Review Article

Non-surgical management of radicular cyst associated with dens invaginatus in a 13-year old child: A Case Report

Dr.Purva Babhulgaonkar1, Dr. Prasanna Dahake2 ,Dr.Mahesh Dadpe3, Dr. Yogesh Kale4, Dr. Shrikant Kendre5

[1]PG Student, Department of Pediatric and preventive dentistry, MIDSR Dental College, Latur
[2]Professor & PG guide Department of Pediatric and preventive dentistry, MIDSR Dental College, Latur
[3]Professor and HOD Department of Pediatric and preventive dentistry, MIDSR Dental College, Latur
[4]Professor, Department of Pediatric and preventive dentistry, MIDSR Dental College, Latur
[5]Reader, Department of Pediatric and preventive dentistry, MIDSR Dental College, Latur

Abstract:
The dental deformity known as dens invaginatus is most likely caused by the papilla folding inward during tooth development, due to which the tooth is at risk for periapical pathosis and lesions. Due to the intricate structure of the teeth, root canal treatment may create several issues. The main objective of the case study is the endodontic management of an Oehler's type III dens invaginatus that perforates into the apical region of the root. A combination of powdered calcium hydroxide and regular saline is used as an intracanal medication. This allowed gutta-percha obturation in the invagination by eliminating the microbes and maintaining tooth in the arch.

Keywords- calcium hydroxide, case report, dens invaginatus, radicular cyst, triple antibiotic paste.

INTRODUCTION:

An uncommon developmental abnormality known as dens invaginatus—also known as dens in dente, invaginated odontome, or dense telescope—arises when before calcification, an enamel organ invaginates into the dental papilla1. However, the etiology remains unknown. It mostly affects the permanent dentition, notably the maxillary lateral incisor, however it can also affect the central incisor, canine, and premolars, in decreasing order of incidence1,2. On routine radiographic imaging, DI is usually visible as an infolding of enamel and dentine that extends into the pulp cavity, the root, or occasionally the root apex1.

DI has historically been divided into three main categories: (Oehler's classification of dens invaginatus)3

Type I: This kind only shows invagination in the crown.
Type II: This type of tissue extends under the cementoenamel junction and terminates in a blind sac that may or may not be able to connect with pulp.
Type III: Without having direct contact with the pulp, spreads through the root and perforates in the apical or lateral radicular region. Involvement of the pulp frequently results in inflammatory lesions and allows direct connection between the oral cavity and the intraosseous periradicular tissues.

This abnormality is linked to periapical disease, such as radicular cysts, and dental caries, among other consequences. Radicular cysts are the most prevalent odontogenic cystic lesions of inflammation, resulting from the proliferation and/or degeneration of the Malassez epithelial rest cells4.

The case report below details the nonsurgical treatment of a periapical lesion caused by type III dens invaginatus.

Clinical case

A 13-year-old girl visited the Department of Pediatric and Preventive Dentistry at MIDSR Dental College in Latur, complaining of discomfort and swelling in the lower front region of her jaw. On examination intraorally, there was the presence of an enlarged crown of the mandibular left central incisor (31) with triangular enamel outgrowth suggesting talon's cusp (TC) and incisal notches along with pronounced cingulum and fissure lingually. The mandible's left central incisor was painful to vertical percussion, while the adjacent teeth responded normally. There was no evidence of trauma, caries, or periodontal pockets associated with the tooth. A CBCT was advised to examine the extent of the lesion. The CBCT reports revealed an intact crown structure of 31 and radioopacity extending over the cingulum pit beyond the radio opaque line of enamel, into the dentin, single root with linear radiolucency and resorption at the apex seen. There was a loss of lamina dura and widening of the PDL space at the apical third region, with a well-defined radiolucency extending from the mesial aspect of tooth 42 to the mesial aspect of tooth 33, approximately 21.6 x 10.5 mm in diameter, and perforating the buccolingual wall [Figure 1]. Therefore, RCT of adjacent teeth was performed. Following the opening of 31, three orifices were located. To navigate the extent of the canals, a 10 K-type file was used. An orifice enlarger was used to widen the canal. Necrotic pulp was extirpated and the working length was determined 1 mm short of the radiographic apex [Figure 2]. Step back technique was used to enlarge the canals upto 25 K file. The canals were copiously irrigated with 3 % sodium hypochlorite and saline (Vishal Dentocare Pvt Ltd, Ahmedabad). Sterile paper points were used to dry the canals and triple antibiotic paste (TAP) was given as intracanal medicament. Zinc oxide eugenol cement was used to temporarily close the access cavity. To ensure proper healing, TAP was placed for 21 days. The tooth had no symptoms at recall after 21 days, and the soft tissue around it was in satisfactory condition. The intracanal dressing was replaced with a fresh paste of calcium hydroxide for 3 months and the access cavity was again sealed with zinc oxide eugenol cement. In between recall appointments were scheduled to assess for presence of sinus tract, oedema, tooth movement, and discomfort. No symptoms and signs of reinfection were associated with the affected tooth. Saline was used to irrigate the canal during these appointments. Following the 3 months observation period, the lateral condensation method was used to perform root canal obturation with gutta-percha points (Hygenic, Akron, OH, USA) [Figure 4]. Composite resin was used for restoring the incisal notching and access cavity (Charisma, Heraeus Kulzer). After six months, the patient was brought back and periapical lesion had completely healed, as showed by the periapical radiograph [Figure 5].

