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Rare Cases of Radicular Dens Invaginatus in Posterior Permanent Teeth

Sergey Kabak, PhD[1], Yuliya Melnichenko, PhD[2], Nina Savrasova, PhD[3]

[1]Professor, Head of the Human Morphology Department, Belarusian State Medical University, Belarus.

[2]Associate Professor of the Human Morphology Department, Belarusian State Medical University, Belarus.

[3]Associate Professor of the Radiation Diagnosis and Radiation Therapy Department Belarusian State Medical University, Belarus.

***Corresponding Author:** Melnichenko Yuliya M., 220116, Dzerzhinskogo Avenue 83, Minsk, Belarus.*

Abstract

Dens invaginatus is the result of the defective tooth formation. Two forms of dens invaginatus, coronal and radicular, are recognized. Two rare cases of radicular dens invaginatus in mandibular third and maxillary second molars are presented.

The first case of impacted mandibular third molar with enamel-lined radicular dens invaginatus is an incidental finding on cone beam computed tomography scans. In contrast, the second case of cementum-lined radicular dens invaginatus in second upper molar is diagnosed by clinical signs and radiological characteristics of periapical lesion.

Presence of dens invaginatus can cause periapical lesions without tooth crown defects. The use of cone beam computed tomography can provide better understanding of varied root canal morphology of such teeth.

Keywords: *Cone beam computed tomography; Dens Invaginatus; Molar.*

Introduction

Dens invaginatus (DI) was first described by Ploquet in 1794 in a Whale's tooth, and identified as such in a human tooth by the dentist Socrates in 1856 [1]. This is a developmental defect that occurs, as a rule, due to abnormal invagination of the enamel organ into the dental papilla at the cap stage starting from the crown and sometimes reaching the root before calcification takes place [2, 3]. Among different terms (dens in dente, invaginated odontome, dilated gestant odontome, dilated composite odontome, tooth inclusion, dentoid in dente, dens telescope) "dens invaginatus" (the term was proposed by Oehler in 1957) seems most suitable as it indicates invagination of the enamel into the dentin leading to formation of the pocket and empty space.

DI is more common in permanent dentition, although cases in deciduous dentition and supernumerary teeth are described in published literature. The maxillary teeth are more commonly involved in comparison to mandibular teeth. Among permanent teeth, the maxillary lateral incisors are most often affected, followed by central incisors, canines and molars [4].

Two forms of DI, coronal and radicular, are recognized. By a great margin coronal dens invaginatus is seen more frequently and Oehlers classified it into types depending on the deepness of invagination [5]. Type one: a lesser form showing the enamel-lined invagination which ends as a blind sac within the crown not transcending cementoenamel junction. Type two: the enamel-lined invagination extends apically beyond the cementoenamel junction staying inside the root. Type three: severe form with invagination, which pierces the root with the formation of additional opening on its surface. The invagination may be entirely covered by enamel (true "dens invaginatus"), but cementum is frequently detected close to radicular perforation.

Radicular dens invaginatus is an incidental finding and, unlike with the coronal form, thought to arise secondary due to the proliferation of Hertwig's epithelial root sheath [6]. There are two types of

radicular dens invaginatus: first type shows cementum-lined invagination and second type (considered as true form) is referred to enamel-lined invagination within root [7].

This article reports two cases of radicular dens invaginatus in lower third and upper second molar. The present study was approved by the Medical Ethics Committee of the Belarusian State Medical University, Minsk, Belarus. Informed consents both for the treatment and for using personal data for research purposes were signed by the patients.

Case Presentation 1

A 47-year-old Caucasian female patient was presented to Minsk dental outpatient clinic for prosthodontic treatment of partial adentia. Cone beam computed tomography (CBCT) images were obtained by the Galileos GAX5 scanner using standard settings and assessed using GALILEOS Viewer (Sirona, Bensheim, Germany). CBCT examination revealed impacted right mandibular third molar in horizontal position with its crown in contact with the partially resorbed distal root of right mandibular second molar and single root in close contact with the upper cortical plate of the mandibular canal. The area of radiopacity similar to enamel inside the root of the impacted tooth, which contributed to the diagnosis of dens invaginatus, was detected. Pulp chamber of dens invaginatus was communicated with the follicular space by means of a hole opening on the tooth neck (Figure 1A). Radiographic signs of damage to the surrounding dental follicle tissues were not revealed. The extracted tooth had a single broad root with deep invagination on the neck distally (Figure 1B). Right mandibular third molar was sectioned using Leica SP 1600 saw microtome (Figure 1C). The microscopic analysis of the longitudinal sections under stereomicroscope Leica MS5 showed enamel, dentin and pulp chamber corresponding to dens invaginatus. Opening of pulp chamber of DI was found on the neck of tooth distally. Contact between cavity of the DI and the pulp cavity of third molar was not detected.

