

Endodontic intervention for type II dens invaginatus: a case report

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DOI: <http://dx.doi.org/10.14436/2358-2545.6.1.043-048.cre>

ABSTRACT

Introduction: Dens invaginatus is an anomaly occurring during morpho-differentiation of the tooth in which there is an alteration caused by invagination of the inner epithelium of the enamel organ before its mineralization. In this context, endodontic therapy can face a great challenge in terms of endodontic access, chemical-mechanical preparation and root canal filling. **Objective:** To report a clinical case of endodontic intervention of tooth #22 presenting internal anatomical variation called dens invaginatus. **Methods:** Caucasian female patient was referred to endodontic evaluation. The main complaint reported by the patient was mild sensibility to palpation and crown darkening. Clinical examination showed alteration in the shape of the dental crown and presence of orthodontic appliance in both arches. Radiographic examination revealed image compatible to dens invaginatus and extensive periapical rarefying osteitis between teeth #21

and #22. Diagnosis of pulp necrosis and periapical diagnosis suggestive of periradicular granuloma of tooth #22 were established after performing pulp sensibility tests, and endodontic therapy was instituted. In the first visit, endodontic access was performed before manual instrumentation and application of intracanal medication with PA calcium hydroxide and propylene glycol. Subsequently, the root canal was sealed with Coltosol for 30 days. In the second visit, the patient was asymptomatic and the root canal system was filled by means of the thermoplasticized technique prior to definitive restorative treatment. **Conclusion:** The proposed treatment achieved the objective. Clinical and radiographic follow-up after three years showed periapical repair and re-establishment of masticatory and esthetic functions by means of restorative procedure.

Keywords: Dental pulp cavity. Endodontics. Root canal. Filling material.

How to cite this article: Santos BS, Silva RV, Pereira RP, Nunes E. Endodontic intervention for type II dens invaginatus: a case report. *Dental Press Endod.* 2016 Jan-Apr;6(1):43-8.

DOI: <http://dx.doi.org/10.14436/2358-2545.6.1.043-048.cre>

» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

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Submitted: 20/10/2015. Revised and accepted: 01/03/2016.

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Introduction

Dens invaginatus is a developmental tooth anomaly also known as dens in dente, dilated composite odontoma, tooth within tooth and telescope tooth, with such a variation in nomenclature owing to the different theories on its etiology.¹ The first case of dens invaginatus was described in 1855 by Salter, but it was Tomes who precisely described the condition in 1859 and defined it as a tooth developmental defect.²

Dens invaginatus is the result of anomalous development of the tooth during its morpho-differentiation. This anomaly is described as an alteration caused by invagination of the inner epithelium of the enamel organ before mineralization; and, at a specific time during tooth development, a more or less developed amelodontal structure is formed within the pulp.^{3,4}

Its etiology has been associated with locally increased external pressure, focal growth stimulation in certain areas of the tooth germ, rapid and abnormal proliferation of enamel cells within the dental papilla, inadequate odontogenic epithelium, insufficient bone development resulting in dental arch constriction and interruption of the lingual fossa development, as well as genetic factors.⁵

The incidence of dens invaginatus ranges from 0.04% to 10%, including milder and more severe forms of the anomaly. Both permanent and deciduous teeth can be affected, as well as the supernumerary ones, occurring unilaterally and bilaterally.¹ The most frequently affected teeth are maxillary permanent incisors (usually maxillary lateral incisors), followed by maxillary central incisors, canines, premolars, molars and mandibular incisors and premolars.^{5,17,18}

Dens invaginatus is classified into three types: Type I – enamel invagination is limited to the tooth crown only; Type II – invagination extends apically beyond the amelo-cemental junction, communicating or not with the pulp, but remaining confined within the root as a blind sac; and Type III – invagination extends beyond the amelo-cemental junction, penetrating the inner root and usually not communicating with the pulp, revealing a second lateral or apical foramen on the root surface.^{3,5,19}

