Dental Research Journal

Case Report

Nonsurgical endodontic treatment of a maxillary lateral incisor with dens invaginatus type II: A case report

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Received: January 2014
Accepted: March 2014

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ABSTRACT

Dens invaginatus is a rare developmental anomaly of teeth with complex root canal system morphology. The present case describes a peg shape maxillary lateral incisor with dens invaginatus (Oehlers type II), necrotic pulp, and an associated large periradicular lesion. Nonsurgical endodontic treatment was performed with the aim of removing the blind sac with diamond bur under the use of operating surgical microscope. The root canal system was obturated with thermoplastic technique. Final restoration was done using composite. The 20-months clinical and radiological follow up revealed an asymptomatic tooth with healing of the periapical pathology; however, for complete healed periradicular lesion more follow up is needed. This case illustrated that a dens invaginatus malformed teeth with a large periradicular lesion can be managed successfully with nonsurgical root canal therapy (NSRCT).

Key Words: Case report, dens invaginatus type II, lateral incisor, nonsurgical endodontic treatment, nonsurgical root canal therapy, periradicular lesion

INTRODUCTION

Dens invagination (dens in dent) (DI) is a rare developmental anomaly of teeth with unclear etiology.[1] Several factors have been proposed for this phenomenon such as genetics,[2] growth pressure of the dental arch, focal failure of growth of the internal enamel epithelium, distortion of the enamel organ, fusion of tooth germs, infection, and trauma.[1] Most authors consider that DI results from an early infolding of the enamel organ into dentin papilla that can extend deep into the pulp cavity or roots or reach the apex.[1,3]

DI prevalence is 0.04 to 10%.[4] It can occur in any deciduous or permanent teeth, but the most commonly affected teeth are maxillary permanent lateral incisors, and it is less common in mandibular teeth and primary teeth.[1]

DI is classified by Oehler[5] into three types to show the degree of malformation: Type I represents an invagination confined within the crown; type II represents an invagination extended into the root (beyond cementoenamel junction (CEJ)) ending as a blind sac and may or may not connect to the dental pulp; type III represents an invagination that penetrates the root and forms an additional foramen and usually is not connected with the pulp.

Teeth with DI are often prone to the need of treatment. Treatment plan depends on the type of DI, its symptoms, and the age of the patient. When there is no communication between the invagination portion and the main root canal system, the aim of treatment is to prevent pulpal involvement to maintain the vitality of the pulp by sealing the orifice of the invagination, obturation of the dens with resin, or by conservative endodontic treatment of invagination as a separate entity.[6-12] However, in these cases, although no radiographical or clinical communication between

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invagination portion and main canal seems to be present, there is histologically strong evidence of the dental tubule connections.[12] If invaginated portion and main canal are connected, both parts need treatment. Different treatment methods are suggested such as conservative treatment, nonsurgical root canal therapy (NSRCT)[13] or combined root canal therapy (RCT) and surgery,[14] intentional replantation,[11] and extraction.[1]

In the current report, invaginated portion was in contact with the main root canal. Therefore, the endeavor was on removing the blind sac with diamond bur under the use of operating surgical microscope, so that the main root canal can be more accessible for cleaning and shaping and also the whole root canal can be obturated evenly.

CASE REPORT

A healthy 25-year-old female patient with a history of a swelling in the right anterior palatal mucosa was referred to the Endodontic Department of Isfahan University of Medical Sciences. Medical history was unremarkable. Patient reported severe local pain with palpation of palatal swelling and spontaneous dental pain. Intraoral soft tissue examination revealed a swelling in the palatal mucosa next to tooth #7 and the missing of upper right canine (#6). The tooth missing was unilateral. The crown of the affected tooth (#7) was peg shape with sides converging or tapering together incisally. The peg-shaped lateral was bilateral that had been reshaped with composite on the maxillary left side

