Diagnostic and Treatment Options for Dens Invaginatus: A Case Report

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Overview

Background

Dens invaginatus (DI) or "dens in dente" is a developmental malformation of teeth whereby the dental papilla folds inwards prior to calcification. This malformation can result in varying crown forms and anatomical features, ranging from deep lingual pits with no pulpal communication to severe invaginations that extend into the pulp cavity and root. This poses challenges to treatment. DI has a prevalence of 0.3%-10% and is most commonly found in permanent maxillary lateral incisors, followed by permanent maxillary central incisors. Early diagnosis is critical as pulpal involvement of the complex root canal system often occurs soon after tooth eruption.

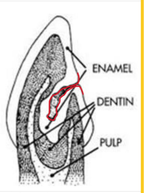

Figure 1

Etiology

Unclear, but several theories have been proposed: Growth pressure causes buckling of enamel organ, focal failure of growth of the internal enamel epithelium, rapid and aggressive proliferation of the part of the internal enamel epithelium invading the dental papilla, distortion and subsequent protrusion of part of the enamel organ during development leading to an enamel-lined channel ending at the cingulum or incisal tip, fusion of two tooth-germs, infection, and trauma.

Classification

Coronal – invagination of the enamel organ into the dental papilla before mineralization

- Type I: enamel-lined minor form that is confined to the crown
- Type II: enamel-lined form that extends into the root and pulp chamber as a blind sac without communication to the periodontal ligament
- Type III: enamel or cementum lined form that invaginates into the root.
  It communicates with the periodontal ligament laterally (IIIA) or at the apical foramen (IIIB) but does not involve the pulp

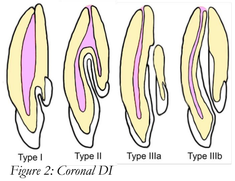

Figure 2: Coronal DI

Radicular – infolding of Hertwig's root sheath into the root upon completion of crown development

- Type I: Cementum lined invagination that is now more commonly referred to as a radicular groove
- Type II: Enamel lined invagination within the root only

Diagnosis and Treatment

Clinical Presentation

- Deep palatal pit or groove
- Barrel-shaped crown
- Cone shaped
- Dilated crown
- Microdontic teeth
- Labial groove associated with incisor notches

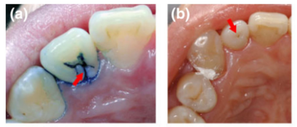

Figure 3: Deep palatal pit/groove

Radiographic Presentation

- Ranges from a linear radiolucent invagination to a radiopaque border with a radiolucent core
- CDI Type III may be located laterally to or centrally within the main canal, communicating with the PDL through a pseudo-foramen at the middle or apical third
- May appear as an irregular root structure with contours that resemble the appearance of two roots
- 3-D radiographic imaging using computed tomography provides detailed information about the root canal system and reveals the type/extent of DI

Figure 4: CDI Type II

Treatment Considerations

Preventive and Restorative Treatment

- Deep pits/grooves, invagination has no connection to the pulp, vital pulp
  - No caries → Seal with fissure sealant to prevent carious destruction
  - Caries → Caries removal followed by composite/GI restoration
  - If invagination may be connected to pulp → Restore with MTA

Root Canal Treatment

- Indicated when pulp is infected or if the tooth has a periapical lesion
- Proper cleaning and shaping is often difficult due to the irregular root canal system (invagination may be treated as a separate root canal)
- Obturation is often done using warm gutta percha techniques such as vertical condensation or thermoplastic filling techniques
- Immature permanent teeth
  - If pulpitis is limited and is not severe, consider pulpotomy
  - If pulp is necrotic, consider apexification or root revascularization to allow for further root development

Other Treatment Options

- Surgical treatment - apicoectomy or apical surgery
- Extraction - indicated for teeth with severe anatomic irregularities or primary teeth with periapical lesions that may affect the permanent tooth germ

Case Report

Patient Description

- 11y0m male with CC of "I have pain on my front tooth"
- Health History: Non-contributory; Allergies: Benadryl (rash)
- HPI: Patient reports experiencing intermittent sensitivity associated with tooth #9 when eating hot and cold foods for the past several months. He is starting middle school next year and is worried about how his front tooth looks.

Figure 5: Facial profile and intraoral photographs

Clinical and Radiographic Examination of Tooth #9

- Unique barrel-shaped morphology consisting of multiple cusp tips and a deep lingual groove with caries
- Negative to percussion and palpation
- Sensitivity to hot and cold as reported by patient
- No report of spontaneous or nocturnal pain
- PA reveals deep invagination of pit or groove on occlusal surface that appears to extend to the apex and divide the pulp canal into two - CDI Type III
- Closed apex with no sign of periapical radiolucency

Figure 6: DI tooth #9

Figure 7: DI tooth #9 (zoomed in)

Figure 8: PA of #9

Endodontic Consultation

Diagnostic testing revealed that tooth #9 was slightly more sensitive to cold than adjacent teeth but did not linger. CBCT revealed no apical tissue pathology as well as multiple pulp chambers and canals that are interconnected.

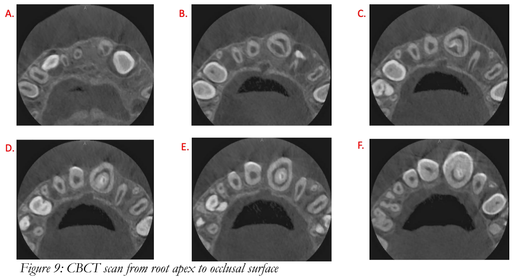

Figure 9: CBCT scan from root apex to occlusal surface

Treatment Recommendation

Diagnosis → Reversible pulpitis with healthy apical tissue. Recommend caries removal with IPT/DPT. Attempt will be made to improve the esthetics of tooth #9 with composite. PFM or Zirconia crown not recommended due to age of patient and risk of pulp exposure during crown preparation. Treatment is still pending.

Other Considerations

- Maintain vitality of the tooth
- If irreversible pulpitis/necrosis occurs, RCT or extraction will be necessary
- Due to complex root canal system, RCT will likely fail or be too difficult to complete, thus necessitating extraction
- Extraction of a permanent tooth during adolescence will likely result in bone loss and make implant placement in the future more difficult

Conclusions

Early diagnosis of DI is key in order to prevent pulpal involvement and periapical inflammation. Emphasis should be made on good oral hygiene and regular recalls so that the tooth can be monitored regularly. Coordination with endo can aid in diagnosis and treatment options. Future treatment options may include a Zirconia crown or extraction and implant placement when the patient is an adult. Bonded composite resin can serve as interim treatment option to help improve esthetics.