Dens in Dente Associated with Radicular Cyst

—Report of a Case—

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The dens in dente first reported by Tomes in 1859 is also known as dens invaginatus, deep foramen Caecum, and dilated composite odontoma¹⁾. The etiological factor has been reported to be a developmental anomaly in the normal growth of the dental papilla of a tooth^{2~4)}.

Cases of dens in dente are not necessarily rare. Ferguson et al. (1980)⁵⁾ reported incidents ranging from 0.25% to 10% in their radiographic surveys. The maxillary lateral incisors are the most frequent site of occurrence, followed by the central incisor, premolars, canines, and molars in descending order. Incidents in the mandibular teeth are considered rare⁶⁾.

In dens in dente even without invaginatus or caries, pulp infection occurs and apical periodontitis or periapical abscess is formed^{2, 7~15)}.

In treating a case of dens in dente found in advance by the family dentist, preventive filling of the entrance to the invaginated site with a restorative material such as amalgam or composite resin is necessary^{15~17)}. Generally, the patient visits his family dentist, in most cases, after pulpitis, periapical lesion, or gingival abscess occurs.

When cure can be expected to be achieved by conservative endodontic therapy, this method should be used. Many dentists have reported that the preventive endodontic therapy was very successful^{18~20)}. However, treatment of the case with an incompletely formed root is most difficult and the preventive endodontic therapy is not the procedure to be chosen⁵⁾.

When the invaginated structure is completely removed and the root canal is successfully negotiated, the apexification technique is said to be effective⁵⁾.

Many of the patients visiting an oral surgeon are likely to have associated periostitis, cellulitis, or gingival abscess, and also have an apical lesion of different degrees.

Recently, a case of dens in dente with a radicular cyst was encountered.

CASE REPORT

A well-developed, well-nourished, 13-year-old Japanese boy was referred to Kyushu

Dental College Hospital on July 22, 1980, with chief complaint of swelling and pain in the left side of the upper lip. He had been under treatment by his family dentist. He had received medication with resulting remission of the swelling and pain. However, the swelling and pain in the buccal fold increased and he was referred to our Maxillofacial Surgery for evaluation.

Examination

Clinical findings ;

All of the teeth present were in excellent alignment. The occlusal type was Class I. The swelling was diffuse and extended from the gingivolabial folds of the left maxillary lateral incisor and canine to the left upper lip (Fig. 1). The palatal mucosa and other mucosa were normal, and no pathological manifestations were observed. These left maxillary lateral incisor and canine were sensitive to percussion pain and the lateral incisor was conical in the external feature. The entrance to the invaginated cavity was macroscopically detected.

Roentgenologic findings ;

On periapical radiograph, the left maxillary lateral incisor demonstrated as an immature tooth containing a tooth-like structure within its canal and a radiolucent area surrounding its open root apex (Fig. 2). Clinical diagnosis was made of the gingival abscess and of the radicular cyst associated with the anomalous crown of the left maxillary lateral incisor. Generally, the patient was in excellent physical condition and had no complaints.

Fig. 1 Clinical photograph showing conical shape of left maxillary lateral incisor and swelling of gingiva.

Fig. 2 Periapical radiograph of left maxillary lateral incisor showing dens in dente and periapical radiolucency.

Treatment

The patient was administered antibiotics (Acetylspiramycin, 400mg, three times a day) and antiphlogistic drugs (Ananase, 2 tablets, three times a day). By the 7th day after medication the swelling and spontaneous pain gradually decreased and discomfort was absent. Vitality testing of the teeth with an electric pulp tester (Ritter Equipment Company) showed non-vitality of the maxillary lateral incisor.

Local anesthesia with 2% Xylocain was performed and the gingival mucosa of the left maxillary central incisor and canine were sectionally incised. The mucoperiosteal flap was reflected and portion of the labial cortex of the root apex of the exposed left maxillary lateral incisor was removed. The radicular cyst was enucleated together with left maxillary lateral incisor (Fig. 3). The mucoperiosteal flap was reapproximated with 4-0 silk black braided interrupted interdental sutures.

