Dens invaginatus with necrotic pulp in a right maxillary lateral incisor with preserved vitality

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Abstract

Dens invaginatus (DI) is a dental malformation occurring in several morphologic types. Consequently, treatment of teeth affected by DI can get complicated because of the complex root canal anatomy. The aim is to describe how to manage a rare report of a DI with necrotic pulp held within the vital pulp of a maxillary lateral incisor. Oral fistula was found on the buccal mucosa of the apex of the vital maxillary lateral incisor with a DI having necrotic pulp. Endodontic treatment of the maxillary lateral incisor and of the tract canal of DI was realized. Clinical disappearance of oral sinus tract was observed after 10 days. On the contrary, the disappearance of radiolucent area occurred after 6 months. A proper and prompt diagnosis is necessary to carry out effective prevention protocols or prevent consequences generating nonrecoverable endo-perio diseases.

Keywords: Dens in dente; dens invaginatus; dental malformation; endodontic treatment; periapical lesion

INTRODUCTION

Dens invaginatus (DI) also known as “dens in dente” was analyzed in a whale’s tooth by Ploquet in 1794 and later identified in a human tooth by the dentist Socrates in 1856. DI represents an unusual developmental anomaly involving an early invagination of enamel and dentin that may deeply extend into both the pulp cavity and the roots, sometimes reaching the apex before calcification occurs.[1-3]

The case described in this study is a rare report of a DI with necrotic pulp held within the vital pulp of a maxillary lateral incisor.

CASE REPORT

A 19-year-old Italian female with a noncontributory medical history presented to our observation for a medical examination. Through intraoral clinical examination, a fistula of the buccal mucosa in correspondence of apex of right maxillary lateral incisor was found (1.2) [Figure 1a]. The response to the electric pulp sensibility test of the right upper canine and the lateral and the central incisor was positive. The 1.2 appeared morphologically normal except for a deep pit on the lingual surface [Figure 1b]. Through periapical radiography, the dilated and amorphous central area was observed in the crown of 1.2, due to inner presence of a wide radiopaque development. The latter occupied the coronal space and got over the enamel cement central area was observed in the crown of 1.2, due to inner presence of a wide radiopaque development. The latter occupied the coronal space and got over the enamel cement junction, enclosing a radiolucent space that communicates with the periodontal space of the middle third of the root [Figure 1c]. The fistulography, performed through the insertion of a gutta-percha cone into the oral fistula and sinus tract, revealed the impact of gutta-percha’s tip against the half of the lateral incisor root surface neighboring a radiolucent area. The radiographic diagnosis showed a DI of 1.2 [Figure 2a and b]. The aim of the therapy was to try the endodontic treatment. The patient was informed about the diagnosis and the treatment plan; then, the agreement was signed by an informed consent form. After the administration
of local anesthesia, under ×20, the pulp chamber of 1.2 was opened and the invagination orifice of malformation was localized [Figure 3a]. Subsequently, the design of the cavity was finished to surround the profile of the malformation. The DI appeared as a rounded shape malformation into the dental chamber, surrounded by vital and bloody pulp [Figure 3b]. The central hole of DI was recognized and enlarged using the Gates Glidden burs in succession from N° 1–3 to facilitate the gentle insertion of K-file 8 in the tract canal and to increase the diameter until the periodontal space was reached. The pulpal tissue of DI appeared necrotic and not bloody. Removal of vital pulp was necessary; thus, a pointed probe was used around the malformation to locate the access of the principal root canal [Figure 3c]. The working length was determined using a K-file 0.8 connected to an apex locator (Root ZX, Morita, Tokyo, Japan) followed by the confirmation of the periapical radiography. The endodontic treatment of dental root canals was carried out in a single session before the treatment of the pulpal tract of the inner malformation to avoid the spread of infectious processes. Canal systems' preparation includes both the enlargement and the shaping of the complex endodontic space using manual and mechanical instrumentation of ProTaper technique (Dentsply) and the disinfection using alternating irrigation solutions with ethylenediaminetetraacetic acid and sodium hypochlorite at 2% heated to 40°C. The filling of the canals was realized by mineral trioxide aggregate (MTA) obturation and three-dimensional gutta-percha obturation for DI canal and root canal systems, respectively; then, the vertical compaction technique with System B Heat Source (SybronEndo) and injection of thermoplastic gutta-percha by Obtura III (SybronEndo) were employed for the down packing and backfilling, respectively, to sealing the surrounding malformation space [Figure 3d]. Ten days after the end of the root canal therapy, clinical disappearance of oral fistula was observed [Figure 4a]. Then, the access cavity was restored by a vetroionomeric cement (3M Espe), used as a filling base, and an indirect composite restoration (A2 GandioSO, Voco) [Figure 4b]. After 6 months, the radiolucent area disappeared as shown by the periapical radiography, differently from the radiography at the end of endodontic treatment [Figure 5a and b]. After 1 year, the patient required to improve her smile complaining about both the discoloration of the lateral incisor and the slope of the central incisor. A cervical gingivoplasty [Figure 6a] and a lithium silicate ceramic veneers on 1.2 associated with a reductive odontoplasty of central incisor were realized with great satisfaction of the patient [Figure 6b].

