

## CASE REPORT

## Dens invaginatus (Type III B)

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**ABSTRACT**

Dens invaginatus or 'dens in dente' is a developmental malformation of the tooth resulting from infolding of the dental papilla before calcification. This article presents a case of dens invaginatus occurring in maxillary right lateral incisor of a 45-year-old male patient. The patient presented with pain and clinically missing maxillary right canine. The tooth was found to be non-vital. Radiographic examination revealed the tooth-in-tooth appearance of lateral incisor with a dilated pulp chamber. The crown of impacted canine was found within the pulp chamber of lateral incisor. Owing to this unique clinical presentation, both the lateral incisor and the impacted canine were extracted. Histopathologic examination confirmed the diagnosis of Dens invaginatus Type III B. A brief review on etiopathogenesis, radiographic features and treatment of dens invaginatus has also been included.

**Key words:** Dens in dente, dens invaginatus, developmental anomaly, dilated composite odontome, impacted tooth

**INTRODUCTION**

Dens invaginatus, known more commonly as 'dens in dente', is an unusual developmental anomaly involving the invagination of crown or root that is lined by enamel. Clinical and radiographic presentation of dens invaginatus varies according to the location and extent of invagination. Two basic forms have been recognized - Coronal and Radicular. The depth of invagination varies from being just an accentuated lingual pit to a severe invagination, giving the appearance of tooth within a tooth. This case report describes a unique presentation of the crown of an impacted canine within the dilated pulp chamber of lateral incisor with dens invaginatus.

**CASE REPORT**

A 45-year-old male patient presented with a complaint of pain in the upper right front tooth region. Pain was of moderate intensity, intermittent in nature and was present since one month. General health of the patient was normal and medical history was non-contributory. Clinical examination revealed tooth 12 with a deep lingual pit, clinically missing 13 and root stumps of 16. Swelling on the right side of the anterior palate

extending upto the midline was also noted. 12 gave negative response to electric pulp vitality test.

Patient was subjected to Intra Oral Peri Apical (IOPA) Radiograph in relation to 12 and Orthopantomograph (OPG), which revealed normal appearing crown of 12 with dilated morphology of the root and enlarged pulp space [Figure 1]. The root dilatation was seen on the distal aspect extending over the roots of 14. The inner surface of the dilatation was lined by enamel-like radiopaque layer. Impacted 13 was noted on the apical region of 12 with the crown of 13 seen in the radiolucent dilated pulp space of 12. The distinction between the follicular space of the canine and the pulp space of 12 was indistinct. The radiographic diagnosis of coronal Dens invaginatus Type III was considered.

Teeth 12 and 13 were extracted under local anesthesia. The bulbous root of 12 showed a wide apical gap which had housed the two-thirds of the crown of 13 [Figure 2]. Tooth 13 was easily separated from this aperture and was found to be normal. Extracted 12 was then subjected to a radiograph due to its unusual radicular morphology, which revealed an accentuated lingual pit extending into a pulp canal and lined by enamel on the coronal side. The pulp canal seemed to be obliterated in the apical region with a sudden constriction. On the labial side of this canal a bulbous radiolucency with scalloped borders was seen. In the coronal half, a layer with similar radiopaque intensity of enamel was seen lining the radiolucency [Figure 3].

On longitudinal sectioning, the swelling in the root showed copious amount of necrotic material with an indentation of

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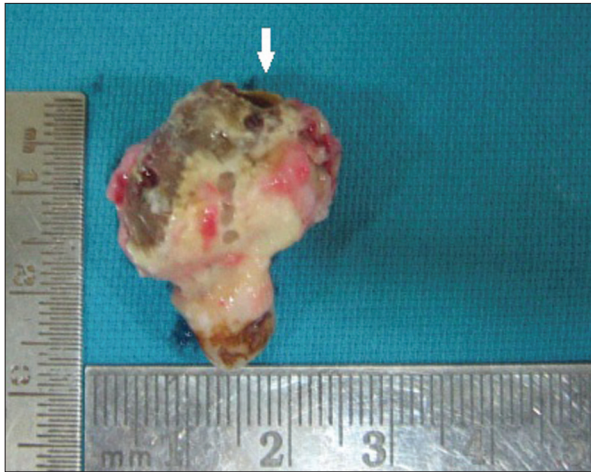
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**Figure 1:** OPG showing the association of impacted canine and lateral incisor with dens invaginatus



**Figure 2:** Photograph of the extracted specimen exhibiting a large bulbous radicular portion with the aperture that housed the crown of canine (arrow)



**Figure 3:** Radiograph of the extracted tooth showing extension of lingual pit lined by enamel and a labially placed enlarged pulp space also lined by enamel

crown of 13 [Figure 4]. Ground section was prepared and viewed under the microscope which revealed normal enamel on the crown and cementum on the outer surface of the root. Enamel on lingual side extended into the pit region for about a third of the length of the canal, the rest of the canal was lined by dentin which showed whorled arrangement [Figure 5]. The

dilated portion of the root showed enamel lining in the coronal part and was lined by dentin elsewhere. The walls showed dentin with tubules arranged irregularly or in a whorled pattern [Figure 6]. No shape or structural abnormalities were noted in 13. Based on the above findings, a final diagnosis of dens invaginatus - Type III B was arrived upon.