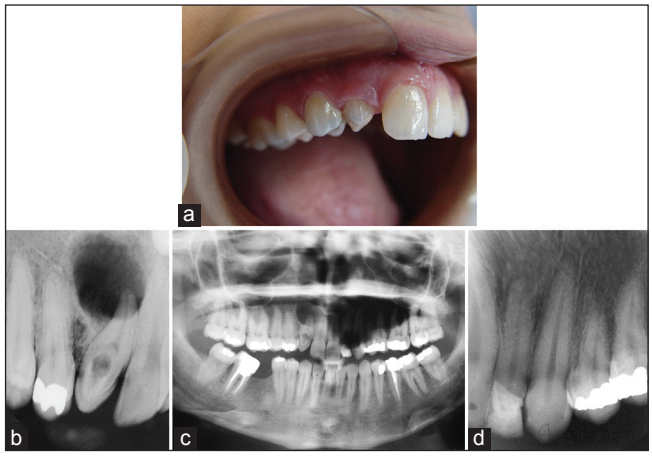

Figure 1: (a) Preoperative photograph: peg shape right maxillary lateral incisor and missing of the canine, (b and c) preoperative periapical and panoramic radiography: a mature lateral incisor with a sac shape invagination diagnosed as DI (type II Oehlers) and an associated large periradicular lesion and missing of the right canine, and (d) peg shape left maxillary lateral incisor, which had been reshaped with composite veneer

[Figure 1]. The tooth #7 did not respond to thermal and electrical tests, and periodontal probing revealed normal periodontium. There was pain on palpation and severe tenderness to percussion without any mobility. The tooth #7 was diagnosed as having a necrotic pulp associated with DI type II and acute apical periodontitis. The radiograph showed a mature lateral incisor with a sac shape invaginated portion limited to the root canal, which is diagnosed as DI (type II Oehlers). The radiograph also demonstrated an enamel-like radioopacity that appeared to be inside the main root canal system. An extended area of radiolucency adjacent to the root apex was noted [Figure 1].

In the emergency appointment, needle aspiration was planned with #18 G needle (Supa, Tehran, Iran) to decompress the pressure and relieve the patient's pain. The anterior palatal mucosa was anesthetized with incisive nerve block injection with 2% lidocaine with 1:80,000 epinephrine (Xylocaine, Dentsply pharmaceutical, York, PA, USA). A clear yellow liquid (2 cc) was aspirated and sent to the pathology laboratory. NSRCT was planned with possible surgical intervention in the future. Patient was subsequently informed about the complex anatomy of the tooth and the long-term prognosis of different treatment plans, and a decision was made to perform NSRCT. A written consent form was acquired before each phase of treatment. The tooth was anesthetized with 2% lidocaine with 1:80,000 epinephrine (Xylocaine, Dentsply pharmaceutical, York, PA, USA). For isolation purposes, the peg-shaped crown was first reconstructed by a composite resin (Solitaire 2, Heraeus Kulzer, Wehrheim, Germany). Then, the tooth was isolated with rubber dam. Access cavity was made from the lingual aspects with high-speed turbine (Super Torque 625; Kavo, Joinville, Santa Catarina, Brazil) and diamond fissure bur (Dentsply, Maillefer, Baillaigues, Switzerland). During access cavity preparation, the fissure bur dropped in yellow necrotic tissue, which confirmed the initial diagnosis. The sac-like invaginated portion was hard like enamel structure. It was tried to remove invaginated portion with fissure diamond bur #0.8 (Dentsply, Maillefer, Baillaigues, Switzerland) under the use of operating surgical microscope (Global Surgical, St.Louis, MO, USA). During this process, radiographs with two different horizontal angles were taken with gutta-percha placed in the drilled pathway to be sure about the direction of the bur drilling. After removing the sac-like portion, working length was determined radiographically with the association of an electronic apex locator (RootZX, J Morita, Osaka,

Japan) [Figure 2a]. Gates Glidden drills and hand k-files (Dentsply, Maillefer, USA) were used to clean and shape canals. Irrigation was performed with copious 0.5% NaOCl solution (IMS Company, Tehran, Iran). Calcium hydroxide (Pulpdent Crop, Watertown, MA, USA) was placed in the canal for one week. The access cavity was sealed with temporary restoration (Cavit, 3M, ESPE, Seefeld, Germany).

