10.5005/jp-journals-10024-1106

CASE REPORT

Management of Dens Invaginatus Type III with Large Periradicular Lesion

Luciana de Souza Falcão, Priscila Sousa de Freitas, Raquel de Oliveira Marreiro, Ângela Delfina Bittencourt Garrido

ABSTRACT

Aim: This study describes a clinical case of type III dens invaginatus with an extensive periradicular lesion treated successfully.

Background: Dens invaginatus is a maldevelopment of the dental germ which occurs as a result of the invagination of the enamel organ. These cases may present difficulties with respect to its diagnosis and treatment because of canal morphology. The success of endodontic therapy requires a knowledge of dental anatomy and its anomalies.

Case report: A 17-year-old female patient is reported presenting right maxillary lateral incisor (tooth no. 7) classified as type III dens invaginatus with necrotic pulp and presence of an extensive radiolucid lesion. Endodontic treatment was recommended for tooth. However, intracanal exudate was present, suggesting a resistant infection. Enucleation of the lesion was performed as a complementary approach. The root canal obturation was carried out by the gutta-percha thermoplastification technique with root canal sealer, followed by restoration of the tooth. Healing of the lesion with hard tissue formation was confirmed at follow-up.

Conclusion: A combination of endodontic and surgical treatments were fundamental to the maintenance of the tooth. The treatment was considered successful.

Clinical significance: Root canal therapy of dens invaginatus should be based on a thorough clinical and radiographic evaluation. The knowledge of classification and anatomical variations of teeth with dens invaginatus are of great importance for correct treatment.

Keywords: Dens in dente, Dens invaginatus, Pulp necrosis, Tooth abnormality.

How to cite this article: de Souza Falcão L, de Freitas PS, de Oliveira Marreiro R, Garrido ÂDB. Management of Dens Invaginatus Type III with Large Periradicular Lesion. J Contemp Dent Pract 2012;13(1):119-124.

Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

Dens invaginatus is a developmental abnormality of the dental germ which occurs as a result of the invagination of the enamel organ during the bell stage, before the formation of hard tissue.[1,2] The following terms are synonymous with this malformation: Telescopic tooth,[1,3] dilated odontoma, dens in dente, invaginated odontoma, dilated gestant odontoma, dilated composite odontoma and tooth inclusion.[1,3-5]

The etiology is considered controversial, since many mechanisms may be possible causes of this phenomenon, such as local external influences on the dental germ,[4] dental arch growth resulting in pressure, limiting and deforming the enamel organ,[2] incomplete fusion of two dental germs,[2,6] infection processes,[1,2] genetic factors[1,6] and trauma.[5,6]

The prevalence of dens invaginatus varies between 0.04 and 10%.[6-8] This variation is probably related to geographical differences and different diagnostic criteria and methods of investigation.[6] The permanent maxillary lateral incisor is the most affected tooth, followed by the central incisor, canine and premolars.[1,7,9] Cases of bilateral and multiple occurrences of dens invaginatus have previously been reported.[1,10] An invaginated tooth can also occur in deciduous[11] and extranumerary teeth.[5]

According to the length of the tooth tissue invagination, Oehlers[12] classified dens invaginatus into three types: Type I—an invagination lined with enamel inside the crown which does not extend beyond the cement-enamel junction (CEJ); type II—an invagination lined with enamel up to the inside of the root, beyond the CEJ, terminating in a blind sac; type III—the invagination lined with enamel extends through the root to form an additional apical or lateral foremen.

In most cases dens invaginatus is diagnosed during a routine radiographic examination.[7] Clinically, the crown of

this tooth can be of normal morphology, but can also have unusual forms, mostly a larger vestibular-lingual diameter, the form of a barrel or a conical shape and it can be associated with a talon cusp. A deep palatal groove can be the first clinical sign indicative of dens invaginatus.[4]

Structural defects frequently exist deep in the invagination. In these defects the enamel is malformed or absent, and there can be many canals which lead to a communication with the pulp.[1,9,13] Consequently, decay develops with the subsequent necrosis of the pulp and the formation of abscesses and cysts.[3,14] Additionally, a case has been reported where dens invaginatus was associated with bacterial endocarditis.[15]

This study describes a clinical case of type III dens invaginatus with an extensive periapical lesion successfully treated with dramatic resolution of the periradicular radiolucency.

