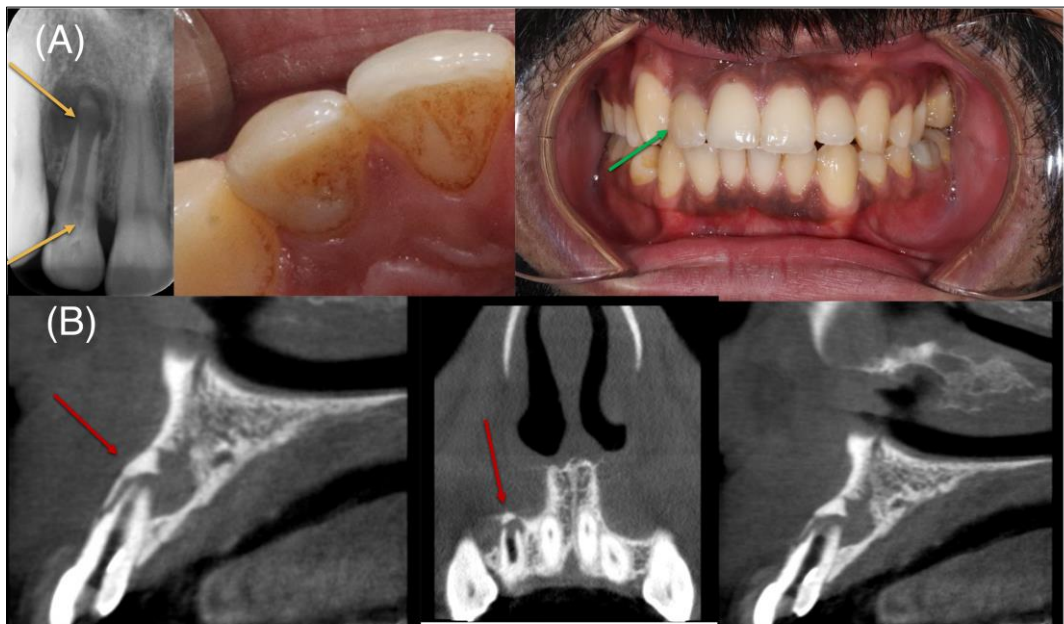


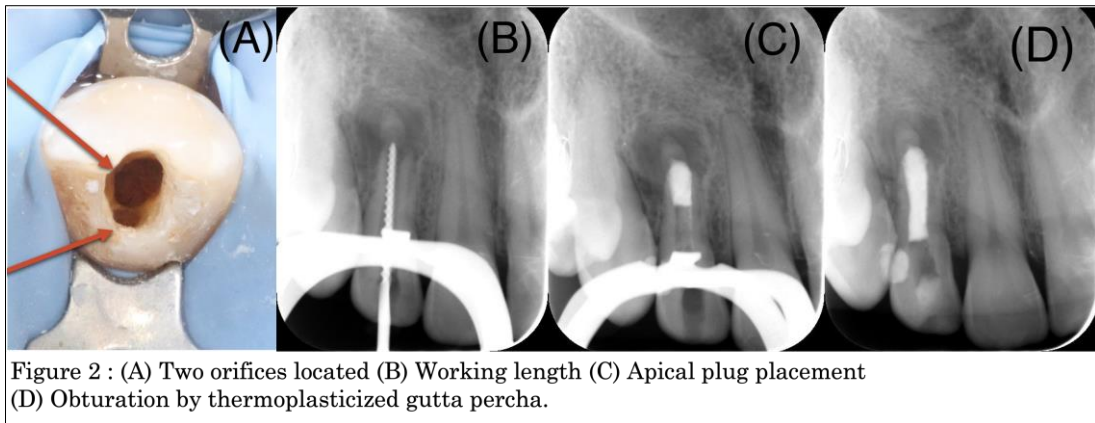
Figure 1 : (A) Showing A different aspect of view orange arrow pointing the dens in periapical radiograph and the discontinued root sheath, Green showing to discoloration in the crown comparing to contra lateral . (B) Showing a different aspect of the CBCT view with a separate root sheath .

