Contemporary Pediatric Dentistry

Case Report
Contemp Pediatr Dent 2025:6(2):172-179
DOI: 10.51463/cpd.2025.15

Endodontic management of a talon cusp and dens invaginatus in a mandibular lateral incisor: A case report

Nagarathna J[1] ✉, S.K. Srinath[2], Bineeth M.K[3], Harikrishnan V[4], Revathi Murugan[5]

Highlights

- Endodontic treatment of teeth with dens invaginatus is complex due to unusual root canal anatomy.
- This case presents endodontic management of a mandibular lateral incisor with both talon cusp and dens invaginatus.
- Early identification and prophylactic treatment of these morphological variations is Early diagnosis and preventive care of dental anomalies can prevent pulpal complications.

[1] Assoc. Prof., Department of Pediatric and Preventive Dentistry, Government Dental College and Research Institute, India
[2] Prof., Department of Pediatric and Preventive Dentistry, Government Dental College and Research Institute, India
[3] Postgraduate student, Department of Pediatric and Preventive Dentistry, Government Dental College and Research Institute, India
[4] Postgraduate student, Department of Pediatric and Preventive Dentistry, Government Dental College and Research Institute, India
[5] Postgraduate student, Department of Pediatric and Preventive Dentistry, Government Dental College and Research Institute, India

Correspondence:
Department of Pediatric and Preventive Dentistry, Government Dental College and Research Institute, India
E-mail address:
nagarathnagiri_1975@yahoo.co.in

Received: 13 Mar 2025
Accepted: 25 Jul 2025
Online First: 05 Aug 2025

Abstract

Anomalies in tooth development represent deviations from normal morphogenesis and may arise due to disturbances in epithelial–mesenchymal interactions during odontogenesis. These disturbances can manifest as variations in the number, shape, size, or morphology of teeth. Talon cusp and dens invaginatus are rare developmental anomalies that present unique diagnostic and therapeutic challenges, particularly when coexisting in a single tooth. This case report describes the endodontic management of a 12-year-old male who presented with a dentoalveolar abscess in the lower anterior region, although the affected mandibular lateral incisor (tooth 42) appeared clinically intact and non-carious. Intraoral examination revealed a prominent talon cusp with a lingual pit on tooth 42, which also exhibited grade I mobility and tenderness on percussion. Radiographic and cone-beam computed tomography (CBCT) analyses revealed a Type II dens invaginatus with mesiobuccal deviation of the primary canal and a centrally located accessory invaginated canal. Access cavity preparation under rubber dam isolation revealed two distinct canal orifices. Endodontic treatment included negotiation and shaping of both canals, followed by intracanal medication with calcium hydroxide and obturation using the lateral condensation technique. The unique internal morphology necessitated tailored endodontic protocols supported by CBCT guidance. This report underscores the importance of recognizing rare morphological anomalies in pediatric patients and adopting a comprehensive diagnostic approach to ensure effective and conservative management of complex endodontic cases.

Keywords: Cone-Beam Computed Tomography; Dens Invaginatus; Incisor; Talon Cusp

INTRODUCTION

The distribution of developmental dental anomalies within the dentition varies across populations.[1] However, prevalence data concerning morphological anomalies in mandibular lateral incisors remain relatively scarce compared to those affecting their maxillary counterparts. Furthermore, the coexistence of multiple anomalies in a single tooth is an uncommon clinical finding.[2]

Talon cusp is a developmental dental anomaly characterized by an accessory cusp that prominently projects from the lingual surface of primary or permanent anterior teeth. Morphologically well-delineated, it extends at least halfway from the cementoenamel junction to the incisal edge.[3] First described by Mitchell in 1892, this anomaly is more frequently observed in the permanent dentition, with a reported prevalence nearly three times higher than in the primary dentition.[4] Although talon cusp most commonly occurs in maxillary lateral incisors, rare instances have also been documented in mandibular incisors.[3]

Several hypotheses have been proposed to explain the etiology of the talon cusp. The most widely accepted theory suggests that it arises from an outward folding of the inner enamel epithelium, combined with localized hyperplasia of the mesenchymal dental papilla.[5] Genetic factors, including consanguinity, have also been implicated.[3] Despite these theories, the precise etiology remains uncertain. Talon cusp has been reported in association with various other developmental anomalies, such as dens invaginatus, peg-shaped laterals, mesiodens, odontomas, macrodontia, microdontia, bifid cingulum, accessory tubercles on incisors, and a prominent cusp of Carabelli.[6] Clinically, its presence can result in numerous complications, including occlusal interference, tooth displacement, esthetic concerns, abnormal tooth wear, limited tongue space, and an increased susceptibility to dental caries.[6]

