Frontiers in Dentistry

A Non-Surgical Endodontic Treatment for a Dens in Dente Type II in a Maxillary Lateral Incisor with Chronic Apical Periodontitis: A Case Report

Wael Ali Zaatari[1], Mahmoud Tarakji[2], Helen Rushdi Ayoubi[3]*

1. Department of Operative Dentistry and Endodontics, Faculty of Dental Medicine, Aleppo University, Aleppo, Syrian Arab Republic
2. Department of Oral and Maxillofacial Surgery, Faculty of Dental Medicine, Aleppo University, Aleppo, Syrian Arab Republic
3. Department of Operative Dentistry and Endodontics, Faculty of Dental Medicine, Damascus University, Damascus, Syrian Arab Republic

Article Info

Article type:
Case Report

Article History:
Received: 25 Jun 2024
Accepted: 21 Dec 2024
Published: 14 Jul 2025

**** Corresponding author:***
Department of Operative Dentistry and Endodontics, Faculty of Dental Medicine, Damascus University, Fayez Mansour Street, Mazzeh Highway, Damascus, Syrian Arab Republic

Email: dr.helen_ayoubi@yahoo.com, helen317.ayoubi@damascusuniversity.edu.sy

A B S T R A C T

Dens in dente is a rare structural abnormality arising during tooth development. It is also called dens invaginatus or dilated odontoma, which develops following inward folding (invagination) of the enamel organ into the dental papilla. Maxillary lateral incisors are the most frequently affected teeth. Dens in dente often leads to pulp necrosis and development of a periapical lesion. Also, impacted teeth are one of the reasons for development of odontogenic cysts and tumors. A dentigerous cyst, classified as an odontogenic cyst, develops around the crown of an unerupted tooth. These cysts most frequently involve mandibular third molars; they are also commonly associated with maxillary canines and mandibular second premolars. This report describes a dens in dente in a maxillary lateral incisor, and impacted maxillary canine teeth with extended periodontitis and their management by a combination of root canal and surgical treatments.

Keywords: Dens in Dente; Tooth, Impacted, Cuspid; Maxilla; Incisor; Odontogenic Cysts

➢ **Cite this article as:** Zaatari WA, Tarakji M, Ayoubi HR. A Non-Surgical Endodontic Treatment for Dens in Dente Type II in Maxillary Lateral Incisor with Chronic Apical Periodontitis: A Case Report. *Front Dent*. 2025:22:25. https://doi.org/10.18502/fid.v22i25.19202

INTRODUCTION

There are many anomalies associated with tooth development, which can result from an environmental insult or a genetic defect, or may be part of a syndrome [1-3]. Dens in dente is a morphological dental anomaly that results from invagination of the inner enamel epithelium, and was first reported by Baume in 1874 [4]. The prevalence of dens in dente ranges from 0.3-10% [1]. Permanent maxillary lateral incisors are the most commonly affected teeth by dens in dente [5], followed by maxillary central incisors, and canine teeth; while, premolars and molars are rarely affected [2]. Pulp necrosis often occurs shortly after tooth eruption, due to canal extension from the central cavity of the invagination to the pulp, and hence bacterial

invasion may occur [5]. Radiographically, there are four main classifications for this anomaly according to Oehlers classification in 1957 [6]. Computed tomography is the most accurate modality to correctly determine the dens in dente classification and aid in designing an efficient treatment plan. Radiographically, type II dens in dente appears as a radiopaque defect (with enamel-like density) extending into the pulp chamber; these defects exhibit diverse morphologies and penetration depths, and may be accompanied by a radiolucent area localized to the central pulp space [7].

Dentigerous cysts are typically small asymptomatic lesions often detected incidentally during routine dental radiographic examinations. While they usually remain unnoticed, they can occasionally enlarge significantly, leading to painless expansion of the jawbone. Discomfort or pain may arise only in case of development of secondary infection [8]. Radiographically, dentigerous cysts appear as sharply demarcated, single-chambered radiolucent lesions, commonly bordered by a sclerotic margin. The cyst's epithelial lining, which arises from the reduced enamel epithelium, results in a radiolucent area that characteristically encircles the crown of the involved tooth [8]. This report describes a dens in dente in a maxillary lateral incisor, and impacted maxillary canine teeth with extended periodontitis and their management by a combination of root canal and surgical treatments.

