

DENTAL ARTICLE

# A Rare Presentation of Bilateral Maxillary Dens Invaginatus Diagnosed Using Cone Beam Computed Tomography

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**ABSTRACT**

Dens invaginatus is a developmental variation in the formation of a tooth that causes changes in the internal anatomy of the tooth. The presence of double dens invaginatus is extremely rare. Understanding the type, extension, and complex morphology of dens invaginatus is essential. Diagnosis of this condition using conventional radiographic techniques is not easy. Advanced imaging techniques, such as cone beam computed tomography (CBCT) are very helpful in diagnosis of these complex anatomic variations. In the present case report, we demonstrate the use of CBCT in the evaluation and treatment planning of bilateral maxillary dens invaginatus, of which one presented as a case of double dens.

**Key words:** Complex morphology, cone beam computed tomography, developmental variation, double dens invaginatus

**INTRODUCTION**

Developmental tooth malformations pose a challenge to the clinician in diagnosis as well as treatment because of their complex crown and root canal morphology. One such developmental anomaly of the teeth is dens invaginatus, which results from the invagination of the enamel into the dental papilla before calcification has occurred.<sup>[1]</sup>

Oehlers described three types of dens invaginatus for anterior teeth: Type 1, enamel-lined invagination confined within the crown; Type 2, enamel-lined invagination invading the root as a blind sac, with possible connection to the dental pulp; and Type 3, invagination penetrating through the root to open in the apical region.<sup>[2]</sup>

Prevalence of dens invaginatus in the normal population ranges from 0.3% to 10%. The teeth most commonly affected are the maxillary lateral incisors and bilateral occurrence is seen in up to 43% of the cases.<sup>[3]</sup> Double dens invaginatus is an extremely rare dental anomaly involving two enamel-lined invaginations that is seen in the crown or roots of a tooth.<sup>[4]</sup>

To provide successful treatment of this lesion, it is very important to evaluate the extent of invagination and the

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complex internal anatomy of the tooth and this cannot be achieved with two-dimensional imaging. Use of more advanced imaging modalities such as cone beam computed tomography (CBCT) can help the clinician in making an accurate diagnosis. Imaging software allows generation of images in three planes that can be continuously scrolled through, thus allowing a three-dimensional (3D) understanding of the structure involved.<sup>[5]</sup>

This report highlights the use of CBCT as an auxiliary resource in the diagnosis as well as treatment planning of double dens invaginatus.

## CASE REPORT

A 22-year-old male patient presented with a complaint of occasional pain and tenderness in the right maxillary lateral incisor. Patient had an unremarkable medical history and reported no history of dental trauma.

Patient was under treatment planning stage of orthodontic therapy for Angle's Class I malocclusion. The bilateral dens invaginatus was identified on a dental panoramic tomography taken for orthodontic diagnostic purposes.

Clinical examination revealed maxillary right lateral incisor (tooth 12) positioned out of the arch and caries on the palatal aspect of the maxillary left lateral incisor (tooth 22). Morphologic alteration was observed in both teeth. Crown portion of tooth 12 was wider both mesiodistally and buccolingually with prominent cingulum and a palatal groove [Figure 1]. A palatal groove was observed in tooth 22 with no significant alteration in the dimensions of the crown [Figure 1]. On pulp sensitivity testing using cold test, tooth 12



**Figure 1:** 22-old-year male with pain and tenderness in the right maxillary lateral incisor diagnosed with dens invaginatus Type 2 in tooth 22 and double dens invaginatus in tooth 12. Clinical picture shows tooth 12, which is wider both mesiodistally and buccolingually with prominent cingulum and a palatal groove. Tooth 22 shows a palatal groove and no significant alteration in the dimensions of the crown.

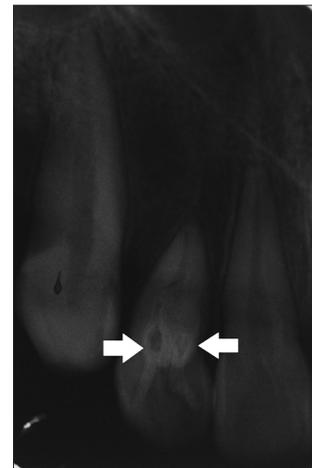
did not respond, while tooth 22 responded normally. On radiographic examination, two enamel-lined invaginations were observed for tooth 12, but the extent of invaginations was unclear [Figure 2]. A single pear shaped enamel-lined invagination extending on to the root surface was observed for tooth 22 [Figure 3].

Because of the invagination, the morphology of the pulp canal space and the relationship between the two were not entirely clear from the conventional diagnostic radiographs. It was decided that a limited-volume CBCT scan of the maxilla may be helpful in understanding the internal anatomy of the tooth and determining the most appropriate treatment protocol.

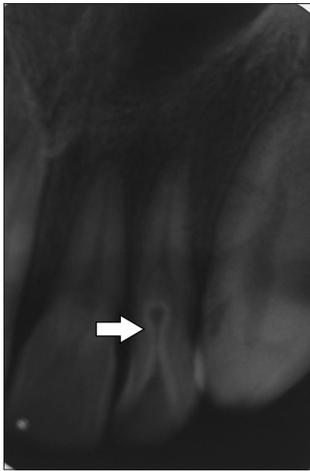
Patient was informed of the intended benefits and potential risks of the CBCT scan. After obtaining written informed consent, a CBCT (CS 3D Imaging Software) of the maxilla was performed with the following exposure parameters: 70 kV, 10 mA and 10.8 s [Figure 4].