Fig. 3 Photograph showing enucleated tooth with periapical lesion.

Histopathological examination

Decalcified longitudinal sections of the specimen showed typical findings of coronal type dens in dente which is postulated to be formed by invagination of part of the crown tip. The dental pulp was in total necrosis and the apical foramen was wide open. The root apex was associated with a radicular cyst (Fig. 4). Since the specimen was prepared into decalcified sections, enamel was hardly observed. A foramen caecum was observed at the incisal portion and invagination was in the form of a U-shape cavity directed toward the root apex. At the bottom of the cavity which was formed of inner dentin were remains of enamel matrix, bacterial plaque-like substance, and a tissue mass of cementoid or osteoid (Fig. 5). Dentin tubules like those in outer dentin were observed in the invaginated inner dentin. However, on the whole periphery, numerous large and small pores and small defect were seen. At the bottom of the cavity where inner dentin invaginated, the dental wall was extremely thin in part and a groove formation like an inlet was observed at this site. However, the groove was not communicated with the pulp cavity. Because of this large invaginated structure, the coronal pulp cavity appeared as if it had two very long pulp horns. In the inner side of outer dentin near the cervical region, an adherent true denticle was observed (Fig. 6). The root apex was incompletely formed and wide open, and root resorption was seen in part. A radicular cyst was formed in the root portion

Fig. 4 Longitudinal section (decalcified) of the specimen.

FC : Foramen Caecum ID : Inner Dentin
OD : Outer Dentin PC : Pulp Chamber
CW : Cyst Wall

Fig. 5 Photomicrograph showing top of invagination

Inner dentin contained many porous defects and tissue inclusion. Other sections showed narrow grooves but not perforated at the top of inner dentin.

EM : Enamel Matrix
ID : Inner Dentin (Arrow ; defect or tissue inclusion)
COT : Cementoid or Osteoid Tissue
(Hematoxylin and Eosin stain. $\times 50$)

Fig. 6 Photomicrograph showing inner and outer dentin walls.

IC : Inner Cavity ID : Inner Dentin
OD : Outer Dentin PC : Pulp Chamber
D : Denticle (True and adherent type)

(Hematoxylin and Eosin stain. Magnification, $\times 50$)

Fig. 7 Photomicrograph of root apical lesion radicular cyst.

RP : Root Pulp (Pulp Gangrene)
RA : Root Apex (incompletely formed and resorpted)
CW : Cyst Wall (inflammatory proliferated epithelium)
CC : Cyst Cavity

(Hematoxylin and Eosin stain, $\times 50$)

and fistular development was observed (Fig. 7).

DISCUSSION

As anomalies of teeth, concrescent teeth, fused teeth, geminated teeth, enamel drop, and dens in dente, etc., have been reported²¹⁾. However, dens in dente is not a rare anomaly at all. Ferguson *et al.* (1980)⁵⁾ reported incidents of 0.25% to 10% in their radiographic surveys. In other reports, Itakura (1938)²²⁾ reported 0.27%, Itoh (1939)²³⁾ 0.01%, Ulmanky *et al.* (1964)¹²⁾ 2%, and Poyton *et al.* (1966)²⁴⁾ 0.25%. The frequency of incidences appears to be quite low.

This anomaly most frequently occurs in the maxillary lateral incisor, but it has also been noted in the maxillary incisor, first premolar, and cuspid. This anomaly is rarely observed in the mandibular teeth, in the primary dentition, bilaterally, or in supernumerary teeth^{21, 25)}. The dens in dente is an anomaly in the development of the teeth in which an enamel-lined invagination within a tooth is produced.