CASE REPORT

A 17-year-old female patient was referred to the Endodontic Clinic of the Federal University of Amazonas, due to the presence of edema on the right side of the face. During an extraoral examination a slight facial asymmetry was observed in which the right side had edema in the middle third of the face, including the maxillary region, nostril and upper lip. During palpation, the presence of a firm mass was noted in the region, without painful symptoms. The intraoral examination revealed swelling in the vestibular region to tooth no. 7 and an anatomical anomaly of the lingual face of the tooth in the form of an accessory cusp (talon cusp). This tooth had a moderate color alteration, no mobility and it did not respond to the pulpal vitality tests with dichlorofluoromethane freezing gas (Endofrost, Maquira, SP). The tooth no. 8 was not responsive to the pulp sensitivity test, suggesting pulp necrosis. The tooth no. 6 presented positive response to the test. The X-ray examination revealed that tooth no. 7 could be classified as type III dens invaginatus according to Oehlers,[12] with an invaginated enamel line which extended from below the cement-enamel junction to the radicular apex forming a second root canal. Furthermore, the presence of an extensive radiolucid lesion was noted, indicating a periapical inflammatory cyst. Endodontic treatment was therefore recommended for tooth no. 7 and 8 (Fig. 1).

Initially was performed the endodontic treatment of the tooth no. 8. After the absolute isolation and surgical access, the canal work length was established. The root canal was cleaned and shaped with manual endodontic files and flushed copiously with 2.5% sodium hypochlorite solution and 17% EDTA as final irrigation. The canal was dried with sterile paper points, filled with medication composed of calcium hydroxide and the tooth was temporarily sealed with glass ionomer cement. After 2 weeks the patient returned. The canal was obturated by lateral condensation technique with gutta-percha and AH-plus cement (Dentsply DeTrey, Konstanz, Germany) and the access cavity was sealed temporarily. The patient was referred to tooth be restored permanently.

For the endodontic treatment tooth no. 7, after the procedures of complete isolation, the surgical access was then carried out creating two isolated orifices, preserving the accessory cusp on the lingual face (Fig. 2). The two canal work lengths were established (Fig. 3) and the chemical-mechanical preparation was then carried out using

Fig. 1: Initial X-ray showing type II dens invaginatus

Fig. 2: Surgical access with two isolated orifices preserving the accessory cusp

Fig. 3: Odontometry showing the two main canals

the manual coronal-apical instrumentation technique with manual stainless steel files (Dentsply, Maillefer, Ballaigues, Switzerland) and flushed copiously with 2.5% sodium hypochlorite solution. The final irrigation was accomplished with 17% EDTA, followed by 1% sodium hypochlorite. Sterile paper points were used to dry the root canal, and a calcium hydroxide paste was placed (Fig. 4). The coronal access was sealed with glass ionomer cement. The patient returned for the medication change every 2 weeks for 6 months. However, intracanal exudate was present, suggesting a resistant infection in the apical region. Enucleation of the lesion was performed as a complementary approach. The root canal obturation was carried out by the gutta-percha thermoplastification technique using AH-plus cement (Figs 5 and 6). The tooth was provisionally sealed and the patient was referred for restorative treatment. After 1 year of clinical and radiographic monitoring, the X-ray examination showed a satisfactory apical repair process (Fig. 7).

DISCUSSION

Dens invaginatus is a tooth abnormality of clinical significance due to the possibility for the pulp to be affected. A recess into the lingual anatomy favors the development of dental caries within the invagination without any clinically detectable lesion. The invaginated enamel is thin and in close proximity to the pulp chamber and thus a caries lesion can easily reach the pulp chamber. Therefore, pulpitis and pulp necrosis are frequently associated with this anomaly.[1,9] In this case, tooth no. 7 was clinically healthy, caries-free and without historical trauma, thus, the etiology of the chronic periapical lesion was probably pulp necrosis caused by the passage of bacteria through the invagination defects, creating direct communication between the oral cavity and the pulp chamber.

Among the classifications presented in the literature for dens invaginatus,[8,13] that is proposed by Oehlers[12] is the most used by clinics, since it is very useful for establishing general guidelines for the treatment of the different types of malformation. Identifying the invagination type through a detailed radiographic evaluation is important for choosing the ideal treatment.[13] In this case, after the radiographic analysis, the tooth in question was classified as type III dens invaginatus according to Oehlers,[12] since the enamel of the invagination penetrated up to the apical region forming a second radicular canal. A surgical access was created through two isolated orifices in order to access the two canals (mesial and distal), while, at the same time, preserving the accessory cusp of the lingual face, since the structure is the point of support and reinforcement of the tooth.