Careful examination of cross-sectional images of tooth 22 revealed invagination extending apically beyond the cemento-enamel junction and ending as a blind sac without communicating with the dental pulp, confirming it as Oehlers Type 2 variant [Figure 4]. Cross-sectional images of tooth 12 revealed large Type 2 invagination as it was extending toward the root and communicating with the pulp and the second invagination was Type 1 with no communication with the pulp [Figure 4a and b].

Based on the confirmative findings of CBCT, conservative nonsurgical endodontic treatment was planned for tooth 12 with the double dens and simple restorative procedure for Type 2 dens invaginatus in tooth 22.



**Figure 2:** 22-old-year male with pain and tenderness in the right maxillary lateral incisor diagnosed with dens invaginatus Type 2 in tooth 22 and double dens invaginatus in tooth 12. Intra-oral radiograph of tooth 12 shows the double dens invaginatus and the presence of two enamel lined invaginations (arrows).



**Figure 3:** 22-old-year male with pain and tenderness in the right maxillary lateral incisor diagnosed with dens invaginatus Type 2 in tooth 22 and double dens invaginatus in tooth 12. Intra-oral radiograph of tooth 22 with Oehlers Type 2 dens invaginatus shows presence of a single pear shaped enamel lined invagination extending on to the root surface.

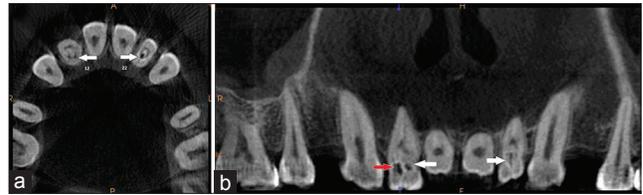
## DISCUSSION

The presumed etiology of dens invaginatus has been assigned to several factors including focal growth retardation, growth pressure of the dental arch, localized external pressure in certain areas of the tooth bud, infection, trauma and in some cases even genetic alterations. However, its real pathogenesis remains unknown.<sup>[3]</sup>

Dens invaginatus was described by "Ploquet" in 1794, in a whale's tooth. Dens invaginatus was described as "a tooth within a tooth" by Salter in 1855 and was seen in human tooth by a dentist named Socrates, in 1856.<sup>[1]</sup> Because of the radiographic appearance of a tooth within a tooth, dens invaginatus is also referred to as dens in dente. It is also called invaginated odontome, dilated composite odontome and dents telescope. According to Alani and Bishop, dens invaginatus seems to be an appropriate nomenclature, because it reflects the in-folding of the outer portion (enamel) into the inner portion (dentin), with the formation of a pocket space.<sup>[3]</sup>

The invagination allows access of irritants into the pulp space or into an area connected to the periradicular tissues leading to necrosis of the pulp tissue and to the development of periapical lesions. In cases without signs of pulp pathology, conservative management like fissure sealing and restorations can effectively be accomplished by early clinical or radiographic diagnosis.<sup>[3]</sup>

Dens invaginatus is relatively common dental anomaly, but the occurrence of double dens is relatively rare. Few cases of double dens were reported in the literature,<sup>[4,6]</sup> but our case is the rare presentation of asymmetrical bilateral maxillary dens invaginatus presenting both double dens



**Figure 4:** 22-old-year male with pain and tenderness in the right maxillary lateral incisor diagnosed with dens invaginatus Type 2 in tooth 22 and double dens invaginatus in tooth 12. (a) Cone beam computed tomography (CBCT) of maxilla shows axial sections of teeth 12 and 22. Cross-sectional image of tooth 12 (white arrow) shows two invaginated canals and tooth 22 (white arrow) shows single invagination. (b) CBCT of maxilla shows coronal sections of teeth 12 and 22. Cross-sectional image of tooth 12 shows large invagination of Oehlers Type 1 extending toward the root and communicating with the pulp (red arrow) and the other invagination of Type 2 with no communication with the pulp (white arrow). Cross-sectional image of tooth 22 confirms Type 2 invagination extending apically beyond the cemento-enamel junction and ending as a blind sac without communicating with the dental pulp.

and Type 2 dens confirmed using advanced technology like CBCT.

Conventional two-dimensional radiographs have inherent limitations, as they are not able to provide a 3D view of the tooth scanned.<sup>[7]</sup> In the present case, conventional radiographs did reveal the presence of invagination in both the teeth, but its extent and presence of communication with the pulp could not be assessed.

Before referring a patient to CBCT, a thorough consideration of risk versus benefit analysis should be carried out. It is essential that the radiation dose be kept as low as reasonably achievable. When compared with the alternative conventional computed tomography, CBCT images are reconstructed with significantly lower doses of radiation.<sup>[8]</sup>

The CBCT scan provided the endodontist a 3D representation of the invaginated tooth and allowed for a true understanding of the nature of the invagination and its relationship to the main canal of the tooth.<sup>[9]</sup> In the present case, CBCT helped in assessment of double dens and hence conservative nonsurgical endodontic treatment was planned for tooth 12. For tooth 22, CBCT examination confirmed no communication between the invagination and root canal, which greatly helped the decision of conservative restorative approach avoiding further intervention.

The visual information generated from CBCT is also useful in explaining to the patient the complexity of the disease and the planned treatment approach.

## CONCLUSION

True nature of developmental anomalies such as dens invaginatus cannot always be assessed from conventional radiographs. The use of CBCT in the present case report

provided information essential for understanding the complex internal anatomy of dens invaginatus and served as an important aid in diagnosis and treatment planning. Clinicians should consider the use of CBCT in the diagnosis and treatment of dens invaginatus.

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