With regard to the etiologic factor, Busch (1897)²⁶⁾ advocated two tooth-germ theory and Moral (1918)²⁷⁾ one tooth-germ theory. Moral's theory has found many supporters such as Hunter (1951)²⁸⁾, Munro (1952)²⁹⁾, Fujita (1965)³⁰⁾, Onodera (1971)⁷⁾, and Ishikawa (1980)²¹⁾. His theory has become the accepted one today.

As to the classification site of dens in dente, Poyton *et al.* (1966)²⁴⁾ classified it by invagination site into coronal type, radicular type, and combination coronal and radicular type. Although other classifications by Oehlers *et al.* (1957)²⁾ and Ulmanky *et al.* (1964)¹²⁾ are also seen, dens in dente is generally described as coronal type or radicular type according to the site of the foramen caecum at invagination.

In Japan, Onodera (1971)⁷⁾ modified the classification by Oehlers *et al.* (1957)²⁾ by incorporating his views and classified it into four types.

Our case coincides with true dens in dente by Ulmanky *et al.* (1964)¹²⁾, radicular type by Poyton *et al.* (1966)²⁴⁾, and Type II by Onodera (1971)⁷⁾. Our case may be said to be relatively frequent type among various dens in dente.

Toto (1953)³¹⁾ reported a case of the lateral incisor with a radicular cyst and Stafne (1958)³²⁾ a case of dens in dente with a radicular cyst. The views of these proponents on the relation between dens in dents and a radicular cyst have been summarized by us as follows :

First of all, invagination reaches the root apex and second apical foramen forms. Consequently, there occur periapical lesion resulting from infection of the apical periodontium, or pulpitis and periapical lesion, and furthermore pulp death and periapical lesion caused by its decomposed substance and toxic substance.

What is interesting is that many of these reporters recognized the presence of periapical lesion but did not observe dentin caries. If dentin caries is present, there should be a perforation or a channel (second apical foramen) somewhere in inner dentin, suggestive of exposed pulp.

In our case also, microscopic examinations did not reveal definite dentin caries or channels. However, the formation of the apical lesion did not lack substantiation, namely (1) foramen caecum was recognized, (2) bacterial plaque-like substance was found in the cavity formed by invagination, (3) on the dental wall at the top of invagination (at the bottom of inner dentin), covering by enamel was unclear, (4) inner dentin wall was porous and dentin was thin in part, and a groove-like inlet was recognized. However, a direct passage which connects the pulp cavity with invagination could not be found.

Based on these findings, although the possibility of infection of exposed pulp, through exposed dentin or directly, cannot be negated completely, it is considered reasonable to postulate that infection originating in the oral environment spreads to the dental pulp and further to the periapical tissue.

CONCLUSION

A case of dens in dente with a radicular cyst in the left maxillary lateral incisor in a 13-year-old boy was encountered. Based on the clinical and radiographic findings, the conservative treatment was judged not possible, and it was surgically removed together with the radicular cyst.

An attempt was made to clarify the formation mechanism from the pathological examination. It was considered that the formation of foramen caecum by invagination and pulp infection through inner dentin with defective structure occur first. Pulp necrosis, spread of infection to the apical periodontium, and the formation of a radicular cyst were postulated to follow.

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歯根嚢胞を伴った歯内歯の1例

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歯内歯の病因については、歯乳頭の発育過程における形成異常とされている。歯内歯は決して稀れなものではなく、X線検査で見い出されることも、しばしばである。また、口腔外科を受診する患者の多くは骨膜炎、蜂窩織炎、歯肉膿瘍、根尖病巣などを合併していることが多い。歯内歯の発現部位は上顎の側切歯が最も多く、次

いで、中切歯、小臼歯、大臼歯の順で、下顎では稀れとされている。

最近、私達は13歳、男子で、上顎左側切歯に、歯根嚢胞をともなった歯内歯の1例を経験した。病理組織学的な所見から盲孔の形成、歯髓感染、歯髓壊死が起り、次いで歯根嚢胞が形成されたものと推測した。