

## Management of a Type III Dens Invaginatus using a Combination Surgical and Non-surgical Endodontic Therapy: A Case Report

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### Abstract

**Aim:** The aim of this report is to present a case of Type III dens invaginatus in a maxillary lateral incisor with a periapical lesion and its successful treatment using a combination of surgical and non-surgical therapy.

**Background:** The morphology of the root canal system is unique for individual teeth. A precise understanding of the morphology is very important for a successful root canal treatment. Dens invaginatus is a rare dental anomaly that can give rise to many complex anatomical forms. The complete removal of the diseased pulp tissue can be a challenge for clinicians due to the complexity of internal canal anatomy and may require either non-surgical endodontic therapy alone or that therapy may have to be combined with surgical endodontics to achieve an adequate sealing of the root canal system.

**Case Report:** A 22-year-old male presented for evaluation of a recurrent painless sinus tract in the attached gingiva adjacent to the maxillary right lateral incisor. The tooth responded negatively to vitality tests while the right central incisor responded normally. Clinically an anatomical malformation in the crown was detected in the form of an abnormal bulbous contour of the tooth in the palatal region above the cingulum. Radiograph evaluation confirmed the presence of dens invaginatus and a periapical radiolucent lesion. The patient received combined non-surgical and surgical endodontic therapy to achieve a favorable outcome.



**Summary:** Complications presented by Type III dens invaginatus and acute periapical abscess necessitated the use of combined non-surgical and surgical endodontic therapy to attain a favorable seal of the root canal. The prognosis at a six-month post-treatment evaluation appeared to be good.

**Clinical Significance:** Dens invaginatus requires an early diagnosis and treatment. It may result in radicular and periapical pathosis requiring a combined non-surgical and surgical endodontic approach to treatment.

**Keywords:** Dens invaginatus, internal anatomy,

adequate sealing, combined method, Oehler's classification

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## Introduction

Variation in dental anatomy is consistent with the rule of nature. This article describes dens invaginatus, an anatomical variation of a developed tooth and its successful management. Salter first described this anomaly in 1855 as a tooth within a tooth.<sup>1</sup> The etiology is controversial and remains unclear. There is general concurrence dens invaginatus results from an infolding of the papilla during tooth development. Other theories include an incomplete fusion of two tooth germs, the distortion of the enamel organ during tooth development, and the formation of abnormal pressure from surrounding tissues during tooth formation.<sup>2-4</sup> The reported incidence ranges from 0.04-10%, and the teeth most commonly affected are the maxillary lateral incisors.<sup>5-7</sup>

Oehler classifies invaginations into three types as follows:<sup>2</sup>

- Type I is an enamel-lined minor invagination occurring within the confines of the crown, not extending beyond the enamel-cemental junction (CEJ).

- Type II consists of an enamel-lined form that invades the root but remains as a blind sac; it may or may not be connected with the dental pulp.
- Type III invaginations penetrates through the root, perforating the apical area and forming a second foramen in the apical or periodontal area; there is no immediate connection with the pulp.

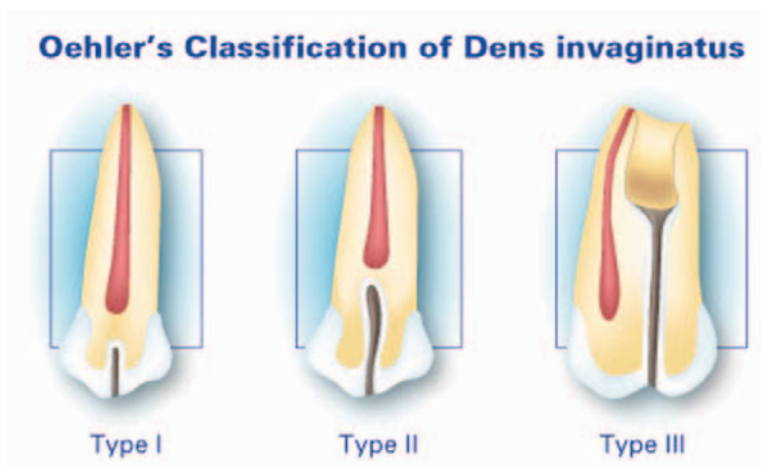
Type III invaginations may be completely lined by enamel, although cementum is also frequently found as shown in Figure 1.

Clinically, the finding most often associated with dens invaginatus is early pulpal involvement when channels extend from the invagination into the pulp.<sup>5</sup> Because the invagination forms a space conducive to dental caries, bacteria and their by-products gain access to the dental pulp via these channels, resulting in pulpal pathosis. Several treatments of pathosis associated with dens invaginatus have been suggested such as endodontic therapy, endodontic surgery, combined treatment, or extraction.<sup>7-11</sup> Some cases have been treated with calcium hydroxide to induce apical closure and promote repair.<sup>4</sup>

## Case Report

### Diagnosis

A 22-year-old male was referred to the Department of Conservative Dentistry and Endodontics of the AB Shetty Memorial Institute of Dental Sciences for evaluation of a recurrent sinus tract in the attached gingiva corresponding



**Figure 1.** Oehler's classification of dens invaginatus.

to the maxillary right lateral incisor. No associated pain was reported. The maxillary right lateral incisor had a negative response to vitality tests while the right central incisor responded normally. Clinically an anatomical malformation in the crown of the upper right lateral incisor was detected in the form of an abnormal bulbous contour of the tooth in the palatal region above the cingulum shown in Figure 2.