Dens invaginatus, also referred to as *dens in dente*, is a developmental dental anomaly characterized by an infolding of the crown or root surface. Although its precise etiology remains uncertain, several hypotheses have been proposed, including increased localized external pressure, focal growth retardation, and focal growth stimulation during the morphodifferentiation stage of tooth development.[7] The most widely accepted theory suggests that an initial distortion of the enamel organ, followed by localized outward growth, leads to the formation of enamel-lined invaginations in the cingulum area and, in some cases, extending to the incisal edge.[6] Reported prevalence in the literature ranges from 0.04% to 10%, with the maxillary lateral incisor being the most frequently affected tooth, followed by the central incisor, premolar, canine, and molar.[7] A root variant of dens invaginatus may also occur, attributed to the invagination of Hertwig's epithelial root sheath after root development has begun. There is no reported gender predilection for this condition.[8]

Radiographically, dens invaginatus presents as an infolding of enamel and dentin that may extend into the pulp chamber and, in rare cases, reach the root apex. Histologically, the enamel lining the invagination is often hypomineralized, rendering the site susceptible to dental caries and facilitating the penetration of microorganisms into the pulp, which may ultimately result in pulpal necrosis and periapical inflammation.[7,8]

Reporting rare anomalies highlights the diverse clinical presentations of such conditions, facilitates early and accurate diagnosis, and aids in managing potential treatment complexities. This case report describes an unrecognized talon cusp occurring concurrently with dens invaginatus in a permanent mandibular lateral incisor, associated with a

periapical lesion, and outlines its clinical management.

CASE REPORT

A 12-year-old male reported to the Department of Pediatric and Preventive Dentistry at the Government Dental College and Research Institute with a chief complaint of pain in the lower right back tooth region for the past week. The history of the presenting illness revealed mild, throbbing, non-radiating pain that was aggravated by mastication and alleviated by over-the-counter medications. The patient's medical history was noncontributory. The patient and his legal guardians were informed about the diagnosis and proposed treatment. Written informed consent was obtained for both the clinical procedure and the publication of this case report.

Extraoral examination revealed no significant findings apart from palpable, non-tender submandibular and submental lymph nodes. The patient was in the late mixed dentition phase and exhibited Angle's Class I molar relationship with normal overjet and overbite. Intraoral soft tissue examination showed erythematous, smooth-textured, and soft gingiva with bleeding on probing. Hard tissue examination revealed preshedding mobility of tooth 85, corresponding with the patient's chief complaint. Calculus deposits were observed on the lingual surfaces of the mandibular incisors. The mesiodistal width of tooth 42 was greater than that of its contralateral counterpart (tooth 32). A prominent accessory cusp with a pit on its superior aspect was noted on the lingual surface of tooth 42. Clinical examination of the lower right lateral incisor (tooth 42) revealed grade I mobility and tenderness on percussion. The patient also reported a history of soft tissue swelling associated with the same tooth two weeks earlier, affecting both the labial and lingual alveolar mucosa. Pulp sensibility testing (heat and cold) elicited no response from tooth 42. Periapical radiographs of the 41–42 region were obtained, revealing a well-defined radiopaque structure surrounded by a thin radiolucent rim, along with diffuse periapical radiolucency, widening of the periodontal ligament space, and a disrupted trabecular bone pattern associated with tooth 42. Based on clinical and radiographic findings, a diagnosis of talon cusp with a lingual pit and dens invaginatus in tooth 42 was established. Cone beam computed tomography (CBCT) was subsequently advised to further evaluate the altered root canal morphology and support endodontic treatment planning. Coronal and sagittal CBCT views confirmed the presence of a talon cusp with irregular calcification within the accessory canal and a clearly visible primary canal (Figure 1A, B). The axial view showed that the invagination had deviated the primary canal mesiobuccally, with a smaller accessory invaginated canal located centrally within the root structure (Figure 1C).

Figure 1. Cone-beam computed tomography (CBCT) images of the mandibular left lateral incisor. A: Coronal view showing Dens invaginatus Type II with associated apical radiolucency; B: Sagittal view indicating the extent of invagination and periapical pathology; C: Axial view demonstrating a mesiobuccally positioned primary canal and a smaller invaginated canal. A prominent Talon's cusp is visible (white arrow)

At the initial visit, oral prophylaxis was performed, followed by the extraction of the preshedding mobile primary molar, which was interfering with mastication. During the second appointment, endodontic treatment of tooth 42 was initiated following isolation with a rubber dam (Figure 2).

