

Dens in Dente: Imageological Relevance

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ABSTRACT

Dens invaginatus, formerly known as “dens in dente,” is a significant dental anomaly resulting from the folding of enamel and dentin into the tooth structure during its formation. This condition exhibits various morphological variations in both crown and root development. Consequently, it often leads to complications such as dental caries, pulpal, and periodontal involvement, ultimately resulting in necrosis and loss of periodontal attachment. Recognizing the importance of early detection and prevention is of great significance.

Historically, treatment options for dens invaginatus were limited due to its intricate nature. However, advancements in dental care have prompted a reevaluation of management strategies. This article offers a comprehensive retrospective of the literature concerning radiological evidence of dens invaginatus. It delves into its clinical manifestations & diagnostic approaches.

Keywords: Dens invaginatus, dens in dente, cone beam computed tomography, radiographic finding

INTRODUCTION & BACKGROUND:

In the fascinating world of dental anomalies and the insights they offer into the intricate nature of our teeth, one such uncommon dental developmental anomaly seen in permanent teeth is dens invaginatus. Dens invaginatus colloquially termed “tooth within a tooth,” represents an infrequent dental anomaly characterized by the invagination of the enamel organ into the dental papillae.¹ The initial documentation of dens invaginatus in whale tooth dates back by Ploquet in 1794,^{2,3} while the comprehensive description of this dental anomaly was provided by a dentist named Socrates in the year 1856. This developmental anomaly is recognised by various names,

including dens invaginatus, dilated composite odontome and dilated gestant odontome,^{3,4} Dens invaginatus can be present in varying degrees of severity. The histology confirms a thin layer of enamel and dentine separating the pulpal tissue which can be hypoplastic and may predispose to the entry of irritants and thereby lead to necrosis of the pulp and infection. As pulpal involvement of teeth with coronal invaginations may occur a short time after tooth eruption, an early diagnosis is mandatory to instigate preventive treatment.⁵

The clinical significance of this malformation lies in its manifestation of a wide spectrum of morphologic variations, often leading to early pulp necrosis. The etiology of this condition remains

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contentious, marked by diverse perspectives and an absence of clarity in understanding. Kronfeld, Fischer, Sprawson, Rushton, Oehlers, and others have presented compelling perspectives, ranging from localized epithelial growth failure and infectious etiology to the influence of external forces and genetic factors.^{6,7}

While some theories focus on the intrinsic processes within the enamel organ, such as rapid proliferation or distortion, others consider external influences and trauma during developmental stages.⁸ In the clinical dental practice, the identification of dental anomalies such as dens invaginatus poses a significant diagnostic challenge for clinicians.

Consequently, the initial detection of such anomalies is frequently incidental, typically occurring through standard dental imaging modalities. Routine dental radiographs often serve as the first line of investigative tool in revealing the presence of such anomalies. However, the intricate nature of dens invaginatus, with its complex internal anatomy, often necessitates more advanced imaging techniques for a definitive diagnosis. Now, cone-beam computed tomography (CBCT) has emerged as a critical diagnostic adjunct—the high-resolution three-dimensional images, allow for a detailed analysis of the tooth's internal structure, enabling clinicians to accurately diagnose the presence and extent of dens invaginatus.

This publication intends to present three cases of dens in dente, which were accidental findings.

Case 1 (Clinical Presentation)

A 13 year-old female reported with complaint of purulent discharge from the left maxillary anterior

region since a week. The patient's medical, social and dental history were non-significant. To the best of her knowledge, she was not allergic to any medication, & revealed no history of any surgery in that region. She gave positive history of alleged trauma while playing 6 months ago. Extra-oral facial examination revealed no gross facial deformity. The submandibular, sub-mental & cervical lymph nodes were not palpable. Intra-oral examination showed an erythematous, smooth, non-tender, stiff papule measuring 1mm x1mm in size which was suggestive of draining sinus with respect to the periapical region of 22 (figure 1). On close examination there was no carious lesion noted.