The treatment options for an invaginated tooth include prevention treatment by sealing or filling in the invagination, endodontic treatment, apical endodontic surgery, intentional reimplantation and exodontics.[14-17] Considerations, such as the functional and esthetic value of the tooth, type of invagination, canal configuration, prosthetic importance, time, financial and psychological factors and systemic conditions are determinants in the treatment selection.[3] In this case, these factors were considered in the decision to carry out the endodontic treatment. Thus, it was possible to preserve the tooth in the oral cavity and to reestablish the facial esthetics of the patient, affected by the facial asymmetry.

Fig. 4: Canals filled with intracanal medication comprised of a calcium hydroxide paste

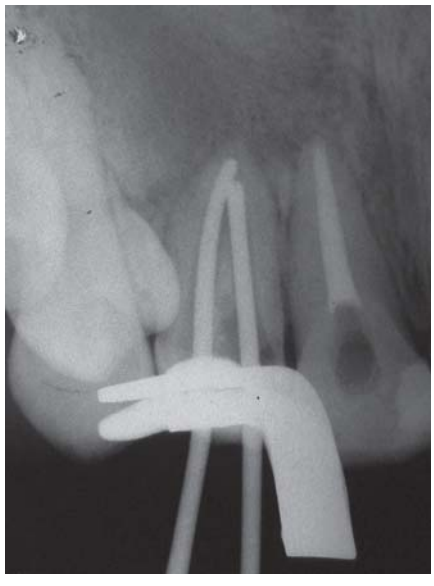

Fig. 5: Radiograph showing main gutta-percha cones

Fig. 6: Obturation using gutta-percha thermoplastification technique

Fig. 7: Annual monitoring of apical repair process

The endodontic techniques for treatment of dens invaginatus type III may involve the invagination treatment separately to the main root canal keeping the pulp vitality. This is possible, if not appear to be any communication between the main root canal and the invaginated canal and the pulp remains healthy.[18] In pulp necrosis it is necessary to treat the main root canal and the invagination, which can be performed separately or not.[2,19,20] In this presented case of dens invaginatus type III with periradicular lesion associated was necessary to treat separately the root canal and the invagination.

The dentist must be aware of these variations and select the most appropriate materials and techniques for the removal of the necrotic tissue and bacteria. During chemomechanical preparation, the use of rotary instruments is not recommended because of the presence of an enamel lining to the lumen of the invagination and an inconsistent shape which may increase the likelihood of instrument fracture.[2,19] The sodium hypochlorite solution used during root canal preparation is essential for reducing the bacterial population inside the root canal.[21] However, studies have revealed that instrumentation and irrigation with sodium hypochlorite solution alone is not sufficient to leave the root canal free from cultivable bacteria and their endotoxins.[22,23] Thus, in order to compliment the action of the instruments and irrigating solutions, the use of intracanal medications is recommended. Calcium hydroxide has commonly been used,[2,24,25] which has antimicrobial activity and can inactivate endotoxins.[26] Considering the need for the complete removal of all the irritants from the root canal system for its subsequent hermetic obturation, the use of an irrigating solution associated with successive changes of intracanal medication based on calcium hydroxide was essential for the success of the treatment.

Although some authors have reported successful obturation of root canals of these teeth with anomalies using the lateral condensation technique,[1,2,18] the thermo-plastification techniques are preferable,[4,26] since they allow the conforming of the gutta-percha within the irregularities of the root canal system.[16] A cement with high plasticity, such as AH-plus, gutta-percha and thermoplasticizing techniques presents a better capacity for apical sealing and adaptation to dentin, thus it is commonly used in the obturation of invaginated teeth,[3,19] as accomplished in the present study.