After access cavity preparation, two distinct canal orifices were identified. The mesiobuccally deviated primary canal was successfully negotiated. Due to the presence of irregular calcification, the centrally positioned invaginated canal required the use of 17% EDTA for negotiation. Working lengths of 28 mm for the primary canal and 12 mm for the accessory canal were established using axial CBCT slices and corroborated with a periapical radiograph (Figure 3). Chemo-mechanical preparation was completed using a size 40 K-file for the primary canal and a size 25 K-file for the accessory canal. Irrigation was performed with 2.5% sodium hypochlorite, followed by saline and 2% chlorhexidine. After final irrigation with normal saline, canals were dried using sterile paper points and medicated with calcium hydroxide paste. The access cavity was temporized using zinc oxide eugenol cement.

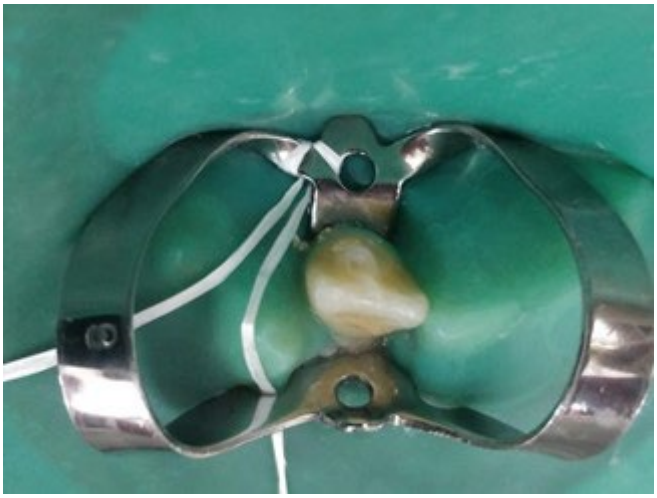

Figure 2. Preoperative clinical view showing rubber dam isolation of the mandibular left lateral incisor prior to access cavity preparation.

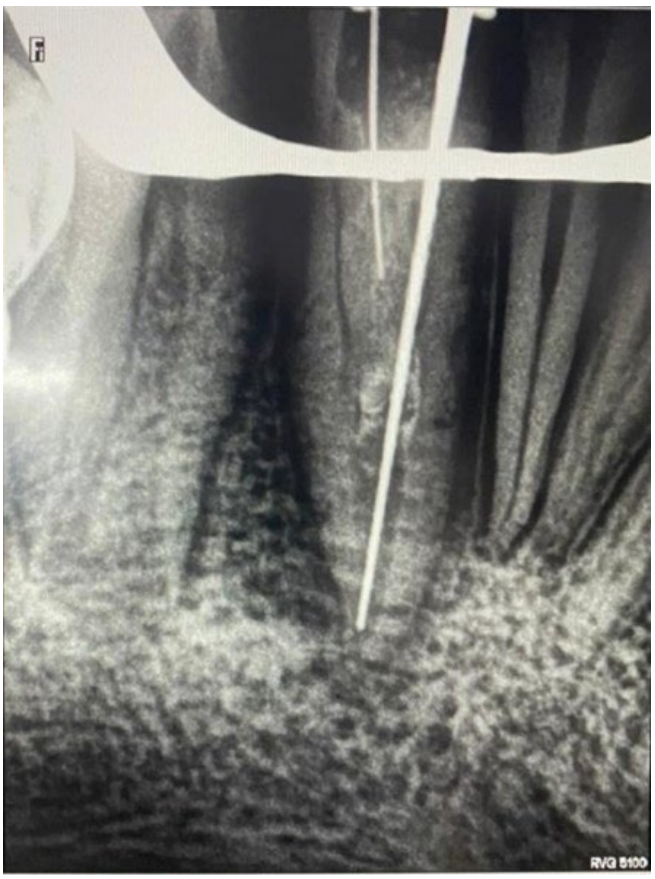

Figure 3. Working length determination radiograph of the mandibular left lateral incisor with endodontic file placed in the main canal.

At the two-week follow-up, tooth 42 exhibited no mobility and only minimal tenderness on percussion. A master cone radiograph confirmed appropriate apical adaptation of gutta-percha (Figure 4). Obturation was completed using the lateral condensation technique to ensure thorough filling of both the primary and invaginated canals. The final radiograph revealed no evidence of communication between the two canal systems and confirmed a hermetic seal in both (Figure 5).

Figure 4. Master cone radiograph demonstrating proper fit of size #60 gutta-percha cone within the root canal space before obturation.

Figure 5. Postoperative radiograph showing completed root canal obturation with adequate apical seal and restoration.