In view of these considerations, chemical-mechanical preparation of root canals represents a challenge and plays a crucial role for the clinical success of endodontic therapy, as it enables antisepsis

through the action of chemical substances, mainly sodium hypochlorite.⁷

With regard to filling material, two important properties should be taken into consideration: physical-chemical characteristics and biocompatibility. The filling material should be capable of acting over anatomical irregularities, curvatures, isthmuses and ramifications.¹

Diagnosis of dens invaginatus can be clinical or radiographic. The morphological aspect of the affected crown can vary from normal to uncommon forms depending on the invagination size.⁵

Therefore, the objective of this study is to report a clinical case of endodontic intervention of a maxillary left lateral incisor with internal anatomical variation called type-II dens invaginatus.

Clinical case report

Caucasian female patient was referred to the graduate endodontic clinic of Bahia Dental Association in the city of Vitória da Conquista for endodontic evaluation of the maxillary left lateral incisor. The main complaint reported by the patient was mild sensibility to palpation and crown darkening. Clinical examination showed alteration in the original anatomy of the tooth shape, presence of light-cured resin at the mesial region and bracket and orthodontic wire cemented to the buccal face, including other teeth of both upper and lower arches. Thermal and electrical pulp sensibility tests were performed, all yielding negative responses. Radiographic examination (Fig 1) showed anomaly corresponding to Type II dens invaginatus and extensive periapical rarefying osteitis between teeth #21 and #22. Diagnosis of pulp necrosis and periapical diagnosis suggestive of periradicular granuloma of tooth #22 were established after performing pulp sensibility tests, and endodontic therapy was instituted.

In the first visit, endodontic access was obtained under total isolation by means of a high-speed drill (KG 1558, Medical Burs, Cotia, Brazil). An ultrasonic tip (Enac ST 08, Osada, Tokyo, Japan) was penetrated to allow instruments to reach the apical foramen. Subsequently, odontometry was performed (Fig 2) before manual instrumentation using the crown-down technique up to #100 K-file (Maillefer, Ballaigues, Switzerland) in the working length 1 mm beyond the apical patency. The chemical substance

used throughout chemical-mechanical preparation was 5.25% sodium hypochlorite (Lenza Farmacêutica, Belo Horizonte, Brazil). Next, ultrasonic tip (Enac ST09, Osada, Tokyo, Japan) was activated in association with 17% EDTA-T (Lenza Farmacêutica, Belo Horizonte, Brazil) and final irrigation with 5.25% sodium hypochlorite (Lenza Farmacêutica, Belo Horizonte, Brazil). The root canal was dried with absorbent paper points before application of intracanal medication with PA calcium hydroxide (Lenza Farmacêutica, Belo Horizonte, Brazil) and propylene glycol (Lenza Farmacêutica, Belo Horizonte, Brazil), and then sealed with Cotosol for 30 days.

At the second visit, the patient was asymptomatic. Before filling the root canal (Fig 4), cone proof was performed (Fig 3) with the aid of the vertical hydraulic compression of accessory cone¹⁶ with natural gutta-percha cones (Odous Medium, Belo Horizonte/MG, Brazil) and endodontic cement (AH Plus, Dentsply, DeTreyGmbH, Germany). Subsequently, temporary sealing with Cotosol was performed and the patient was referred to restorative treatment. Follow-up clinical and radiographic examinations (Fig 5) after three years showed re-establishment and repair of the periapical region, including masticatory and esthetic functions by means of restorative procedure.