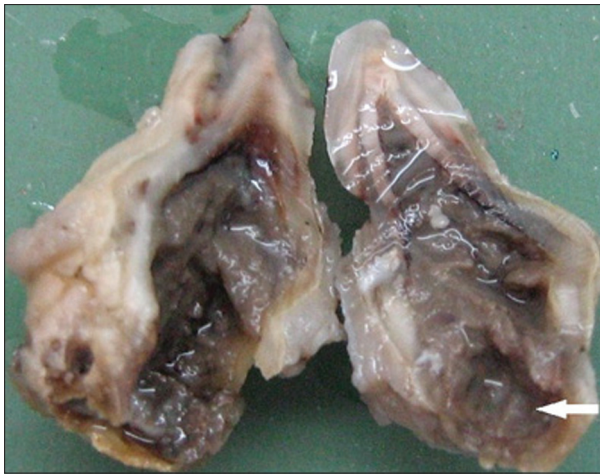
## DISCUSSION

Dens Invaginatus was described by Ploquet in 1794 in a whale's tooth and was identified as such in a human tooth by the dentist Socrates in 1856.<sup>[1]</sup> Baume was the first to suggest use of the term dens in dente.<sup>[2]</sup> Other terms that have been coined include "dilated composite odontome", "gestant odontome", "dentinoid in dente", "invaginated odontome", "telescopic tooth" and "tooth inclusion".<sup>[3,4]</sup>

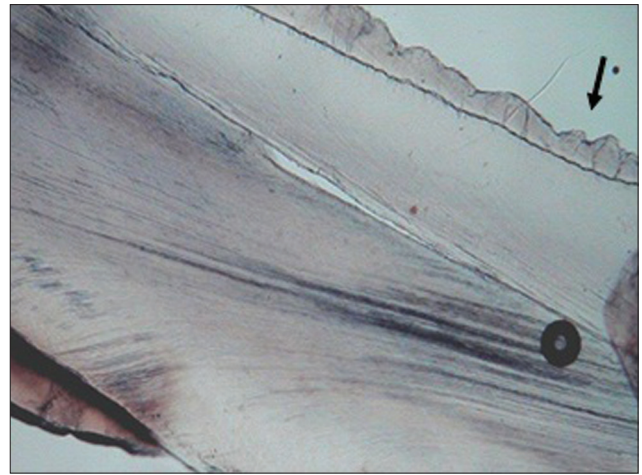
Several theories have been put forward to elucidate the etiopathogenesis of dens invaginatus. A focal failure of growth of the internal enamel epithelium while the surrounding normal epithelium continues to proliferate engulfing the static area has been proposed as the cause. Conversely, Rushton *et al.*, proposed that hyperproliferation of the inner enamel epithelium rather than retardation to be an etiologic factor.<sup>[5]</sup> Mechanical factors like growth pressure leading to buckling of tooth germ and trauma, Infection and a twin theory suggesting fusion of two tooth germs have also been suggested. The genetic basis for occurrence of dens invaginatus has been probed by Grahnén, who in 1959 reported a striking number of dens invaginatus cases in patients, their siblings and parents.<sup>[6]</sup> Dental anomalies that have been reported along with dens invaginatus include supernumerary teeth, microdontia, macrodontia, hypodontia, oligodontia, taurodontism, fusion and gemination.<sup>[4]</sup> Syndromic association of dens invaginatus has been reported in Ekman-Westborg-Julin syndrome, Williams syndrome and Nance Huran syndrome.<sup>[7]</sup>

Among all developmental anomalies that occur in relation to teeth, dens invaginatus represents a rare form of anomaly contributing to 0.04 to 10% with a female to male predilection in the ratio of 3:1.<sup>[8]</sup> Dens invaginatus primarily occur in permanent dentition, however cases have been reported in deciduous dentition and supernumerary teeth.<sup>[9]</sup> The maxillary teeth are more commonly affected than mandibular teeth. Among permanent teeth, the maxillary lateral incisors are the most commonly affected tooth as is the case here, followed by central incisors, canines and molars.<sup>[4,10]</sup> The accentuated pit within the dens invaginatus accumulates debris resulting in rapid initiation and progression of dental caries with subsequent involvement of the pulp, resulting in periapical pathology. The present case also involved a maxillary lateral incisor which showed an accentuated pit. The tooth was non-vital and the pulp space was filled with necrotic pulp. However, the canal through the lingual pit did not appear to have communication with the space containing the necrotic pulp. The cause for