DISCUSSION

The occurrence of a talon cusp in the mandibular arch is relatively uncommon and most frequently presents as a lingual talon on the mandibular central incisor.[5] The simultaneous presence of multiple developmental anomalies in a single tooth is rare. In the present case, we report the concurrent occurrence of a talon cusp and dens invaginatus in a mandibular lateral incisor. Talon cusp has been reported to exhibit a male predilection and is typically unilateral.[3] Consistent with this, the current case also involved a male patient and a unilaterally affected mandibular lateral incisor. However, bilateral occurrences and, in extremely rare instances, multiple talon cusps in a single individual have been documented.[7] According to the classification by Hattab et al.,[5] the talon cusp identified in this case qualifies as a true talon, as it was morphologically well-delineated and prominently projected from the lingual surface of the mandibular lateral incisor, extending just beneath the incisal edge. The affected tooth appeared larger mesiodistally and thicker labiolingually compared to the contralateral lateral incisor. Although talon cusp has been reported in association with various syndromes, including Mohr syndrome, Rubinstein-Taybi syndrome, and Ellis–Van Creveld syndrome,[6] no syndromic association was observed in this patient.

Oehlers[9] classified dens invaginatus into three types based on the depth of invagination and its communication with the periodontal ligament. In the present case, the invagination did not extend to the root apex but remained confined within the crown and root beyond the cementoenamel junction (CEJ), consistent with a unilateral Type II variant. Dens invaginatus is associated with a significantly increased risk of pulpal pathology. The invaginated portion frequently communicates with the oral environment, allowing the ingress of microbial and chemical irritants into the pulp, which can lead to pulpal necrosis and subsequent periapical inflammation.[7]

The clinical presentation of dens invaginatus may range from a normal appearance to unusual morphological forms with increased buccolingual dimensions, such as wedge-shaped, cylindrical, or conical configurations.[10] In the present case, the invagination altered the tooth morphology, affecting the overall length and increasing the mesiodistal and labiolingual dimensions of the radicular portion, which led to a mesiobuccal deviation of the primary root canal. Gangwar et al.[2] reported a case of a talon cusp associated with Type II dens invaginatus in an immature mandibular left lateral incisor. Similarly, Dharmani et al.[11] described a Type III talon cusp coexisting with Type III B dens invaginatus in the mandibular left lateral incisor. The concurrent occurrence of a unilateral talon cusp with dens invaginatus in a mandibular lateral incisor remains extremely rare.

Talon cusp associated with dens invaginatus presents a complex endodontic challenge due to the potential communication pathways between the invagination and the pulp, as well as the unpredictable internal morphology, as observed in the present case. The affected tooth exhibited a lingual pit at the apex of the talon cusp, which served as a portal for microbial ingress. This led to irreversible pulp inflammation and subsequent periapical pathology, necessitating endodontic intervention. The presence of infected pulp tissue in anatomically inaccessible regions of the root canal system, combined with deviations and invaginations of the canal pathways, complicates endodontic procedures such as access cavity preparation, working length determination, canal instrumentation, and obturation.[12]

While modern apex locators are generally reliable for teeth with normal anatomy, the unique anatomical complexities associated with a talon cusp and dens invaginatus require a meticulous approach to working length determination. In such cases, it is essential to rely on a combination of diagnostic tools rather than depending solely on electronic readings.[12] Recent studies[13,14] have shown that cone-beam computed tomography (CBCT) can be used effectively for determining root canal working length, with accuracy comparable to actual measurements. In the present case, the pre-existing CBCT, along with periapical radiographs, was employed to determine the working lengths precisely. Copious irrigation and achieving a hermetic seal remain the fundamental pillars of successful endodontic treatment in such anatomically complex situations.

In the present case, sodium hypochlorite was used for canal disinfection due to its well-established antibacterial properties. Clinical studies support the use of sodium hypochlorite at varying concentrations (0.5% to 5.25%) as an effective irrigation solution.[10] Calcium hydroxide was employed as an intracanal medicament because of its high alkaline pH, strong bactericidal activity, ability to stimulate mineralized tissue formation, and capacity to denature and hydrolyze proteins.[15] CBCT played a critical role in identifying the altered canal morphology and guiding working length determination, thereby facilitating a more precise and conservative endodontic approach in managing the complexities associated with talon cusp and dens invaginatus. Regular follow-up appointments are essential to monitor clinical signs and symptoms, provide appropriate post-endodontic restorations, and confirm radiographic evidence of periapical healing to ensure a favorable long-term prognosis.

