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International Journal of Current Research
Vol. 9, Issue, 05, pp.49956-49959, May, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

CASE REPORT

DIAGNOSIS OF TYPE III DENS INVAGINATUS IN MAXILLARY CANINE USING CONE BEAM COMPUTED TOMOGRAPHY: A RARE CASE REPORT

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ARTICLE INFO

Article History:
Received 22nd February, 2017
Received in revised form
12th March, 2017
Accepted 26th April, 2017
Published online 19th May, 2017

Key words:

Dens in dente,
Cone beam computed tomography,
developmental anomaly,
Maxillary canine.

ABSTRACT

Dens invaginatus commonly known as Dens in dente is an invagination of coronary or root surface, bounded by enamel which can simulate appearance of a tooth within a tooth. It commonly affects the maxillary lateral incisors, presence of DI in maxillary canine is very rare. The aim of this case report is to describe the bizarre radiographic findings and aberrant root canal anatomy in the affected tooth which are difficult to describe using conventional radiography and hence use of cone beam computed tomography (CBCT) as a invaluable diagnostic tool.

Citation: Shraddha Supnekar 2017. "Diagnosis of type iii dens invaginatus in maxillary canine using cone beam computed tomography: A rare case report", *International Journal of Current Research*, 9, (05), 49956-49959.

INTRODUCTION

The 'dens in dente' is a developmental variation which is thought to arise as a result of an invagination in the surface of tooth crown or root before calcification has occurred. Invagination in the coronal portion of tooth usually originates from an anomalous infolding of the enamel organ into the dental papilla (Neves, 2010). The most extreme form of this anomaly is referred to as 'dilated odontome' (Neves, 2010). Tomes first described a case of coronal Dens in dente as early as 1859. Swanson and McCarthy almost a century later, described dense in dente in depth. Oehlers *et al* and Pindborg reviewed multiple instances of occurrence of dens in dente in the general population (Mupparapu, 2004). The permanent maxillary lateral incisors are the teeth most frequently involved, and in the majority of cases the 'dens in dente' appears to represent simply an accentuation in the development of the lingual pit (Rajendran, 2012). Although Dens invaginatus is a relatively common anomaly, the presented case demonstrates an unusual presentation of a Dense invaginatus in a maxillary right canine which very rare.

Case report

A 24 yr old male patient reported to the department of oral medicine and radiology with a chief complaint of swelling in upper right front region of jaw. The patient was asymptomatic; no pain or discharge associated with the swelling. The patient was in good general health and the systems review was unremarkable. The extra-oral exam revealed no significant findings. Intraoral examination revealed a discolored right maxillary canine with a dome shaped swelling in upper right labial vestibule, extending from the distal aspect of canine to mesial aspect of adjacent premolar. Mucosa covering this region appeared to be normal like the adjacent mucosa. On palpation the swelling was firm to hard in consistency with no pus discharge seen to be associated. The tooth tested nonvital for electrical pulp sensitivity test. Intraoral periapical radiograph revealed presence of invagination of enamel and dentin in the radicular portion of the maxillary canine region with a radiolucent pulp space in it along with periapical rarefaction (Figure 1). Since the pulp chamber and the root canal anatomy could not be properly appreciated by conventional radiograph, Cone beam computed tomography (CBCT) was performed. CBCT is a three-dimensional imaging technique has been specially designed for imaging the dentomaxillo-facial structures. The exam was performed with Kodak CS 9300 3D system, Carestream; the Frankfort Horizontal Plane parallel to the Horizontal Plane and perpendicular to the Median Sagittal Plane, with slices in all the three orthogonal planes and multiplanar reconstructions with voxel size0.2mm XO.2mm X 0.2mm with the following exposure factors: 90 kVp, 10 mA, time 10 seconds.

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A CBCT scan was taken which revealed following findings:

The panoramic reconstruction revealed morphologic alteration in radicular portion of maxillary canine with periapical radiolucent lesion (Figure 2).

