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## Microradiography in the differentiation and definite diagnosis of odontomas

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### Abstract

The present study evaluated the usefulness of microradiography in differentiating and making a definite diagnosis of odontomas. A surgically removed odontoma from a 14-year-old girl was used here. The specimen was sectioned at approximately 100 $\mu$ m thickness and ground to 50 $\mu$ m. Microradiographic images were obtained using soft X-ray equipment (Sofron, Japan) under the conditions of : tube voltage, 10kVp ; tube current, 5mA ; FSD 7.5cm ; and exposure time, 20min. The images were evaluated by comparing to images obtained by histological procedures. The results showed that the microradiographic images had almost the same resolution as that of the microscopic images.

**Key words :** Microradiography, complex odontoma, compound odontoma, differential diagnosis, definite diagnosis

### Introduction

Odontomas are hamartomas of odontogenic tissues that demonstrate various states of histodifferentiation and morphodifferentiation of dental tissue such as enamel, dentin, cementum, and sometimes pulp<sup>1)</sup>. One level of differentiation distinguishes two types of odontoma, compound and complex odontomas<sup>2,3)</sup>. Radiographically<sup>4,5)</sup>, both kinds of odontoma appear as clearly outlined dense radiopaque lesions surrounded by a thin radiolucent zone. In the compound type, there may be crudely formed teeth of varying sizes and shapes.

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The radiopacity of the complex type does not show a specific shape but appears as an ill-organized irregular mass. There are the transitional types with varying degrees of morphodifferentiation and/or histodifferentiation, and it is often difficult to discriminate the two types of odontoma by clinical radiography<sup>6)</sup>. Where discrimination is difficult, differentiation and/or definite diagnoses have preferentially been made by histological examination<sup>1,2,7,8)</sup>, although radiographic procedure, microradiography, is also useful to establish a diagnoses. There are no reports which compare the usefulness of microradiography in the diagnoses of odontomas with diagnosis by microscopy.

The study here was carried out to evaluate the usefulness of microradiography in differentiating these two types of odontoma and to establish definite diagnoses.

### Materials and methods

The odontoma offered to this study was surgically removed from a 14-year-old girl. The radiographic features of the lesion were similar to those of an osteoma (Fig. 1). The outer surface of the surgically removed specimen was slightly lobular and showed an ovoid-shaped conglomeratic solid feature with a rugged outward appearance and mottled enamel-like structures (Fig. 2-A). The soft X-ray radiograph obtained from the specimen demonstrated radially arranged radiopaque spicules spreading peripherally from the central region of the lesion (Fig. 2-B). The specimen was dehydrated in an ascending series of alcohol rinses and was sectioned at about 100 $\mu$ m thicknesses, and, further, ground to 50 $\mu$ m thickness, and used in the microradiographic and histological examination.

The microradiographs were taken under the following conditions : tube voltage, 10kVp ; tube current, 5mA ; FSD, 7.5cm ; and exposure time, 20minutes. Low ( $\times 10$ ) and high ( $\times 40$ , and  $\times 100$ ) magnification images were obtained to assist in defining the lesion as a compound or a complex odontoma. After making microradiographs, the same slides were stained by hematoxylin and eosin. Low ( $\times 10$ ) and high ( $\times 40$ ) magnification microscopic images were also obtained. The microradiographic images and microscopic images were compared and evaluated.

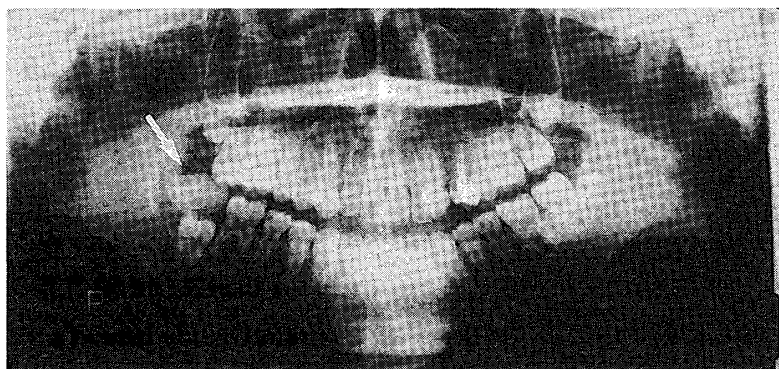


Fig. 1 Radiographic image of the lesion showing an oval-shaped radiopaque mass in the right mandible of the patient.

