OPEN ACCESS

Saudi Journal of Oral and Dental Research
Abbreviated Key Title: Saudi J Oral Dent Res
ISSN 2518-1300 (Print) | ISSN 2518-1297 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Case Report **Endodontist**

Combined Endodontic and Surgical Management of a Maxillary Lateral Incisor with Type 3 of Dens Invaginatus

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DOI: 10.36348/sjodr.2023.v08i12.008 | **Received:** 22.09.2023 | **Accepted:** 31.10.2023 | **Published:** 27.12.2023

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Abstract

Dens invaginatus (DI) is a developmental anomaly characterized by invagination of the enamel organ into the dental papilla before calcification of the dental tissues. The etiology of this phenomenon has been related either to focal growth retardation or focal growth stimulation, or localized external pressure in certain areas of the tooth bud. In this case of upper lateral incisor showing type 3 dense invaginatus and diagnose as necrotic pulp with chronic apical abscess and treated by nonsurgical root canal treatment during follow up patient comlaing of recurrent swelling associated with treated tooth so we did surgical approach has been employed to resolve patient chief complaint. A follow up of one year is also presented to show healing.

Keywords: Dens invaginatus (DI), enamel organ, etiology, patient comlaing.

INTRODUCTION

Dens invaginatus (DI) is a developmental anomaly characterized by invagination of the enamel organ into the dental papilla before calcification of the dental tissues [1]. The etiology of this phenomenon has been related either to focal growth retardation or focal growth stimulation, or localized external pressure in certain areas of the tooth bud in addition, genetic factors have been suggested [1]. The prevalence of this anomaly has been reported to range from 0.3 to 10% of teeth [2], the prevalence of this incidence of our population in Saudi arabia 7.3% [3], the most affected tooth is upper lateral incisor[3]the classification of dense invaginatus according to ohler (1957) are [4]:

Type I: an enamel-lined minor form occurring within the confines of the crown not extending beyond the amelocemental junction.

Type II: an enamel-lined form which invades the root but remains confined as a blind sac. It may or may not communicate with the dental pulp.

Type III: a form which penetrates through the root perforating at the apical area showing a 'second foramen' in the apical or in the periodontal area. There is no immediate communication with the pulp. The invagination may be completely lined by enamel, but frequently cementum will be found lining the invagination.

Oehlers (1957a,b) [4] also described different crown forms (normal with a deep lingual or palatal pit; conical, barrel-shaped or peg-shaped with an incisal pit) relating to the three groups mentioned above .

Using Oehlers' Classification, the prevalence of each type of invagination was reported by Ridell *et al*., [5] with Type I being the most common (79%) (Fig 2) whilst Type II (15%) (Fig 3) and III (5%) (Fig 4) less frequently observed.

An early diagnosis of such malformations is crucial. A tooth with an invagination provides technical challenges for clinical management because of its aberrant anatomical configuration. Additionally, it is believed that an invagination increases the risk of periodontal inflammation, pulpal pathosis, and caries. furthermore, the type of the issue can frequently make any required endodontic therapy complex [6, 4, 7-10]. Various techniques for treating dens invaginatus have been reported, including conservative restorative treatment [11], non-surgical root canal treatment [12],

endodontic surgery [13], intentional replantation and extraction [14].

The purpose of this report is to describe the combined nonsurgical and surgical management of a maxillary lateral incisor associated with a rare type of dens invaginatus.

The Report

13 years old male Saudi patient non aware of any medical condition (Medically fit) was referred from general dentist due to localized swelling and abnormal morphology from upper anterior tooth left side , the patient describe it that he developed bumble of his gingiva, and he came to general dentist who referred the case to our department (endodontic department), clinical examination revealed that the tooth upper lateral is free of caries and has large enamel projection in the center of palatal surface (Picture 1), the probing depth was normal limit except for mid buccal deep pocket reach 7-8mm, the tooth was not responded to sensibility test ,and it has sinus tract related to upper lateral incisor (Picture 2) which has been traced using 25 gutta percha the adjacent teeth all responded to normally to sensibility testing and percussion and palpation. So, the diagnosis of this tooth is necrotic pulp and chronic apical abscess.