CASE PRESENTATION

A left-sided facial swelling involving the left eye prompted the referral of a 12-year-old female patient to a dental clinic. The patient's medical history was unremarkable, and she was not using any medication. Dental history of the patient did not reveal any history of trauma or related procedures. Clinical examination revealed tenderness and swelling associated with the maxillary lateral incisor, but no sinus tract was detected. Intraoral examination revealed tenderness on percussion associated with tooth #12. Also, tooth #12 had no response to thermal tests (Fig 1a). Panoramic radiographic examination showed that the maxillary lateral incisor had a complicated anatomy, and was associated with a large periapical radiolucency (Fig 1b). A periapical radiograph showed dens in dente (Fig 1c) and cone-beam computed tomography (CBCT) revealed the presence of an impacted canine tooth adjacent to the nose (Fig 2). The definitive diagnosis of dens in dente type II was made.

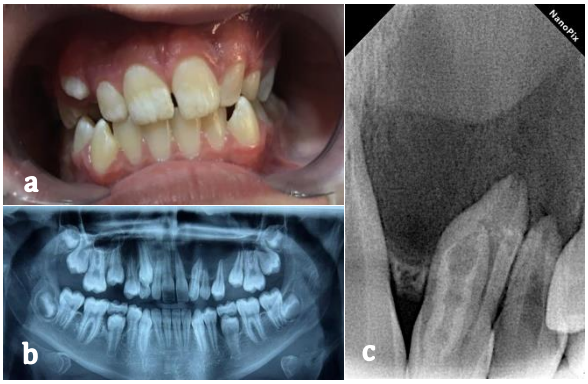

Fig 1. a) Intraoral view of the patient. b) Panoramic radiograph of the patient c) Periapical radiograph of the patient

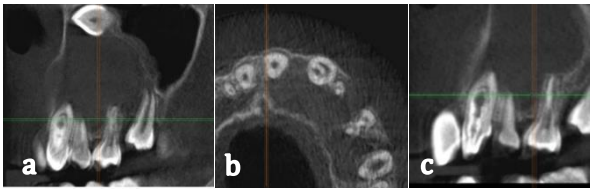

Fig 2. a) Sagittal CBCT image demonstrating an impacted canine tooth adjacent to the maxillary sinus and a maxillary lateral incisor with dens in dente. b) Axial CBCT image showing a maxillary lateral incisor with two orifices. c) Sagittal CBCT image showing a maxillary lateral incisor with a dens in dente

Treatment was carried out in two-phases of endodontic treatment and surgical treatment.

Endodontic Phase:

Endodontic treatment was performed in three appointments. In the first appointment, an endodontic access cavity was prepared. Then, the root canal orifices were identified (Fig 3a). The working length was estimated by using a #10 K-file (Fanta, China) (Figs 3b, 3c). The root canals were prepared by a rotary system with ISO size files 20/.04, 25/.04, and 25/.06

(Fanta, China), and irrigated using sufficient amounts of 2.5% NaOCl solution. Next, calcium hydroxide (i-CAL Plus; i-dental, Lithuania) was applied as an intracanal medicament. The access cavity was then temporarily restored (Coltosol F, Colten, Switzerland).

In the second appointment, the temporary restoration was removed, followed by calcium hydroxide removal. The root canals were dried, and a mineral trioxide aggregate plug (Trioxident, ValdMiVa, Russian) was placed to seal the apical third. A wet cotton pellet was then placed at the orifice, and the access cavity was temporarily restored.

In the third session, the root canal was obturated by using the warm gutta-percha vertical condensation technique (Denjoy, China) with MTA Bioseal sealer (MTA Bioseal, Itena, France) as per manufacturer's instructions (Figs 3d, 3e). The tooth was finally restored with composite resin (Tetric N-Ceram, Ivoclar Vivadent, Liechtenstein).

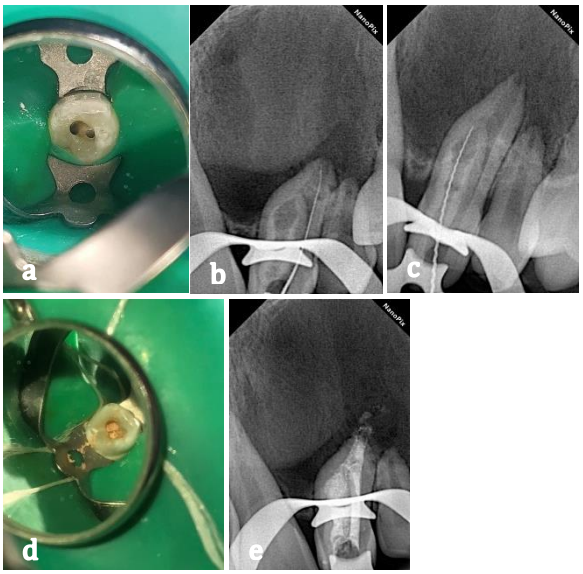

Fig 3. a) Access cavity preparation for the maxillary lateral incisor. b) Working length radiograph of the maxillary lateral incisor. c) Working length radiograph associated with Dens Invaginatus. d) Intraoral photograph of obturated maxillary lateral incisor. e) Radiograph of obturated maxillary lateral incisor

