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Review

Integrated Endodontic Therapy and Cyst Enucleation in Dens Invaginatus Type II: A Case Report

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Abstract:
Dens invaginatus Type II poses endodontic challenges due to its complex anatomy and early pulpal involvement. This case describes the management of a tooth with Type II dens invaginatus complicated by external root resorption and a periapical cyst. Nonsurgical endodontic treatment was performed with careful debridement and disinfection of the intricate canal system, and calcium hydroxide was placed as an intracanal medicament to enhance microbial control and arrest resorptive activity thorough canal disinfection. After adequate disinfection, the canal was obturated to achieve a hermetic seal. Due to the persistent periapical cyst and associated fenestration, surgical enucleation was carried out, followed by placement of platelet-rich fibrin (PRF) to enhance healing. A Periocol membrane was used to manage the bony defect and support tissue regeneration. This combined approach resulted in successful management and favorable healing outcomes.

Keywords: Dens invaginatus Type II,External root resorption, Periapical cyst, Surgical enucleation, Platelet-rich fibrin (PRF)

Introduction

Dens in dente or dens invaginatus is a dental malformation of teeth due to an infolding of enamel into dentin, prior to dental tissues calcification, which results in an invagination into the pulp chamber. [1] The condition was first reported by Ploquet in 1794 in a whale's tooth, while the first description in human dentition was later provided by a dentist named Socrates in 1856, who termed it dens in dente.[2]

Multiple etiopathogenic theories have been proposed for this anomaly, including Kronfeld's concept of localized growth retardation, Rushton's embryological theory of enamel organ proliferation into the papilla, and Atkinson's suggestion of mechanical forces from adjacent developing tooth germs. Additional contributing factors such as trauma and infection have also been implicated in its development.

Dens invaginatus occurs in both primary and permanent dentitions, with a prevalence of 0.25%–7.7%, and most commonly affects permanent maxillary lateral incisors, often bilaterally, though it has also been reported in other anterior and premolar teeth as well as supernumerary teeth. Familial occurrence has been documented, suggesting a possible genetic component in its etiology.[3]

The primary clinical concern of dens invaginatus is its high susceptibility to pulpal pathology. [4] The sequelae of undiagnosed and untreated invaginated teeth include delayed eruption, cyst formation, and internal resorption. External root resorptions, around the apical foramen, are present in 87.3 and 83.2% of roots associated with periapical lesions.[5]

Predictable endodontic outcomes in teeth with dens invaginatus depend on thorough debridement and disinfection; however, this is particularly challenging due to the complex invaginated anatomy. While the condition may be detected on routine two-dimensional periapical radiographs, cone beam computed tomography provides a more accurate understanding of the anatomical

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complexity, aids in proper classification, and facilitates appropriate treatment planning.[6]

This case report highlights the comprehensive management of a Type II dens invaginatus associated with external root resorption and a periapical cyst, emphasizing the importance of an integrated endodontic and surgical approach for successful clinical outcomes.

Case report

A 41-year-old patient reported with discoloration in the upper front teeth region of jaw with respect to lateral incisor. Clinical examination revealed a deep palatal pit in the maxillary lateral incisor, which was non-responsive to pulp vitality testing.

Radiographic evaluation using Intraoral periapical radiograph and cone beam computed tomography (CBCT) confirmed the presence of Type II dens invaginatus, characterized by an invagination extending into the root canal, just beyond the cementoenamel junction and without exiting at the apex. The scan also revealed external root resorption and a well-defined periapical radiolucency suggestive of a cyst, along with associated cortical bone fenestration.

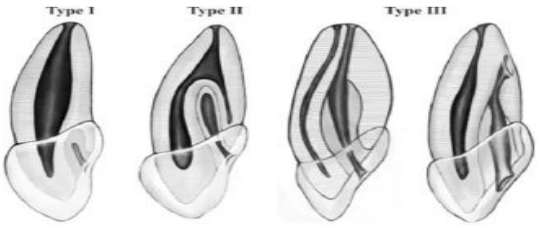
Nonsurgical endodontic treatment was initiated under rubber dam isolation. Access cavity preparation was carefully performed to negotiate the complex canal anatomy. Dens tissue was removed for adequate cleaning and shaping of the canal using tapered fissure bur and ultrasonics.