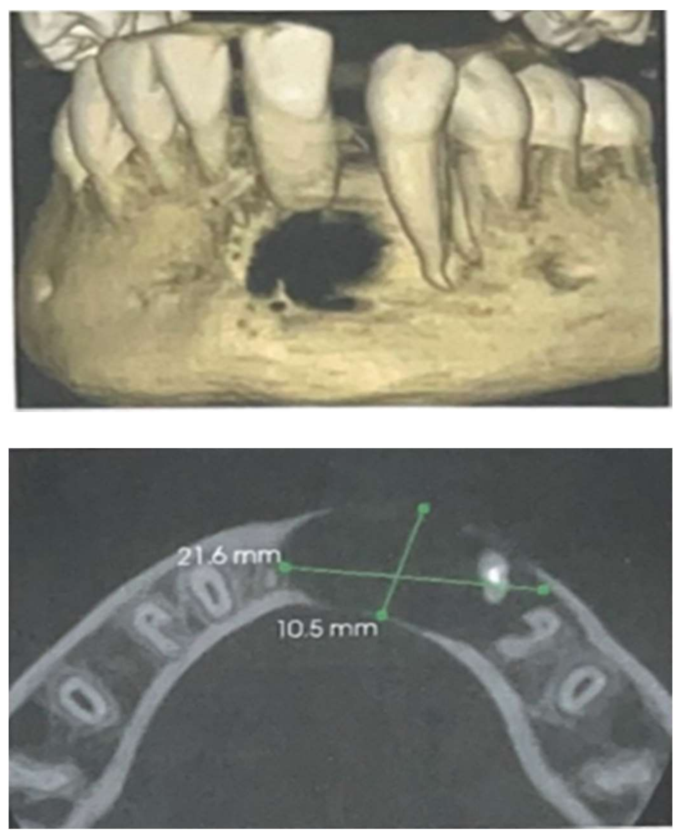

Fig. 1 Well defined radiolucency seen at apical region of 31 region extending from mesial aspect of 33. Mesiodistal dimension at apical region 21.6 mm X 10.5mm. Buccolingual wall perforated.

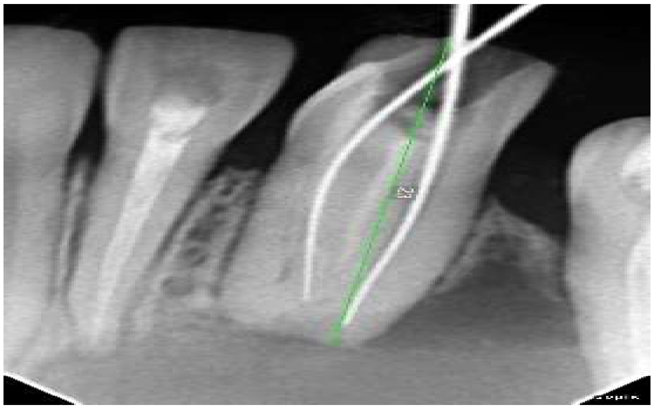

Fig 2. Intraoral periapical radiograph showing estimated working length.

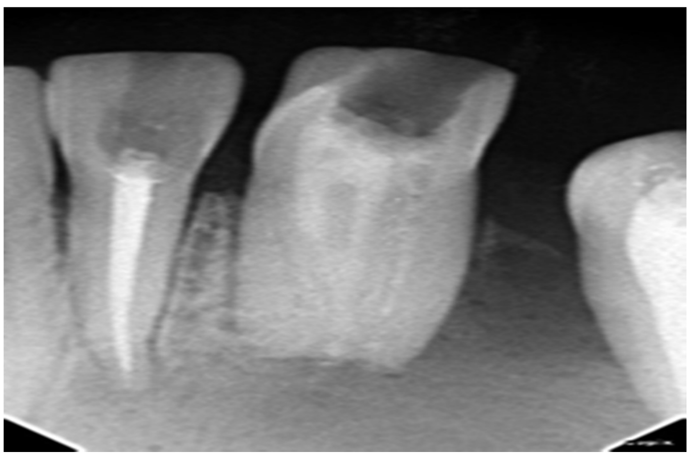

Fig 3. Intraoral periapical radiograph showing calcium hydroxide as intracanal medicament.

Fig 4. Three month periapical radiograph showing root canal obturation.

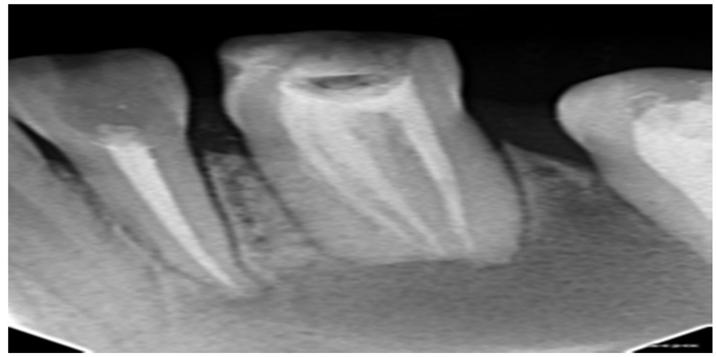

Fig 5. Periapical radiograph showing root canal obturation after 6 months follow up.

Discussion

It is still unclear exactly what causes dens invaginatus (DI) and talon's cusp (TC). These two abnormalities occurring together in one tooth indicates to a shared etiological cause5,6. Transient localised hyperplasia of the peripheral cells of the mesenchymal dental papilla and aberrant proliferation of inner enamel epithelial cells are two possible causes of TC, which begins during the morpho-differentiation stage of tooth formation7,8. The aetiology involves both environmental and genetic variables9. Several reasons, including profound folding of the foramen caecum during tooth formation, localised failure of growth of the internal enamel epithelium, rapidly proliferating internal enamel epithelium, hereditary factors, infection, trauma, etc., can cause DI1. As anticipated, soft tissue resembling the dental follicle fills the lumen of the invagination prior to tooth eruption (i.e., reduced enamel epithelium with a fibrous connective tissue). Following eruption, microbes enter the invagination and inflame the tissue. At the beginning, the pulp is most likely healthy; nevertheless, the infection might enter the pulp by the apical foramen, which would be a retrograde route, or through channels that exist between the pulp and the invagination1,10. Early detection and preventative care, such as sealing the cingulum pit with composite resin as soon as the tooth erupts over the gingival margin, can frequently prevent inflammatory changes associated with the invagination. To prevent severe periradicular problems, however, routine follow-up examinations are required, including radiographic monitoring and pulp vitality testing1,11,12.White and Pharoah (2014) presented six distinct cone-beam computed tomography (CBCT) diagnostic criteria for inflammatory radicular cysts. (i) location: the apex of the affected tooth, (ii) well-defined corticated boundaries, (iii) Lesion shape: curved or circular, (iv) Internal structure: radiolucent, (v) Effect on surrounding structures: displacement and resorption of the roots of adjacent teeth, and (vi) Cortical plate perforation. In a prospective cohort study, Saini et al. used CBCT to evaluate the outcomes of nonsurgical RCT in the management of large periapical lesions. The study involved 54 subjects with 77 permanent maxillary anterior teeth affected by the condition. ¬e radiographic assessments were conducted at 6, 12, and 24 months, with CBCT scans taken at the 24-month mark. The results showed an 82.2% success rate for RCT, with 8.9% of cases resolved and 73.3% exhibiting reduced lesions. The study also showed that the presence of preoperative cortical bone defects and the apical extent of obturation negatively affected the reduction in lesion13.

When pulp is necrosed of a tooth with the typical type III DI, endodontic treatment can frequently be difficult to perform. The intricacy of the root canals and the kind and degree of invagination are directly linked to the challenges of treating type III DI. The positioning of root canal openings presents the initial difficulty in the majority of complicated situations. The root canal system can be enlarged and better illuminated with a surgical microscope. For teeth with DI, Girish and McClammy, Jung, Shoner, and Wallace suggested using ultrasonic cleaning for intricate root canal openings14,15,16.

The persistence of microbes in the root's surrounding tissue is frequently linked to endodontic treatment failure. Thus, dressing with intracanal medications is one of the most crucial procedures for achieving and preserving a sterile root canal following mechanical instrumentation and prior to root canal obturation17. Triple antibiotic paste (TAP) and calcium hydroxide are the most common and effective intracanal medicaments used.

TAP contains ciprofloxacin, metronidazole, and minocycline. Metronidazole, a nitroimidazole molecule, is noxious to anaerobes and is used as an antibacterial agent against protozoa and anaerobic bacteria. TAP should be administered at the lowest feasible concentration (1 mg/mL), as larger doses may have unfavourable effects on stem cells. TAP, even at low concentrations, harms the proliferative ability and mineralised matrix development of dental pulp and apical papilla cells. Murvindran and James revealed the effectiveness of TAP in eliminating bacteria and providing an appropriate environment for subsequent endodontic treatments, whereas Kim and Kim found that TAP displayed bigger inhibitory zones against E. faecalis than calcium hydroxide18.

Since, its debut in dentistry, calcium hydroxide has been employed for many different applications. Calcium hydroxide has a high pH (11) when it is pure, and its primary use in dentistry are related to its antibacterial and mineralization-stimulating qualities. Because of its tissue-dissolving qualities, low toxicity, bactericidal action, and biocompatibility, calcium hydroxide has been suggested as a root canal medication in recent investigations19,20. According to Souza et al., calcium hydroxide may have four different actions outside of the apex: (1) hygroscopic action that reduces inflammation; (2) neutralisation of acid products such hydrolase; (3) activation of alkaline phosphatase; and (4) antibacterial activity. Intracanal calcium hydroxide medication has been used to treat periapical pathology in the majority of cases21,22. Apart from its antimicrobial properties, calcium hydroxide dressing aids in the development of dentinal bridges and preserves the health of the surrounding pulp in DI23.

C. albicans is frequently prevalent in resistant and secondary endodontic infections, as well as peri-radicular lesions. One percent sodium hypochlorite (NaOCl) has shown bactericidal effect against C. albicans and E. faecalis. It also dissolves leftover necrotic tissue more quickly. Therefore, it can be used as an irrigation solution before administering intracanal calcium hydroxide dressings24.

Large periapical lesions would require regular calcium hydroxide replacement at the initial follow-up session six weeks later for a more predictable outcome. Webber recommended changing the calcium hydroxide dressings as needed. He stated that one of the criteria for replacing the dressing should be the degree of dryness of the calcium hydroxide dressing at the apical half. The dressing must also be replaced if the patient experiences a recurrence of sinus tract and/or symptoms within the first several months of therapy. The body's natural defences begin to work once the active infection has subsided, causing the periapical disease to recover. While some writers advocate obturating the canals prior to the periapical pathology healing process, others would rather wait for the pathology to heal25. Kursat obturated DI when the radiograph showed large periapical lesion had significantly healed26. To rule out a lesion recurrence, a lengthy follow-up is necessary.

CONCLUSION

This case study highlights the effectiveness of nonsurgically managing extensive radicular cysts associated with dens invaginatus, especially in cases where there has been significant bone loss. Using diagnostic methods such as CBCT helps in precise evaluation and investigation of the lesion. The potential of non-surgical endodontic management using triple antibiotic paste and calcium hydroxide as intracanal medicaments is a conservative and effective method of treating radicular cyst. This should be considered as the primary treatment strategy in such situations.

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