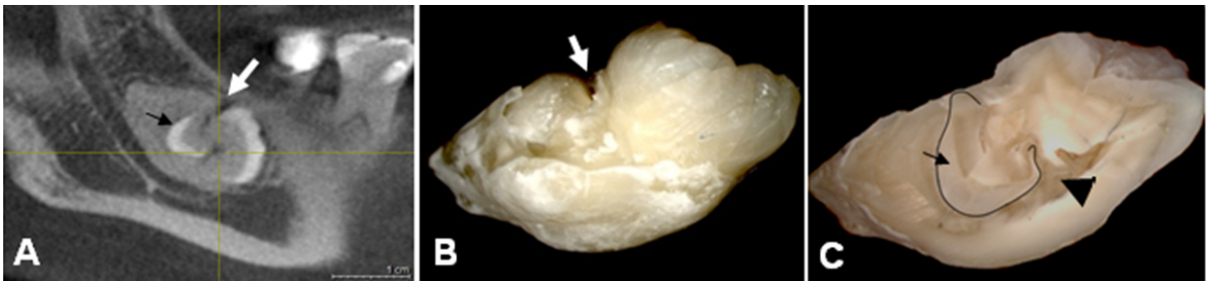

Figure1. *Radicular dens invaginatus in right impacted mandibular third molar. A – CBCT, coronal view, showing impacted mandibular molar with radicular invagination (white arrow – opening of pulp chamber of DI), lined by enamel (black arrow); B – extracted molar with broad root and invagination on the neck (white arrow); C – longitudinal section of extracted mandibular molar showing enamel-lined (black arrow) dens invaginatus (arrowhead shows pulp chamber of mandibular molar).*

Case Presentation 2

A 21-year-old Caucasian female patient attended the Minsk dental outpatient clinic with the main complaint of a fistula on the mucosa of the apical region of maxillary left second molar present for several days. Intraoral examination revealed an oral fistula on the buccal mucosa in correspondence to the root tips of the upper left second molar. The tooth did not show clinical signs of carious or non-carious lesions of the crown. CBCT scans were performed on the Planmeca Pro Max 3D Max CBCT unit (FOV 268*268*334) and an alyzed by Planmeca Romexis viewer software.

Radiographic examination revealed atypical pulp anatomy of maxillary left second molar, corresponding to radicular dens invaginatus with radiopacity similar to neighboring root tissues (Figure 2 B, F, white arrow). The pulp cavity of the dens invaginatus (Figure 2 A, D, black arrow) was opened on the buccal surface of the palatal root of maxillary left second molar at the middle third level. There was no communication between cavity of the DI and the pulp cavity of second molar found. Periapical radiolucency with well-defined borders was present around the all roots of maxillary left second molar. Interradicular septum and inner cortical plates were destroyed (Figure 2 A, C, star), no resorption of the roots was seen.