Working length was determined. Thorough cleaning and shaping was carried out using copious irrigation with sodium hypochlorite 5.25% and saline. Calcium hydroxide was placed as an intracanal medicament to achieve disinfection and to arrest the resorptive process. The access cavity was temporarily sealed, and the patient was recalled after two weeks.

At the subsequent visit, the patient was asymptomatic. The intracanal medicament was removed, and the canal was irrigated with final rinse of 17%EDTA and saline and then dried using paper points. Obturation was completed using lateral condensation technique to ensure complete sealing of the canal system. A permanent coronal restoration was placed to prevent reinfection.

Due to the presence of a persistent periapical cyst and cortical fenestration, surgical intervention was planned. Under local anesthesia, a full-thickness mucoperiosteal flap was reflected to expose the lesion. Complete enucleation of the cystic tissue was performed, followed by curettage of the periapical area. Platelet-rich fibrin (PRF) was placed in the defect to promote healing and regeneration. The fenestration defect was managed using a Periocol membrane as part of a guided tissue regeneration approach. The flap was repositioned and sutured.

Postoperative healing was uneventful, and the patient was followed up periodically. Clinical and radiographic evaluation demonstrated satisfactory healing, with resolution of symptoms and progressive bone regeneration at the periapical site. This case highlights the importance of CBCT in diagnosis and treatment planning, as well as the effectiveness of a combined endodontic and surgical approach in managing complex cases of dens invaginatus associated with periapical pathology and external root resorption.



Oehlers Classification of Dens Invaginatus

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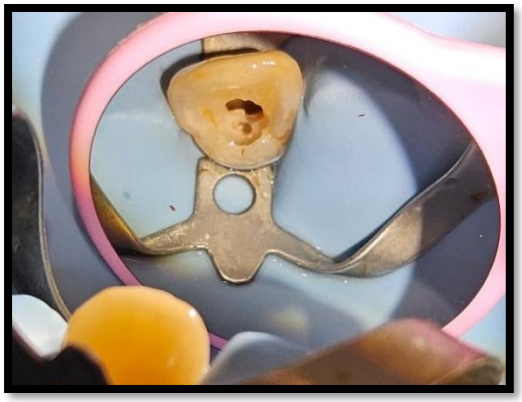
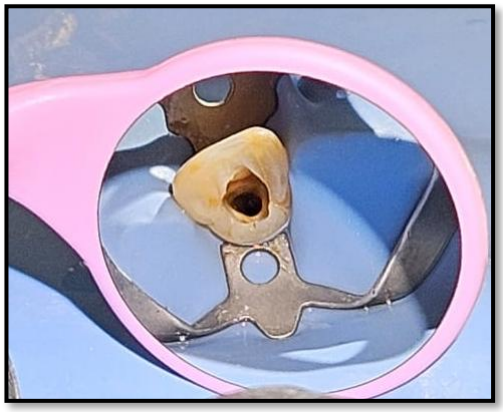
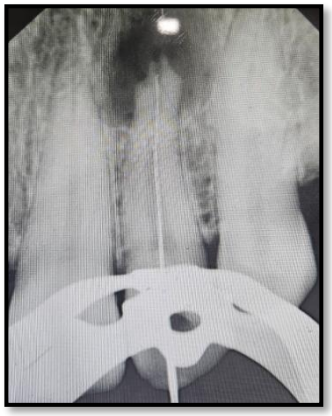
Preoperative Radiograph	Preoperative CBCT
 Access opening with dens invaginatus	 Dens tissue removed for adequate cleaning and shaping of the canal
 Access opening after removal of dens invaginatus	 Working length determined
 Calcium hydroxide dressing given	 Master cone radiograph taken

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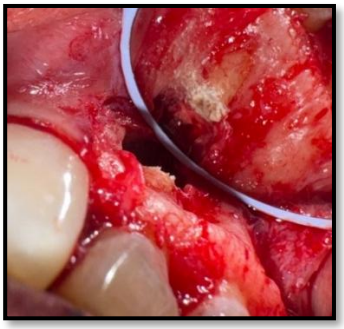
Post-obturation radiograph

Crevicular and vertical releasing incisions given

Flap raised to expose the periapical area and fenestration



Apicectomy done and MTA placed

PRF placed in the bony cavity

PerioCol membrane placed for guided tissue regeneration

Sutures given

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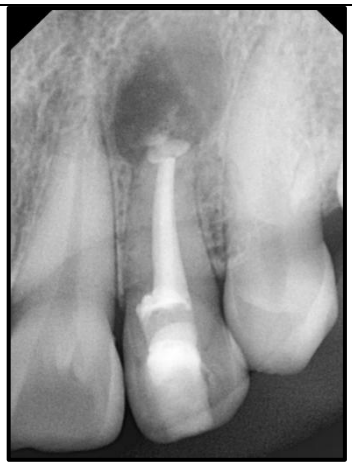
IOPA radiograph post treatment



