Endodontic Treatment of Dens Invaginatus – Case Report

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Summary

Dens invaginatus is a developmental anomaly, manifested by the insertion of the enamel and dentin inside crown and root. Aberration is manifested by the broad spectrum of morphological variations from foramen coecum to the smaller or larger root insertion, sometimes to the very apex. The treatment depends on the type of anomaly and whether there is a communication with the pulp and the periapical tissue. The purpose of this study was to show endodontic treatment possibilities for this anomaly.

Key words: *dens invaginatus, classification, therapy.*

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Introduction

Developmental anomaly of a dental organ formed during morphodifferentiation called *dens in dente, dens invaginatus, deep foramen caecum or dilated odontom*, according to the authors who studied it, was first mentioned in the nineteenth century.

In 1855 Salter first mentioned the anomaly, calling it a *"warty tooth"*. In 1897 Busch introduced the term *"dens in dente"*, thinking there are two dental elements involved. In 1910 Zekendorf named the anomaly *"dens telescopes"*.

Rushton in 1936 introduced the term composite "dilated odontom". However, this term was not completely correct because certain invaginated teeth, especially those with a lesser degree of invagination that appear most commonly, do not possess any crown dilatation.

Swanson & McCarty (1947) first described bilateral invagination as a very rare occurrence while Atkinson (1943) and Rabinovich (1949) determined invagination as a predominantly bilateral occurrence.

In 1953, Hallet introduced the term *"dens invaginatus"*, which remains the most commonly used name for this anomaly in current literature. In 1970 Pindborg gave a detailed anomaly description and accepted Hallet's term dens invaginatus as the most appropriate.

Several different classifications of enamel invaginations exist:

Kitchin divides enamel invagination into two classes:

- Coronary invagination.
- Radicular invagination.

Oehlers divides it into three classes:

- Invagination is expressed in lesser form. Enamel coats the recess that does not pass the enamel-cement junction and is limited to the dental crown.
- Invagination is coated by enamel, penetrates in the form of a sack into the root. Communication with the pulp is possible.
- Invagination penetrates through the root and drives out apically onto the foramen or laterally. Usually, there is no communication with the pulp (1-3).

Ulmansky and Hermel also divide it into three classes:

- Teeth that do not have recess fossa lingualis.
- Teeth with deep fossa lingualis.
- Teeth with primary or expressed dens in dente (4).

Hallet presented classification based on X-ray findings:

- Fissure exists on the enamel level on the palatal side at the cervical level. Fissure spreads vertically and there is no deformation or dilatation.
- Invagination spreads deep towards the pulp chamber and at the cingulum level, there is an indentation.
- Invagination spreads deep towards the pulp chamber. It can extend under the enamel-cement junction. Pulp chamber surrounds the invagination with the entire circumference excluding the cingulum opening level. Invagination covers the enamel layer almost entirely, sometimes excluding the deepest part where enamel defects may be present.
- Invagination takes up the entire coronary pulp and extends in depth towards the apex.

Later Monteil and Knoche divided Hallet' s 4th class into two subgroups. In the subgroup 4a invagination communicates directly with the pulp, while in 4b it extends deep without communication with the pulp, but communication with periapex is possible (5).

Particularly important is the detection of an invaginated tooth early enough for prophylaxis or other appropriate treatment, in order to prevent later complications such as pulp necrosis, periapical infection and cyst formation as the most extreme form. During routine inspections special attention should be given to incisives that have deeper lingual fossas and marked cingulum

Discussion

As a developmental anomaly invagination can be encountered in all permanent teeth, most often in the permanent upper lateral incisor. Epidemiological research shows this anomaly has incidence of 0, 04 – 10% of cases. Aside from the lateral incisors, it can affect central incisors, premolars and canines in the upper jaw. Anomaly rarely appears in the lower jaw.

Occurrence of invagination should be expected if any other developmental anomaly is already present, such as surplus teeth or partial anodontics, because dental anomalies and malformations often appear in groups.