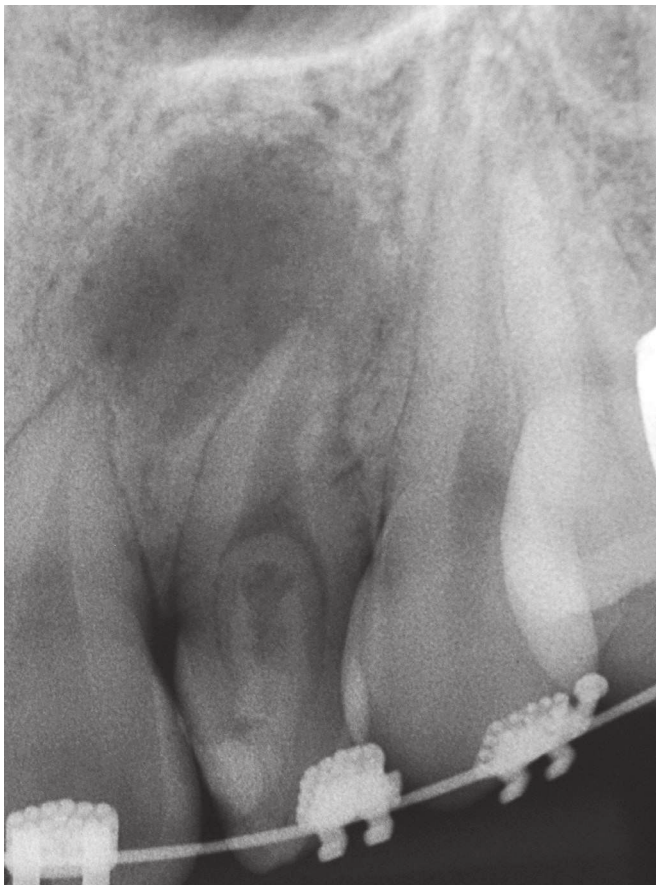


Figure 1. Preoperative periapical radiograph.

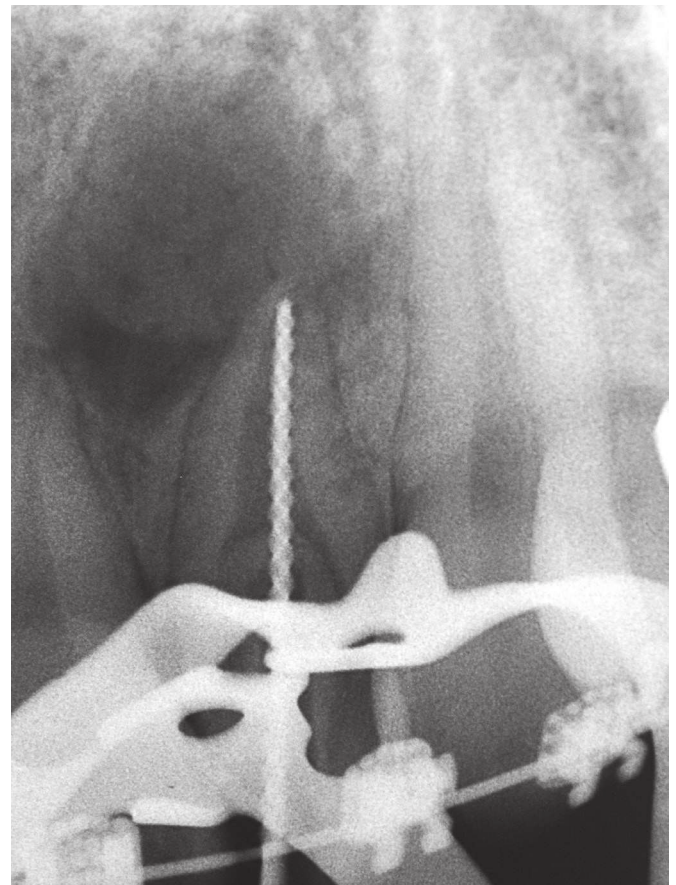


Figure 2. Odontometry periapical radiograph.