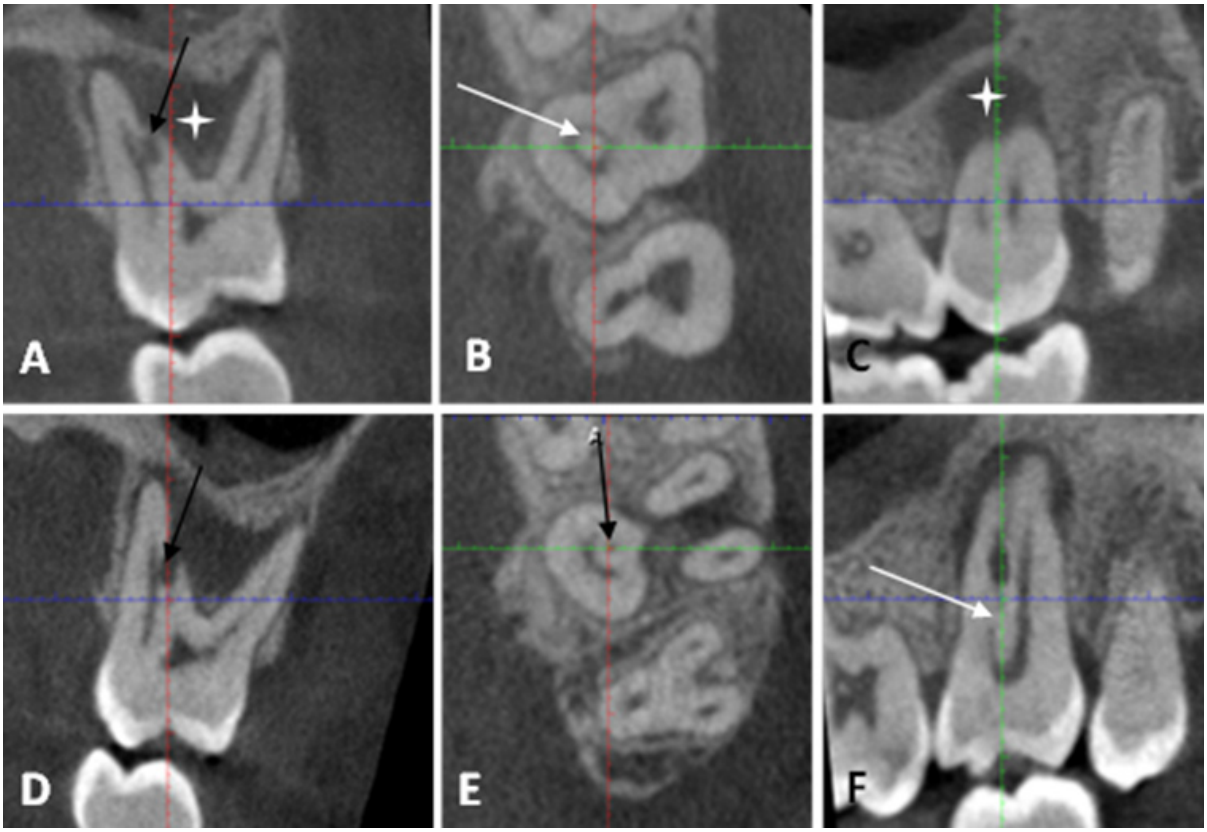

Figure2. *Radicular dens invaginatus in maxillary left second molar. CBCT showing maxillary molar with periapical lesion (star) and radicular invagination (white arrow) with cavity (black arrow) emerging on the buccal surface of palatal root.*

A, D – sagittal view; B, E – axial view; C, F – coronal view.

Discussion

There is a controversy surrounding dens invaginatus etiology. Some causes of this condition have been suggested. These include an increased localized external pressure, focal growth retardation, and focal growth stimulation in certain areas of the tooth bud. A recent hypothesis suggested that it occurs due to degeneration of dental lamina which leads to fusion, gemination or agenesis. While some authors believe infection, trauma and genetics to be the reason for DI. A detailed analysis of theories and conditions attributed to DI was summarized in the literature review of Khan et al. [8].

The prevalence permanent teeth afflicted with dens invaginatus in selective population studies varies in a wide range. As reported by Nu Nu Lwin et al. DI was detected in 0.25-41% of the population and frequency of this anomaly was lower in Western countries in comparison to other parts of the world. It can mainly occur in Chinese or Malaysian population in accordance to previous studies [9].

Radicular DI is rare and only a few cases of enamel lined invagination within root have been reported in the world literature.

The key difference between the coronal and radicular types of dens invaginatus is the place where the invagination process starts. In the coronal form, the invagination is the result of infolding of the enamel organ; it communicates with the oral cavity through a pit or groove in the crown which usually shows an unusual, though typical, crown shape. The radicular type of DI originates in the root due to invagination of the Hertwig's root sheath.

Mandibular first premolars and second molars are especially prone to develop the radicular form of dens invaginatus. Pulpal necrosis and apical lesions are more commonly accompany radicular DI than coronal DI [10].

In this article, two cases of unusual variants of dens invaginatus affecting posterior teeth were described. The first case of impacted mandibular third molar with enamel-lined radicular DI was an incidental finding on CBCT scans. In contrast, the second case of cementum-lined radicular DI in maxillary second molar was diagnosed based on clinical and radiographic signs of periapical lesion.

Conclusion

DI is an ocassional congenital anomaly. All details of the abnormal tooth anatomy are well identified using CBCT. The clinical significance of dens invaginatus due to the potentiality of pulp damage and chronic periapical lesions without carious or non-carious defects of the tooth crown, if the invagination area communicates with the oral cavity. In the impacted teeth this anomaly is not accompanied by sings of periodontal disease.

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