Cone Beam Computed Tomography Aided Diagnosis of Double Dens Invaginatus in a Fused Supernumerary Tooth and Maxillary Central Incisor: A Case Report

Hima John¹, S Padmashree², Rema Jayalekshmy³
¹Post-graduate Student, Department of Oral Medicine & Radiology, Vydehi Institute of Dental Science and Research Centre, Bengaluru, Karnataka, India, ²Professor & Head, Department of Oral Medicine & Radiology, Vydehi Institute of Dental Science and Research Centre, Bengaluru, Karnataka, India, ³Professor, Department of Oral Medicine & Radiology, Vydehi Institute of Dental Science and Research Centre, Bengaluru, Karnataka, India

Dens invaginatus is a developmental malformation that causes changes in the internal anatomy of the tooth. Fusion and twinning are terms commonly used to describe the clinical presentation of double teeth. The presence of double dens invaginatus is extremely rare. Therefore understanding the complex morphology, type and extension of dens invaginatus are very essential. To establish the diagnostic hypothesis based on a periapical radiograph is a challenge for all different dentistry specialties. With cone-beam computed tomography (CBCT), the diagnostic dilemma is minimized because of the accurate visualization of the anatomy. The visualization of three-dimensional structures is very helpful in the diagnosis of these complex anatomic variations as it favors precise definition of the problem and treatment planning. With this case report, we would like to highlight how CBCT helped in the evaluation and treatment planning of Double dens invaginatus of a fused supernumerary tooth and maxillary central incisor, which could not be done using the intraoral periapical method.

Keywords: Cone beam computed tomography, Dens in dente, Dental anomaly, Double dens invaginatus, Supernumerary tooth

INTRODUCTION

Developmental tooth malformations because of their complex crown and root canal morphology pose a challenge to the clinician in the diagnosis, as well as treatment. 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. The malformation results from an in folding of dental papilla, which takes place during early tooth development. The affected tooth shows a deep in folding of enamel and dentine starting from the foramen cecum or even the tip of cusps and which may extend to any level of the tooth depending on the severity.¹

Fusion and twinning are terms commonly used to describe the clinical presentation of double teeth. The fusion process involves the tooth epithelial and mesenchymal germ layers and, as a consequence, irregular teeth formation occurs and compromises esthetics and dental alignment.²

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 with possible connection to the dental pulp; and Type 3, invagination penetrating through the length of the root to open in the apical region.³

The prevalence of dens invaginatus in the normal population has been reported to range from 0.3% to 10%. The teeth most common affected are the maxillary lateral incisors with bilateral occurrence seen in up to 43% of the cases. Double dens invaginatus is a very rare type of dental anomaly involving two enamel lined invaginations that are seen in the crown or roots of a tooth.⁴ Clinically, the invaginations appear in the tooth crown at the site of an anatomical lingual pit thereby making it highly susceptible to caries. Radio-graphically, the invaginations appear radiopaque, equal in density to enamel, extending from the cingulum into the root canal. The defects may vary in size and shape from a ribbon like pear-shaped slightly...
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Radiolucent structure to a severe form resembling a “tooth within a tooth.”

To provide successful treatment of this malformation, the accurate evaluation of the extent of invaginations should be done which will help us get a better picture of the complex internal anatomy of the tooth. This accuracy cannot be achieved with two-dimensional imaging hence use of more advanced imaging modalities such as cone-beam computed tomography (CBCT) can help the clinician in making the correct diagnosis. CBCT software allows generation of images in three orthogonal planes that can be continuously scrolled through, thereby allowing a three-dimensional (3D) understanding of the area being studied.

This report highlights the use of CBCT as diagnostic imaging resource, as well as treatment planning of double dens invaginatus.

CASE REPORT

A 23-year-old male patient presented with the complaint of a swelling in the upper front teeth region since 1 month. From when the patient first noticed, it has remained the same size. Associated with dull aching pain, with a discharge of pus in the upper front teeth region since 1 month. History of restoration in the same tooth done 6 months ago. The patient had an unremarkable medical history and reported no history of dental trauma.

On clinical examination, altered morphology of 11 was noted with the presence of a cervico-incisal groove on the labial surface indicating it to be a fusion between 11 and supernumerary tooth. A diffuse swelling was noted on the gingiva with a sinus tract opening in relation to the same tooth (Figure 1). Palatally, tooth colored restoration noted on the palatal surface of 11 with diffuse swelling in the palatal gingiva in relation to the same tooth. The swelling on palpation was firm in consistency, and the tooth was tender on vertical percussion (Figure 2).

On intraoral periapical radiographic examination, two enamel lined invaginations were observed for tooth 11 and the fused supernumerary, but the extent of invaginations were unclear. In the periapical region a well-defined radiolucency measuring about 1.5 cm was seen involving the apex of 11 with corticated margins and loss of lamina dura in relation to 11 (Figure 3).

