Histopathological Studies of Four Cases of Dilated Odontoma

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The characteristics of four cases of dilated odontoma were studied using thinly sliced decalcified sections and non-decalcified ground sections. Histological features common to the lesions in all four cases included an outer layer of cementum which enclosed a layer of dentin. Enamel was found within the dentin layer. The proliferation of irregular, calcified tissue with no distinct tissue structure was seen at the center of the lesion. This tissue was apparently derived primarily from dentin and partially from enamel. Dilated odontoma is considered to be a lesion positioned between dens invaginatus and complex odontoma.

Key words: dilated odontoma, dens invaginatus, complex odontoma

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Introduction

The term "dilated odontoma" is generally not used as a current disease classification. In the past, however, dilated odontoma was included in the classification of odontoma (1) proposed by the British Dental Association in 1914 and as a subclassification of odontomas in the odontogenic tumor classification proposed by the American Academy of Oral Pathology in 1950 (2).

The characteristics of dilated odontoma have been described in detail by Rushton (3). However, in recent years, there have been few reports of this entity, and its current status is unknown. We therefore studied decalcified thinly sliced preparations and microradiographs of non-decalcified ground preparations of dilated odontomas that were resected from patients.

Materials and Methods

Dilated odontomas were resected from four patients. The tissue of each lesion was divided into two approximately equal portions. One half was decalcified and thinly sliced; the other half was prepared into non-decalcified ground sections. The decalcified sections were decalcified according to conventional methods, embedded in paraffin, thinly sliced, and stained with hematoxylin-eosin stain (HE stain), van Gieson's stain, silver impregnation, PAS reaction, and Alcian blue stain. The non-decalcified ground sections were prepared by first embedding the tissue in polyester resin; ground sections, about 50 μ in thickness, were then prepared. Microradiographs were taken of the preparations.

Results

Case 1

The patient was a 60-year-old man. The lesion was located near the left mandibular third molar. Radiographic examination revealed a clearly demarcated, relatively uniform, radiopaque area (Fig. 1).

Fig. 1: Case 1. Part of panorama radiograph at presentation.

Histopathological findings: Microradiographs of non-decalcified ground sections of the resected tissue disclosed a tooth that was apparently the left mandibular third molar. A mass of tumor tissue was seen at its side. The outer layer of the lesion was composed of cementum, primarily of cellular cementum. Inside this layer was dentin, which similarly enclosed a layer of highly calcified enamel. A proliferation of irregular calcified tissue was seen at the center of the lesion (Fig. 2). The degree of calcification of this irregular calcified tissue was equivalent to, or higher than, that of dentin (Fig. 3). On decalcified sections stained with HE stain, the central

Fig.2:Case 1. Overview of a microradiograph of a non-decalcified section. c:cementum

Fig.3:Case 1. The irregular calcified tissue at the center of the lesion under high magnification. e:enamel d:dentin ic:irregular calcified tissue

Fig.4:Case 1. Overview of a decalcified section stained with HE stain. e:enamel matrix d:dentin c:cementum ic:irregular calcified tissue

region, stained primarily with eosin, consisted of a dense unstructured region and a filamentously structured region (Fig.4). Between these regions, there were scattered areas which stained yellow with van Gieson's stain. There were no cells in this region.

The proliferation of enamel had a low degree of calcification in some areas, which distinctly showed enamel rods. In the dentin, there were no signs of an irregular arrangement of the dentinal tubules or a remarkable decrease in their number.

Fig.5:Case 2. Overview of a microradiograph of a non-decalcified section.

Fig.6:Case 2. Overview of a decalcified section stained with HE stain. dc:dental caries

Fig.7:Case 2. The irregular calcified tissue at the center of the lesion under high magnification of a decalcified section stained with HE stain. e:enamel matrix d:dentin ic:irregular calcified tissue

Case 2

The patient was a 30-year-old man. The lesion was situated at the right mandibular first molar.

A microradiograph of non-decalcified ground preparation revealed the tooth root of the mandibular first molar. A proliferation of tumor tissue was noted beside the root. Irregular calcified tissue was seen at the center of this lesion. The calcification degree of this calcified tissue was equivalent to, or higher than, that of dentin (Fig.5). On decalcified sections stained with HE (Fig.6), the presence of pulp-like tissue of the first molar and caries-in-

duced destruction of the dentin was confirmed. The irregular calcified tissue in the center of this lesion stained mainly with eosin; this tissue was composed of a filamentous matrix which was relatively dense in some areas and sparse in others (Fig. 7). Intervening between these matrices were several round areas which stained yellow with van Gieson's stain.

In this patient, there was minimal proliferation of enamel, but the enamel that was present showed a low degree of calcification in some areas, which displayed distinct signs of enamel rods. Remarkable signs of interglobular dentin were seen in part of the dentin. There was no evidence of a marked decrease in the number of dentinal tubules or an irregular arrangement of these tubules.

Case 3

The patient was a 49-year-old woman. The lesion was located near the right maxillary third molar.

Microradiograph of a non-decalcified ground section showed a tooth regarded to be a maxillary third molar. A proliferation of tumor tissue was seen beside this tooth. Irregular proliferation and invagination of enamel was present (Fig. 8). There was minimal proliferation of irregular calcified tissue at the center of this lesion. However, the lesion was characterized by the presence of a small amount of osseous tissue.