Picture 1: Lateral incisor is free of caries and has large enamel projection in the center of palatal surface

Picture 2: Tracing of sinus tract by using Gutta-percha

Peri apical radiograph (preoperative radiograph 1) of upper anterior teeth left side showing the crown and root of upper central and lateral incisor, in addition radiolucent lesion in the apical part of the root and resorption of root tip with larger radiolucent lesion associated with upper lateral incisor left side cone beam computed tomography system (CBCT) taken to see the morphology and the nature of invagination. A diagnosis of dense invaginatus type 3. Treatment option discuss with patient which are:

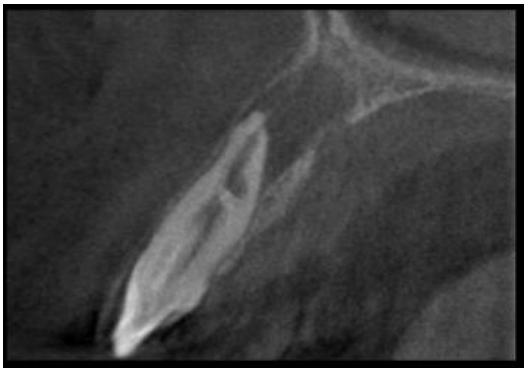
1. No treatment
2. Extraction
3. Nonsurgical root canal treatment
4. Surgical root canal treatment.

Following profound anesthesia using lidocaine 1.8\100000mg rubber dam isolation , the pulp chamber was opened and the invagination orifice located. Clinical photo of the access (Picture 3). A radiograph (3) with files in the root canals was obtained The working lengths were established and recorded using apex locator, There appear to be communication between the primary root

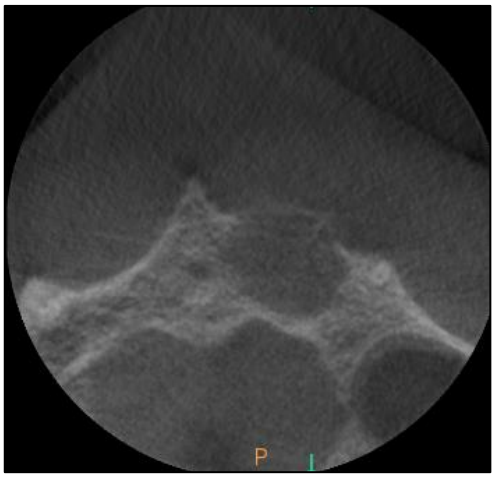
canal and the invagination. The canal system was debrided thoroughly and prepared by the single length technique by using protaper gold F2, Copious irrigation with 2.25% sodium hypochlorite solution was used throughout the procedure. After drying the root canals with paper points, calcium hydroxide medication applied as intra canal medicament, a cotton pellet was placed in the pulp chamber and the tooth was temporarily sealed with Cavit (ESPE, Seefeld, Germany) and radiograph taken (4). One week later, the patient returned with symptoms and the swelling had disappeared. In the second visit after local anesthesia and ruuber dam placement and removing medicament using instrumentation and saling and sodium hypochlorite, radiograph of master cone (5) taken which shows inability to reach to the full length, both root canal and invagination dried and obturated using gutta percha and bioceramic selar postoperative radiograph was taken (radiograh 6).

Preoperative Radiograph 1) of upper anterior teeth left side showing the crown and root of upper central and lateral incisor, in addition radiolucent lesion in the apical part of the root and resorption of root tip with larger radiolucent lesion associated with upper lateral incisor left side

Preoperative Radiograph 2) of upper anterior teeth left side showing the crown and root of upper central and lateral incisor, in addition tracing the source of lesion by using gutta percha



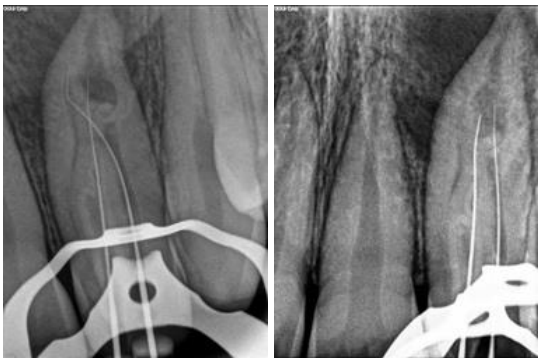
Sagittal slice of CBCT showing 2 canals and internal resorption and large lesion



Axial slice of cbct showing perforation and resorption of buccal cortical plate

Axial slice of cbct showing the 2 canals (dense invaginatus

Picture 3) of upper anterior teeth left side showing the Clinical photo of the access (picture 3)



Radiograph 3: Working length radiograph)

Radiograph (4) of calcium hydroxide as intra canal medicament

Radiograph (5) of master cone, there is obstruction of invaginatus prevent reaching full length

Radiograph (6) of obturation

The patient was recalled periodically however patient shows some symptoms of recurrent swelling and pain so tx option discussed with pt which are:

1. Retreatment
2. Surgical (apicoectomy-, intentional implantation)
3. Extraction

So treatment with apoicoectomy planned

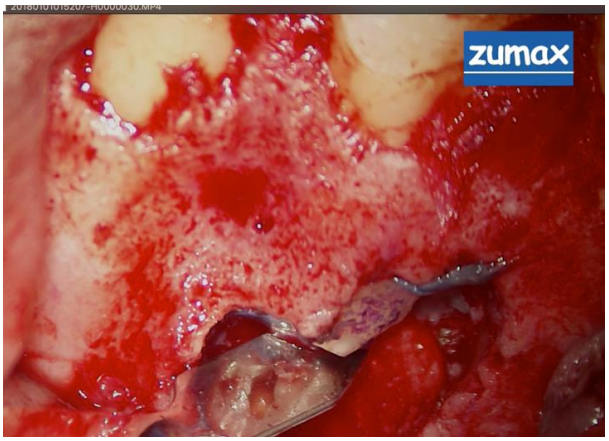
At a subsequent appointment, the tooth was prepared for surgical treatment. A full- thickness mucoperiosteal flap was reflected under local anesthesia 2% Lidocaine with 1:50000 epinephrine, and a fenestration on the cortical plate was noted at the level of the periradicular lesion. the surgical site and the reflected mucoperiosteal flap were regularly rinsed with saline to prevent dehydration.

After complete curettage of the soft tissue was performed using suitable sharp bone and periodontal curettes. and followed by removal of granulation tissue. hemostasis of the bony crypt was achieved with pellets containing epinephrine (Racellet Hemostatic Pellets with 0.55mg Epinephrine, #3). After staining of the surgical area with methylene blue (1% Methylthionin HCL; Dr. G. Bichsel AG, Interlaken, Switzerland), the root end was inspected.

Apicoectomy of 3 mm from the root apex was completed and root- end cavity was prepared along the long axis of TOOTH #22 with sonic-driven microtips (KiS Tips, SybronEndo, USA) to a depth of 3 mm, Isthmuses, fins, and other significant anatomic irregularities were identified and treated with ultrasonic instruments than the entire area of dehiscence along with the resected root surfaces were stained with the methylene blue and inspected with micromirrors (Hu-Friedy, Chicago, IL) under a high magnification of 24X to examine the cleanness of the root- end preparation and to identify other anatomic details like vertical root fracture. And photo has been taken (Picture 4) Root-end filling was done with mineral trioxide aggregate (ProRoot MTA; Dentsply Tulsa Dental, Tulsa, OK).The adaptation of the filling material to the canal apical walls was confirmed with the aid of an operating microscope at a high magnification.

Bone graft (CopiOs Cancellous Particulate Xenografts, Zimmer Dental, USA) and membrane (R.T.R. absorbable Membrane, septodont, USA) were placed over the surgery window.

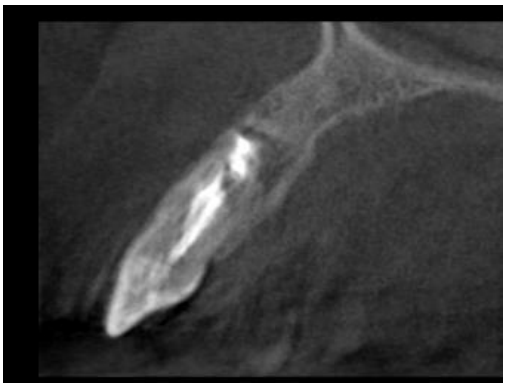
After the wound area was cleaned, the primary wound was closed using several interrupted sutures spaced 2 to 3 mm apart. With a resorbable Vicryl 5/O suture, the flap was gently repositioned. Ibuprofen (400 mg) tablets were recommended for the patient to take every eight hours for five days, along with twice-daily mouth rinses of chlorhexidine gluconate (0.12%) for 30 seconds until the sutures were removed. The tissues were observed to be healing normally at the 2-week follow-up visit for suture removal. The patient was symptom-free three months after finishing treatment. On the radiographic examination, hard-tissue healing in the periradicular region could be seen. One year later, radiographic scans taken as a follow-up revealed evidence of complete healing.



