

Management of Dens Invaginatus (DI) in a Young Permanent Tooth

Preeti M Tippashetty¹, Vedavathi Boregowda², Veena S Pai², Sijo P Mathew¹, Gis George¹, Roopa R Nadig³

¹Post Graduate Student, Department of Conservative dentistry and Endodontics, Dayananda Sagar College of Dental Sciences, Bengaluru, India; ²Reader, Department of Conservative dentistry and Endodontics, Dayananda Sagar College of Dental Sciences, Bengaluru, India; ³Professor & HOD, Department of Conservative dentistry and Endodontics, Dayananda Sagar College of Dental Sciences, Bengaluru, India.

Address for Correspondence:

Dr. Preeti M Tippashetty, Post Graduate Student, Department of Conservative dentistry and Endodontics, Dayananda Sagar College of Dental Sciences, Bengaluru, India.

ABSTRACT:

Dens invaginatus is a developmental anomaly and results due to an in-folding of the dental papilla during tooth development before calcification occurs. This abnormality in tooth morphology, occurs most commonly in permanent maxillary lateral incisors. It may be associated with an extra root canal and separate apical opening. Diagnosing, access preparation, Biomechanical preparation and obturation of such teeth is challenging due to its complex anatomy. This case report describes the effective management with a 6-month follow-up of maxillary lateral incisor with Dens invaginatus using Regeneration procedure.

Keywords: Dens Invaginatus, PRF, Open Apex, Revascularization, Regeneration.

INTRODUCTION

Dens Invaginatus in human teeth was first described by a dentist named ‘Socrates’ in 1856, as a developmental anomaly resulting due to epithelial invagination into the dental papilla.¹ Dens invaginatus also known as, Dens in Dente, Dilated Compound Odontoma or Telescopic tooth. It is a malformation that can occur in both dentitions.^{2,3} The incidence of DI as reported till date ranges from 0.04%-10%.^{6,7} The etiology behind the occurrence of DI is not very clear, though, it was thought to be due to distortion of enamel organ during tooth development, rapid and aggressive proliferation of a part of Internal enamel epithelium invading the dental papilla or may be due to the focal failure of growth in Internal Enamel Epithelium.⁴

Oehler (1957a) has classified DI into different types based on the extent of involvement as⁵:

Type I: Enamel-lined minor form confined to tooth crown not extending beyond the CE junction. (Figure 1A)

Type II: Enamel-lined form which invades the root but remains confined as a blind sac. It

may or may not communicate with the dental pulp. [Figure 1B]

Type III A: Invagination extends through root & communicates laterally with pdl space through pseudo-foramen. No communication with pulp. [Figure 1C]

Type III B: Invagination extends thru root & communicates with pdl at apical foramen. No communication with pulp. [Figure 1D]

Dens invaginatus may allow the entry of irritants into pulp space through a thin hypomineralised enamel and dentin layer.⁸ This penetration of irritants causes pulpal necrosis and periapical inflammation before the root development, leaving the apex open if the infection occurred at an early age. Commonly two types of open apices are seen

1. Non Blunderbuss canal – Lateral walls of the root may remain parallel or slightly convergent as canal exits the root apex. Apex is usually tapered (convergent).
2. Blunderbuss canal – walls are divergent, flaring, more especially in buccolingual direction. Apex is funnel shaped and wider than at coronal aspect.

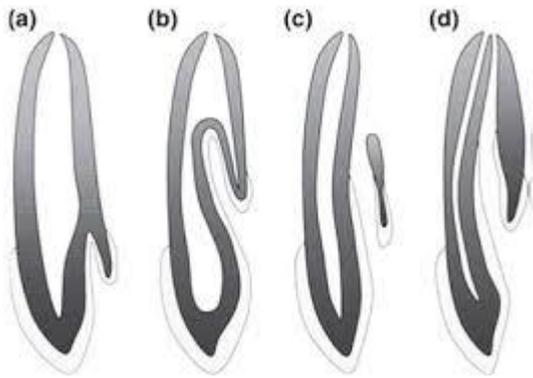


Figure 1

The challenges encountered while treating open apices are diverging and thin root canal walls that are susceptible to fracture, large open apex difficult to obtain an apical seal causing frequent periapical lesions, obturation of flared canals is also of concern.

Calcium hydroxide is one of the conventional methods of inducing apexification. It has its own limitations, as it makes the tooth brittle due to its hygroscopic and proteolytic properties.⁹ Studies have shown that non vital infected immature teeth can be alternatively treated by pulp regenerative process whereby bleeding is induced followed by PRF placement.

CASE REPORT

An eleven year old female patient reported to the department of Conservative Dentistry and endodontics with the chief complaint of pain in relation to upper right front tooth since 1 week with no history of trauma. Clinical examination revealed, palatally placed lateral incisor on both the sides of the arch.(Figure 2)



Figure 2

Maxillary right lateral incisor (12) was tender to percussion with a deep palatal groove which failed to respond to thermal and electrical pulp

testing.RVG demonstrated an Oehlers' type I dens invaginatus, incomplete root end formation and periapical radiolucency in relation to maxillary lateral incisor.(Figure 3,4)



Figure 3



Figure 4

CBCT evaluation revealed presence of Dens invaginatus bilaterally with an additional canal palatally and uniting with the main canal.(Figure 5)



Figure 5

The root apex was wide and open apex. There was diffuse destruction of the apical bone with thinning of the labial cortex. A clinical diagnosis of necrotic pulp with chronic periapical abscess with Dens invaginatus in

relation to 12 and blunder buss apex was established.