The proliferation of enamel showed no signs of uniform calcification; an area of low calcification was present. There was no evidence of an irregular arrangement of the dentinal tubules or of a decrease in their number.

Fig. 8: Case 3. Overview of a microradiograph of a non-decalcified section.

Case 4

The patient was a 32-year-old woman. The lesion was located in the right maxillary molar region. Radiographic examination revealed a localized radiopaque area at 7] (Fig. 9). Several years previously, 6] had been extracted.

An overview of decalcified sections stained with HE stain (Fig. 10) and of microradiograph of non-decalcified section (Fig. 11) showed the presence of 7]; a proliferation of tumor tissue was seen at its lateral aspect. Small amounts of cellular cementum, dentin, and enamel were

Fig. 9: Case 4. A panorama radiograph at presentation.

Fig. 10: Case 4. Overview of a decalcified section stained with HE stain. ic: irregular calcified tissue

Fig. 11: Case 4. Overview of a microradiograph of a non-decalcified section; a composite of two microradiographs. ic: irregular calcified tissue

seen in the tumor tissue in contact with 7], but the tumor tissue consisted mainly of a proliferation of irregular calcified tissue. In most regions, the degree of calcification of this irregular calcified tissue was higher than that of enamel.

In decalcified sections stained with HE stain, some regions had a relatively dense and unstructured matrix and were stained with eosin, while other regions had a fine filamentous structure and were stained lightly with hematoxylin alone (Fig. 12).

Overall, in Cases 1 to 4, there were no signs of ameloblasts or odontoblasts around the irregular calcified tissue or around adjacent areas of enamel or dentin.

Fig.12:Case 4. The irregular calcified tissue at the center of the lesion under high magnification of a decalcified section stained with HE stain.

Discussion

Although the term "dilated odontoma" is no longer generally used, it was included in the classification of odontoma proposed by the British Dental Association in 1914, as stated above. The term "odontoma" in this context is actually a classification that encompasses all odontogenic tumors. The classification "composite odontomes", which is a more limited definition of odontoma, is divided into complex composite odontomes, compound composite odontomes, geminate composite odontomes, gestant composite odontomes, enamel nodules, and dilated composite odontomes(1).

In the classification of odontogenic tumors proposed by the American Academy of Oral Pathology in 1950, the term "odontoma" included geminated odontoma, compound odontoma, complex odontoma, dilated odontoma, and cystic odontoma (2). However, there have been virtually no reports of dilated odontoma in recent years. The reasons for this are unknown; an extremely low incidence of this lesion or its inclusion under a different category in current classification may be involved(4), but this is speculative.

Rushton has issued a detailed report on dilated odontomas(3). He divided dilated odontomas occurring from the anterior tooth to the molar region into five categories, which were further divided into a total of 13 subcategories. Five categories were as follows: 1) There is a short invagination of the crown of a tooth not of a molar type. 2) There is complete invagination through a similar tooth. 3) An invagination through the crown of a similar tooth has burst out at one side of the dentine papilla. 4) There is an occlusal invagination in a molar tooth. 5) The invagination is presumed to start in Hertwig's sheath. This classification encompassed lesions showing mild invagination at the anterior teeth, which should be referred to as "dens invaginatus", as well as true odontomas, similar to the ones seen in our patients. Oehlers(5) considered it inappropriate to refer to mildly invaginated teeth as "dilated odontoma" for the following reason: "The term dilated composite odontome itself cannot be considered as satisfactory because several

invaginated teeth, including those with minor invaginations, which constitute the largest group, show no dilatation of crown or root whatsoever". Thus, dilated odontoma were considered to include various types of invaginated teeth.

The lesion in our patient was considered to belong to categories 5a and 5b in Rushton's classification(3). Lesions of this category are regarded to be caused by invagination arising from Hertwig's sheath. However, such lesions do not arise from simple invagination alone; in addition, there is a distinct proliferation of odontogenic tissue, adhering to the apex or lateral aspect of the root of a normal tooth. Consequently, dilated odontoma should be differentiated from dens invaginatus.

When compared with complex odontoma, the hard tissue in dilated odontoma formation appears to be less irregular. This point was also addressed by Rushton, who contrasted complex composite odontome with dilated odontoma and stated that the behavior of the proliferation of dilated odontoma is modified by the greater age of the epithelium and by the presence of the relatively normal and mature remainder of a tooth germ(3).

On the basis of this opinion, we considered dilated odontoma to be positioned between dens invaginatus and complex odontoma.

There was no evidence of cells such as ameloblasts, odontoblasts, or ghost cells around the irregular calcified tissue at the center of the lesion. This calcified tissue was unlike the dysplastic dentin or dysplastic enamel seen in compound odontoma or complex odontoma, and its origin could not be determined on the basis of tissue structure. However, this irregular calcified tissue was considered to be derived primarily from dentin and partially from enamel because of the location of the lesion; the degree of calcification was comparable to or greater than that of dentin, most of the lesion was stained red, and the remaining part was stained yellow with van Gieson's stain.

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