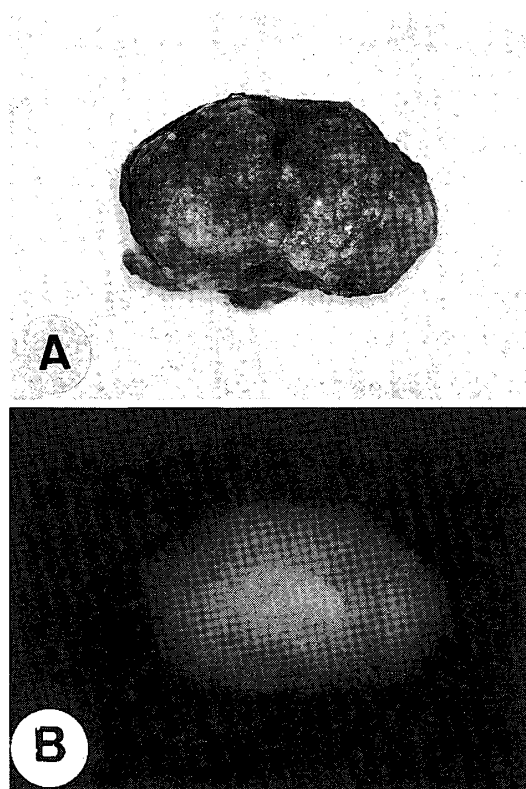


Fig. 2 Visual image (A) and soft X-ray radiograph (B) obtained from the surgically removed specimen.

## Results

The Low ( $\times 10$ ) magnification microradiograph in Fig. 3 was obtained from a ground section of the surgically removed specimen, and showed an ill-organized structure with irregularly arranged enamel, dentin, and cementum. Dentin was present in large quantities and formed the bulk of the tumor, whereas there was only small quantities of enamel and cementum. The peripheral region of the section had numerous immature toothlike structures, arranged radially toward the peripheral direction from the central region, where a large malformed toothlike structure was observed. The peripheral toothlike structures did not show well-differentiated and complete enamel tissue, and consisted of dentin and dental pulp space. One of the high ( $\times 40$ ) magnification microradiographs (Fig. 4-A) obtained from the same section showed ill-organized and irregularly arranged enamel, dentin, cementum, and pulp spaces. Another high ( $\times 100$ ) magnification microradiograph (Fig. 4-B) demonstrated dentinal tubules forming regular radiolucent lines overlapping the interglobular dentin areas.

The Low ( $\times 10$ ) magnification microscopic images (Fig. 5) obtained to compare with the microradiographic images showed irregularly arranged ill-differentiated toothlike structures, corresponding to the microradiographic images. In the central region of the specimen, enamel

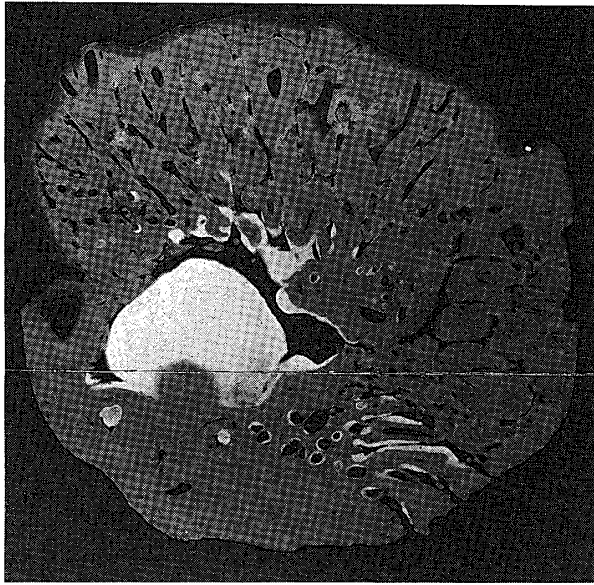


Fig. 3 Low magnification ( $\times 10$ ) microradiograph obtained from the ground section.

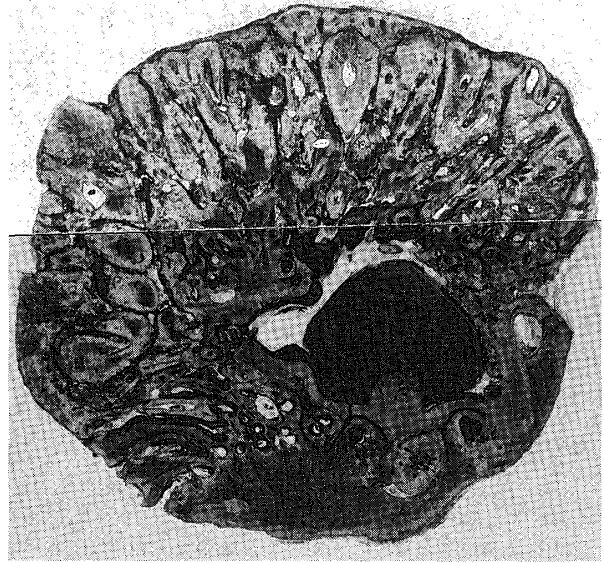


Fig. 5 Low magnification ( $\times 10$ ) microscopic image obtained from the ground section used for microradiography.