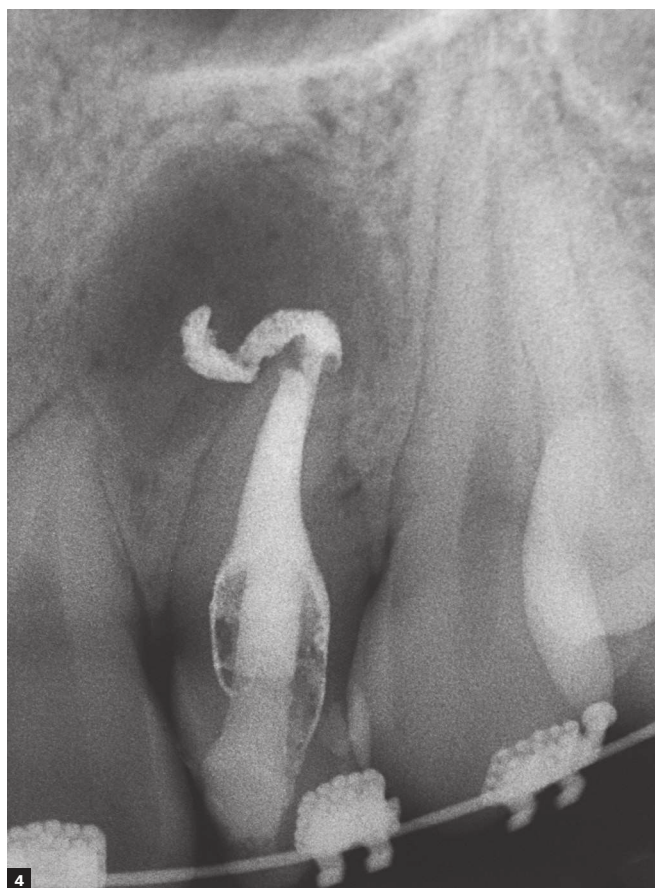
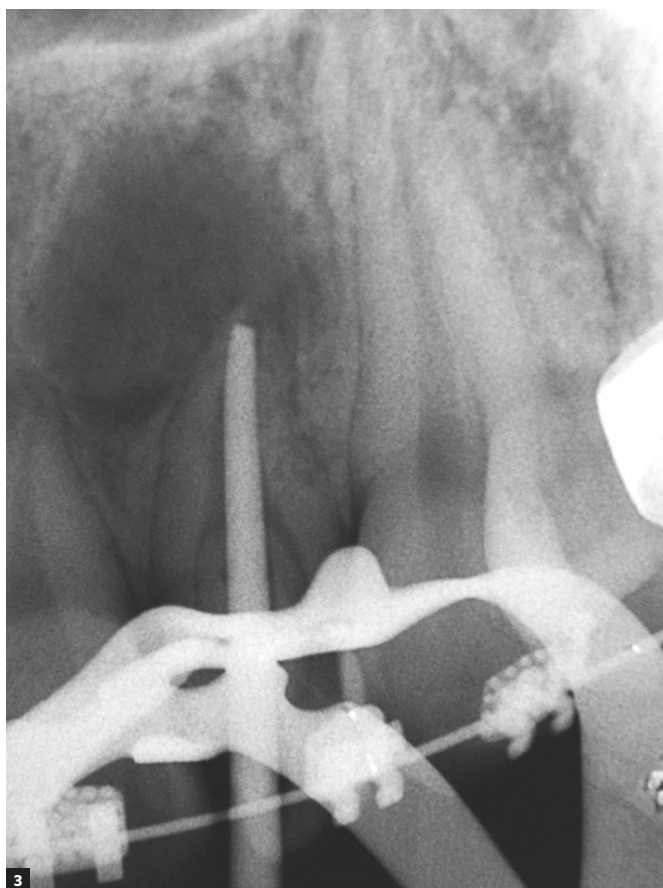


Figure 3. Cone try-in periapical radiograph.

Figure 4. Root canal system patency periapical radiograph.

Figure 5. Three-year follow-up periapical radiograph.

Discussion

Dens invaginatus, also known as dens in dente, is a developmental tooth anomaly occurring during morpho-differentiation of the tooth germ, which results in a structure invaginated by enamel tissue with characteristics similar to a normal tooth. As described in the present case report, this anomaly mainly affects the permanent dentition, especially maxillary lateral incisors, although it can also affect deciduous dentition.⁸

Dens invaginatus can cause clinical and functional problems, such as carious lesions, periodontal problems, soft-tissue irritation (e.g., tongue) during speech or mastication, and pulp necrosis and crown darkening due to chronic occlusal interference, thus causing esthetic impairment.⁹ Some of these findings were observed in our clinical case.