Intra oral periapical Radiographic findings:

Intraoral periapical radiograph showed the crown of 22 which was slightly wider by 2 mm than the usual dimension. The coronal anatomy with enamel and dentin & pulp appeared normal. The distal part of the crown showed radiopacity which was similar to that of enamel & was extending till middle third of the root. This radiopaque border in the root was resembling a parallelogram like shape which was causing the dilation of the root on the distal aspect giving it a non-slender & non-conical shape. Whereas, the mesial aspect of the root showed normal anatomical slender & conical shape. The dentin laid down in the root surrounded the enamel like radiopacity mimicking the parallelogram shape as seen in figure. However, the root canal continued like a spiral shadow until the middle third of the root and is obscured midway reaching the apex of root. Lamina dura on the mesial aspect of the root was not traceable. However it is important to note that there was no well defined periodontal



Fig. 1: a) intraoral clinical picture showing draining sinus with 22, b) Intraoral periapical radiograph confirming dens invaginatus, c) ohlers classification for dens invaginatus

ligament space & lamina dura on distal side of the entire root length was not traceable. An ill defined radiolucency measuring approximately 1mm x 2mm in dimension was evident on the distal aspect of the root suggestive of periapical abscess. (Figure 1b). For evaluating the contralateral lateral incisor, an OPG was taken and it revealed no such anatomical discrepancy.

This case was diagnosed as Ohler type IIIb variety⁸.

Case 2

A 22 year-old undergraduate student reported with a chief complaint of pus discharge

from the left maxillary anterior tooth region which was persistent since one month. The medical & social history given by the patient was non-significant. There was no history of allergy or surgical procedure. Extra-oral examination revealed no gross asymmetry. Submandibular, sublingual & cervical lymph nodes were non-palpable. Intra oral examination of the area of chief complaint showed soft, smooth, erythematous papule noted on the maxillary left gingival region of 22 suggestive of parulis / draining sinus (figure 3a). On close examination there were no overt sign of caries in any of the tooth concerning that region

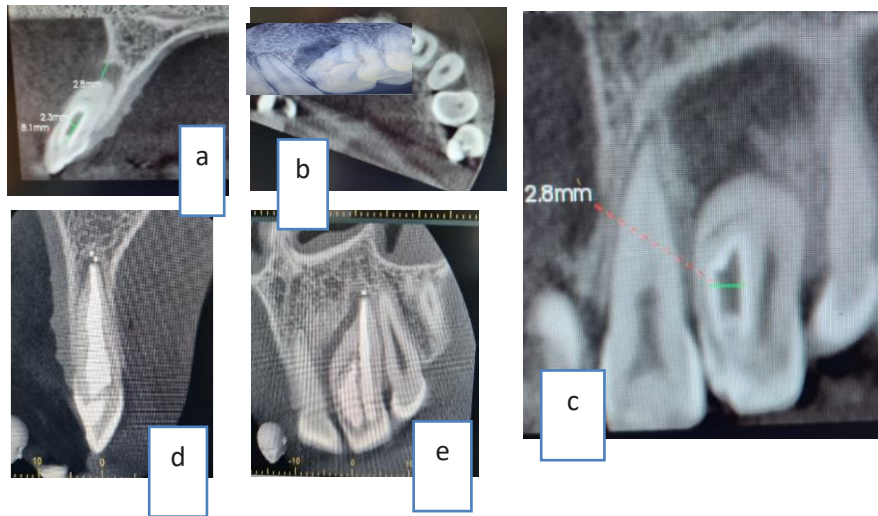


Fig. 2: Cone beam computed tomography images confirming the type of dens invaginatus a) Sagittal section, b) axial section, c) coronal section, d) & e) showing post operated pictures in Sagittal and coronal view respectively.

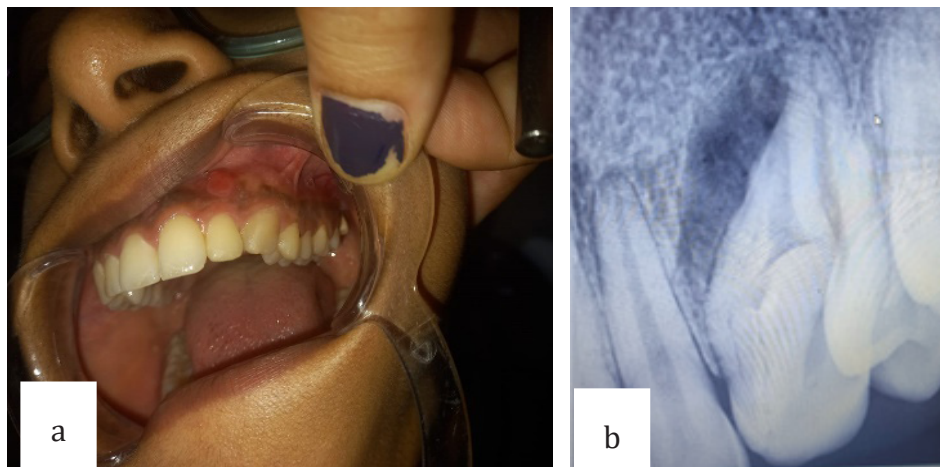


Fig. 3: a) intraoral clinical picture showing draining sinus, b) intraoral periapical radiograph showing unusual anatomy of 23 confirming dens invaginatus.