IOPA radiograph 3 months follow-up

Discussion

The anatomy and morphology of dens invaginatus are often highly complex, making both diagnosis and treatment more challenging. Therefore, a thorough understanding of its morphological variations is essential for clinicians to formulate an accurate diagnosis and achieve successful endodontic management.[7]

Depending on the location and how was the tooth affected, two types of invaginations are distinguished: coronal and radicular invaginations. The classification proposed by Oehlers in 1957[8] allows us to highlight three types of invaginations, according to their radiographic extension from crown to root:

• Type I: is a minimal invagination, enamel-lined and confined within the crown of the tooth. It is the most common lesion, with a frequency of 79%.

• Type II: the invagination extends apically to the amelocemental line. It forms a blind dead-end that may or not communicate with the pulp but remains within the root canal without communication with periodontal ligament.

• Type III: the invagination extends through the root. Normally there is no pulp communication, which is compressed within the root. Two sub-types can be stablished: type IIIa, when communicates laterally with periodontal space through a pseudo-foramen, and type IIIb, when the invagination extends through the root and communicates with the periodontal ligament in the apical foramen.

The invagination often communicates with the oral cavity, permitting direct ingress of irritants and microorganisms into the pulp; although lined by enamel, this layer is typically thin, poorly mineralized, or even absent in areas.[9] The associated pit is difficult to maintain hygienically, creating a favourable environment for caries development, which frequently results in pulpal necrosis and subsequent periapical involvement.[10] Cone beam computed tomography (CBCT) facilitated accurate identification of the type of dens invaginatus, its extent, the associated complex pulpal anatomy, and the nature of the periapical lesion.[6] Treatment procedure was decided after CBCT evaluation which involved removal of the dens invaginatus structure. Although preserving the invagination may contribute to increased root strength, it complicates thorough debridement and separate endodontic management of both the invaginated structure and the main pulp canal, thereby potentially compromising the prognosis.[11] Calcium hydroxide paste was initially placed as an intracanal medicament using a syringe delivery system; however, it was inadvertently extruded into the periapical region, likely due to excessive injection pressure and the absence of an apical stop. As reported by De Moor et al. [12], although calcium hydroxide pastes possess high alkalinity, their extrusion into periradicular tissues typically elicits only mild and transient reactions.

Direct composite restoration was preferred, as the remaining pericervical dentin thickness was inadequate and tooth preparation to receive an indirect restoration would have further compromised the tooth structure. On a 4-month follow-up, an intact postobturation restoration clinically and periapical healing were observed radiographically.

Regardless of the size of the periradicular lesion, surgical treatment is the second option only when the nonsurgical endodontic treatment has failed.[13]

Surgical endodontic intervention, in conjunction with conventional treatment, should be considered for large periapical lesions that do not resolve with nonsurgical therapy or in cases where adequate coronal access cannot be achieved. Such procedures facilitate thorough disinfection and allow for retrograde sealing of the apical portion of the invagination and/or root canal, which might otherwise serve as a persistent source of infection. Surgical approaches typically include apical resection, periapical curettage, and retrograde restoration. [14,15]

Numerous studies on autogenous platelet-rich fibrin (PRF) highlight its regenerative and reparative effects, attributed to its high platelet concentration and subsequent release of growth factors. These factors enhance tissue healing and cellular regeneration, resulting in faster healing at surgical sites compared to normal healing.[16] Guided tissue regeneration can be considered an effective and predictable surgical approach, which involves the placement of either resorbable or nonresorbable barrier to seclude a space around the diseased root surface and allow cells from periodontal ligament (PDL) and alveolar bone to repopulate the defect. PerioCol® is a sterile type 1 collagen membrane having many biological activities such as hemostatic ability, attraction and activation of PDL and gingival fibroblast cells, and augmentation of tissue thickness, biocompatibility, biodegradability, and cell affinity.[17]

This case highlights the importance of comprehensive approach and the use of bioactive materials used in integration which in turn enhances the healing and prognosis of the tooth.