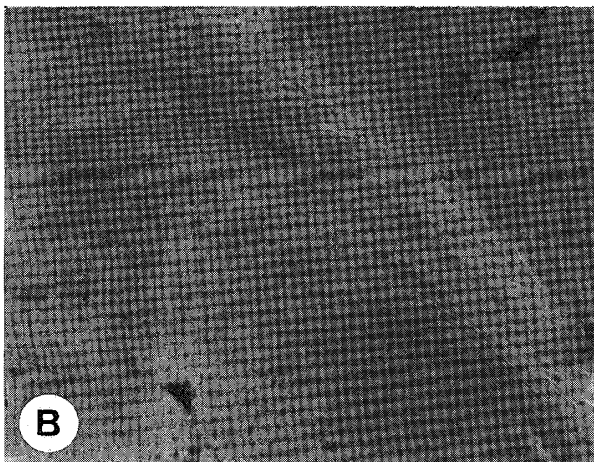
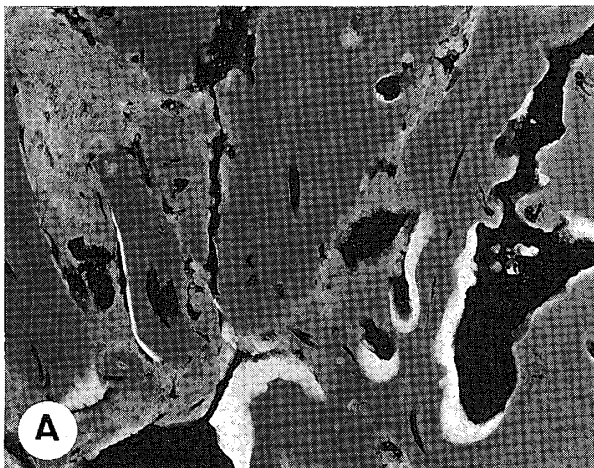


Fig. 4 High magnification ( $\times 40$ ) microradiograph obtained from the peripheral region of the section (A) and that ( $\times 100$ ) obtained from the dentin in the central area of the lesion (B).



Fig. 6 High magnification ( $\times 40$ ) microscopic images obtained from the peripheral region of the section (A) and the dentin in the central area of the lesion (B).

was clearly stained by hematoxylin and eosin. The high ( $\times 40$ ) magnification microscopic images (Fig. 6-A, B) demonstrated clear structural differences, and even the finest dentinal tubules were distinguishable.

These results show that microradiography is useful in making a differential and definite diagnosis of the two types of odontoma, and that the resolution of the microradiographs is not inferior to that of the microscopic images.

### Discussion

The differences between compound and complex odontomas have been described in detail<sup>1-5</sup>. Generally, a diagnosis is reached by comparing the degree of morphodifferentiation and histodifferentiation of the dental hard tissue. In typical compound odontomas, comparatively large well-organized malformed teeth or toothlike structures are seen in a cyst-like radiolucent lesion<sup>4-6</sup>. The complex odontomas consist of less well-organized dental tissue and seldom show teeth or toothlike structures<sup>4-6</sup>, further they generally have an irregularly shaped oval radiopacity surrounded by a well-defined thin radiolucent zone. The typical appearance of the two kinds of odontoma make discrimination simple<sup>6</sup>. However, with compound odontomas where extremely small, conglomerated malformed teeth or toothlike structures are numerous, radiographic images are very similar to those of complex odontomas. In such cases, differentiation between the two types is often difficult because of poor resolution of conventional radiographs. To establish a definite diagnosis or to differentiate between the two, other procedures, usually histological examinations, must be employed<sup>1,2,7,8</sup>. However, even a histological examination may not always be able to differentiate between the two and provide a definite diagnosis. The odontoma examined here is one such case where the degree of morphodifferentiation and histodifferentiation are not uniform throughout.

Microradiography would seem to offer a useful procedure to differentiate between the two types of odontoma. The most significant advantage of microradiography is to make histological structures visible as radiolucent and/or radiopaque images. In the present study, histological differences were clearly demonstrated by microradiography as well as by histological methods. The resolution of the microradiographic images is almost equal to that of the histological images. The Low ( $\times 10$ ) and high ( $\times 40$  and  $\times 100$ ) magnification microradiographs in the present study showed the structural differences as clearly as the histological images. The results show microradiography to be a useful procedure to differentiate between the two types of odontomas, and to establish a definite diagnoses of odontomas.

### Conclusion

The present study showed that the resolution of microradiographs is not inferior to that of histological images. It further showed that in addition to histological procedures microradiography is a useful radiological procedures which can be applied to differentiate and establish

a definite diagnoses of odontomas.

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