Radiographic assesment

Intra-oral periapical radiograph showed the crown of 23 which appeared to be wider mesiodistally by 3mm than the normal. The coronal anatomy on the mesial aspect showed enamel like radiopacity forming a deep fissure & was extending till middle third of the root. This enamel like radiopacity in the crown appeared to penetrate through root and communicating through a pseudo foremen opening mesially and laterally to the main root canal (figure 4). There was no comomunication with the main pulp canal which was lying compressed within the root. This deep fissure on the mesial aspect of the crown resulted in dilation of the root giving it non-slender & non-conical shape. Periodontal ligament space & lamina dura was not traceable on the mesial side of the entire root length. An ill defined radiolucency was noted on the mesial aspect of the root extending from cervical 3rd till

apical region of the root which is suggestive of periapical lesion most probably periapical abscess.

This particular case of dens invaginatus has a characteristic of Oehlers' Type III a variety⁸

Case 3

In one such unfortunate case, a 35year old who had excruciating pain with upper right lateral incisor, with no history of trauma or pus underwent extraction of the offending lateral incisor on urgent basis, without any radiographic investigation. The extracted tooth was procured and we tried to unravel the mystery of pain. The roots were unusual looking almost like a conch-shell measuring approximately 15 mm. A periapical radiograph taken revealed unusual internal anatomy of the tooth, which complicated the pain of the patient. A longitudinal section was taken which showed presence of a triangular window as depicted in the picture below.

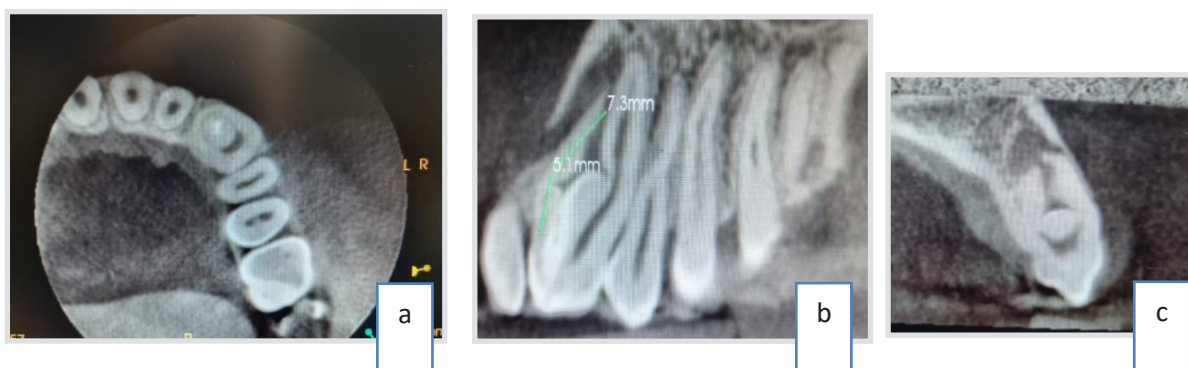


Fig. 4: Cone beam computed tomography images to confirm type of dens invaginatus and treatment planning, a)axial view, b) coronal view, c) Sagittal view

