症　　例

# Endodontic treatment of typeⅢ dens invaginatus in maxillary lateral incisor with sinus tract:Five-year follow-up

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**Abstract** : A case of typeⅢ dens invaginatus in maxillary lateral incisor with sinus tract and periradicular lesion is reported. Dens invaginatus present technical difficulties with respect to their management because of variation of the forms. This case was treated by conventional root canal treatment. At follow up examination after 5 years the tooth was asymptomatic and the radiograph showed repair of the periradicular lesion.

**Key word** : Dens invaginatus, Maxillary lateral incisor, Endodontic treatment

## Introduction

Various diagnostic terms have been used for dental hard tissue anomalies[1,2]. Maxillary lateral incisor may vary dramatically in their internal and external morphology[3]; dens in dente[4], developmental palatal groove[3], extra canals[4], fusion[2,4], gemination[5], and twinning[6]. Dens invaginatus (Dens in dente) is a developmental defect resulting from invagination of the crown or root before calcification has occurred. Oehlers[7] classified dens invaginatus into 3 types (Type I : an enamel minor form within the crown of the tooth and not extending beyond the cementoenamel junction; TypeⅡ: an enamel-line form which invades the root as a blind sac and may communicate with the pulp; TypeⅢ: a severe form which extends through the root and opens in the apical region without communication with the pulp). The complex anatomy of dens invaginatus presents technical difficulties with respect to their management because of variation of the forms.

Root canal morphology dictates the conditions under which endodontic treatment is carried out and can directly affect its

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prognosis[8]. A comprehensive knowledge of root canal morphology and its variations is required in order to prevent procedural errors, which may cause endodontic failures[9].

A case is presented in which endodontic treatment was carried out on a maxillary lateral incisor with dens invaginatus in association with sinus tracts and periradicular lesion.

## Case report

A 24-year-old female was referred by a general practitioner for endodontic treatment in the maxillary left lateral incisor. The tooth showed two sinus tracts in the apical area of labial mucosa next to the affected incisor. Medical and familial history was noncontributory. Dental history was also noncontributory. Three years ago, she tripped over the step and hit her left upper lip and cheek against the step. Clinical evaluation showed a healthy woman with no other physical abnormalities. Intraoral examination demonstrated an unusual enlarged crown configuration of the maxillary left lateral incisor (Fig. 1). The crown of the tooth was not discolored. There was no associated swelling. The crown of the affected tooth was intact but had a linguocervical groove with no evidence of dental caries. The affected tooth was slightly sensitive to vertical percussion, and did not respond to an electric pulp tester. The periodontal probing revealed a normal and intact periodontium. The primary canine was still in the dental arch and responded to an electric pulp tester. The radiograph showed a mature tooth with a dens invaginatus, and an area of periradicular radiolucency could be observed (Fig. 2-A).

Fig. 1. Clinical photograph at the initial visit. Maxillary left lateral incisor was an unusual enlarged crown configuration in association with sinus tract.

The diagnosis of type Ⅲ dens invaginatus and chronic periradicular periodontitis was established. A rubber dam was placed, and a triangular access cavity was prepared from the lingual surface. The access opening showed two canals separated by enamel-like structure (Fig. 3). Working lengths were electronically determined with Root ZX (Morita, Tokyo, Japan). The working length of mesial root canal was 23 mm and that of the distal root canal was 19 mm. Both root canals were prepared apically to a size 40 K-file under continuous irrigation with 5% sodium hypochlorite solution. After finishing preparation, the irrigation with 3% EDTA was supported by ultrasonic root canal cleaning system (ENAC; Osada Inc, Tokyo, Japan) for 60 seconds and the final irrigation was done with 5% sodium hypochlorite solution. The dampened formalin tricreosol (Neo Dental Chemical Products, Tokyo, Japan) paper point was inserted in each root canal for healing sinus tract and the tooth was temporarily sealed with ZOE cement (Eugedain; Showa Chemical Co. Ltd, Tokyo, Japan). After 1 week, the sinus tracts were disappeared and the tooth was asymptomatic. The intracanal dressing was