The diagnosis of the tooth was Necrotic Pulp with Symptomatic Apical Periodontitis, the treatment options were:

- Revascularization
- Non-Surgical Root Canal Treatment (NSRCT) followed by Apical Plug (Apexification)
- NSRCT followed by surgical treatment
- Extraction

The NSRCT approach was planned for multiple visits. At the first visit, consent was taken, administration of profound local anesthesia using lidocaine 1.8 ml (1/100000 mg), rubber dam isolation and endodontic access were performed under microscope using a high-speed long shank. Rounded Diamond Bridge and Two Canal Entrance were founded. Working length was obtained by size 100 k-file using an apex locator and confirmed by radiograph. Irrigation was done using

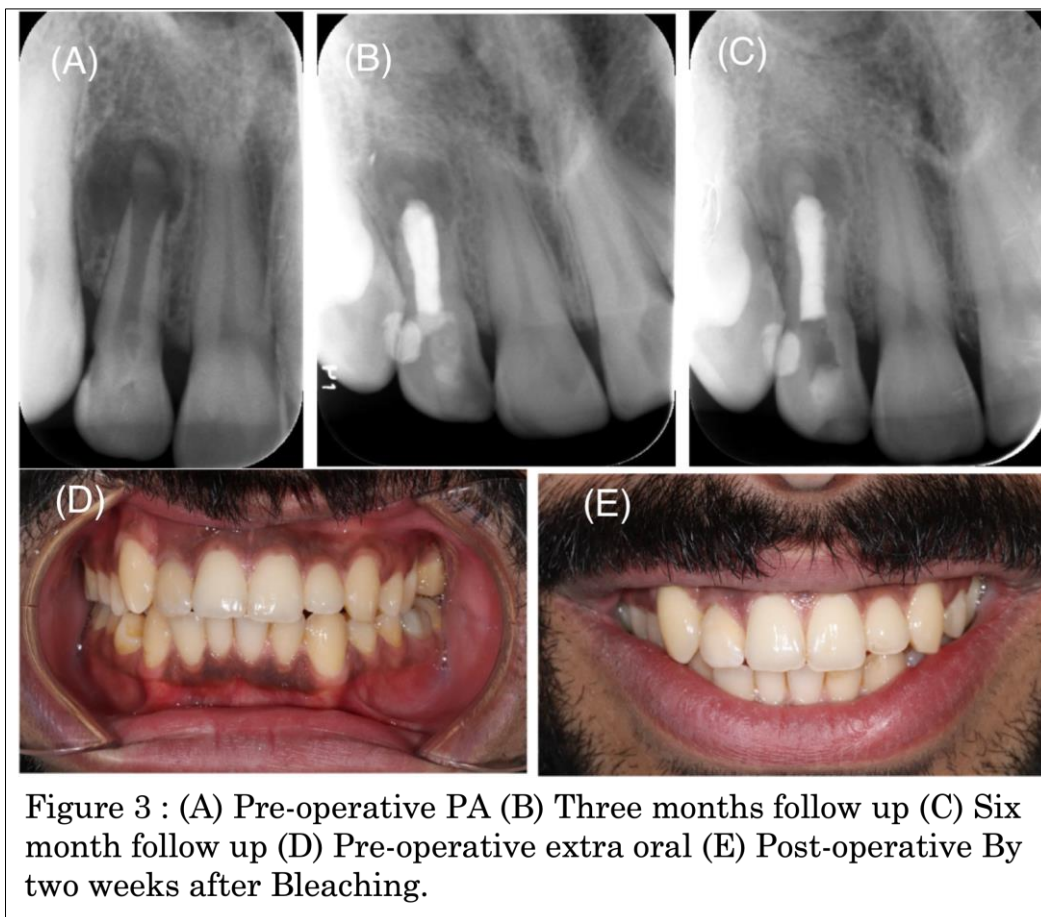
NACOL 5.25% and ultrasonic activation for one minute. Minimal instrumentation of the internal walls was done using a size 100 K-file irrigation with EDTA 20 ml% 17, and the canal space was dried with paper points. Calcium hydroxide from (Calcicur, Voco GmbH, Germany) was injected into the canal. For two weeks, Access Cavity was temporized by Cavit™ (3M ESPE, Seelfel, Germany) for filling material and RMGIC (Fuji II LC, GC America Inc., Alsip, IL, USA). Second visit: calcium hydroxide was flushed out by K-file and copious irrigation. Ultrasonic was used to clean the invagination and the main canal separately with final irrigation with 5.25 % NAOCL and EDTA (20 ml). The apical plug was made by using FKG Bio ceramic root repair material (FKG Dentaire, La Chaux-des-Fonds, Switzerland), Buchanan plugger size #2, and paper point size #90 were used to pack it down to a four-mm thickness. The remaining portion of the canal was backfilled with thermoplasticized gutta percha using Obtura.