Conclusion

Management of Type II dens invaginatus with external root resorption and a periapical cyst requires a comprehensive approach. CBCT is essential for accurate diagnosis and treatment planning. Effective disinfection with calcium hydroxide and proper obturation are key to endodontic success. Surgical intervention is necessary in cases with persistent lesions and defects such as fenestration. The use of PRF and Periocol membrane enhances healing, leading to favourable outcomes.

References:

1. Vierling L. Dens in Dente. Aetiology, Prevalence and Differential Diagnosis.
2. Alenazy M. S., Murwahi A. E., Altwaijri S. M., and Mosadomi H. A., Endodontic management of dens invaginatus of maxillary lateral incisor: report of two cases, *Saudi Endodontic Journal*. (2017) **7**, no. 3, 194–198,
3. González-Mancilla S, Montero-Miralles P, Saúco-Márquez JJ, Areal-Quecuty V, Cabanillas-Balsera D, Segura-Egea JJ. Prevalence of dens invaginatus assessed by CBCT: Systematic review and meta-analysis. Journal of clinical and experimental dentistry. 2022 Nov 1;14(11):e959.
4. Meghana SM, Thejokrishna P. Type III Dens Invaginatus with an Associated Cyst: A Case Report and Literature Review. Int J Clin Pediatr Dent. 2011 May-Aug;4(2):139-41. doi: 10.5005/jp-journals-10005-1098. Epub 2010 Apr 15. PMID: 27672254; PMCID: PMC5030501.
5. Vier FV, Figueiredo JA. Prevalence of different periapical lesions associated with human teeth and their correlation with the presence and extension of apical external root resorption.
6. Agarwal NS, Singh S, Chandrasekhar P, Kulkarni G, Podar R. Conservative nonsurgical approach for management of a case of type II dens in dente. *Case Rep Dent.* 2024;2024:8843758. doi:10.1155/2024/8843758.
7. Jakupović S, Bajsman A, Vuković A, Šehić A, Jušić M, Sofić A, Julardžija F. Endodontic treatment of dens invaginatus with periapical lesion: a case report. *J Health Sci.* 2022;12(2):174–177.
8. Oehlers FAC. Dens invaginatus (dilated composite odontome): I. Variations of the invagination process and associated anterior crown forms. Oral Surgery Oral Medicine Oral Pathology. 1957;10:1204–1218. doi: 10.1016/0030-4220(57)90077-4.
9. Greenfeld R. S. and Cambruzzi J. V., Complexities of endodontic treatment of maxillary lateral incisors with anomalous root formation, *Oral Surgery,*

Oral Medicine, Oral Pathology. (1986) **62**, no. 1, 82–88,

10. Goel S., Nawal R. R., and Talwar S., Management of dens invaginatus type II associated with immature apex and large periradicular lesion using platelet-rich fibrin and Biodentine, *Journal of Endodontics*. (2017) **43**, no. 10, 1750–1755,
11. Zhu J., Wang X., Fang Y., Von den Hoff J. W., and Meng L., An update on the diagnosis and treatment of dens invaginatus, *Australian Dental Journal*. (2017) **62**, no. 3, 261–275,
12. De Moor R. J. and De Witte A. M., Periapical lesions accidentally filled with calcium hydroxide, *International Endodontic Journal*. (2002) **35**, no. 11, 946–958.
13. 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. doi:10.1097/00004770-200408000-00009.
14. Bishop K. and Alani A., Dens invaginatus. Part 2: clinical, radiographic features and management options, *International Endodontic Journal*. (2008) **41**, no. 12, 1137–1154,
15. Ranganathan J, Sundaresan MKR, Ramasamy S. Management of Oehler's Type III dens invaginatus using cone beam computed tomography. *Case Rep Dent.* 2016;2016:3573612. doi:10.1155/2016/3573612
16. Mazumdar S, Joshi S, Ansari S. Experiences with the use of PRF (platelet-rich fibrin) in enucleated cystic cavity. *J Indian Dent Assoc.* 2014;8(6):19.
17. Tyagi, Aanchal[1]; Tomar, Nitin[1]; Nazar Rana, Mohd[1]. Comparative evaluation between collagen membrane (PerioCol®) and periosteum membrane in the treatment of gingival recession defects of maxillary anterior teeth: a clinical study. Annals of Medical Science and Research 2(2):p 76-82, May-August 2023. | DOI: 10.4103/amsr.amsr_55_22

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