Early diagnosis of dens invaginatus is important in order to create barriers against the development of caries and endodontic impairment. To avoid mistakes during access, preparation and obturation of teeth affected by this anomaly, it is necessary to give special attention to both internal and external morphological changes. Early detection of anomalies is important to prevent damage to occlusion and pulp, thus leading to a more conservative therapy.¹⁰ However, these considerations were not taken into account in the present clinical case and endodontic therapy was the treatment modality indicated.

Among the anatomical variations which can make endodontic treatment difficult, dens invaginatus is the most complex one. Depending on the severity of the dental anomaly, endodontic treatment should be performed in different manners. Endodontic treatment is more difficult to be performed, mainly regarding types II and III. However, results evidenced that endodontic treatment in both cases was successfully performed, since diagnosis was precise.¹¹ In Type III cases, for example, retrofilling is often necessary in order to achieve a satisfactory treatment.^{10,20} Our clinical case fitted into the classification of Type II dens invaginatus, with endodontic therapy being performed on a conventional basis.

Developmental anomalies, such as fusion, germination, concrescence or dens invaginatus, are related to each other, mainly when incisors have two root canals completely separated from the apex. In those cases

involving maxillary lateral incisors, of which anatomy seems to be atypical in the radiographic examination, it is necessary to perform a precise inspection of the pulp chamber during surgical access, always having in mind the possible existence of extra canals.¹² In our clinical case, the anomaly presented two well-defined isthmuses between the micro-tooth and the root portion, which was completely filled by means of the thermoplasticized technique.

The thermoplasticized filling techniques, initiated by Schilder in 1967, aims to achieve greater contact of gutta-percha with the root canal walls, including sealing ramifications, isthmuses and irregular spaces of the root canal system, three-dimensionally sealing the endodontic cavity^{21,22} when compared to conventional techniques, such as lateral condensation.²³ Nevertheless, its disadvantage would be no control of the filling material, especially of endodontic cement, overflowed to periapical tissues.²⁴ However, the prevalence of postoperative pain and the long-term results were similar in both techniques.²⁵ Such fact occurred in this case report, but overflow was not a factor for failure of the proposed therapy, as evidenced in clinical and radiographic examinations. A MTA apical plug could have been used to minimize the incident.

Still, with regard to morphological anomalies, in a study on main pulp chamber alterations influencing endodontic treatment, it was shown that the most common changes were the following: dens in dente, taurodontism, dilaceration, fusion and germination. These may or may not influence treatment, depending on their intensity. It was also highlighted the skill of the practitioner in always using radiographic resources at each step of treatment for better visualization, including efficacy of endodontic procedure.¹³ These criteria were of great importance in the adequate conduction of the clinical case described.

In another study on the treatment of a patient with bilateral dens in dente, no carious lesions or pulp damages were reported, despite high susceptibility. Pulp sensibility test was performed because of the report of trauma at the region. Moreover, both presence of the anomaly and risk of pulp damage also reinforced the indication for the test. The clinical picture justified sealing of palatal fossae in order to prevent accumulation of bacterial plaque and reduce the risk of caries.¹⁴ In that clinical case, all pulp sensibility tests

were performed to confirm diagnosis of pulp necrosis, but the tooth had no caries and, therefore, endodontic therapy was instituted.

This study described a clinical case of Type II dens invagination in maxillary lateral incisor with periapical lesion. According to the results found, it was shown that conventional endodontic treatment is a viable alternative for cases of Type II dens invaginatus,¹⁵ thus corroborating the findings of our case report.

Conclusion

Endodontic therapy for dens invaginatus represents a great challenge. After three years of clinical and radiographic follow-up, it was possible to observe that there was periapical repair as well as re-establishment of masticatory and esthetic functions by means of restorative procedure, which characterized the success of the proposed therapy.

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