Electron Microscopic Aspects of Teeth taken from the Ovarian Dermoid Cysts

by

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1. Introduction

The ovarian dermoid cyst, the most common teratoma of the ovary, is generally regarded as accounting for 10 to 20% of the tumors in the ovarian region. The most susceptible age bracket is said to be in 20 to 30 years.

In terms of its appearance and structure, this cystic tumor is filled with oily substance secreted from the sebaceous glands that are distributed on the skin linings covering the innermost wall. At one point in the lining of the cyst, node or thumb-like projection usually called the nipple or tubercle is present in most cases. The stratified squamous epithelium, hair follicles, sebaceous as well as sweat glands cover this point and its neighboring areas. On the other hand, the areas opposite to these are covered with the flattened squamous epithelium and usually lack in hair, glands, etc.

The core of this nipple consists of a characteristic mixture of heterotopic tissues, where ectodermal or one germinal layer is usually attested to. Occasionally two or three layers are found there. Embryologically, skins, accessory apparatuses, salivary glands, pigmented retinal cells, teeth, etc. are formed from the ectoderm, while cellular connective tissues, bone and cartilages are formed from the mesodermal tissues. In some cases, besides, those tissues belonging to the entoderm are also formed.

The tooth, taken from this ovarian dermoid cyst, resembles an ordinary oral tooth in respect of macroscopic appearance, color and lustre, optical microscopic structure and hardness, and for these reasons, it has been subjected to scholarly attention in the dental field.

In the present report, the author is concerned with some interesting findings of the ovarian cystic teeth that were studied electron microscopically.

2. Materials and Method

2.1 Materials.

7 teeth which were taken from 3 cases of ovarian dermoid cysts were surgically removed (36, 35 and 23 years of age). These materials were placed at the disposal of the author by the Faculty of Medicine, the University of Tokyo. All the 3 cases were found to possess skins, hair and incisors, premolars and molars resembling the permanent or deciduous teeth in the cysts. The presence of bones and cartilages was also attested to.
Prior to removal, the cysts and their contents were thoroughly fixed in a 10% solution of formalin. The teeth were then separated from the rest of cystic contents and put to observations of enamel, dentin and cementum by the following method.

2.3 Observation method.

Except for an observation of the natural surface of enamel, part of enamel, dentin and cementum was abraded by a whet-stone. The abraded surface was exposed to 3-second etching in a 0.25% solution of hydrochloric acid. As for the natural surface of enamel, a film replica was prepared with no treatment of HCl etching. For the replica preparation, acetylcellulose film was used with methyl acetate as a solvent. After the replica was prepared, carbon was evaporated to the replica surface at a right angle and, then, a chromium shadowing was effected on that surface.

3. Findings

3.1 Enamel surface.

Scale-like somewhat raised enamel rod ends and interrod substance among them in somewhat depressed fashion are observed. Regardless of rods or interrod substance, masses of amorphous calcium rich in suspected organic matters densely cover these spots (Fig. 1).

3.2 Enamel subsurface.

Here, crystals of apparent apatite are hardly found. As in Fig. 1, amorphous masses, large and small, are densely present (Fig. 2). Since these masses are not acidly destroyed, they seem to possess a high degree of acid resistancy.

3.3 Deeper insides of enamel.

In place much deeper than enamel subsurface, crystals which suggest apatite morphologically are not found. Again amorphous masses, large and small, are found here and there raised in diffuse enamel.

The enamel rods run vertically in Fig. 3, while they are crosswise in Fig. 4, the arrangements being somewhat snaky in both. Some of the rods fail to make a continuous run; both figures reveal one rod which comes to an abrupt end respectively.

From the figures, it can be also known that these amorphous masses form an organic connection with rods or interrod substance. From these findings, it may be assumed that the amorphous masses are made up of suspected carbonate rich in organic materials.

3.4 Dentin.

Dentin is imperfectly formed; dentin matrix and dentinal tubules are everywhere imperfectly diffused.

The matrix is found to be full of large and small scar-like depressions distributed densely. The arrangements and structures of tubules are irregular and while tubules definitely exist in dentin, an impression at a first glance is that they are non-existent (Fig. 5).

Fig. 6 gives a fairly clear view of 3 tubular cross sections. Collagenous fibers are
also imperfectly formed and therefore, their characteristic cross striations are scarcely found.

3.5 Cementum.

Cementum of the ovarian cystic teeth resembles that of orally derived teeth. Fig. 7 reveals numerous cementum lacunae and canaliculi originating from them. In Fig. 8, these canaliculi are clearly observed to spread from the cementum lacunae as if radiating.

Like the dentin matrix, matrix of cementum is also imperfect in its formation with attendant imperfect formation of collagenous fibers. Cross-striations characteristic of the collagenous fibers are not observable.

4. Summary

1. Teeth taken from the ovarian dermoid cyst resemble those of the oral derivation in respect of macroscopic morphology, lustre, hardness and optical microscopic findings.

   However, when studied under the electron microscope the following interesting features are revealed.

2. Enamel is imperfectly formed and, for this reason, apatite crystals which form an important and principal constituent of enamel cannot be morphologically ascertainable.

   Masses of amorphous calcium that are raised and smooth in outer appearance are found diffusely here and there in enamel.

3. Dentin is also structurally imperfect. The imperfectly formed matrix and tubules give characteristically imperfect images.

4. Because of defective formation of dentin and cementum, the collagenous fibers are found to lack cross striations that are characteristic of them.
Explanation of electron micrographs

Fig. 1 A natural surface of tooth enamel taken from an ovarian dermoid cyst. There are found dense amorphous materials which are raised on a diffuse enamel.

Fig. 2 A subsurface enamel of tooth extirpated from ovarian dermoid cyst. As in Fig. 1, amorphous matters are diffusely present.

Figs. 3 and 4 An enamel inside, much deeper than enamel subsurface, of an ovarian cystic tooth. Respectively in both pictures, is there found an abruption of a longitudinal rod. Amorphous small masses of calcium exist densely in a raised manner.

Figs. 5 and 6 A dentin finding of ovarian cystic tooth. Defective scar-like depressions of various irregular shapes are detected there. In Fig. 5, an impression at a first glance is that dentinal tubules are non-existent, though they definitely exist there. Additionally to the characteristic defects of diffuse dentin, 3 cross-sections of malformed dentinal tubules are seen in Fig. 6.

Figs. 7 and 8 Cementum structures of an ovarian cystic tooth. The photos display numerous cementum lacunae and canaliculi radiating from them. Fig. 8 is the magnification of lacunae and canaliculi. Like the dentin, cementum matrix is also incomplete in its formation with the lack of cross-striations characteristic of the collagenous fibers.