Surgical management of lateral incisor with type II dens invaginatus and a periapical pathosis: A case report with 1-year follow-up

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Abstract
Dens invaginatus is a relatively common dental malformation resulting from an infolding of enamel organ into the dental papilla varying in depth into the tooth tissues. Complex morphological anatomy associated with the pulpal pathology presents inaccessibility to completely remove the necrotic pulp tissues and hence poses challenges in rendering endodontic treatment. A combination of nonsurgical and surgical management in treating such cases is advisable depending on the presented variations. The present case reports the surgical endodontic treatment of an immature maxillary lateral incisor with type II dens invaginatus and periapical pathology.

Keywords: Cone beam computed tomography; dens invaginatus; microscope; mineral trioxide aggregate; obtura II; ultrasonics

INTRODUCTION
Dens invaginatus is a relatively common dental malformation resulting from an infolding of enamel organ into the dental papilla at varying depths, before the tooth calcification. Incidence of dens invaginatus from the literature is reported to be in a range of 0.04%–10% and affecting the maxillary lateral incisors more commonly with unilateral and bilateral predilection. The occurrence is also reported in mandibular teeth. Dens invaginatus is reported in association with gemination. Sequelae of such untreated invaginations may be abscess formation, displacement of teeth, cysts, and internal resorption. Depending on the depth of the invagination and the tooth tissue involved in the malformation, Oehlers has classified this abnormality into three types.

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CASE REPORT

A 20-year-old male with pain in the mandibular right first molar was referred to the department of conservative dentistry, and endodontics and patient gave a history of pus discharge from the upper front teeth region that was episodic since many years with no occurrence of pain. The tooth 46 had a deep carious lesion which was tender to the clinical tests. On examination of the remaining oral structures, a morphological alteration in the crown structure of maxillary left lateral incisor 22 was detected with no visible decay and color change [Figure 1a]. The soft tissue above 22 disclosed a sinus tract opening which on the application of slight digital pressure discharged the purulent exudate. Sinus tracing was done with gutta-percha (GP) cone which was directed distolateral to the lateral incisor root and ended in the periapical lesion present around the apex [Figure 1b]. Radiographic examination revealed the presence of apical periodontitis in relation to 46 and dens invaginatus in 22, the palatal invagination that ended at the middle third of the root and presented an immature root apex surrounded by a radiolucent lesion. The condition was diagnosed as a chronic apical abscess secondary to type II dens invaginatus in relation to 22.

In the first appointment, 46 was root canal treated and also access cavity preparation was done in 22 under surgical operating microscope (Labo America Inc, USA) which revealed three orifices-mesiolabial (ML), distolabial (DL), and palatal (P) [Figure 1c]. The palatal invaginatus canal had an obvious apical stop with no communication with the main canal. Working length was determined for all the canals, files inserted in the ML and DL orifices were found to be crossing each other in the main canal beyond the compressed area by the invagination indicating that it is a continuous communicating channel [Figure 1d]. Invaginatus canal was biomechanically prepared and obturated using GP and zinc-oxide root canal sealer by conventional lateral compaction technique [Figure 1e].

The patient was posted for surgical management of the dens invaginatus in 22 for the treatment of the main canal with open apex as there was limited accessibility through the small coronal orifices. Under local anesthesia, full thickness mucoperiosteal trapezoidal flap was elevated following which bony defect and a mass of granulation tissue was observed distolateral to 22 running toward the apex [Figure 1f]. Curettage was performed and the apex located. Through the coronal orifices, manual biomechanical preparation was accomplished gently, and thorough irrigation was performed with 2% chlorhexidine solution and saline from the apical end followed by irrigation through the orifices which ensured optimal evacuation of the debris.

At the apex, the flat end of the warm plastic filling instrument was held by the assistant as an apical stop. Obtura tip (Obtura II, Spartan, USA) was inserted into the

![Figure 1: (a) Preoperative photograph of 22. (b) Sinus tracing. (c) Access opening showing mesiolabial, distolabial, P orifices. (d) Files in mesiolabial and distolabial canals communicating. (e) Invaginatus obturation. (f) Bony defect distolateral to 22. (g) Schematic representation of obtura material flowing in the main canal indicated by orange colored arrows and red color showing apical stop with plastic filling instrument. (h) Immediate posttreatment radiograph](image)
ML orifice to down-pack the entire canal with the shooting pressure, and the flow of the obturating material emerged through the DL orifice that ensured a three-dimensional obturation of the main wide canal with complex internal anatomy [Figure 1g]. Retro-preparation was done in apical one-third with ultrasonic tip-S12-90ND (Satelec, France) and the root-end cavity was filled with mineral trioxide aggregate (MTA) [Figure 1h]. Flap was approximated and sutured. Thorous intraoral betadine irrigation was done on the following day. Sutures were removed 1 week later, and the clinical evaluation revealed signs of healing. Follow-up periods were scheduled at 1 week, 1, 3, 6, months, and 1 year to observe the healing which revealed a reduction in the apical radiolucency [Figure 2a-d]. Cone beam computed tomography (CBCT) imaging at 1-year follow-up revealed three-dimensional void free obturation and the complexity of the internal anatomy [Figure 3a-g].

DISCUSSION

Dens invaginatus poses a challenge in accurate diagnosis and proper treatment planning because of its variations in occurrence involving different levels of tooth tissues, being only enamel-lined in few cases and complicated by involving the pulpal and presenting the periapical pathosis in few. The complexity of the internal anatomy is an important predetermining factor in decision-making regarding surgical or nonsurgical intervention. As in the present case, wide open apex with two small labial coronal orifices and a continuous intercommunicating intracanal anatomy and a large periapical pathology presented a situation with limited orthograde accessibility for thorough chemo-mechanical preparation and obturation, hence surgical technique was chosen.

Formation of the invagination on the palatal aspect resulted in the compression of the main canal that resulted in the division of the canal into two orifices, ML and DL, at the coronal aspect. Thorough debridement of the infected canal is the key for success in such complicated cases. In the present case, intracanal calcium hydroxide dressing was placed for 2 weeks to achieve disinfection. Two weeks of waiting period optimized the dryness of the canal to render the endodontic treatment.

Thermoplasticized obturation was chosen because of the presence of complicated internal anatomy where three-dimensional obturation with conventional technique was not possible. Flat end of the plastic filling instrument was heated and placed at the apex to maintain continuous flow of the GP when contacted, thus providing a “flow-enhancing” apical stop.

MTA was placed as a retrograde filling material because of its superior biocompatibility. Evaluation of the tooth at the follow-up periods revealed “healing in progress” from 1 week, with signs of trabeculation at the apex and “complete healing” in the distolateral aspect of 22 at 1 year. CBCT imaging performed at 1-year follow-up revealed the three dimensional void free obturation of a complex type II dens invaginatus tooth.

Figure 2: (a-c) Follow-up radiographs at 1, 6 months, and 1 year, respectively. (d) Clinical photograph after 1 year

Figure 3: (a) Cone beam computed tomography frontal view. (b-f) Axial sections from coronal to apical level. (g) Sagittal view
CONCLUSION

A triad of innovative treatment planning, improved materials and technological advancements aids in the successful clinical outcome and endodontic management of type II dens invaginatus.

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Conflicts of interest
There are no conflicts of interest.

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