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# A Rare Case Report of Regenerative Endodontics Treatment in an Immature Permanent Tooth with Dens Invaginatus and Class III Defect

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## Keywords

Regenerative Endodontic Treatment, Stem Cell, Dens In Dente, Open Apex

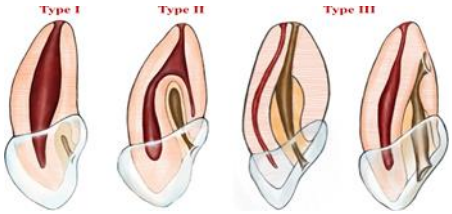
## Abstract

Dens invaginatus is a developmental anomaly resulting from the invagination of the enamel organ into the dental papilla during the soft tissue stage of development. There are three main requirements that need to be followed to achieve successful revascularization; complete disinfection of the root canal; Supplying the canal lumen with the pulp's essential components, including its stem cells, growth factors, and scaffolds, is a precondition for the pulp's regeneration process. This can be accomplished through blood clotting, platelet-rich plasma, and platelet-rich fibrin. introduction of the intracanal matrix to allow tissue growth, and tight seal of the access filling. This case report aims to describe the regenerative endodontics approach in the treatment of an immature permanent tooth with dens invaginatus in the maxillary left central incisor.

## 1. Introduction

Dens in dente also called dens invaginatus (DI), dilated odontoma, or gestant odontoma is an uncommon tooth deformity brought on by the infolding of enamel organ into developing dentin during tooth development, prior to biological mineralization, resulting in invagination of enamel and dentin into the pulp. In a human tooth in 1856, dentist Socrates addressed the first dens in dente. Dens in dente are similar to enamel in density and would seem radiopaque, providing it the appearance of a tooth within a tooth. A pocket of organic substances forms underneath the enamel surface as a consequence of the infolding of the dental papilla, due to microorganisms that might contaminate and continue to spread inside the deformity, cause early caries.[2]

Dens in dente often develop below the cusp tip or palatal pit, but they can potentially extend all the way to the root canal system. Additionally, it is separated into two categories: coronal and radicular dens in dente. The cause of invagination is the primary distinction between the two types. The more common coronal type is induced by enamel organ invagination before mineralization. The radicular dens in dente, on the other side, would seem after crown development as a consequence of Hartwig's root sheath infolding into the root.




**Dens Invaginatus (Oehlers Classification, 1957)** Based On The Radiographic Interpretation Of The Degree Of Invagination

The regenerative endodontic treatment (REP) was proposed by Banchs and Trope in 2004.[1] In regenerative endodontics, scaffolds of a blood clot, platelet-rich plasma/fibrin is used with endogenous stem cells from

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the apical papilla triggered by periapical bleeding. This method, called "paradigm shift," is the initial option for treating teeth with immature apex with pulp necrosis. Regenerative endodontics comes with three treatment outcomes: (i) cure of the clinical symptoms, (ii) root maturation, and (iii) return to neurogenesis. Actual regeneration of the dentin-pulp complex is not achieved, as is well known, and the results of these objectives are likely to differ. Histological analysis has shown that periodontal and osseous tissues are the main sources of healing.[5]

The field of regenerative endodontics, there are lot of open questions (Smith & Cooper 2017). Regenerative endodontics has recently attracted the interest and curiosity of the endodontic community due to the treatments and results being so distinct from conventional endodontic therapy.

Usually, calcium hydroxide apexification necessitates numerous treatment sessions spread out over long period (Rafter 2005). Extended exposure of developing permanent teeth to calcium hydroxide dressing may increase the risk of root fracture. Apical MTA plugs can shorten the course of treatment (Rafter 2005). Apical MTA plug therapy and calcium hydroxide apexification appear to produce similar effects. Apexification approach, on the other hand, tender no prospect of reinstating the vitality of injured tissue in the canal or supporting root maturation (thinner root canal walls and/or apical closure) of immature permanent teeth with necrotic pulp.[5]

## 2. Case Report

24-year adult male with a chief complaint of pain in the upper left front teeth visited the Department of Conservative Dentistry and Endodontics. For the past four days, the patient had been experiencing extreme discomfort in the same area. A patient disclosed a 15-year-old history of trauma to the area surrounding the upper front teeth. There was no noteworthy medical background.

Preoperative image (Figures:1 and 2) showing tooth discoloration in upper left central incisor. Class 3 caries along with external deformity, exaggerated conical cusp which is wider mesially and pronounced palatal cingulum upper left central incisor. A poor outcome in the testing of carbon dioxide snow (CO2) pulp. CBCT image demonstrating a single mesial invagination in the upper left incisor (Figure:3).

**Figure 1**: Labial View

**Figure 2:** Palatal View

**Figure 3:** CBCT View

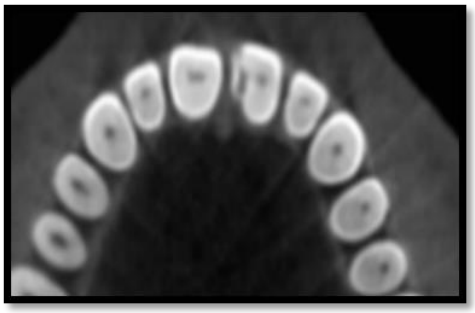

**Figure 4:** Intraoral Periapical Radiograph

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An immature apex, an invagination extending at CEJ in upper left central incisor, and periapical radiolucency partially engaging the mesial side of the root are all seen on an intraoral periapical radiograph. The tooth was found to have a persistent apical abscess and an infected necrotic pulp in the immature apex with Dens invaginatus.