At the second appointment, the swelling disappeared. The results of the pathology laboratory showed that the sample was cystic liquid. The tooth was anesthetized by buccal infiltration with 2% lidocaine with 1:80,000 epinephrine (Xylocaine, Dentsply pharmaceutical, York, PA, USA). Intracanal medicament was removed by 6% NaoCl irrigation for 5 min, and canal was made completely dried with paper points (Dentsply, Maillefer, OK, USA). Root canal was obturated with gutta-percha (Dentsply, Maillefer, OK, USA) and AH-26 sealer (Dentsply, DeTrey, Konstanz, Germany) by injectable thermoplastic method [Figure 2b]. The access cavity was restored with composite resin (Solitaire 2, Heraeus Kulzer, Wehrheim, Germany).

The 20-months follow-up clinical examination revealed healthy clinical appearance and function; radiographs showed healing of periapical pathology. However, for complete healing of periradicular lesion more follow up is needed [Figure 2c].

DISCUSSION

DI always is an endodontic challenge for clinicians in both the diagnosis and the treatment stages. Early diagnosis and dental treatment is commonly required for teeth with invagination. Because of the frequent communication between the invagination and the oral cavity, the invagination makes the penetration of bacteria and their products into the pulp and periradicular tissue faster and easier and that increases the chances of pulp necrosis and periapical lesions.[15] Teeth with DI can be asympthomatic and therefore not diagnosed even with large periapical radiolucencies, which leads to a more complex profile and more extensive bone loss.[15]

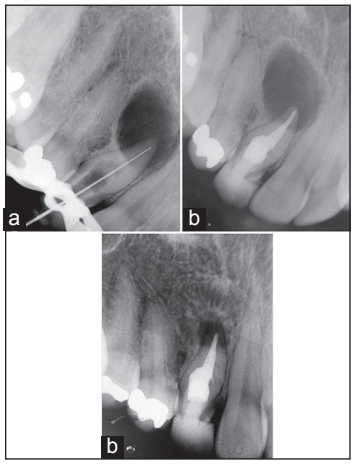

Figure 2: (a) Working length determination, (b) immediate postoperative periapical radiopraph taken after final canal obturation, and (c) 20-months follow-up radiograph demonstrating healing of periradicular lesion

DI treatments vary from simple preventive treatment like fissure sealant in early diagnosed cases to surgery and even extraction of the tooth, depending on the type and the degree of malformation. Surgery may have been regarded as a suitable treatment in the past, but numerous studies have shown that NSRCT can also be a successful alternative.[16-18] Shadmehr and Farhad[18] reported a large periapical lesion associated with DI type III in a canine tooth, which was completely healed by NSRCT. Because the tendency is to move toward more conservative treatments to avoid imposing unnecessary operative and radical medical procedures to the patient, it is often recommended to carry out surgery only if the NSRCT has been attempted first and it has been unable to cure the problem. In the present case, the tooth appeared to be an Oehler's class II with an invagination that remained confined within the root canal as a blind sac, with connection with the main root canal, which was treated successfully with NSRCT.