DISCUSSION

Several theories have been put forward to explain the etiopathogenesis of DI.[1] Kronfeld suggested that the invagination results from a focal failure of the growth of the internal enamel epithelium, while the surrounding normal epithelium continues to proliferate engulfing the static area.[4] Conversely, Rushton proposed that the invagination is a result of rapid and aggressive proliferation, rather than a retardation, of a part of the internal enamel epithelium invading the dental papilla.[5] Fischer and Sprawson considered the infection to be responsible for the malformation.[6,7] Growth pressure of the dental arch results in buckling of the enamel organ.[8] The “twin-theorie” suggested a fusion of two tooth germs.[9] Oehlers considered that distortion of the enamel organ during tooth development and subsequent protrusion of a part of the enamel organ would lead to the formation of an enamel-lined channel ending at the cingulum or occasionally at the incisal tip. Oehlers classified the DI into three types, in the light of the radiographic interpretation of the degree of invagination: Type I, Type II, and Type III.

- Type I indicates a minor enamel-lined invagination that is restricted within the crown of the tooth and does not cross beyond the cementoenamel junction
- Type II indicates the enamel-lined invagination extending into the pulp chamber but remains confined to the root canals without interaction with the periodontium
- Type III is further subclassified into Type III A and Type III B.
A. The invagination extends to the roots and communicates laterally, through a pseudoforamen, with the periodontal ligament without pulpal involvement.

B. The invagination extends into the root and communicates, through the apical foramen, with the periodontal ligament. The invagination is usually lined by enamel and in rare instances by cementum.\textsuperscript{[10]}

DI mainly occurs in permanent dentition, even if several cases have been described in deciduous dentition and supernumerary teeth. The maxillary teeth are more commonly affected than mandibular teeth. Among permanent teeth, the maxillary lateral incisors are the most commonly affected teeth, as shown by the previous case, followed by central incisors, canines, and molars.\textsuperscript{[10]} The upper lateral incisor can sometimes be a difficult element to treat endodontically because a narrow apical and pronounced curvature can be observed. Furthermore, the maxillary lateral incisor can often be characterized by abnormalities of form, of embryological basis, which can determine the need for endodontic, periodontal, or combined endo-perio treatment. The clinical appearance of the crown may vary ranging from a normal form to different unusual forms such as a greater labiolingual diameter, peg-shaped, barrel-shaped, and conical and talon cusp. The radiographic examination showed a radiopaque invagination of density equal to enamel and that extended from the cingulum to the root canal. The defects may vary in size and shape from a loop-like, pear-shaped, or slightly radiolucent structure to severe forms resembling a tooth within a tooth. In most cases, the invaginated tooth is occasionally highlighted in a radiography; furthermore, it usually shows no clinical symptoms; however, a deep
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The reported case involved a maxillary lateral incisor with 4 root canals and a dens invaginatus tract. J Endod 2015;41:1167‑71.

CONCLUSIONS

- DI is a dental anomaly of embryological origin occurring in several morphologic types. Consequently, root canal treatment of teeth affected by DI can get complicated because of the complex root canal anatomy since residual infected pulpal tissues can be in inaccessible areas of the canal system.
- MTA obturation is a suitable technique to treat this kind of malformation.
- The formulation of a proper and prompt diagnosis in this report is necessary to carry out effective prevention protocols, when possible, or prevent consequences generating nonrecoverable endodontic, periodontal, or combined diseases.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand 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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