Surgical Phase:

Enucleation is a surgical procedure that involves total removal of the lesion. The lesions should be carefully removed in one piece without fragmentation to reduce the risk of recurrence. In practice, however, preserving the lesion's architecture is not always possible as rupture of the lesion may occur during the procedure.

Under general anesthesia, a trapezoidal full-thickness mucoperiosteal flap was elevated to uncover the affected region. Initially, a sulcular incision was made, extending from the distal papilla of the left incisor to the distal papilla of the left second premolar tooth. Then, two releasing incisions were made to achieve a broad-based flap designed to improve blood circulation. The flap was gently elevated to avoid tissue injury. Upon bone exposure, a defect in the cortical plate of the left maxillary lateral incisor was evident. To ensure good access to the lesion, bone was removed using surgical burs with constant flushing to expand the defect's opening. Next, liquid was aspirated from the affected area.

The upper left canine was exposed (Fig. 4a), and the affected area was seen. The impacted canine was removed, and the lesion was excised using the convex surface of a mucoperiosteal elevator. The lesion around the lateral incisor was thoroughly removed using a surgical bur and handpiece under abundant sterile saline irrigation. After removal, the area was thoroughly cleaned and flushed with saline to eliminate any debris, ensuring clear visibility for evaluation of any tissue remnant (Fig 4b). A bone curette was used for cleaning and scraping of the osteotomy site to eliminate the pathological remnants, which could hinder osseointegration. The bony edges of the defect were smoothened with a file before closure, and the osteotomy site was reirrigated with aseptic saline solution. Prior to placement of surgical sutures, grafting of the defect site and covering with advanced platelet-rich fibrin (A-PRF) membrane were performed (Figs 4c, 5).

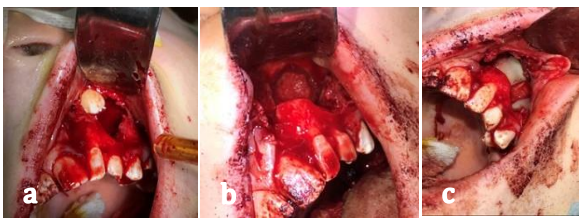

Fig 4. a) Exposure of impacted canine tooth b) Defect site after enucleation. *c*) Grafting of defect site and its coverage with A-PRF membrane

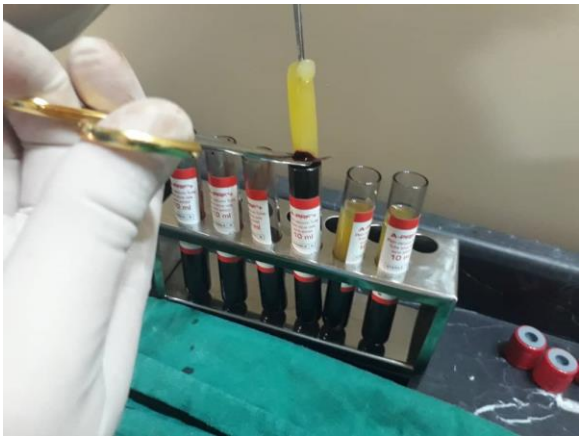

Fig 5. PRF clot obtained after centrifugation

A-PRF Preparation:

Peripheral blood (40cm^3) was collected from the patient and transferred to anticoagulant-free vacuum tubes, followed by centrifugation at 1500rpm for 14 minutes. This process yielded three distinct layers:

Red blood cells accumulated at the bottom of the tube.

A thin, jelly-like film of A-PRF, comprising of leukocytes and platelets, was observed in the middle section.

Platelet-poor plasma occupied the topmost layer, and was retrieved via syringe aspiration.

A xenon graft was placed within the osteotomy site. The natural xenogeneic bone graft material (EURO-OSS) as a natural, large-particle (1400µm) bone substitute was mixed with PRF to fill the defect. The prepared A-PRF clot was adapted around the graft block, and the remaining material was compressed into the membrane to cover the bone graft and prevent epithelial ingrowth.