One of the difficulties and limitations of NSRCT method that could lead to its unpredictable prognosis and its failure is the obstruction caused by invagination and the variability of complex internal anatomy of the root canal system limit the accessibility and makes it impossible to achieve complete debridement followed by its complete obturation with a biocompatible material. These varieties of canal morphology leave some regions of the canal unreachable.[19,20] Some authors have suggested strategies to overcome these issues. For instance, Khabbaz *et al*.,[21] Holtzman and Lezion,[20] and Shadmehr and Farhad[18] have assumed the invagination space and root canal space as two separate areas. Holtzman and Lezion[20] treated his case by NSRCT with calcium hydroxide, claiming to have cured the periapical lesion. However, he acknowledges that the space underneath the invagination area was inaccessible and was only filled by sealer. Er *et al*.,[13] used a triple antibiotic

paste, a mixture of ciprofloxacin, metronidazole, and minocycline, which was described by Takushige *et al*.,[22] as an intracanal dressing as an alterantive to the use of calcium hydroxide and reported a complete healing. Lichota *et al*.,[23] have also treated DI spaces separately, necessitating the need for a lubricant to prevent blockage of the file and reported successful NSRCT even in DI type III with large periradicular lesion. In the present case, hard central invaginated part of the tooth was removed by fissure bur under surgical microscope, which provides better access for the clinician and in turn enables complete debridement and obturation to be achieved. Girsch and McClammy[24] and Silberman *et al*.,[19] also recommended the removal of the central structure with the use of surgical microscope when the invagination tract and the main canal are separate entities.

In the present case, calcium hydroxide was used as an intracanal medicament for a number of reasons. This substance has an antimicrobial effect and could dissolve the remaining pulpal tissue.[25] It also helps the healing of periradicular lesion through increasing the pH of the periapical enviroment, providing calcium ion for repair process,[26] and its denaturating effect on proinflammatory mediators such as interleukin-1 and tumour necrosis factor.[27] Use of ultrasonics for irrigation is another method that has been suggested to enhance disinfection process.[28]

Some authors have used lateral[9,18] or vertical[29] gutta-percha obturation techniques or made use of mineral trioxide aggregate[10] for obturation, but Rotstein *et al*.,[6] and Nallapati[30] recommended the use of thermoplastic technique, which was used in this case, as an effective method to obtain a sufficient seal at filling of such irregular canal spaces.

It might appear that existence of periradicular lesion could interfere with NSRCT, but most researchers [13,29] state that the size of the periradicular lesion does not influence the method or the prognosis of the treatment. This case is another evidence that reports successful NSRCT for a DI tooth with assosiated large periradicular lesion.

CONCLUSION

This case illustrated that a DI type II malformed tooth with a large periradicular lesion can be managed successfully with NSRCT. Furthermore, removing the hard central blind sac under surgical microscope provided better access for complete debridement. The use of calcium hydroxide paste as an intracanal medicament may provide an additional chemical debridement. Utilization of thermoplastic technique for obturation may provide better adaptation to the complex internal morphology of invaginated canal.