**Figure 5:** Treatment of Dens Invaginatus

Taking care of Dens invaginatus After surgically elevating a flap, glass ionomer cement, biodentin, and sutures were applied. A radiograph was taken (Figure 5). It was provided periopack. Class III caries was removed using the DI procedure, and composite was used for repair. After one week, the sutures were removed. A diamond fissure bur was used to create straight-line access to the canal while the rubber dam was isolated. Bleeding and purulent discharge from the canal were seen. The working length was verified radiographically (Figure 6). The canal was Irrigated with normal saline during instrumentation. The final rinse was done with 17% EDTA and 2% chlorhexidine. Medicament was placed thrice with an interval of 21 days between each.

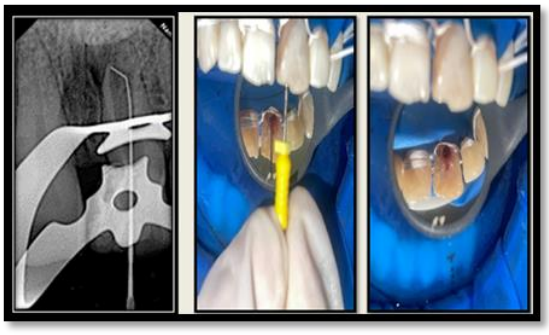

**Figure 6:** Working length was confirmed radiographically

Platelet rich fibrin was collected using 20 ml of blood from the patient's antecubital vein and centrifuged for 10 min at a speed of 3000 rpm. After placing PRF with the use of Plugger Periocol-GTR bone graft placed over it and permanent restoration done glass ionomer cement (Figure 7).


**Figure 7:** PRF and Periocol-GTR bone graft

After receiving therapy, the patient's radiograph was checked at 3, 6, and 9 months, during which time there were no signs of pain, inflammation, or discomfort. On postoperative radiographs, there was evidence of bony healing (Figure 8).

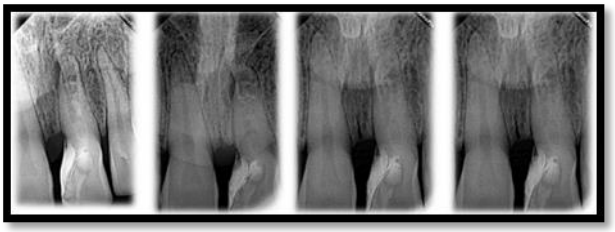

**Figure 8:** Radiographs at baseline, 3 months, 6 months, and 9 months

## 3. Discussion

After minimum canal debridement and calcium hydroxide dressing, the case study showed potential pulp regeneration of the infected maxillary left central incisor with Dense Invegination with immature apex. The experiments of Nygaard-Ostby (1961) and NygarrdOstby & Hjortdal established regenerative endodontics (1971). In order to induce bleeding from apical papilla into the chemo-mechanically cleaned and partially filled root canal spaces of teeth, Nygarrd-Ostby&Hjortdal (1971) used a root filling.

This lateral incisor's reaction might show that there is still some healthy tissue in the canal's apical region, which might signify partial pulp regeneration.

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Odontoblasts and Hertwig's root sheath epithelial cells are two types of cells necessary for root formation. At the apical end of an immature root with inflammation, one can still find former cells which resist oxidation.

A permanent tooth with an immature open apex and apical pathosis presents a substantial difficulty to endodontists. A young immature tooth with open apex will have pulp tissue rich in blood supply and stem cells with the capacity to recover after injury. Therefore, it is considered that infected open-apex teeth should always be handled with extreme caution in order to promote successful abiogenesis.[6]

Growth factors have been discovered to promote angiogenesis and odontoblast-like cellular growth in the dentin matrix. The concentrations of these growth factors (like Transforming Growth Factor 1 (TGF- 1) and Dentin Matrix Protein-1) released with EDTA vary, with TGF- 1 releasing the highest amounts. It may be possible to create stem cell binding sites on the dentin surface by treating it with Ethylene Diamine Tetra Acetic acid and removing the smear layer. Ca(OH)2 in Regenerative Endodontic Procedure demonstrated a high rate of stem cell survival and enhances the levels of TGF- 1 sequestered in the dentin matrix.[7]

There exists a chance that the tissue inside the canal is pulp-like, and the hard tissue that has been formed is dentin or material that looks like dentin. However, according to data from animal research, the new tissue may be PDL tissue filling the canal space, cementum like or bone-like tissue, or both.

## 4. Conclusion:

The conventional treatment for immature permanent root with necrotic pulp may change in the upcoming years to Regenerative Endodontic Procedure. According to endodontics, key events include the development of pulp like tissue in the canal with the help of scaffolds, 1.

growth factors, and stem cells. The results of therapy were discussed in this case report for permanent central incisors with type II Oehler's Dens Invaginatus and apical abscesses. The use of PRF in endodontic regeneration operations will be discussed in this paper, which also stresses the necessity of doing routine examinations on teeth with open apices.

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