If there is a clinical confirmation of the existence of enamel invagination, the class needs to be determined, based on clinical findings and X-ray analysis. If the finding is Hallet's class I and II, prophylaxis will be sufficient, encompassing the closing of fossas at the place where the invagination passes the gingival margin during eruption or immediately after tooth emergence. It is desirable to conduct minimal fossa preparation in the cingulum area at the palatal enamel depth and fill it with composite material. This will stop the passage of any harmful agents through the invagination opening towards the pulp of the affected tooth (6-9).

In the case of complicated invaginations (Hallet, class III & IV), X-ray analysis and clinical findings with corresponding symptoms will determine the type of therapy to be performed. Lately, endodontic therapy is preferred (10-13).

More than half of the enamel invagination cases belong to class I & II according to Hallet. In this type of invagination, vitality of the pulp is not threatened. Development of caries process in the invagination immediately after the tooth eruption or later will depend on the individual predisposition for caries. However, caries will always eventually appear in the invagination since it is an ideal retention place for plaque accumulation and cariogenic microorganism activity.

In the case of class IV invagination the finding is always necrotic pulp with more or less expressed periapical lesion.

The problem of spontaneous endodontic tissue necrosis was researched by Kramer in 1953. He noticed spontaneous necrosis was always preceded by the formation of an abscess in the pulpal tissue. Necrosis of the entire tissue starts soon after abscess formation. Kramer listed three ways of microorganism penetration from the oral cavity into the endodontic tissue:

- Relationship exists between the pulp horns and invagination.
- Dentinal defect between the deepest part of the invagination and the pulp
- Enamel defect that encompasses the deepest part of the invagination.

The third possibility is today accepted as the most realistic. The rate of the pulp tissue necrosis is dependant on the size of the structural defect of the enamel. Usually, necrosis of the pulp tissue occurs before the formation of the apical root section, resulting in rapid infection spreading periapically and into the surroundings. The entire process lasts for several years after the eruption of the tooth with enamel invagination.

Dens invaginatus class III & IV anomaly is diagnosed accidentally during clinical and X-ray examination, or after manifestation of complications in the form of acute dentoalveolar abscess or fistula.

In the treatment of teeth with class III or IV invagination where spontaneous necrosis arises, as well as complications in the periapical tissue, contemporary endodontic literature offers three possibilities:

- Endodontic treatment.
- Endodontic surgical treatment.
- Intentional replantation after the endodontic and surgical treatment outside the alveoli (14-17).

If none of the mentioned procedures ensures success, extraction is necessary.

In the case of invagination of enamel and dentin at the palatal surface of the permanent incisors, when spontaneous necrosis occurs as well as consequent periapical complications, it is necessary to attempt endodontic treatment. If it is a case of periapical complications in the form of a cystic process surgical treatment is recommended with the retrograde filling of the root canal (18,19).

In teeth with invagination at the palatal surface where root growth is not finished, the process of apexification should be undertaken after the removal of invaginated structures from the root canal. Temporary filling, calcium hydroxide paste, is placed in the root canal to help root growth and achieve apical closing. After which the root canal is definitely filled with lateral condensation technique or thermoplastic technique (20,21).

Success of the endodontic treatment will depend on the correct case selection, degree of invagination, possibility for removal of the invaginated structure, cleaning, widening and correct filling of the endodontic space.

Case Report

A twenty year old patient came to the Department of Dental Pathology, School of Dental Medicine, Zagreb, because of pain in the upper right central incisor area. Clinical examination determined palatal protuberation and Y shape of the palatal tooth surface with three visible foramen (Figure 1).

X-ray findings showed visible class III invagination according to Oehlers, with periapical communication and an extensive diffuse periapical process (Figure 2). Endodontic treatment

was undertaken with simultaneous widening of each invagination opening and central space between them formed by double invagination (Figures 3, 4). The distal root canal was C shaped, while the mesial was more oval (Figure 5). Intracanal instrumentation was performed using "step back" technique (Figures 6, 7). Working length of the root canal was checked using electronic device Endometer ES- 03 (Artronic, Croatia) (Figures 8, 9). Root canal was filled using the technique of lateral condensation and the central space using termafill technique. An X-ray shot was made which showed complete sealing of all spaces (Figure 10). The crown was esthetically reconstructed with composite resins (Figures 11, 12). Follow-up was done after 1, 3 and 6 months when reduction of the periapical pathological process was noticed, with absence of clinical symptoms.igure description: