# ENDODONTIC MANAGEMENT OF TYPE II DENSE INVAGINATUS USING CONE BEAM COMPUTED TOMOGRAPHY: CASE REPORT

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**ABSTRACT**

*Dens invaginatus is a dental anomaly that occurs during tooth development before mineralization phase, due to an infolding of the outer surface into the interior of teeth. The maxillary lateral incisors are the most frequently involved teeth. Using 3-dimensional imaging would help the dentist in making definitive diagnosis and performing the treatment.*

*This paper illustrates the root canal treatment of Oehlers' type II dens invaginatus in maxillary left lateral incisors. A 48 –year-old male patient was examined at the dental department, Queen Alia Military Hospital. After history taking and proper clinical and radiographic examination his various maxillary left lateral incisor appeared to have dens invaginatus. Root canal treatment was initiated. Two canals, one of which represented the invagination, were instrumented, irrigated, and then obturated with a lateral condensation technique.*

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## INTRODUCTION

Dens invaginatus is a dental anomaly that occurs due to infolding of the outer surface into the interior of tooth. It occur during tooth development and can include pulp chamber or root canal, making deformity in the crown or root. It occurs most commonly in maxillary permanent lateral incisors. It is also seen in maxillary central incisors, premolars and canines .

It was first described by Ploquet in 1794 in a Whales' tooth. In humans, dens invaginatus was first described by a dentist named Socrates in 1856.

Many theories described the etiology of dens invaginatus:

Kronfeld speculated that dens invaginatus is caused by a failure in growth of the internal dental epithelium, while at the same time there is also a proliferation of the surrounding normal epithelium, producing a static area of engulfing.[1] Infection was considered to be responsible for the malformation by Fisher and Sprawson.[2,3]

Rushton considered that the invagination is a result of rapid and aggressive proliferation of a part of the internal enamel epithelium invading the dental papilla.[4]

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Growth pressure of the dental arch results in buckling of the enamel organ that was the opinion Euler and Atkinson.[5,6]

The "twin- theorie" by Bruszt suggested a fusion of two tooth germs.

Schulze considered dens invaginatus as a deep folding of the foramen cecum during tooth development which in some cases may result in a second apical foramen.[7] The invagination also may start from the incisal edge of the tooth. Genetic factors cannot be excluded.

The reported prevalence of adult teeth affected with dens invaginatus is between 0.3% and 10% with symptoms in 0.25%–26.1% of individuals. Oehlers classified dens invaginatus according to invagination degree in three forms;

- Type I: Invagination ends in a blind sac, limited to the dental crown.
- Type II: Invagination extends to the cementoenamel junction, also extending in blind sac. It may or may not extend into the root pulp.
- Type III: Invagination extends to the interior of the root, providing an opening to the periodontium, sometimes presenting another foramen in the apical region of tooth.[8]

The clinical appearance of dens invaginatus varies considerably. The crown of affected teeth can have normal morphology or it can also show unusual forms such as a greater buccolingual dimension, peg-shaped form,

barrelshaped form, conical shapes and talon cusps. A deep foramen caecum might be the first clinical sign indicating the presence of an invaginated tooth. As this area is difficult to access and clean, caries can develop with a subsequent pulp necrosis and apical pathosis.[9,10]

### *Case Report*

A 48-year-old male patient who had no medical problems was referred to dental department, Queen Alia Military Hospital for dental treatment. After clinical and radiologic evaluations, the maxillary left lateral incisor was found carious which had normal coronal anatomy. The initial periapical radiographic examination revealed that the maxillary left lateral incisor showed an abnormal morphology with an invagination (Oehlers' type II). Fig 1.

A three dimensional radiographic evaluation was taken in order to thoroughly investigate the internal anatomy of the carious tooth and to prepare an appropriate treatment plan.

A cone beam computed tomography (CS 9600 Carestream) was done. Sagittal and coronal sections of CBCT revealed an atypical crown and root canal morphology showing the look of a tooth inside the affected tooth. The line of invagination, overpassing the cement enamel junction was shown on the sagittal sections of CBCT investigations. Fig 2, 3 & 4.

After administration of local anesthesia, and during the removal of deep dentin caries the pulp tissue was exposed which necessitate RCT that was initiated after rubber dam placement. Two canals were visualized: a buccal (semi lunar shaped major canal) and a lingual (invaginated) canal. The invagination, extends to coronal third of the root length .There was no communication between the main canal and invaginated canal.

The working length was established by a NSK iPexII apex locator (Nakanishi Inc., Tochigi, Japan). Fig 5.

The root canals were prepared with stainless steel k files (Mani Inc., Tochigi, Japan) using a step-back technique. Copious irrigation with a 2.5% sodium hypochlorite solution, and EDTA (MD-ChelCream, META BIOMED, Chungbuk, the Republic of Korea) was used. The root canals were dried with paper points (Precise Dental, Zapopan, Mexico) and obturated with a lateral condensation technique with a 0.02 tapered gutta percha (Diadent, Choongchong Buk Do, the Republic of Korea) and an AH plus (Dentsply De Trey GmbH, Konstanz, Germany) root canal sealer. Fig 6.

A two-step total-etch adhesive system (3M ESPE Adoper single Bond2 Adhesive) was used in order to perform restorative treatment. The teeth were restored with a 3M ESPE Filtek XT Dental NanoHybrid resin composite.

Fig 1: Intraoral radiograph

Fig 2: CBCT image: sagittal view

Fig 3: CBCT image: axial view.

## DISCUSSION

Identifying the type of invagination is the key to proper treatment as several treatment options have been presented in many case reports.

Using periapical x-ray (2- D radiograph) provides insufficient information for the dentist to value the complexity of the invaginatus which may lead to unsuitable treatment.

Using additional radiographic technique (cone-

Fig 4: CBCT image. Coronal view.

Fig 5: Working length determination.

Fig 6: Obturation of root canals.

beam CT imaging) helps with the diagnosis, treatment planning and a thorough understanding of the true morphology of root canal system.

Many treatment options have been reported, including conventional root canal treatment or surgical endodontic treatment.

In this case conventional root canal treatment was enough since the pulp was exposed during caries removal and there was no periapical lesion.[10-14]

## CONCLUSION

Meticulous dental examination of maxillary anterior teeth especially the lateral incisors is of increasing importance as dens invaginatus is a rare dental anomaly; the complexity of these anomalies makes the diagnosis, treatment plan and endodontic treatment difficult.

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**All authors contributed substantially**