Figure 1. Intra-oral periapical radiograph revealing invagination in radicular portion of canine

Figure 2. Panoramic reconstruction showing invagination in the radicular portion of canine

Cross-sectional images of CBCT scan of maxillary right canine in all the three orthogonal planes revealed-

- 4mm below the Cemento-enamel junction the invagination is seen which further extends to the root apex and opens as a separate canal in the apical third region, (Figure 3)
- The axial cross section shows infolding of enamel and dentin clearly visible, distinct from main pulp. Hyperdense enamel and dentin seen to be invaginated in the pulp space in the cervical one third of radicular portion of canine as seen in axial sections as well as coronal and sagittal cross sections (Figure 4)
- Coronal cross sections show periapical radiolucency with respect to 13 (Figure 5).
- Periapical radiolucency seen in the sagittal cross sections causing breach in the continuity of buccal cortical plate (Figure 6).
- Three dimensional reconstructed view reveals bony destruction on the periapical region of maxillary right canine (Figure 7)
- The grey scale value of invaginated enamel in the radicular portion is 1345 while that of enamel of crown is 1477.Similarly the grey scale value of invaginated dentin which extends through the radicular portion of canine upto the root apex is 555 while in the coronal portion this value is 515. Based on the above mentioned findings type III dens in dente was diagnosed.

Figure 3. Sagittal section of canine showing invagination beneath the cement-enamel junction

Figure 4. Axial cross-sections

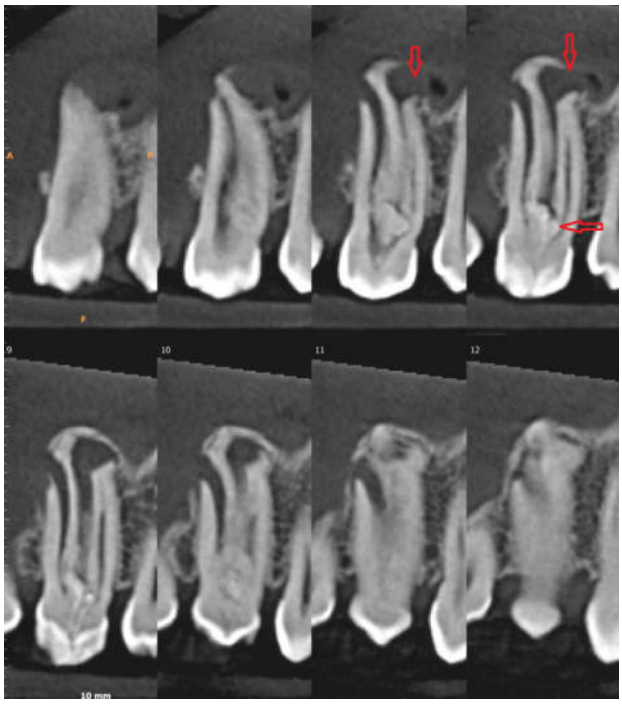

Figure 5. Coronal cross sections showing extent of invagination and periapical radiolucency

DISCUSSION

Dens invaginatus is a developmental anomaly resulting in a invagination of the enamel organ into the dental papilla prior to calcification of the dental tissues (Bishop, 2008). Various terminologies have been used to describe dense in dente of which dens invaginatus would appear to be the most appropriate as it reflects the infolding of the outer portion (enamel) into the inner portion (dentine) with the formation of a pocket or dead space. Dens invaginatus also better represents range of appearances than other descriptions that appear more applicable to specific variations which are fundamental to the condition. For example, the term 'dilated odontome' is not appropriate in minor invaginations where crown dilation may not occur (Bishop, 2008).

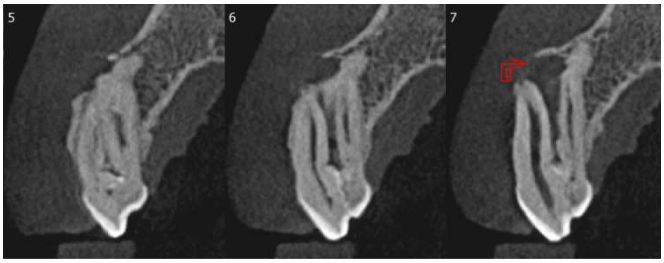

Figure 6. Sagiital cross sections revealing periapical radiolucency and breach in continuity if buccal cortical plate