The periodontal condition was normal, but an intraoral sinus tract was evident at the attached gingiva in the region between the central incisor and the lateral incisor. The sinus tract was traced using a gutta-percha cone (Figure 3).

The radiographic evaluation showed a radiolucent area of about 6 mm extending more towards the mesial surface of the lateral incisor and distal aspect of the central incisor, but not involving the periapical area of the central incisor. A radiolucent defect lined by an enamel-like radiopacity appeared to pass through the root of the tooth and penetrate into the apical radicular area without any direct communication with the pulp. Direct communication with the intraosseous periradicular tissues resulting in a periradicular lesion was evident. A diagnosis of a Type III dens invaginatus associated with chronic periradicular lesion and draining sinus tract was confirmed.

### Treatment

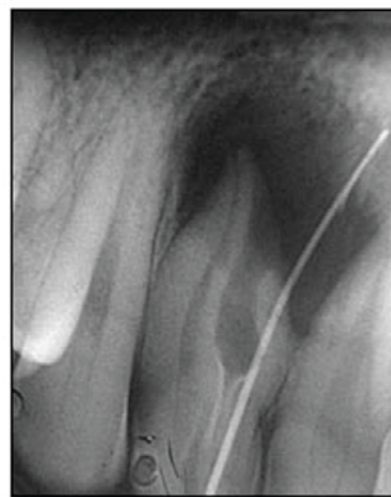
The tooth was isolated with a rubber dam, the pulp chamber was accessed, and the invagination located. When the access opening was enlarged further, the primary root canal was detected in a more distal portion of the tooth. There was no identifiable connection between the primary root canal and the invagination and working length was determined.

The primary canal was debrided and instrumented using hand and rotary ProTaper instruments (Dentsply, Mangalore, Karnataka, India) to achieve an apical enlargement of an ISO 35 size file along with a copious irrigation of sodium hypochlorite and EDTA. The invagination portion of the tooth was enlarged to an ISO 45 size file, but short of the working length as shown in Figures 4 and 5.

Two weeks later a combined non-surgical and surgical endodontic procedure was performed.



**Figure 2.** Pre-operative photograph of the coronal anomaly.



**Figure 3.** Pre-operative radiograph of intraoral sinus tracing using a gutta percha cone.



**Figure 4.** Access opening showing two distinct canal orifices.



**Figure 5.** Radiograph with K-files in both canals.



**Figure 6.** Pre-obturation surgical view.



**Figure 7.** Immediate post-obturation and post surgery radiograph. (Taken on the same day of the obturation and surgery)

A Leubke-Oschenbien surgical flap was raised followed by an osteotomy and curettage of the periapical lesion. Instrumentation of the invagination was done using a retrograde approach with hand and rotary ProTaper instruments as in Figure 6.

Obturation of the primary root canal was accomplished with Guttaflow (Reoko, Karnataka, India) in combination with 2% taper gutta percha (Densply, Malliefer, Karnataka, India) as the master cone. The obturation of the invagination and the retrograde sealing was done with Guttaflow using a canal tip delivery via a retrograde approach. The flap was then repositioned and sutured. Healing was uneventful.

Two post-operative evaluations were done. The first was performed after six weeks and the second after six months. During the first post-operative visit at six weeks a clinical examination of the lateral incisor showed no signs of inflammation, a healed sinus tract, and radiographic evidence of resolution of the apical radiolucency. A second radiographic evaluation six months after the surgery showed signs of new bone formation and healing of the periapical lesion, as seen in Figures 7 and 8.

## Discussion

Dens invaginatus requires an early diagnosis and treatment, as it may result in radicular and



**Figure 8.** Six months post-surgical radiograph.

periapical pathosis. Treatment may vary from case to case. In the current case, a Type III invagination in a maxillary lateral incisor extended from the crown to the apex of the root with no apparent connection with the main canal. A periapical radiograph revealed the presence of periapical pathosis.

Other investigators have reported the occurrence of pulpal and periapical pathosis due to caries or defects within the invagination.<sup>12</sup> Typically these anomalies are discovered only when clinical signs appear. Treatment of dens invaginatus can be a challenging endodontic procedure because they present a complex root canal configuration that is often impossible to instrument completely. A surgical approach provides access to attain a retrograde seal of these complex root canals. Thus, teeth with dens invaginatus usually require combined non-surgical and surgical treatment<sup>5,13</sup> as was done in the present case.

## Conclusion

Complications presented by Type III dens invaginatus and acute periapical abscess necessitated the use of combined non-surgical and surgical endodontic therapy to attain a favorable seal of the root canal. The prognosis at a six-month post-treatment evaluation appeared to be good.

## Clinical Significance

Dens invaginatus requires an early diagnosis and treatment. It may result in radicular and periapical pathosis requiring a combined non-surgical and surgical endodontic approach to treatment.

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