Picture of flap and it shows the apical preparation of upper lateral

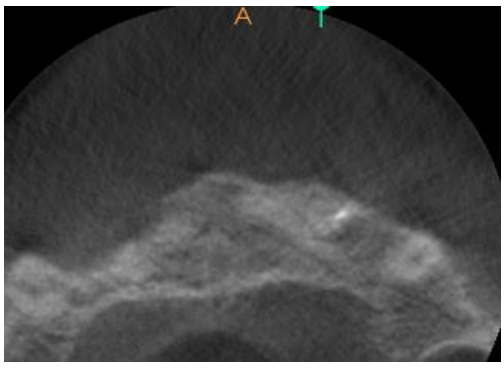
Radiograph of post operation and bone graft and membrane

Radiograph of follow up after 1 year



Follow up after 1 year showing healing (decreasing size of lesion)

Follow up after 1 year showing healing (decreasing size of lesion)



Follow up after 1 year showing healing (continuity of buccal cortical plate)

DISCUSSION

In 1957 Oehlers17 created a classification system of these malformations according to severity: type I, confined within the crown; type II, blind sac extending beyond the cementoenamel junction with second foramen extending into the periradicular tissues, and type III with second foramen in the apical area.

Some have suggested that growth pressure of the dental arch leads to the enamel organ buckling.1,18 Kronfeld19 postulated a focal failure of growth of the internal enamel epithelium while the surrounding normal epithelium continues to proliferate and engulf the static area.

Early diagnosis of dens invaginatus is crucial and requires thorough clinical examination of all teeth, especially lateral incisors. The condition can be diagnosed based on clinical and radiographic findings

In the present case, the lateral upper incisor had DI type III. According to previous case reports, important clinical clues to detect DI include dilated or larger crown morphology than the contralateral tooth, a deep pit at the lingual or occlusal surface, pronounced cingulum for the maxillary canines, and talon cusp for the mandibular incisors

Management of DI varies depending on the pulpal and periapical status and the complexity of the anatomy. Management of Oehlers' type III lesions is more complex. Peri-invaginatus periodontitis is a condition in which the tissue within an invagination becomes infected [21]. Treatment of a tooth with peri-invaginatus periodontitis requires root canal treatment of the invagination. Schwartz and Schindler [19] reported a case in which invagination was treated with a root canal separate from the main canal. Surgical endodontics were used to seal the invagination apically in several cases. In the present case, apical surgery was conducted in order to access the untreated apical one-third of the root, and apical sealing was performed using white mineral trioxide aggregate. Chaniotis *et al*., reported a case of a mandibular lateral incisor with DI in which the malformed root was removed using a diamond bur after root canal treatment.

Bone graft material was employed in the above case, with the use of a membrane barrier.

The use of guided tissue regeneration (GTR) techniques has been proposed as an adjunct to endodontic surgery in order to promote bone healing [15, 16].

Several biomaterials were used as an osteoconductive scaffold in periapical surgery [17, 18].

Bone grafting materials include auto- grafts, allografts, xenografts, and alloplasts. They have been used in periodontal regenerative therapy as space maintainers for selective cell repopulation onto the denuded root surfaces or to act as osteoin- ductive or osteoconductive biomaterials for regeneration of bone loss as a result of periodontal disease [19, 20].

The application of a membrane barrier in periodontal regenerative therapy is to prevent apical migration of gingival epithelial and connective tissue cells onto the denuded root surface and to facilitate the repopulation of the damaged root surface with PDL progenitor/ stem cells to differentiate into PDL cells and cementoblasts [21].

In conclusion, the exact etiology of DI remains uncertain, and the prevalence of DI varies depending on the studied subject and region. Because teeth with DI are prone to pulpal disease, regular clinical and radiographic examinations in at-risk patients are advisable. Clinicians should understand the anatomy and apply modern endodontic technologies such as an operating microscope and ultrasonic instrument.

REFERENCE

1. Hülsmann, M. (1997). Dens invaginatus: aetiology, classification, prevalence, diagnosis, and treatment considerations. *International endodontic journal*, *30*(2), 79-90. doi:10.1046/j.1365-2591.1997.00065.x.
2. Alani, A., & Bishop, K. (2008). Dens invaginatus. Part 1: classification, prevalence and aetiology. *International endodontic journal*, *41*(12), 1123-1136. doi:10.1111/j.1365-2591.2008.01468.x.
3. Alkadi, M., Almohareb, R., Mansour, S., Mehanny, M., & Alsadhan, R. (2021). Assessment of dens invaginatus and its characteristics in maxillary anterior teeth using cone-beam computed tomography. *Scientific reports*, *11*(1), 19727. doi: 10.1038/s41598-021-99258-0.
4. Oral Pathology DENS INVAGINATUS (DILATED COB'IPOSITE ODONTOME).
5. Ridell, K., Mejare, I., & Matsson, L. (2001). Dens invaginatus: a retrospective study of prophylactic invagination treatment. *International journal of paediatric dentistry*, *11*(2), 92-97. doi: 10.1046/J.1365-263X.2001.00234.X.
6. Braitt, A. H., Gioster, M. L., da Silva, D. M., Andrade, C. A., Braitt, G. R., da Silveira Bueno, C. E., ... & da Silva Limoeiro, A. G. (2016). Single-visit Treatment of Non-vital Type 2 Dens Invaginatus: A Case Report. *Article in Journal of Dental Sciences*, 4. Available: https://www.researchgate.net/publication/350524524
7. Omnell, K. A., Swanbeck, G., & Lindahl, B. (1960). Dens invaginatus II. A microradiographical, histological and micro X-ray diffraction study. *Acta Odontologica Scandinavica*, *18*(3), 303-330. doi: 10.3109/00016356009003015.
8. Beynon, A. D. (1982). Developing dens invaginatus (dens in dente). A quantitative microradiographic study and a reconsideration of the histogenesis of