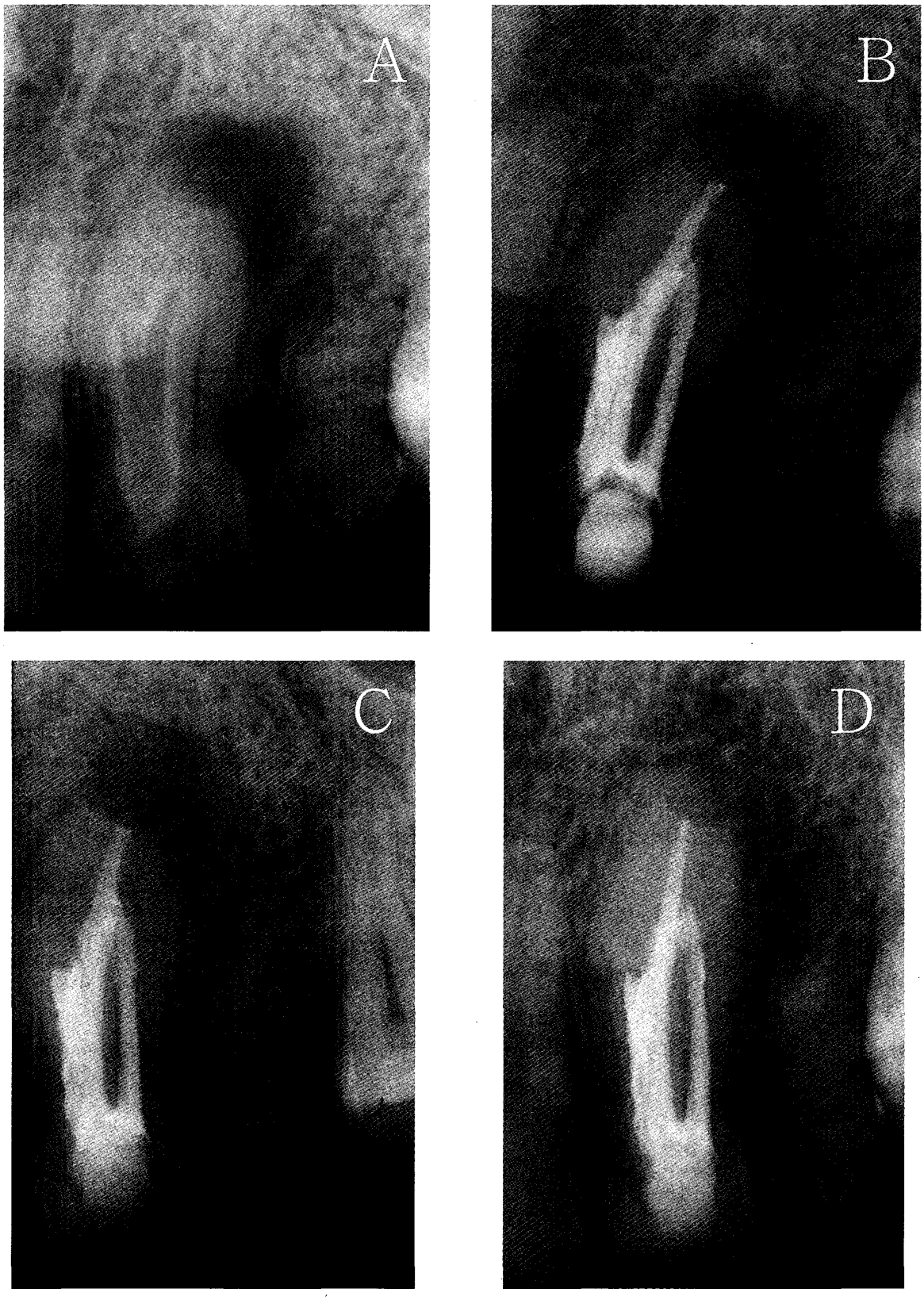


Fig. 2. A : Preoperative radiograph showed maxillary left lateral incisor with dens invaginatus and periradicular radiolucency.
B : Immediate post-operative radiograph of obturated root canals.
C : Six months follow-up radiograph showed that periradicular radiolucency was decreased resembling a "Halo sign".
D : Five-years follow-up radiograph showed the periradicular repair had progressed well.