Following graft placement, the mucoperiosteal flaps were repositioned to achieve optimal interproximal closure and secured with 4-0 silk sutures using a combination of modified vertical mattress and interrupted sutures as needed. Postoperative care included a 10-day course of 500mg amoxicillin (Barakat, Syria Syrian Arab Republic) every 8 hours.

Suitable analgesics and anti-inflammatory medications such as 500mg ciprofloxacin every 12 hours for 7 days (Elsaad, Syria) and 500mg paracetamol every 8 hours (Citypharma, Syrian Arab Republic) were also prescribed. Additionally, 0.12% chlorhexidine gluconate mouth rinse (Afamia, Syrian Arab Republic) was prescribed twice daily for the first 4 weeks after surgery.

Histopathological Analysis:

An incisional biopsy was sent to a histopathology laboratory to confirm the diagnosis. The results were negative showing no epithelial cells or malignancy. The histological changes were related to an acute nonspecific inflammatory lesion.

Follow-up:

At the one-year follow-up, the patient was asymptomatic and had no chief complaint. Clinically, the gingiva around the maxillary lateral incisor had a normal texture and color. Radiographic examination demonstrated improvement in healing of the periradicular tissue of the maxillary lateral incisor (Fig 6).

Fig 6. One-year follow-up radiograph showing excellent healing of the periradicular tissue

DISCUSSION

Periapical tissue inflammation occurs due to the presence of bacteria within the root canal system following dental caries, trauma or iatrogenic causes [9]. The presence of bacteria within the root canal system results in development of periapical disease; this infection results in development of a periapical lesion as a periapical granuloma or cyst [9, 10]. The main goal of endodontic treatment is to prevent the occurrence of periapical infection or ensure healing of the affected periapical area when infection develops. Most dental anomalies occur at an early age; these anomalies are classified by number, shape, color, structure, texture, eruption, exfoliation, or position [11]. The diagnosis of such anomalies requires taking a

patient history and chief complaint, and conduction of clinical and radiographic examinations in addition to performing some blood tests as required [12].

Dens in dente is a morphological dental anomaly [13]. It predominantly involves the maxillary lateral incisors, followed by central incisors, premolars, canine teeth, and molars [14]. Radiographs often reveal a tapered, pear-shaped enamel-dentin invagination originating from the tooth surface [15]. Due to low thickness of enamel, bacteria reach the dental pulp and may lead to pulp necrosis especially at an early age. Abscess, cysts, or periapical radiolucency may develop later [4]. Thus, root canal treatment is often required. Maxillary canines are the second most commonly impacted teeth after third molars [16]. There are two different theories for impacted canines: guidance and genetics. The guidance theory states that the canine tooth erupts due to guidance by the root of the maxillary lateral incisor, and therefore if the maxillary lateral incisor is absent or malformed, the canine tooth will not erupt [17]. The genetic theory posits that hereditary factors play a central role in the primary etiology of palatally displaced maxillary canines, and it can also be associated with other dental abnormalities such as missing or small lateral incisors [18]. Baccetti [19] noted that palatally impacted maxillary canines are frequently associated with concurrent dental anomalies, including enamel hypoplasia, primary molar infra-occlusion, agenesis of second premolars, and microdontic maxillary lateral incisors. The prognosis of dens in dente treatment is good with a success rate of up to 90% [20].

Dentigerous cyst formation can be one of the outcomes of impacted canines [21]. An intraoral radiograph showing a pericoronal space exceeding 2.5 mm and a rotational panoramic radiograph showing a space exceeding 3 mm may suggest a dentigerous cyst [22]. It is recommended to use marsupialization for treatment of dentigerous cyst cyst if it is expected to be drawn towards the dental arch normally to be placed in its natural place if the tooth is expected to erupt normally into the dental arch and assume its proper position[21] because the recurrence of dentigerous cyst is rare [23]. However, it is recommended to enucleate the dentigerous cyst along with its associated permanent tooth if its development has stopped, it is distantly impacted [24], or the lesion is very extensive. The treatment success depends primarily on early diagnosis and treatment [25].

CONCLUSION

A dens in dente is a dental abnormality in which the tooth is often associated with necrotic pulp tissue, which later develops into apical periodontitis; thus, a non-surgical endodontic treatment is necessary. Also, such cases are often accompanied by the presence of impacted teeth, such as impacted maxillary canines, which may be associated with an odontogenic cyst, and subsequently the need for enucleation.

CONFLICT OF INTEREST STATEMENT

None declared.

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