Teeth infected and with necrotic pulp may be associated with radicular cysts.[27] According to Simon,[28] there are two distinct categories of radicular cysts of endodontic origin. The true cysts represent an apical inflammatory region with epithelium completely lining the cavity with no aperture or connection with the apical foramen and root canal. In bay cysts the cavity is interrupted by the dental apex, which protrudes into its interior. Nair, Pajarola and Schroeder,[29] renamed them 'periapical pocket cysts'. These cysts may recede after endodontic treatment. On the other hand, the true apical cysts frequently require surgical intervention. In the case reported, the apical repair occurring after enucleation and endodontic treatment suggests the presence of a true cyst, demonstrating that the appropriateness of the treatment for the particular clinical situation is essential, in order to verify the prognosis of each case and the need for surgical complementation.[30]

According to Pai, Yang and Lin,[31] the complex anatomy of dens invaginatus becomes difficult and usually complicated the conservative endodontic treatment, especially when large apical lesions exist. The conventional endodontic therapy associated with periradicular surgery has been proposed only when conventional treatment is associated with posttreatment disease[19,25] or when it was not possible to locate the invaginated canal through a coronal access cavity.[32] Although in this case, it was possible to locate the invaginated canal through a coronal access cavity, was observed the persistence of exudate even after of chemomechanical preparation and placement of intracanal pastes, therefore, periradicular surgery was required.

Given the awareness regarding the clinical and radiographic characteristics, possible complications and the treatment of this anomaly, dentists can arrive at the correct diagnosis and thus prevent pulp alterations and other pathologies which can affect teeth with this condition. Considering that dens invaginatus is not a rare anomaly in its less severe form, the dentist must be aware of this condition during the clinical and radiographic examination

in order to detect it. Therefore, given the morphological complexity of this anomaly, the dentist needs to plan the ideal treatment for each case.

CONCLUSION

The types of treatment proposed for cases of invaginated teeth range from prevention and control, and endodontic treatment aiming to keep the tooth, to surgical and extraction treatment. In this case, a combination of endodontic and surgical treatments was fundamental to the maintenance of the tooth. Under these circumstances, at 1 year follow-up, satisfactory bone healing was observed and the treatment was considered successful.

CLINICAL SIGNIFICANCE

The endodontic treatment in dens invaginatus may present difficulty because of the complex anatomy. The root canal therapy of this anomaly should be based on a thorough clinical and radiographic evaluation. Therefore, the knowledge of classification and anatomical variations of teeth with dens invaginatus are of great importance for correct treatment.