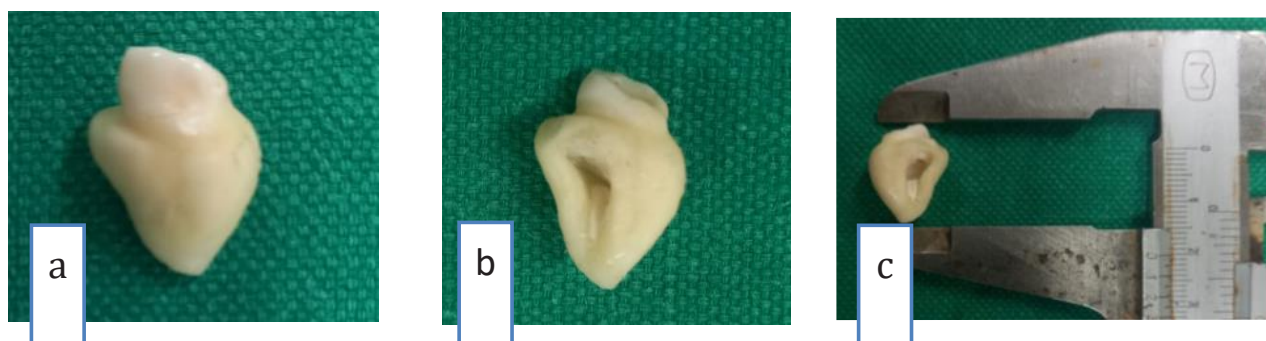


Fig. 5: Images of the Extracted tooth a) labial aspect with wider mesiodistal dimension, b) palatal view showing hollow groove on the mesial aspect of the root, c) measurement approximately 15mm, d) radiograph of the extracted tooth confirming ohler type3 a form

DISCUSSION

Dens invaginatus presents with varying degrees of severity, histology often confirms thin layer of enamel and dentin separating the pulpal tissue which could be hypoplastic and predisposes entry of irritants/microbes -thereby leading to necrosis of the pulp and infection. Alongwith pulpal involvement, the coronal invaginations occur in short time after tooth eruption, an early diagnosis or radiographic intervention is mandatory to instigate preventive treatment⁵.

Thus, the extension of invagination, type of DI and the condition of pulp changes the treatment options and course of treatment. Superior diagnostic ability in the detection of DI and assessment of its type offers better prognostic value. The location of the extension of invagination and the course of penetration into the affected tooth can be visualized in a more detailed way by the use of CBCT, may be easily overlooked in the absence of clinical signs⁹. Pre treatment radiographs are mandatory for good assessment of architecture of the root canal. If good illustration is obtained & good use of instruments & configuration is done, Root Canal treatment can be facilitated. In case such advance imageology can not be obtained, then it leads to disastrous moments for patient, wherein patients succumb to resort for extraction

The maxillary anterior region has special importance in facial and dental esthetic, therefore tooth loss and malformed structures could affect the appearance as well as the quality of life of an individual. This region particularly has importance when it comes to dental anomalies and stands at the top of the list as being the most affected region of mouth regarding dental anomalies including Dens invaginatus (Kronfeld 1934; "2011_Munir_DENS_INVAGINATUS_AETIOLOGY_CL," n.d.). The advanced imaging modalities like cone-beam computed tomography (CBCT) has revolutionized the diagnosis and assessment of dens invagination, offering superior spatial resolution and 3D visualization capabilities. CBCT facilitates precise identification of the type and extent of dens invagination, enabling radiologists to provide accurate information crucial for effective treatment planning and

management decisions. Cone-beam computed tomography CBCT aids in precise diagnosis and treatment planning, especially when considering the proximity of adjacent anatomical structures and the feasibility of endodontic interventions. Such imageology highlights a tooth with hidden pathology, evidenced by a chronic sinus tract and complex root anatomy consistent with dens invaginatus, resulting in a periapical abscess as in case 1 & 2. It emphasizes the importance of comprehensive radiographic imaging in diagnosing dental issues not evident through clinical examination alone. Both cases stress considering dental anomalies and past history of trauma as contributory factors in chronic dental infections. The extreme pain and distress as seen in Case 3 necessitated extraction, indicating the need for further investigation when developmental defects or unexplained sinus tracts are present. Post-extraction, it's crucial to analyze the reasons behind the tooth's removal and explore alternatives. In spite of complicated root canal architecture, with present day endodontic procedures, the tooth can be obdurate judiciously and thereby saved. Thus dental anomalies must be borne in mind while assessing any patient.

CONCLUSION

In conclusion, these cases highlights the importance of comprehensive radiographic imaging in diagnosing underlying dental anomalies, especially when clinical examination alone may not suffice. Discovery of xrays have been a great boon to mankind which facilitated one to be able to improvise and lead to invention of further advanced imaging modalities to better understand the internal architecture of the tooth. Prudence lies in the good and clean diagnostic which help us navigate into complicated anatomical architecture. Therefore facilitating good service to our pateints. Advanced imaging modality aids clinicians in diagnosing the specific class of dens invaginatus affecting the tooth and facilitates the assessment of the feasibility of any planned endodontic treatment, particularly when considering the proximity of adjacent anatomical structures in cases of potential apical surgery. The utilization

of cone-beam computed tomography (CBCT) has been documented for evaluating dens invaginatus lesions before initiating treatment.

Informed Consent was taken from the patient for using the radiographs, no personal facial image was used.

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Conflict of Interest : None

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