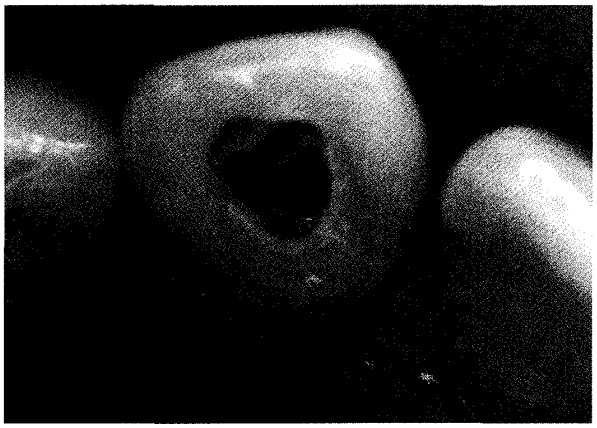

Fig. 3. Access opening showed two canals separated by enamel-like structure.

removed and the mesial root canal was prepared apically to a size 60 K-file and distal root canal was prepared to a size 50 K-file. The calcium hydroxide paste (Vitapex; Neo Dental Chemical Products, Tokyo, Japan) was inserted and the access cavity was sealed with ZOE cement. After 3 weeks, the intracanal dressing was removed and the root canals were obturated with gutta-percha points and Dentalis KEZ (Neo Dental Chemical Products, Tokyo, Japan) by the lateral condensation method (Fig. 2-B). The access cavity was sealed with zinc phosphate cement (Elite Cement 100; GC, Tokyo, Japan).

After 6 months, the crown was restored with the composite resin Z 250 and Multipurpose Adhesive System (3M Dental Products, St. Paul, MN, USA). The radiograph showed that periradicular radiolucency was decreased resembling a "Halo sign"(Fig. 2-C).

After 5 years, the tooth remained asymptomatic. The radiograph showed that periradicular radiolucency was disappeared (Fig. 2-D). The periradicular repair had progressed well.

## Discussion

In most cases, a dens invaginatus is detected by chance on the radiograph. Clinically, an unusual crown morphology (dilated, peg-shaped, barrel-shaped) or a deep foramen coecum may be important hints, but affected teeth also may show no clinical signs of the malformation[10].

The prevalence of dens invaginatus is from 0.04% to 10% and a rare dental malformation[11]. The most teeth in dens invaginatus are maxillary lateral incisor; bilateral occurrence is not uncommon, and occurs in 43% cases of all the case[12]. The etiology of this malformation remains unclear. It exhibits a broad spectrum of morphologic variations. Most authors consider dens invaginatus as a deep folding of the foramen coecum during tooth development, which in some cases even may result in a second apical foramen[13]. The most commonly used classification was proposed by Oehlers[7], who classified dens invaginatus into three categories according to the depth of penetration and communication with the periapical tissue or periodontal ligament.

In this case, the invagination communicated with the oral cavity; thus it led pulp necrosis and caused the periradicular lesion. In addition, affected teeth might have had concussion or subluxation, when the patient hit her left upper lip and cheek against the step 3 years ago. This traumatic factor also might cause pulp necrosis and the periradicular lesion.

The complex anatomy of dens invaginatus makes a conservative endodontic treatment of such teeth difficult and unpredictable; thus combination with surgical treatment or sometimes extraction of such

teeth is necessary[14]. In some cases, radiographic examination is not sufficient to clarify the root canal configuration. Dental CT and 3-Dimensional image reconstructed from the CT may bring about more useful information[15]. Careful examination of the access opening also helped to clarify the root canal and the invagination.

For obturation of root canal, the vertical condensation method or thermoplastic filling techniques seemed preferable to other techniques[11]. However, in this case the lateral condensation method led to success similar to some reports[11, 16, 17]. The kinds of obturation technique might be not important for the endodontic treatment of such dens invaginatus. The irrigation might be important rather than the obturation. In this case, we used ultrasonic root canal cleaning system for the irrigation. The irrigation supported by ultrasonic cleaning system has been described as an efficient means of disinfection[18] and has been recommended for cleaning of the complex morphology of the root canal system in teeth with dens invaginatus[19].

Postoperative follow-up was essential, because the risk of root fracture is very high by the thin walls and loss of substance.

## Conclusion

This was a report of endodontic treatment of a maxillary lateral incisor with type Ⅲ dens invaginatus in association with sinus tract and periradicular lesion. Though dens invaginatus present technical difficulties with respect to their management because of variety of forms, the consideration of the root canal morphology in conjunction with adequate endodontic procedures and the irrigation appeared to be the main requirements for successful endodontic treatment of these dental anomalies.