REFERENCES

1. Hülsmann M. Dens invaginatus: Aetiology, classification, prevalence, diagnosis, and treatment considerations. Int Endod J 1997;30:79-90.
2. Hosey MT, Bedi R. Multiple dens invaginatus in two brothers. Endod Dent Traumatol 1996;12:44-7.
3. Alani A, Bishop K. Dens invaginatus. Part 1: Classification, prevalence and aetiology. Int Endod J 2008;41:1123-36.
4. Hovland EJ, Block RM. Nonrecognition and subsequent endodontic treatment of dens invaginatus. J Endod 1977;3:360-2.
5. Oehlers FA. Dens invaginatus (Dilated composite odontome): II. Associated posterior crown forms and pathogenesis. Oral Surg Oral Med Oral Pathol 1957;10:1302-16.
6. Rotstein I, Stabholz A, Heling I, Friedman S. Clinical considerations in the treatment of dens invaginatus. Endod Dent Traumatol 1987;3:249-54.
7. Mupparapu M, Singer SR. A review of dens invaginatus (dens in dente) in permanent and primary teeth: Report of a case in a microdontic maxillary lateral incisor. Quintessence Int 2006;37:125-9.
8. Gonçalves A, Gonçalves M, Oliveira DP, Gonçalves N. Dens invaginatus type III: Report of a case and 10-year radiographic follow-up. Int Endod J 2002;35:873-9.
9. Steffen H, Splieth C. Conventional treatment of dens invaginatus in maxillary lateral incisor with sinus tract: One year follow-up. J Endod 2005;31:130-3.
10. Demartis P, Dessì C, Cotti M, Cotti E. Endodontic treatment and hypotheses on an unusual case of dens invaginatus. J Endod 2009;35:417-21.
11. Nedley MP, Powers GK. Intentional extraction and reimplantation of an immature invaginated central incisor. ASDC J Dent Child 1997;64:417-20.
12. 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;34:1255-60.
13. Er K, Kuştarcı A, Özan Ü, Taşdemir T. Nonsurgical endodontic treatment of dens invaginatus in a mandibular premolar with large periradicular lesion: A case report. J Endod 2007;33:322-4.
14. Kristoffersen Ø, Nag O, Fristad I. Dens invaginatus and treatment options based on a classification system: Report of a type II invagination. Int Endod J 2008;41:702-9.
15. Schmitz MS, Montagner F, Flores CB, Morari VH, Quesada GA, Gomes BP. Management of dens invaginatus type I and open apex: Report of three cases. J Endod 2010;36:1079-85.
16. Kato H. Non-surgical endodontic treatment for dens invaginatus type III using cone beam computed tomography and dental operating microscope: A case report. Bull Tokyo Dent Coll 2013;54:103-8.

17. George R, Moule AJ, Walsh LJ. A rare case of dens invaginatus in a mandibular canine. Aust Endod J 2010;36:83-6.
18. Shadmehr E, Farhad AR. Clinical management of dens invaginatus Type 3: A case report. Iran Endod J 2011;6:129-32.
19. 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;137:180-5.
20. Holtzman L, Lezion R. Endodontic treatment of maxillary canine with dens invaginatus and immature root. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1996;82:452-5.
21. Khabbaz MG, Konstantaki MN, Sykaras SN. Dens invaginatus in a mandibular lateral incisor. Int Endod J 1995;28:303-5.
22. Takushige T, Cruz E, Asgor Moral A, Hoshino E. Endodontic treatment of primary teeth using a combination of antibacterial drugs. Int Endod J 2004;37:132-8.
23. Lichota D, Lipski M, Woźniak K, Buczkowska-Radlińska J. Endodontic treatment of a maxillary canine with type 3 dens invaginatus and large periradicular lesion: A case report. J Endod 2008;34:756-8.
24. Girsch WJ, McClammy TV. Microscopic removal of dens invaginatus. J Endod 2002;28:336-9.
25. Sathorn C, Parashos P, Messer H. Antibacterial efficacy of calcium hydroxide intracanal dressing: A systematic review and meta-analysis. Int Endod J 2007;40:2-10.
26. Farhad A, Mohammadi Z. Calcium hydroxide: A review. Int Dent J 2005;55:293-301.
27. Khan AA, Sun X, Hargreaves KM. Effect of calcium hydroxide on proinflammatory cytokines and neuropeptides. J Endod 2008;34:1360-3.
28. Cunningham WT, Martin H, Pelleu GB Jr, Stoops DE. A comparison of antimicrobial effectiveness of endosonic and hand root canal therapy. Oral Surg Oral Med Oral Pathol 1982;54:238-41.
29. Fayazi S, Bayat-Movahed S, White SN. Rapid endodontic management of type II dens invaginatus using an MTA plug: A case report. Spec Care Dentist 2013;33:96-100.
30. Nallapati S. Clinical management of a maxillary lateral incisor with vital pulp and type 3 dens invaginatus: A case report. J Endod 2004;30:726-31.

How to cite this article: Shadmehr E, Kiaani S, Mahdavian P. Nonsurgical endodontic treatment of a maxillary lateral incisor with dens invaginatus type II: A case report. Dent Res J 2015;12:187-91.
Source of Support: Nil. **Conflict of Interest:** None declared.