this condition. *British dental journal*, *153*(7), 255-260. doi: 10.1038/SJ.BDJ.4804912.

9. De Smit, A., & Demaut, L. (1982). Nonsurgical endodontic treatment of invaginated teeth. *Journal of Endodontics*, *8*(11), 506-511. doi: 10.1016/S0099-2399(82)80077-0.
10. Rotstein, I., Stabholz, A., Heling, I., & Friedman, S. (1987). Clinical considerations in the treatment of dens invaginatus. *Dental Traumatology*, *3*(5), 249-254. doi: 10.1111/J.1600-9657.1987.TB00632.X.
11. De Sousa, S. M. G., & Bramante, C. M. (1998). Dens invaginatus: treatment choices. *Dental Traumatology*, *14*(4), 152-158. doi: 10.1111/J.1600-9657.1998.TB00830.X.
12. Hosey, M. T., & Bedi, R. (1996). Multiple dens invaginatus in two brothers. *Dental Traumatology*, *12*(1), 44-47. doi: 10.1111/J.1600-9657.1996.TB00094.X.
13. Bolanos, O. R., Martell, B., & Morse, D. R. (1988). A unique approach to the treatment of a tooth with dens invaginatus. *Journal of Endodontics*, *14*(6), 315-317. doi: 10.1016/S0099-2399(88)80034-7.
14. Lindner, C., Messer, H. H., & Tyas, M. J. (1995). A complex treatment of dens invaginatus. *Dental Traumatology*, *11*(3), 153-155. doi: 10.1111/J.1600-9657.1995.TB00478.X.
15. von Arx, T., & AlSaeed, M. (2011). The use of regenerative techniques in apical surgery: A literature review. *The Saudi Dental Journal*, *23*(3), 113-127. doi: 10.1016/J.SDENTJ.2011.02.004.
16. Baek, S. H., & Kim, S. (2001). Bone repair of experimentally induced through-and-through defects by Gore-Tex, Guidor, and Vicryl in ferrets: a pilot study. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, *91*(6), 710-714. doi: 10.1067/MOE.2001.115393.
17. Dietrich, T., Zunker, P., Dietrich, D., & Bernimoulin, J. P. (2003). Periapical and periodontal healing after osseous grafting and guided tissue regeneration treatment of apicomarginal defects in periradicular surgery: results after 12 months. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, *95*(4), 474-482. doi: 10.1067/moe.2003.39.
18. Murashima, Y., Yoshikawa, G., Wadachi, R., Sawada, N., & Suda, H. (2002). Calcium sulphate as a bone substitute for various osseous defects in conjunction with apicectomy. *International Endodontic Journal*, *35*(9), 768-774. doi:10.1046/J.1365-2591.2002.00565.X.
19. Schwartz, Z., Mellonig, J. T., Carnes Jr, D. L., De La Fontaine, J., Cochran, D. L., Dean, D. D., & Boyan, B. D. (1996). Ability of commercial demineralized freeze-dried bone allograft to induce new bone formation. *Journal of periodontology*, *67*(9), 918-926. doi: 10.1902/JOP.1996.67.9.918.
20. Melloaig, J. T., Nevins, M., & Sanchez, R. (1998). Evaluation of a bioabsorbable physical barrier for guided bone regeneration. Part II. Material and a bone replacement graft. *International Journal of Periodontics & Restorative Dentistry*, *18*(2). https://pubmed.ncbi.nlm.nih.gov/9663092/ (accessed Jun. 09, 2023).
21. Nyman, S., Lindhe, J., Karring, T., & Rylander, H. (1982). New attachment following surgical treatment of human periodontal disease. *Journal of clinical periodontology*, *9*(4), 290-296. doi: 10.1111/J.1600-051X.1982.TB02095.X.