## References


1) Tannenbaeum A. K., and Alling E. E. : Anomalous tooth development: case reports of gemination and twinning. *Oral Surg. Oral Med. Oral Pathol.* 16 : 883-887, 1963.

2) Pindborg J. J. : *Pathology of dental hard tissue.* W. B. Saunders Co., Philadelphia, pp51-53, 1970.

3) Smith B. E., and Carroll B. : Maxillary lateral incisor with two developmental grooves. *Oral Surg. Oral Med. Oral Pathol.* 70 : 523-525, 1990.

4) Mangani F., and Clifford J. R. : Endodontic treatment of a "very particular" maxillary central incisor. *J. Endod.* 20 : 560-561, 1994.

5) Caliskan, M. K. : Traumatic gemination-triple tooth. Survey of the literature and report of a case. *Endod. Dent. Traumatol.* 8 : 130-133, 1992.

6) O'Carroll M. K. : Fusion and gemination in alternate dentitions. *Oral Surg. Oral Med. Oral Pathol.* 69 : 655, 1990.

7) Oehler F. A. : Dens invaginatus. I. Variations of the invagination process and associated anterior crown forms. *Oral Surg. Oral Med. Oral Pathol.* 10 : 1204-1218, 1957.

8) Slowey R. R. : Root canal anatomy: road map to successful endodontics. *Dent. Clin. North Am.* 23 : 555-573, 1979.

9) Rotstein I., Moshonov J., and Cohenca N. : Endodontic therapy for fused mandibular molar. *Endod. Dent. Traumatol.* 13 : 149-151, 1997.

10) Hūlsmann M. : Dens invaginatus: Aetiology, classification, prevalence, diagnosis, and treatment considerations. *Int. Endod. J.* 30 : 79-90, 1997.

11) Hovland E. J., and Block R. M. : Nonrecognation and subsequent endodontic treatment of dens invaginatus. *J. Endod.* 3 : 360-362, 1977.

12) Grahnen H., Lindahl B., and Omnell K. : Dens invaginatus. I. A clinical, roentgenological and genetical study of permanent upper lateral incisors. *Odontol. Revy.* 10 : 115-137, 1959.

13) Schulze C. : Developmental abnormalities of the teeth and the jaws. In: Gorlin O., and Goldman H., eds. *Thoma's Oral Pathology.* Mosby Co., St. Louis, pp 96-183, 1970.

14) Fruōner I.C., Da Costa Rocha L.F., Da Costa Rocha W.F., Da Rocha Barros V.M., and Morello D. : Complex treatment of dens invaginatus type Ⅲ in maxillary incisor. *Endod. Dent. Traumatol.* 15 : 88-90, 1999.

15) Kobayashi K., Kotani Y., Takahashi T., Kure T., and Katayama T. : Conservative endodontic treatment for dens in dente which appeared in

mandibular lateral incisor. *Japan. J. Conserv. Dent.* 49 : 607-616, 2006.
16) De Smit A., and Demaut L. : Nonsurgical endodontic treatment of invaginated teeth. *J. Endod.* 8 : 506-511, 1982.
17) Zillich R. M., Ash J. L., and Corcotan J. F. : Maxillary lateral incisor with two roots and dens formation: A case report. *J. Endod.* 9 : 143-144, 1983.
18) Cunningham W., Martin H., Pelleu G., and Stoops D.: A comparison of antimicrobial effectiveness of endosonic and hand root canal therapy. *Oral Surg. Oral Med. Oral Pathol.* 54 : 238-241, 1982.
19) Skoner J. R., and Wallace L. A. : Dens invaginatus: another use of the ultrasonics. *J. Endod.* 20 : 138-140, 1994.

# 瘻孔を有する上顎左側側切歯Ⅲ型歯内歯の歯内治療5年経過症例

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**抄録**：瘻孔を有した根尖性歯周炎に罹患した上顎左側側切歯歯内歯の歯内療法治療症例について報告する。歯内治療は，根管系の複雑性により技術的に難しい問題を抱える。報告症例は，歯内歯に従来の歯内療法を行い，5年経過を観察し，症状もなくエックス線的にも治癒が認められ経過良好である。

キーワード：歯内歯，上顎側切歯，歯内療法