

Dens Invaginatus : Diagnosis and its treatment options

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Abstract

Dens invaginatus is one of the developmental anomaly involving most commonly maxillary lateral incisors. Dens invaginatus is associated with an increased prevalence of pulp disease and any necessary endodontic treatment may be difficult because of its aberrant anatomy. This paper discusses the clinical and radiographic features of Dens invaginatus and various treatment options.

Introduction

Dens Invaginatus is the developmental malformation of teeth. There are number of terms to describe dens invaginatus like Dens in Dente (Busch 1897), dilated composite odontome (Hunter 1951), dents telescope, gestant anomaly (Colby 1956). According to A. Alanic and K. Bishop, the term Dens invaginatus is more appropriate as it reflects the infolding of the outer portion enamel into the inner portion dentin with the formation of a pocket or dead space. Dens invaginatus is a developmental anomaly which results in deepening of enamel organ into the dental papilla before calcification of the dental tissues¹. Dens invaginatus may be easily over looked because there is no significant clinical signs of anomaly. According to study conducted by Bachman and Wahlin, 6. 8% of the subjects had evidence of dens invaginatus where as peg shaped lateral incisors occurred in 0. 8%, germination 0. 3% and taurodontism 0. 3%². The authors also found that prevalence of dens invaginatus was comparable to hypodontia and more common than hyperdontia. The incidence of Dens invaginatus in the population varies from 0. 04% to 10% depending on the type of classification³. Dens invaginatus is observed more frequently in permanent lateral incisor with posterior teeth less frequently to be affected⁴. Dens invaginatus may not be an uncommon anomaly in permanent teeth therefore early identification and treatment is important. Several theories have been put forward explaining the etiology of Dens invaginatus. These include constriction of dental arch on enamel organ, a retardation or acceleration of growth of internal enamel epithelium, abnormal pressure from the surrounding tissues during tooth formation, a distortion of the enamel organ during tooth development or inadequate nutrition of a portion of a single tooth germ⁵.

Clinical and radiographic feature

The clinical appearance of dens invaginatus may vary from normal form (Tarjan & Rozsa)⁶ to more unusual forms such as greater labio-lingual or mesio-buccal diameter (Sousa & Bramante)⁵, peg shaped (Chen et al)⁷, barrel- shaped and conical (Sauveur et al)⁸, talons cusp (Goncalves et al)⁹ or grooving of the palatal enamel coincident with the entrance of the invagination. Identification of entrance to the invagination can be aided by use of magnification, methylene blue dye and radiopaque markers¹⁰. Radiographically anomaly exhibits a radiopaque invagination that is equal in density to enamel and according to its extension it is classified by Oehlers as Types I, II and III.

Many authors have attempted to classify dens invaginatus; Hallet's classification was the first documented classification of Dens invaginatus. Many classifications have been described by various authors Ulmanky & Hermel 1964³, Vincent-townend 1974¹¹. However classification described by Oehlers is most widely used because of its simplicity and ease of application. Oehlers classified Dens invaginatus into three classes depending on its extension from crown to root radiographically¹².

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.

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

The prevalence of each type of invaginatus was reported by Ridell et al with Type I being the most common while Type II and III were observed less frequently¹³.

Treatment Options

Dens invaginatus is regarded as a developmental anomaly resulting from an invagination of the dental papilla during the soft tissue stage of tooth formation¹⁴. The clinical appearance of dens invaginatus varies considerably. According to Jung M¹⁴ a deep foramen caecum might be a first clinical sign indicating the presence of an invaginated tooth. An invaginated tooth presents technical difficulties in its clinical management because of its abnormal anatomical configuration. Depending on the degree of malformation and the presence of clinical symptoms, various treatment techniques have been reported which includes prophylactic treatment, conservative restorative treatment, non surgical root canal treatment, endodontic surgery and extraction. Dens invaginatus without any symptoms may require treatment because of access of irritants to the invagination may result in immediate or eventual contact with dental pulp¹⁵. Application of fissure sealants was suggested by Jung M¹⁴ during prophylactic management of invaginatus. Szajkis & Kaufman¹⁶ suggested a conservative restorative therapy with placement of direct fillings. If prophylactic or restorative treatment is not possible then a conventional root canal treatment was suggested by Hulsman M¹ and Bachman B and Wahlin YB². Depending on the type of malformation, in some cases Endodontic therapy may be confined to the invaginatus preserving the vitality of the pulp as suggested by Holtzman¹², where as according to Yeh SC¹⁸ et al endodontic therapy involving invagination and the root canals has to be performed to preserve the tooth.

Treatment decision for Dens invaginatus should be based on a thorough pre-operative evaluation of the severity and complexity of the invaginatus¹⁹. According to Bishop K and Alani A¹⁰, the presence of invagination may not be seen clearly on standard parallel views in a radiograph, so they advised when suspected, to obtain a second radiograph with a 15degree angle in the horizontal angulation of the beam with the tube placed

more mesially. Cone beam CT imaging makes a three dimensional reconstruction of affected tooth helping to identify the type of invagination²⁰.

Dens invaginatus will contain remnants of the dental papilla or periodontal connective tissue, which will become necrotic and subsequently become nutrient rich environment following bacterial contamination from the mouth. Thorough debridement of canal is very important for the success of endodontic treatment. But this debridement may be compromised in a tooth with invagination because of limited access and aberrant anatomy. Holtzman and Lezion²¹ described the problems associated with management of Type III invaginatus because of presence of an enamel lining to the lumen, the variable aberrant anatomy, absence of apical constriction that makes debridement of the canal difficult. Use of ultrasonic instrumentation and magnification assists to create more predictable root canal for cleaning and subsequent filling in teeth with dens invaginatus²². Surgical approach to treat den invaginatus should be considered only when conventional treatment is not successful. In some teeth with severe invagination, extraction of tooth may still be the correct treatment option.

In immature invaginated teeth with necrotic pulp, Apexification technique using calcium hydroxide²³ and MTA²⁴ to achieve apical barrier has also been reported. The successful management of dens invaginatus depends mainly on the ability to gain access to and disinfect and seal the root canal system in presence of its complex and variable presentation and unpredictable morphology²⁵.

Conclusion

Teeth with Dens invaginatus are prone to caries and subsequent necrosis of pulp which may also lead to formation of abscess and cyst. Failure to diagnose, debride and obturate will lead to failure of treatment. With accurate diagnosis and appropriate treatment planning, teeth with Dens invaginatus even with its aberrant anatomy can be saved.

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