REFERENCES

1. Er K, Kustarci A, Ozan U, Tasdemir T. Nonsurgical endodontic treatment of dens invaginatus in a mandibular premolar with large periradicular lesion: A case report. J Endod 2007;33(3): 322-24.
2. Lichota D, Lipski M, WoŸniak K, Buczkowska-Radlinñska J. Endodontic treatment of a maxillary canine with type 3 dens invaginatus and large periradicular lesion: A case report. J Endod 2008;34(6):756-58.
3. Reddy YP, Karpagavinayagam K, Subbarao CV. Management of dens invaginatus diagnosed by spiral computed tomography: A case report. J Endod 2008;34(9):1138-42.
4. Jaramillo A, Fernandez R, Villa P. Endodontic treatment of dens invaginatus: A 5-year follow-up. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101(1):e15-21.
5. Sannomiya EK, Asaumi JI, Kishi K, Dalben GS. Rare associations of dens invaginatus and mesiodens. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;104(2): e41-44.
6. Ridell K, Mejare I, Matsson L. Dens invaginatus: A retrospective study of prophylactic invagination treatment. Int J of Paed Dent 2001;11(2):92-97.
7. Hamasha AA, Alomari QD. Prevalence of dens invaginatus in Jordanian adults. Int Endod J 2004;37(5):307-10.
8. Chaniotis AM, Tzanetakis GN, Kontakiotis EG, Tosios KI. Combined endodontic and surgical management of a mandibular lateral incisor with a rare type of dens invaginatus. J Endod 2008;34(10):1255-60.
9. Mupparapu M, Singer SR. A rare presentation of dens invaginatus in a mandibular lateral incisor occurring concurrently with bilateral maxillary dens invaginatus: Case report and review of literature. Aust Dent J 2004; 49(2):90-93.
10. McNamara CM, Garvey MT, Winter GB. Root abnormalities, talon cusps, dens invaginati with reduced alveolar bone levels: Case report. Int J of Paed Dent 1998;8(1):41-45.
11. Holan G. Dens invaginatus in a primary canine: A case report. Int J of Paed Dent 1998;8(1):61-64.
12. Oehlers FAC. Dens invaginatus (dilated composite odontome). I. Variations of the invagination process and associated anterior crown forms. Oral Surg Oral Med Oral Pathol 1957;10(11): 1204-18.
13. Kristoffersen Ø, Nag OH, Fristad I. Dens invaginatus and treatment options based on a classification system: Report of a type II invagination. Int Endod J 2008;41(8):702-09.
14. Canger EM, Kayipmaz S, Celenk P. Bilateral dens invaginatus in the mandibular premolar region. Ind J Dent Res 2009;20(2):238-40.
15. Whyman RA, MacFadyen EE. Dens in dente associated with infective endocarditis. Oral Surg Oral Med Oral Pathol 1994;78(1):47-50.
16. Silberman A, Cohenca N, Simon JH. Anatomical redesign for the treatment of dens invaginatus type III with open apexes: A literature review and case presentation. J Am Dent Assoc 2006;137(2):180-85.
17. Subay RK, Kayatas M. Dens invaginatus in an immature maxillary lateral incisor: A case report of complex endodontic treatment. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;102(2):e37-41.
18. Keleş A, Çakici FC. Endodontic treatment of a maxillary lateral incisor with vital pulp, periradicular lesion and type III dens invaginatus: A case report. Int Endod J 2010;43(7): 608-14.
19. Bishop K, Alani A. Dens invaginatus. Part 2: Clinical, radiographic features and management options. Int Endod J 2008;41(12):1137-54.
20. Kaneko T, Sakaue H, Okiji T, Suda H. Clinical management of dens invaginatus in a maxillary lateral incisor with the aid of cone-beam computed tomography: A case report. Dent Traumatol 2011, [Epub ahead of print].
21. Rôças IN, Siqueira Jr JF. Comparison of the in vivo antimicrobial effectiveness of sodium hypochlorite and chlorhexidine used as root canal irrigants: A molecular microbiology study. J Endod 2011;37(2):143-50.
22. Oliveira LD, Jorge AOC, Carvalho CAT, Koga-Ito CY, Valera MC. In vitro effects of endodontic irrigants on endotoxins in root canals. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;104(1):135-42.
23. Martinho FC, Gomes BPFA. Quantification of endotoxins and cultivable bacteria in root canal infection before and after chemomechanical preparation with 2.5% sodium hypochlorite. J Endod 2008;34(3):268-72.
24. Carvalho-Sousa B, Almeida-Gomes F, Gominho LF, Albuquerque DS. Endodontic treatment of a periradicular lesion on an invaginated type III mandibular lateral incisor. Ind J Dent Res 2009;20(2):243-45.
25. Schmitz MS, Montagner F, Flores CB, Morari VHC, Quesada GAT, Gomes B. Management of dens invaginatus type I and open apex: Report of three cases. J Endod 2010;36(6): 1079-85.
26. Mohammadi Z, Dummer PMH. Properties and applications of calcium hydroxide in endodontics and dental traumatology. Int Endod J 2011; 44(8):697-730.

27. Nair P. New perspectives on radicular cysts: Do they heal? Inter Endod J 1998;31(3):155-60.
28. Simon JHS. Incidence of periapical cysts in relation to root canal. J Endod 1980;6(11):845-48.
29. Nair PHN, Pajarola G, Schroeder HE. Types and incidence of human periapical lesions obtained with extracted teeth. Oral Surg Oral Med Oral Pathol 1996;81(1):93-102.
30. Martin SA. Conventional endodontic therapy of upper central incisor combined with cyst decompression: A case report. J Endod 2007;33(6):753-57.
31. Pai SF, Yang SF, Lin LM. Nonsurgical endodontic treatment of dens invaginatus with large periradicular lesion: A case report. J Endod 2004; 30(8):597-600.
32. Vier-Pelisser FV, Pelisser A, Recuero LC, Só MV, Borba MG, Figueiredo JA. Use of cone beam computed tomography in the diagnosis, planning and follow up of a type III dens invaginatus case. Int Endod J 2011, [Epub ahead of print].

ABOUT THE AUTHORS

Luciana de Souza Falcão (Corresponding Author)

Graduate, School of Dentistry, Federal University of Amazonas Amazonas, Brazil, e-mail: lusfalcao@yahoo.com.br

Priscila Sousa de Freitas

Graduate, School of Dentistry, Federal University of Amazonas Amazonas, Brazil

Raquel de Oliveira Marreiro

Graduate, School of Dentistry, Federal University of Amazonas Amazonas, Brazil

Ângela Delfina Bittencourt Garrido

Postgraduate Student, Department of Endodontics, School of Dentistry Federal University of Amazonas, Amazonas, Brazil