CONCLUSIONS

Developmental anomalies are defined as significant deviations from normal morphological features and expected growth patterns. In the present case, a mandibular lateral incisor exhibiting a talon cusp in association with dens invaginatus revealed several noteworthy findings: the presence of a lingual pit, increased mesiodistal and labiolingual dimensions of both coronal and radicular portions, a deviated primary canal pathway, and an elongated

root length. The application of CBCT greatly facilitated the diagnostic process and endodontic planning, emphasizing the critical role of detailed patient history and comprehensive clinical and radiographic examination in the management of complex dental anomalies.

REFERENCES

1. Jain A, Saxena A, Jain S, Parihar APS, Rawat A. Prevalence of developmental dental anomalies of number and size in Indian population according to age and gender. Int J Clin Pediatr Dent 2021;14:531–536

2. Gangwar A, Singal D, Giri KY, Agarwal A, Keerthi SS. An immature type II dens invaginatus in a mandibular lateral incisor with Talon's cusp: a clinical dilemma to confront. Case Rep Dent 2014;2014: 826294

3. Mathew MG. Mandibular talon cusp: a rare dental anomaly. BMJ Case Rep 2022;15:e252227

4. Hattab FN, Yassin OM, Al-Nimri KS. Talon cusp in permanent dentition associated with other dental anomalies: review of literature and reports of seven cases. ASDC J Dent Child 1996;63:368–376

5. Ali A, Zoya A, Ali S, Arslan H. Rare variant of dens invaginatus with accessory root and labial talon cusp in maxillary lateral incisor: a case report. Aust Endod J 2023;49:192–201

6. Siraci E, Gungor HC, Cehreli ZC. Dens invaginatus and talon cusp co-occurring in a mandibular central incisor: a case report. J Dent Child 2008;75:177–180

7. Ghosh S, Dhungel S, Subedi B, Pradhan S. Cooccurrence of Talon's cusp with dens invaginatus in the maxillary lateral incisor: a case report with review of literature. Case Rep Dent 2022;2022:9165574

8. Lwin HN, Kyaw PP, Thu SW. Coexistence of true talon cusp and double dens invaginatus in a single tooth: a rare case report and review of the literature. Clin Case Rep 2017;5:2017–2021

9. Oehlers FA. Dens invaginatus. I. Variations of the invagination process and associated anterior crown forms. Oral Surg Oral Med Oral Pathol 1957;10:1204–1218

10. Malik A, Bansal P, Sharma N, Kothari A. Type III dens invaginatus in a permanent maxillary canine: a rare case report. Endodontology 2017;29:69–72

11. Dharmani U, Rajput A, Chaudhary S, Talwar S, Verma M. Type III talon cusp and type III B dens invaginatus occurring simultaneously in a mandibular lateral incisor. Gen Dent 2014;62:16–21

12. Bhagat E, Agnihotri Y, Das A, Das S, Panda S, Hota S. Accuracy of an electronic apex locator in measuring the working length of root canals in comparison with radiographs: an in vivo study. Cureus 2024;16:e60283

13. Izadi A, Golmakani F, Kazeminejad E, Mahdavi Asl A. Accuracy of working length measurement using cone beam computed tomography at three field of view settings, conventional radiography, and electronic apex locator: an ex-vivo study. Eur Endod J 2024;9:266–272

14. Kosta S, Chandwani N, Bopche P. Reliability of CBCT in working length determination for successful endodontic treatment: an in vitro study. Int J Orofac Res 2022;6:55–60

15. Steffen H, Splieth C. Conventional treatment of dens invaginatus in maxillary lateral incisor with sinus tract: one year follow-up. J Endod 2005;31:130–133

How to cite this article:

Nagarathna J, S.K. Srinath, Bineeth M.K., Harikrishnan V, Revathi Murugan. Endodontic management of a talon cusp and dens invaginatus in a mandibular lateral incisor: A case report. Contemp Pediatr Dent 2025:6(2):172-179

Declarations

Acknowledgements: *Not applicable.*

Conflict of Interest Statement: A*uthors disclose no potential conflicts of interest.*

Ethics Statement: *Not applicable.*

Informed Consent: *Procedure was explained to the parents and written consent was obtained for the treatment and publication of the case report.*

Author contributions: *Conception and design: All authors; Acquisition of data: NJ, SKS; Interpretation of data: BMK, HV; Drafting article: HV, RM; Revision article: HV, RM; Final approval: All authors.*

Funding: *There is no financial support or sponsorship to declare.*

Data Availability: *The data used to support the findings of this study can be made available upon request to the corresponding author.*

Peer-review: *Externally double-blinded peer-reviewed.*