

Radicular Dens Invaginatus: Rare Variant of a Common Anomaly

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Abstract

Dens invaginatus is an anomaly of the shape of teeth resulting from invagination of the developing tooth germ. Although the coronal variant is frequently observed in the clinical setting, the true “radicular” variant of Dens invaginatus resulting from invagination of the Hertwig’s epithelial root sheath at the root level is extremely rare. The anomaly can present in itself with multiple sequelae owing to the peculiar structure of the tooth which makes it vulnerable for entry and lodging of bacteria even in a tooth with an apparently normal crown devoid of any carious process. It also complicates the treatment plan whereby it renders root canal treatment impracticable and makes it difficult to extract the tooth atraumatically. The present report consists of one such case of radicular dens invaginatus that was diagnosed by correlating clinical, radiographic, and histopathological findings. Management of the case was done by extracting the tooth in multiple sections without any posttreatment complications.

Keywords: Dens in dente, dental anomaly, periapical lesion

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INTRODUCTION

Dens invaginatus is a relatively common developmental anomaly of the shape of teeth which is thought to result from invagination into the surface of a tooth before calcification has occurred. The most common teeth involved are reported to be maxillary lateral incisors followed by maxillary central incisors and molars.^[1] The invagination can occur at different levels on the tooth crown or root and can be of varying depths based on which they have been classified into the corresponding groups-Type 1: invagination confined to crown, Type II: Invagination extends beyond CEJ or arises from root subsequently causing dilatation of the root, Type III: The invagination penetrates through the root and ‘bursts’ apically [Figure 1]. These differences can be attributed to the time and the area of tooth bud at which etiological factors such as increased local pressure or focal growth abnormality affect during tooth formation.^[2]

Depending upon the extent of involvement, a spectrum of appearances can be elicited clinically, ranging from a mild invagination giving rise to a pit in the lingual area to a severe

form of invagination until the apex of the root demonstrating a bizarre radiographic appearance of tooth-within-tooth.^[3] Consequently, numerous terminologies have been associated with the anomaly over time such as “dens in dente,” gestant odontoma, dilated composite odontoma, tooth inclusion, and denstlescope.^[2,4] However, the majority of cases comprise mild invagination with imperceptible clinical manifestation, and thus, the term “dens invaginatus” could be deemed as appropriate for the anomaly.^[5]

Although the coronal variant has been commonly reported, infrequently an analogous form of invagination has been reported to occur in the radicular portion of the tooth. It has been hypothesized to occur as a result of an attempt of the root to bifurcate^[6] or as a distinct “true” type representing morphogenic and clinical characteristics of an actual radicular

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invagination.^[7] The presence of a radicular invagination in itself poses numerous clinical problems such as entry of microbes in case of communication with the pulp and subsequent complications in root canal treatment. The present case report comprises of one such case of “radicular dens invaginatus” presenting with a periapical lesion.

CASE REPORT

A 34-year-old female reported with a chief complaint of pain and pus discharge in the front region of the upper jaw. The patient revealed a past dental history of attempted root canal treatment with the associated tooth a year ago. The extraoral examination did not reveal any significant findings. Intraorally, a draining sinus could be noted on the labial aspect of the attached gingiva slightly above the crown of the right maxillary central incisor with a slight erythematous lesion in its periapical area [Figure 2a]. Considering the history and clinical features, a provisional clinical diagnosis of nonvital right maxillary central incisor with periapical abscess was established with a differential diagnosis of the radicular cyst. Radiographic investigations were advised to confirm the provisional diagnosis.

Intraoral periapical radiograph with maxillary anterior region showed a radiolucent access cavity preparation with radiopaque filling material in the pulp chamber in right maxillary central incisor. The root appeared to be dilated with a central radiolucency surrounded by thin radiopaque border with density similar to that of enamel. A discontinuous lamina dura was noted in the apical third of the root. The periapical region showed ill-defined radiolucency suggestive of the abscess [Figure 2b]. The radiographic picture was suggestive of a root anomaly and warranted further imaging.