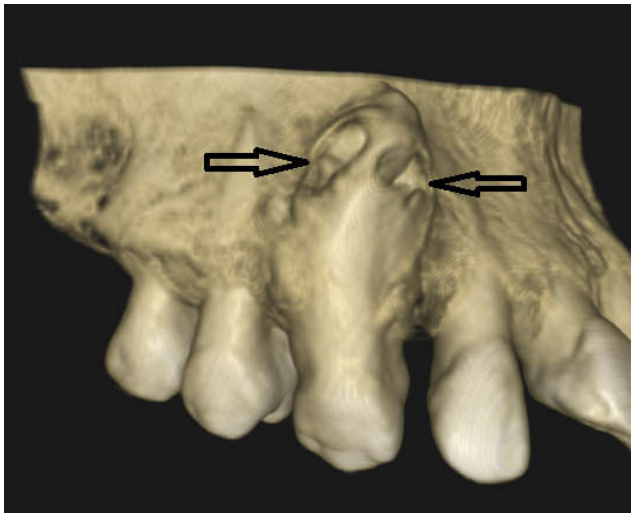

Figure 7. 3D reconstructed view

The system described by Oehlers is the most widely used, because of its simple nomenclature and ease of application. This system categorizes invaginations into three classes as determined by how far they extend radiographically from the crown into the root.

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.

Type IIIA: 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 IIIB: The invagination extends through the root and communicates with the periodontal ligament at the apical foramen. There is usually no communication with the pulp (Oehlers, 1957).

In Type III lesions, any infection within the invagination can lead to an inflammatory response within the periodontal tissues giving rise to a 'peri-invagination periodontitis'.

Oehlers' system is based on a two dimensional radiographic image and as such may underestimate the true extent and complexity of the invagination. However, despite its limitations, Oehlers' classification makes a distinction between complete (Type III) and incomplete (Type I and II) invaginations which is important as the management of each is potentially different (Oehlers, 1957).

The incidence of Type III invagination is less as compared to type I and II

The etiology of DI is controversial and remains unclear. The possible factors responsible are consequence of 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, external forces exerted on the developing tooth germ by the growing dental arch, adjacent developing tooth germs, absence of certain inter-cellular 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 DI. In permanent dentition, it commonly occurs in maxillary lateral incisors followed by the maxillary central incisors, premolars, canines, and less often in the molars. The clinical presentation of dens invaginatus varies according to its severity; crowns can appear normal or it can also show unusual forms such as a slightly deeper than normal cingulum pit, a greater buccolingual dimension, peg-shaped form, barrel-shaped form, conical shapes, and talon cusps, a complex fissure pattern on posterior teeth (Sekerci, 2013). Furthermore there can be pulp (sensitivity to percussion and necrosis) and periodontal alterations (presence of periodontal pocket), as well as dental mobility and presence of sinus track, can be associated with it. It may lead to periapical pathology hence needs to be treated accordingly; early detection of such lesions and sealing with restorative materials prevents further complications (Bansal, 2010). Radiographically, one can observe an uncommon morphology of the crown and root, as well as the presence of periapical lesion, increasing size of the pulp chamber and root canal ending in two apices (Neves, 2010). In the conventional radiographs, it is not always possible to determine, with great precision, the relationship between the invaginated portion of the tooth with the chamber and/or the root canals. In the present case, the CBCT images made it possible to observe an invagination which was communicating with the periodontal space, resulting in a large periapical lesion, which permitted us to classify the condition as type III Dens invaginatus. Though conventional radiography has been used for the diagnosis of Dens invaginatus in the past; however, the recent cases have been imaged with the help of CBCT, thus emphasizing the importance of the 3 Dimensional imaging for unusual tooth anatomies (Mishra, 2012). Use of CBCT was an important tool to define the actual extension of the periapical lesion and provided relevant details of the

internal anatomy of this invaginated tooth which help in further treatment planning (Kfir, 2013). The complex anatomy of teeth with Type III Dens invaginatus makes conventional endodontic treatment challenging, especially in cases with wide apical opening. Although conservative root canal treatment of Type III Dens invaginatus is possible in some cases, the combination of nonsurgical and surgical endodontic procedures is necessary (Vier-Pelisser, 2012).

Conclusion

It is essential that the dental surgeons be aware of this anomaly when they are presented with a case of pulpitis or periapical lesions, in the absence of any history of trauma or a clinical evidence of caries or restorations. The diagnostic pitfalls in the conventional radiography ought to be kept in mind and a CBCT scan, preferably a small Field of View (FOV) can not only help in the diagnosis but it can also serve as an important aid in the treatment planning and in ensuring successful results.

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