Endodontic therapy was started under Local anaesthesia.

Access cavity was prepared and the canal negotiated with no. 10 K-file and ultrasonic troughing was done under surgical operating microscope for the negotiation of invaginatus.(Figure 6)



Figure 6

After the complete debridement of the canal with copious irrigant and working length determined which measured 9mm for DI and 16mm for the main canal.(Figure7)



Figure 7

Biomechanical preparation was done with hand files in a crown down manner. Triple antibiotic paste intracanal medicament placed for a period of 3 weeks. The patient was asymptomatic after 3 weeks. At successive recall appointment, for DI self etch adhesive was applied and flowable composites was placed.(Figure 8)

Proper debridement of the main canal was done with saline, then irrigated with 20ml of 17% EDTA followed by saline and dried with an absorbent paper point. Bleeding was induced by intentionally going 2-3mm beyond the apex with the help of a 25 size H-file after giving local anaesthesia without

vasoconstrictor till the fresh blood fills atleast to half of the cleaned canal.(Figure 9)



Figure 8

This helps to stimulate apical root stem cells, PRF prepared(Figure 10) from the patients own blood was placed inside the canal(Figure 11) to act as a scaffold for the seeding of regenerated stem cells.



Figure 9



Figure 10



Figure 11

The root canal opening was sealed orthogradely with a 2-3mm thick MTA.(Figure 12) and a wet cotton pellet placed over MTA

and sealed with ZOE temporary cement. Patient was recalled next day for permanent restoration of the access cavity with GIC, followed by etching, bonding and Composite resin placement.(Figure 13)



Figure 12



Figure 13

DISCUSSION

The treatments options of DL include prophylactic or preventive sealing of the invagination, root canal treatment, endodontic apical surgery, intentional replantation, and extraction.

In our case the DI was of type 1 confined to the crown not extending beyond CEJ and the invagination might have allowed the entry of irritants into which separated into the pulpal tissues by a thin layer of enamel and dentin for the development of infection without any history of caries, or trauma, irritants and microorganisms from the oral¹⁹ and so treated by self etch adhesive and flowable composite. The success of regenerative endodontic therapy in necrotic teeth was first explored by Nygaard-Østby in 1961 with limited success.¹⁰ Thin, fragile blunderbuss canal with thin lateral root canal walls and non vital tooth is a challenge to the endodontist.¹¹

Although there was no detectable coronal caries, the tooth did not respond to pulp vitality tests.

The main canal was planned to be treated by re-vascularization with PRF procedure as the patient was Young, the apex was blunder buss and the presence of stem cells will be high.

The concept of slight to no mechanical instrumentation of the root canal wall is based on clinical consideration of American Association of Endodontists (AAE) based on the rationale that the control of root canal infection should be achieved only by the use of irrigating solutions and intracanal medicaments.¹²⁻¹⁴ Furthermore, the mechanical debridement should be avoided in order to protect the vitality of stem cells in the apical tissues, promoting tissue regeneration.^{12,14} In our case, EDTA is used, which is considered to release various entrapped growth factors from dentin, promoting the differentiation of dental pulp stem cells seeded on dentin surfaces into odontoblastic cells.¹⁵

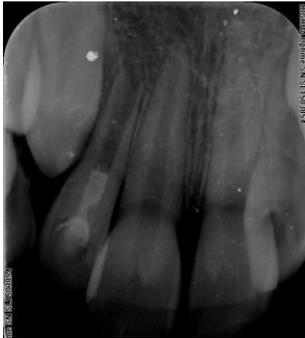
Intentionally going beyond the apex to induce bleeding helps the stem cells from apical papillae[SCAP] present at the root apex to migrate into root canal, These cells are positive for telomerase activity which play a role in hard tissue regeneration.²⁰

PRF obtained from patients own blood acts as a natural scaffold for the seeding of stem cells promoting wound healing, bone regeneration, graft stabilization and hemostasis. The fibrin matrix also helps to direct stem cell migration, release growth factors which in turn help in regeneration procedures¹⁶⁻¹⁸ and the same has been followed in our case.

At further follow-up visits the patient did not complain of any discomfort and at 6th month recall period, a clear indication of lateral root development with some apical root closure was clearly seen on the radiograph indicating that there could be a possibility of stem cells from apical dental papilla differentiating into pulp-like cells helping in regeneration process. The patient is under follow-up and if we can see root closure, then this method of treating an immature non vital tooth can hold a promise for further such treatments.



1 Month Follow Up



6 Months Follow Up

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How to cite this article: Tippashetty PM, Boregowda V, Pai VS, Mathew SP, George G, Nadig RR. Management of Dens Invagenatus (DI) in a Young Permanent Tooth. Arch of Dent and Med Res 2016;2(3):102-107.