Internal bleaching was done. Following the visit, by removing the gutta percha below the labial gingival margin, a resin-bonded composite was placed as a barrier of at least two mm to prevent the penetration of the bleaching material into the root filling. 35% hydrogen peroxide was placed for one week. The tooth was temporized by Cavit™ (3M ESPE, Seelfel,

Germany). After one week of removing the bleaching material, the access cavity was restored with resin composite.

A follow-up of both clinical and radiographic examinations was made six months post-treatment, and it showed signs of healing.



## DISCUSSION

Dens invaginatus, also known by its other name, dens in dente, has an unknown etiology but can resemble both environmental and genetic interrelations [7, 8], where the invagination process can guide the microbial diffusion to both dentine tubes and pulp

invasion [9], and depending on the case variation, different approaches can be used [10], the early diagnosis of teeth with dens invagination and preventive treatment measures can reduce the future need for endodontic treatment [11].

Regarding our case of DI type 2, we depend on our evaluation on the radiographic interpretation where CBCT evaluation is effective in identifying anomalies, such as dense invaginatus, because it provides an accurate representation of the external and internal dental anatomy [12], and can help to both endodontic approaches and predicate successful outcomes [13]. In our finding of radio dense structure can resemble a failed-developed root tip further away from the corresponding root wall, where during infection and necrotizing of the immature tooth with an open apex, the microbial load and biofilm provoked Hartwig's epithelial root sheath to be undifferentiated, causing the cell to be dead, which can impair root development [14]. And in a different case report discussed the potential of complete the growing of separate root fragment with a proper approach [15].

However, Due to large lesion with an open apex, Apexification was selected in this case instead of Revascularization, where in Cohort study found there's no Radiographic or Clinical superiority of revascularization than apexification technique [16]. In comparison a Case Report Demonstrate a Successful signs of Healing with A year follow up with a Reduction of the lesion an signs of Apical closure [17]. In A Systematic Review and Meta-analysis of Randomized Controlled Trials study stated Regenerative can be an alternative treatment But Further RCT study's needed [18], our Rational of apexification to follow patient concern and due potential of discoloration when use a Regenerative where a randomized controlled study discussed the potential of discoloration.in multiple cases [19].

Moreover, apexification was done after chemo-mechanical root treatment by using 5.25 NAOCL and active activation after calcium hydroxide application, where it had peak efficacy within two weeks in the majority of studies supported [20, 21], and supportive of another case report finding regarding DI type [22]. This case demonstrated a large apical lesion and provided insight into the importance of long-term follow-up and the importance of applying good antimicrobial action.

The apexification was done by final irrigation of EDTA, which can positively impact apical migration [23], and by packing Total Fill Bio ceramic martial in the four-mm apical, which can demonstrate easy handling, a good margin of apical seal, and less void [24], and instead of MTA, which can cause future discoloration [25]. In our case we treated the root canal and the invagination separately because the was no communication between them and they were not close to each other, so care should be taken when joining the root canal and the invagination because it might weaken the tooth structure and compromise the apical constriction when the proximity of the root canal to the invagination may necessitate treating them both [26], and as recommended, a cervical barrier is placed to prevent

cervical resorption over the backfilled gutta percha to act as a barrier, and %35 hydrogen peroxide as internal bleaching to match the aesthetic resolution of adjacent teeth [27].

In conclusion, our rationale for treatment followed both clinical signs. Further recall should be assessed until complete healing is present, in the present case, a reduction of the size of the periapical lesion was noticed after 6 months. The case should be followed for more time. And In case of a future failure, endodontic surgery and histopathology assessment for the radio dense structure, where in most cases radiographical and clinical assessment is not able to differentiate the nature of the apical lesion [28].

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