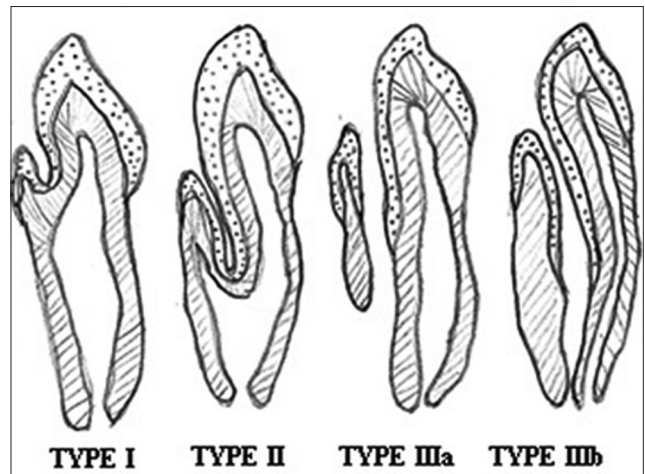
**Figure 4:** Cut section of the tooth with necrotic material and indentation (arrow) from the impacted 13



**Figure 5:** Longitudinal ground section with enamel in the pit region extending beyond the CEJ (arrow)



**Figure 6:** Longitudinal section of root depicting whorls of dentine



**Figure 7:** Types of dens invaginatus (Oehlers classification, 1957)

necrosis thus seems to be of periodontal origin.

Oehlers classified dens invaginatus based on the radiographic interpretation of the degree of invagination<sup>[11]</sup> into three types: Type I, Type II and Type III [Figure 7].

Type I indicates a minor enamel lined invagination that is restricted within the crown of the tooth and does not cross beyond the cemento-enamel junction.

In Type II, the enamel-lined invagination extends into the pulp chamber without any communications to either the pulpal or periodontal ligament.

Type III dens invaginatus is further sub classified into Type III A and Type III B. Type III A is an invagination seen running into the root, communicating laterally with the periodontal ligament without pulpal involvement. Type III B invaginates into the root communicating with the periodontal ligament at the apical foramen and is lined usually by enamel and in rare instances by cementum.<sup>[11]</sup>

Among the different types of dens invaginatus, Type III

dens invaginatus are relatively rare constituting only 5% in comparison to Type I (79%) and Type II (15%).<sup>[12]</sup>

While conventional radiographic methods may be sufficient for diagnosis, the three dimensional nature of the anomaly may require the use of a second radiograph with a 15° change in horizontal angulation of the beam with a more mesial placement of the tube.<sup>[7]</sup> The radiographic presentation could be a simple radiolucent fissure on most occasions lined completely by radiopaque enamel or there might be an enamel lined fissure of variable length running all the way to the periodontal ligament laterally or apically, giving the appearance of a ‘pseudocanal’.<sup>[13]</sup> Chronic inflammation at the apical region of the dens invaginatus may cause proliferative periostitis.

The invaginations may be intact with no pulpal involvement or in some cases exhibit extensions into the pulp. The dentine underlying the folded enamel may also show irregular histology.<sup>[14]</sup> The enamel found is usually aprismatic and hypomineralised. In the present case, in addition to the enamel lined pit, a wide radiolucent space lined by enamel was found.

The continuity of this layer of enamel with the surface enamel was not appreciable on both radiographs and ground section. Another unusual finding was the presence of impacted canine within the wide pulp space filled with necrotic tissue. The canine remained unaffected showing a normal morphology.

The inaccessible nature of the anomaly and its variable presentation along with its proximity from the pulpal chamber and canal present treatment challenges. Partially developed roots and tortuous pit further complicate the treatment of dens invaginatus. Treatment for Type I dens invaginatus includes minimally invasive procedures and sealing of the defect with restorative materials. Bishop (2008) indicated that minor debridement with ultrasonic instruments and use of sealants may be successful in Type I and Type II cases.<sup>[7]</sup> However, most cases require further invasive procedures, including root canal therapy due to extension of the defect over a period of time. In cases where pulpal involvement is foreseen, the treatment could range from conservative pulpotomy to a full-fledged root canal treatment, preferably with the use of a dental endoscope. Use of aqueous intracanal medicaments and thermoplasticizing techniques have been seen to provide successful results.<sup>[15]</sup> In teeth with open apices, various restorative materials have been utilised, including calcium hydroxide, zinc oxide cement (IRM), mineral trioxide aggregate (MTA) and gutta percha. Surgical treatments may be indicated in cases of dens invaginatus with extensive infection in the periapical region as well as in cases of Type III with complex root canal anatomy and incomplete root canal development. Methods that have been utilised include: intentional reimplantation and removal of invaginated portion.<sup>[16]</sup> A tooth with dens invaginatus having severe mobility, pulpal and periapical infection may need to be extracted. The necrotic process involving the lateral incisor and the close association of canine necessitated the extraction of both teeth in the present case.

In summary, the present case of dens invaginatus Type III B in maxillary lateral incisor was accompanied by a unique finding of crown of impacted canine in its bulbous root canal. The necrotic pulp of lateral incisor necessitated the extraction of both the teeth.

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