To understand the extent of invagination and get an accurate view of the tooth morphology; it was decided that a single field of view CBCT scan of the anterior maxilla may be helpful. This would help in understanding the internal anatomy of the tooth which in turn would be helpful in determining the most appropriate treatment protocol. CBCT (CS 3D Imaging Software) of the anterior maxilla was performed with the following exposure parameters: 70 kVp, 10 mA and 10.8 s.
In the cross-sectional images that were obtained; it was
noted that the supernumerary tooth (seen mesially) had
Oehlers Type 2 invagination and the 11 had a double
invaginatus which was Oehlers Type 3. The invaginatus of
the supernumerary tooth communicated with the pulp,
whereas the double invaginatus in 11 did not communicate
with pulp and opened separately at the apex (Figure 4).

Based on the accurate findings obtained from the CBCT
sections, enucleation of the radicular cyst, apicoectomy, and
endodontic treatment was planned for tooth 11.

**DISCUSSION**

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 Socrates stated the
incidence of the same in human tooth in 1856.1 Due to 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 dens telescope. According to Alani and Bishop, dens
invaginatus seems to be the suitable nomenclature, as it
reflects the in folding of the outer enamel into the inner
dentin, with the formation of a pocket space.4 The incidence
of Double dens invaginatus is extremely rare. Only 9 cases of
double dens invaginatus were reported prior to the advent
of the CBCT era.7

The etiology of Dens invaginatus is controversial and
remains unclear. Various theories have been put forward
for the pathogenesis of this condition has been proposed,
but with little agreement. The probable factors responsible
could be due to an uncontrolled growth of a portion of
the enamel epithelium, rapid in-growth of a portion of the
internal enamel epithelium into the developing adjacent
dental papilla. The other factors could be the external forces
exerted on the developing tooth germ, absence of certain
intercellular signal molecules causing dental anomalies,
trauma, and infection during tooth development. Along
with these factors, there is significant evidence suggesting a
 genetic component in the development of Dens invaginatus.8

The invagination allows entry of irritants from the oral
cavity into an area that is separated from the pulp tissue
by only a thin layer of enamel and dentine, which thereby
presents a predisposition for the development of dental
caries.9 In some cases, the enamel lining is incomplete,
and channels may also exist between the invagination
and the pulp. Therefore, the pulp involvement and its
sequel often occurs rather early, within a few years of
eruption, sometimes even before apex closure. Other
reported sequelae of undiagnosed and untreated coronal
invaginations are abscess/cyst formation.10

Several clinical, radiographic and histologic attempts have
been made for a better understanding of the morphology
of the invagination and its association with pulp disease.
Conventional two-dimensional radiographs do not provide
enough structural information about the malformation.
CBCT being a 3D imaging technique, with a radiation
dose much lesser than a CT, overcomes the limitations of
conventional radiographic methods by providing more
structural information.9 The CBCT scan provides the
endodontist a 3D representation of the invaginated tooth
thereby allowing a true understanding of the nature of the
invagination and its relationship to the main canal of the
tooth.11

In the present case, CBCT helped in the assessment of
double dens which was not evident in the conventional
radiograph. It gave better clarity of the underlying
complexity and hence helped in charting out the treatment
plan. The visual information generated from CBCT was also
useful in explaining to the patient the nature of the disease
and the treatment planned for the same.

The treatment options vary from case to case and depends on
the type of invagination. To summarize, they are: (1) Oehlers
Type 1 prevention, clinical and radiographic control;

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**Figure 4:** (a) Coronal cone-beam computed tomography section showing the presence of enamel lined invaginatus of supernumerary tooth and 11 with the double
invaginatus of 11 depicted with the arrow. (b) Sagital section showing the invaginatus with the periapical pathology. (c) Three-dimensional reconstruction showing the
altered morphology of 11 and the perforation of the buccal cortical plate
Application of sealant in invagination; restoration of teeth. (2) Oehlers Type 2 restoration of invagination if dental pulp is not involved; endodontic therapy; combined endodontic-surgical treatment. (3) Oehlers Type 3 endodontic therapy; surgical therapy; combined endodontic-surgical treatment; extraction.

CONCLUSION

For the assessment of the true nature of developmental anomalies such as dens invaginatus, we cannot always depend on conventional radiographs. The present case report clearly pointed out the importance of the images obtained from the CBCT sections and the role it played in visualizing the double invaginatus that was not visible in the conventional radiograph. It provided information essential for understanding the complex internal anatomy of dens invaginatus and served as a crucial aid in diagnosis and treatment planning. Clinicians should, therefore, consider the use of CBCT in the diagnosis and treatment of dens invaginatus.

REFERENCES