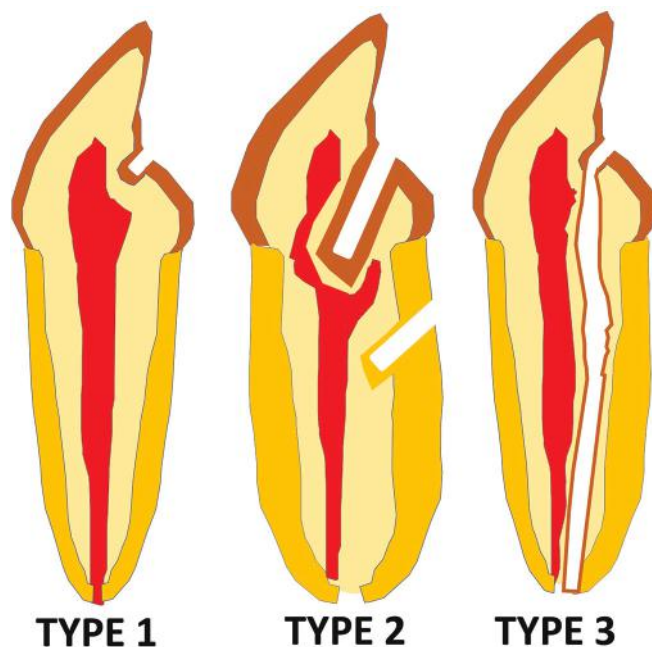


Figure 1: Types of dens invaginatus as described by Oehlers in 1958

To further evaluate the complicated anomalous appearance of the root, a multi-planar cone-beam computed tomography (CT) scan of the anterior maxillary region was performed with three-dimensional reconstruction [Figure 2c]. The crown of the right maxillary central incisor was relatively well-formed and showed a prepared access cavity with the hyperdense filling material. A single root noted with altered morphology was noted as it appeared to be dilated with an inverted cone-shaped appearance. Hypodensity was noted in the center of the root with a maximum diameter being 5 mm. A dense hyperdense rim was seen surrounding the central hypodense area at some places resembling a calcified tissue. The pulp chamber of the tooth appeared to be normal while the root canal appeared to be curved and winding around an involution. Perforation of the palatal surface of the root and the palatal cortical plate was noted in the middle 1/3rd of the root. The periapical area showed ill-defined hypodense area of bone loss causing perforation of labial cortical plate. Based on these peculiar clinical and radiological features, a provisional diagnosis of dens in dente and associated periapical abscess was established. The differential diagnosis included cementoblastoma, regional odontodysplasia, and periapical cemental dysplasia.

Root canal therapy was deemed as impracticable for the case and thus, the tooth was indicated for extraction. The patient was explained about the treatment plan and their consent was obtained. Lignocaine anesthesia was delivered by local infiltration technique. When the mucoperiosteal flap was raised, the root with its bizzare appearance could be observed [Figure 3a]. Owing to the peculiar shape of the root, it could not be extracted by conventional methods. The tooth was sectioned horizontally separating the crown and root portion; the latter was further sectioned into two halves to facilitate an atraumatic and efficient extraction procedure [Figure 3b]. The periapical region was then curetted and wound was closed by means of 3-0 silk suture. The procedure was uneventful and



Figure 2: (a) Clinical presentation of tooth with pus discharge (b) Intraoral periapical radiograph demonstrating dilated root with periapical lesion (c) Multi-planar cone-beam computed tomography scan of the anterior maxillary region at the root level with three-dimensional reconstruction

the socket exhibited healing without any complication after a week.

One-half of the root was thinned by means of an airotor and subsequently reduced to a thickness of 0.5 mm on Carborundum Stone. The other half was decalcified in 5% nitric acid for 1 week, following which it underwent routine histotechnical procedure of processing, embedding, sectioning, and staining to obtain Hematoxylin and Eosin stained decalcified sections. Both the specimens were mounted with DPX and observed under light microscope.

Under scanner view, the ground section of the root portion exhibited cementum peripherally surrounding the bulk of the tooth that comprised of dentin [Figure 4a]. However, the dentin was further covered by a lining of cementum on its inner aspect toward the pulp space. Under high power, cementocytes along the incremental lines of Salter were also demonstrable in both the cemental layers [Figure 4b]. The decalcified section displayed a similar picture of irregularly laid down dentin with occasional spaces for dentinal tubules peripherally bordered by cementum on both sides [Figure 4c]. This provided evidence for the invagination communicating with the pulp that was lined by cementum. Correlating the findings noted on the ground section with the clinical and radiographic morphology of the root, a final diagnosis of “type II radicular dens invaginatus” was imparted.

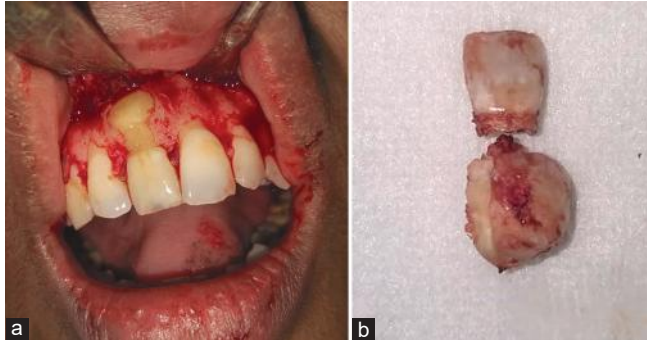


Figure 3: (a) Revelation of bizarre root structure on the elevation of mucoperiosteal flap (b) Tooth extracted in multiple sections

DISCUSSION

The invagination noted in a “true” radicular dens invaginatus results from infolding of the Hertwig’s epithelial root sheath that occurs after termination of root formation. The infolding may either be lined by enamel or cementum.^[8] This was confirmed on the ground section as cementum with cementocytes was demonstrable both on the outer as well as inner aspect of the root on the ground section. The extent of invagination in the present case can be designated as Oehler’s type 2 wherein it has invaded into the root.^[3] Based on gross dilatation of the root, it can be deduced that there was an existent causal communication with the pulp before the access opening procedure was performed as noted commonly in Oehler’s type 2 Dens invaginatus. Radiographically, the lesion is commonly described as a pear-shaped invagination of tooth structures involving enamel and dentin which may closely approximate the pulp or extend to involve it. A narrow constriction is usually seen at the opening on the surface of the tooth which was evident in respective sections of CT scan in the present case.^[9]

Although several theories have been put forth to explain the cause of such a malformation, a definitive etiology is still unclear. External pressure from developing dental arch and its components, aberrant growth of inner enamel epithelium, or merging of two tooth germs have been suggested as possible causes for the invagination.^[5] Certain other factors such as genetic mutation, infection, or trauma during different stages of tooth development have been ascribed to varying levels and severity of invaginations that are noted.^[2] Radicular dens invaginatus also needs to be distinguished from cementoblastoma and periapical cemental dysplasia, although these anomalies would involve primarily the apical third of the root rather than its entire length. Also, unlike dens invaginatus, there would be the absence of communication of the pulp with oral cavity in the case of the latter entities.

The invagination facilitates the entry of microbes and other irritants from the oral environment that leads to infection and necrosis of pulpal tissue that may consequently result in the development of periapical abscess. This was reinforced

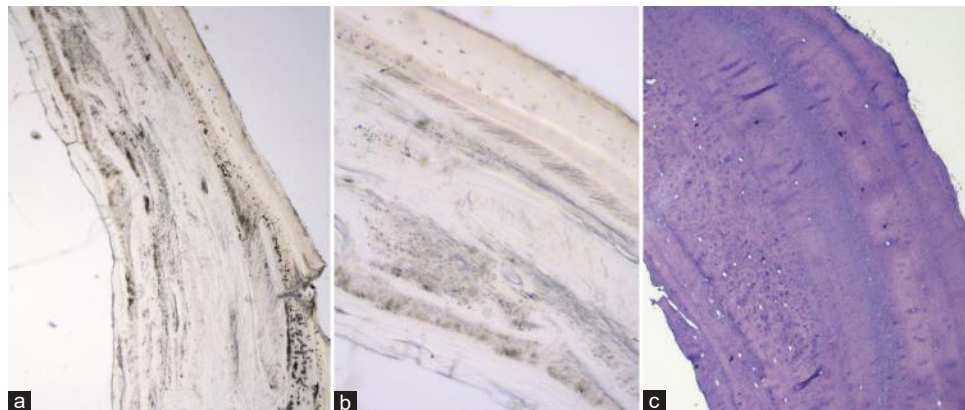


Figure 4: (a) Ground section under $\times 10$ (b) Ground section under $\times 40$ (c) H and E, stained decalcified section under $\times 40$

in the present case wherein the pulp was infected along with subsequent periapical abscess even in a tooth with an apparently normal crown devoid of any carious process. Owing to the grossly deformed shape of the root canal, performing satisfactory obturation would not be possible in such teeth. Consequently, cases of severe invagination render root canal therapy impracticable which held true for the present case.^[10] Therefore, to resolve the periapical pathology, extraction was deemed as the appropriate treatment modality.

CONCLUSION

Although the coronal variant of dens invaginatus is observed frequently, the “pure” radicular variety is strikingly rare. The present case report serves to add to the modicum of cases reported pertaining to the rare variant of dental anomaly. Since the anomaly predisposes the tooth for various pathological sequelae, prompt diagnosis, and management are warranted especially if the lesion is associated with a periapical lesion.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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